

# Media Use and Metabolic Syndrome and its Components in **Europeans Children and Adolescents**

### **Results from the I.Family Study**

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# **2020 ABSTRACT BOOK**







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#### Note about the content of the abstract book

The organizing and abstract review committees have not made any edits to the content of the abstract. The abstracts are, therefore, presented as they were submitted by the authors.





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The ISBNPA 2020 Abstracts Committee wish to acknowledge the abstract reviewers for the ISBNPA 2020 Annual Meeting. Their expertise is central to the quality of communications of the meeting. Thank you for your invaluable contribution to the ISBNPA.

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# Symposia





# S.1.01 Improving infant and toddler nutrition in low-income communities to reduce inequity

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# Satisfaction of California WIC participants with proposed WIC food package recommendations

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Children and families (SIG)

Purpose: In 2017, the National Academies of Science, Engineering and Medicine (NASEM) released comprehensive recommendations for updates to the foods provided by the U.S. Special Supplemental Nutrition Program for Women, Infants and Children (WIC). These recommendations included providing supplemental amounts of most food groups, providing at least 50 percent of most priority nutrients, aligning with the 2015-2020 Dietary Guidelines for Americans, and enhancing responsiveness to cultural needs. The purpose of this study was to assess WIC participant satisfaction with the proposed NASEM WIC food package recommendations and to compare satisfaction by language preference (Spanish vs. English).

Methods: The study was a cross-sectional examination of 2,993 California, U.S. WIC participants' satisfaction with the program. Interviewer-administered telephone surveys were conducted between January and May 2019 with WIC participants who had children between the ages of 1 to 4 years. Comparisons by language preference were conducted using Chi-square or ANOVA tests.

Results: The most common change requested by WIC participants related to fruits and vegetables. While many (69.6%) thought the amount of juice offered was just right, most participants (91.0%) wanted to substitute more fruit and vegetables in place of juice. Further, many (56.1%) wanted an increase in the cash value amount offered of \$9/month. More English speakers (62.8%) wanted an increase in the cash value compared to Spanish speakers (43.2%), P<0.0001. Most participants were satisfied with the amount of beans (78.4%), peanut butter (78.7%), and milk (88.3%) offered by WIC. Differences were seen by language with more English speakers being dissatisfied in amounts of yogurt and peanut butter offered (P=0.005, P<0.0001, respectively). Spanish speakers were more dissatisfied with the amount of beans offered (P<0.0001).

Conclusions: This research suggests that many WIC participants are supportive of proposed NASEM policy changes to the WIC food package, including increasing the amount of the cash value for fruit and vegetables. Differences by language preference suggest the need for greater flexibility in the WIC food packages.





# Contribution of WIC-eligible foods to the overall diet of 13 and 24 month toddlers in the U.S. WIC Infant and Toddler Feeding Practices Study-2

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Children and families (SIG)

Purpose: The U.S. Special Supplemental Nutrition Program for Women, Infants and Children (WIC) provides supplemental foods to assist low-income participants meet their dietary needs. Few studies have described the extent to which WIC-eligible foods contribute to the overall diet of children. The purpose of this study is to examine commonly consumed foods and estimate the proportion of dietary intake contributed by WIC-eligible foods among 13- and 24-month-old children; and to assess differences by WIC participation status at 24-months.

Methods: A national observational study of children participating in the WIC Infant and Toddler Feeding Practices Study-2 were included [13-month old (n=2,777) and 24-month old (n=2,450)] from 2013-2016. Dietary intakes were assessed using 24-hour dietary recalls at 13 and 24 months. The ten most commonly consumed foods were described using the What We Eat in America food category classification system. WIC-eligible foods were defined as meeting the WIC nutrient criteria set forth in WIC Federal regulation. The proportion of WIC-eligible foods to total daily intake was calculated for energy, macronutrients, and select micronutrients. Multiple linear regression, adjusted for confounders, was conducted to compare the estimated proportion of nutrient intake from WIC-eligible foods by WIC participation at 24 months.

Results: At 13 and 24 months, most (60% and 63%, respectively) of the commonly consumed foods were eligible for purchase as part of the child WIC food package. WIC-eligible foods provided over 40% of calories and close to 50% or more of other nutrients, and the contribution of WIC-eligible foods to overall micronutrient intake increased between 13 and 24 months. Children who remained on WIC at 24 months obtained a larger proportion of calories and most other nutrients from WIC-eligible foods than children no longer on WIC.

Conclusions: WIC-eligible foods contribute substantively to the overall diet of toddlers and appear to contribute nutritional benefits to the children who remain on the program longer.





# Social, cultural and economic determinants of infant feeding practices: Findings from the Growing Up in New Zealand cohort study

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### Children and families (SIG)

Purpose: Indequate infant feeding practices are known to impact on a child's lifetime health trajectory. However, few longitudinal studies have investigated the determinants of overall feeding practices during the first year of life. We created an infant feeding index (IFI) to measure overall adherence to national infant feeding guidelines and examined associations with maternal sociodemographic and health behaviour characteristics.

Methods: Data were from 6,435 infants born in 2009-10, whose mothers participated in the 9-month face-to-face interview. Based on the Ministry of Health's Food and Nutrition Guidelines (2008), the IFI included 12 indicators covering breastfeeding, introduction to complementary foods, and food/drinks intake at 9-months assessed with a food frequency questionnaire (score range 0-12). Associations of child and mother characteristics with IFI scores were examined using multivariable linear regression models (p<0.05), adjusted for maternal antenatal age, ethnicity, deprivation, diet, smoking, physical activity and pre-pregnancy BMI.

Results: Individual indicators with lowest adherence were exclusive breastfeeding to 6-months (32.8%), any breastfeeding to 12-months (36.3%), vegetables 2xdaily (32.8%) and fruit 2xdaily at 9-months (37.0%). The mean IFI score was 8.2 (SD: 2.1). In the fully adjusted model, compared to reference groups, infants of mothers aged under 20 years ( $\beta$ 1.39, 95%CI:1.66-1.11), with no secondary school qualification ( $\beta$ 1.19, 95%CI:1.45-0.93), who smoked before and during pregnancy ( $\beta$ 1.03, 95%CI:1.22-0.84), or lived in a deprived neighbourhood ( $\beta$  0.91, 95%CI:1.08-0.74) scored lower on the IFI. Compared to European infants, Māori, Pacific and Asian infants scored on average 0.62 ( $\beta$ , 95%CI:0.80-0.44); 0.89 ( $\beta$ , 95%CI:0.07-0.71), 0.46 ( $\beta$ , 95%CI:0.63-0.29) adjusted points lower on the IFI, respectively.

Conclusions: This study highlights the impact maternal education, neighbourhood deprivation and ethnicity have on infant feeding practices in New Zealand. Culturally appropriate policies are needed that specifically address infant nutrition inequities (particularly, to support breastfeeding, introduction of complementary foods, and increased fruit and vegetable intake). Additionally, policies that support women to be well educated and smokefree may help to improve infant nutrition





# S.1.02 Novel accelerometer data processing methods for quantifying movement behaviors in free living environments

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# Activity classification models for children: how well do lab-developed models generalise to free-living conditions?

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Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Classification of activity behaviours using raw accelerometer data is becoming more prominent. Almost all activity classification algorithms are developed using data collected in controlled laboratory environments which may not be generalisable to free-living settings. This study examined how machine learning models trained on laboratory data performed in free-living settings, and how the accuracy changed when the models were retrained with additional free-living data.

Methods: In a lab setting 40 children (19 males, aged  $10.1 \pm 1.7$  years) were equipped with two Axivity AX3 accelerometers worn on their thigh and lower back. They performed a series of activities (e.g., sitting, standing, walking, running, lying) that were captured by video camera (criterion measure). Fifteen new children (10 male, aged  $10.0 \pm 2.6$ ) wore the same two accelerometers and a small wearable video camera that captured their free-living movement behaviours.

Using the lab dataset, a random forest was trained to classify each activity using several features of the accelerometer data (e.g. axis means). After this model was evaluated in the lab setting, it was used to predict activity type in the free-living dataset. As a last step, the model was retrained with both the lab and free-living data together, and the accuracy was estimated using leave-one-subject-out-cross validation.

Results: The accuracy of the lab-trained model was 97.8% (95% CI: 97.6–98), kappa  $\kappa$  = 0.98. This dropped to 92% (91.6–92.5),  $\kappa$  = 0.88, when applied to the free-living data. Retraining the model with additional free-living data improved the free-living accuracy to 97.2% (97–97.4),  $\kappa$  = 0.96.

Conclusions: Activity classification models developed in a laboratory setting showed a ~6% reduction in accuracy (10% reduction in  $\kappa$ ) when applied in a free living setting. Accuracy improved when models were retrained with additional free-living data. Future studies should include free-living data when developing classification models to ensure their generalisability.





# Can free-living activity classification models developed in healthy adults be used in a dialysis patient population?

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### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Machine learned (ML) models developed to classify activity behaviours from raw accelerometer data in free-living were shown to be accurate (82.7%, kappa  $\kappa$ =0.74) and demonstrated epidemiological utility in over 90,000 UK Biobank participants. However, it is unknown how well these ML models generalise to inactive diseased populations. We therefore examined if ML models trained on free-living data from healthy adults could be used in a dialysis patient population.

Methods: 153 healthy UK adults were asked to wear an Axivity AX3 accelerometer on the dominant wrist for 24 hours and a Vicon Autographer wearable camera to capture their free-living movement behaviours. In a separate study, 25 adults with end-stage kidney disease on maintenance dialysis were asked to undergo the same accelerometer and wearable camera protocol. Camera data was labelled by trained annotators into four classes: sedentary behaviour, light tasks, moderate activity, and walking.

Random Forest models were trained to classify activity type from 132 time and frequency domain features for each 30 second epoch, with a Hidden Markov model used to smooth predictions. The models developed in healthy adults were then applied to data from dialysis patients. Models were then retrained using dialysis patients' data only. Finally, models were retrained with a mix of healthy and dialysis patient data together.

Results: When the model trained in healthy adults was applied to dialysis patients, accuracy was 74.3% ( $\kappa$ =0.16). When trained in dialysis patients only, models achieved accuracy of 72.5% ( $\kappa$ =0.19). When trained in healthy adults and dialysis patients, models achieved accuracy of 74.4% ( $\kappa$ =0.15) on dialysis patients only.

Conclusions: Activity classification models developed in a healthy population achieved substantially lower accuracy and kappa statistics when applied to a highly inactive dialysis population. While retraining with data from dialysis patients improved the kappa statistics, classification performance remained much lower than in the healthy population. Future studies should be aware of population-specific challenges in machine-learned activity classification, and where possible collect relevant training and validation data in the disease populations of interest.





# Evaluation and comparison of laboratory-based and free-living activity recognition models for preschool-aged children under free-living conditions

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### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Machine learning activity recognition models provide researchers with alternative activity metrics in addition to intensity. However, existing algorithms for preschool children have been trained on data from laboratory-based activity trials and their performance has not been investigated under free-living conditions.

Purpose: To evaluate the accuracy of laboratory trained hip and wrist Random Forest (RF) classifiers for automatic recognition of five activity classes: sedentary, light household activities and games, moderate-to-vigorous sports and games, walking, and running in preschool children under free-living conditions. In addition, the performance of the laboratory trained models was benchmarked against models trained on free-living data.

Methods: 31 children  $(4.0 \pm 0.9 \text{ yrs})$  were video recorded using a GoPro during a 20-minute unstructured active play session. Participants wore an ActiGraph GT3X+ on their right hip and non-dominant wrist. A bespoke two-stage direct observation scheme was used to continuously code ground truth activity class, and to identify which movement behaviours contributed to misclassification errors, the specific activity types occurring within each class. Twenty-one of the children were randomly selected to train free-living RF classifiers for the hip and wrist. Performance of the laboratory and free-living classifiers was subsequently assessed in the hold-out ten children by calculating overall recognition accuracy, kappa statistics, and generating confusion matrices summarising class level accuracy.

Results: Accuracy for the hip and wrist laboratory trained RF classifiers was 67.5% ( $\kappa = 0.42$ ) and 56.9% ( $\kappa = 0.32$ ) respectively. In comparison, accuracy for the free-living trained hip and wrist RF classifiers was 83.1% ( $\kappa = 0.70$ ) and 79.7% ( $\kappa = 0.64$ ), respectively. The free-living RF classifiers provided substantial improvement for classification of sedentary (5.6% - 11.3%), light household activities and games (10.2% - 26.7%), walking (43.5% - 65.0%) and running (16.6% - 22.2%).

Conclusions: Laboratory trained activity recognition models for preschool aged children do not perform well when implemented in new data collected under true free-living conditions. In contrast, classifiers trained on free living data perform well. These findings support the view that machine learning activity recognition models be trained under free-living conditions.





# S.1.03 People-centred food policy research: Towards a more impactful and coordinated approach to exploring lived experience of local food environments

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# Understanding the lived food environment to generate urban policy recommendations: The Heart Healthy Hoods study in Madrid

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Policies and environments (SIG)

#### Purpose

1) Identify, using Photovoice, community perceptions of urban factors associated with dietary behaviors.

2) Generate community-driven policy recommendations to improve the food environment.

Methods Madrid residents from two low-income neighborhoods engaged in collecting, analyzing, and disseminating their results in this Heart Healthy Hoods (HHH) Photovoice project. In a first phase, 24 residents engaged in a Photovoice project where they took photographs on their local food environment. These photographs served as prompts to elicit their health concerns and be-liefs regarding food environment determinants of dietary behaviors. In a second phase, residents translated their results into more concrete recommendations to improve their local food environment. Finally, we organized a nominal group session including participants, researchers, public health practitioners and local policymakers to discuss and prioritize the previouosly proposed policy recommendations.

Results Participants took 163 photographs nd selected 31 as the ones best reflecting their local food environment. They identified 30 categories, which emerged from

these photographs and their corresponding narratives. Out of these, they generated a set of 12 policy recommendations related to their food environment. Some related to the political (e.g., regulation of street vending) and the economic environment (e.g., the cost of gluten-free foods). Regarding the physical environment, they suggested increasing the availability of organic foods in the neighborhood while restricting the availability of unhealthy products within vending machines in their worksites. In relation to the sociocultural environment, participants discussed the social meaning of grocery shopping, stating the need to support local small retailers and public markets. Madrid photovoice team also offered trainings and helped conducting lived food environment projects in Baltimore and Bilbao. Lived food environment research conducted in Madrid, also included qualitative approaches in combination with geospatial and mapping analyses.

Conclusions Residents' direct experiences in combination with other stakeholders' views as researchers, public health professionals and local policymakers, contributed adapting nutrition related diseases prevention approaches to real-world local needs. Since nutrition related diseases as diabetes and obesity do affect disproportionally vulnerable populations, interventions that include community engagement and build local capacity are key to address urban health disparities.





# The social and physical environment as drivers of dietary behaviours in a low income urban setting: A participatory photovoice project in Nairobi City, Kenya

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### Policies and environments (SIG)

Purpose Kenya is experiencing rapid urbanisation leading to changes in food environments, which are associated with changing diets and related non-communicable diseases (NCDs). The aim of our study was to identify which drivers in these social and physical food environments influence dietary behaviours among urban dwellers in Nairobi.

Methods We used participatory photography (Photo voice), with men/women (n=48) aged  $\geq$ 13 years living in a low income neighbourhood in Nairobi. Participants took photographs representing: places where they eat; things that make eating healthy difficult/easy; and a person/things that influence what they eat. Participants told the 'stories' of their photographs during in-depth interviews. NVivo was used for thematic analysis drawing on principles of socio-ecological theory.

Results The photographs and interviews with the participants revealed that poor hygiene, environmental sanitation, food contamination and adulteration were key concerns regarding foods sold in the neighbourhood. While quality and food preparation methods were major considerations in decisions on food purchase and consumption, money was a major barrier to accessing good quality healthy foods. In the home environment, urban farming supplemented household food needs. Within the social food environment, family and food vendors were key influencers of dietary behaviours. Preferences of children, spouses and parents were important drivers of food purchases/consumption. Food vendors' hospitality and services including credit, packaging and subsidized prices also influenced dietary behaviours.

Conclusions The findings highlight the continuing challenges of poor food hygiene and food safety alongside unhealthy diets associated with NCDs in urban areas. Enforceable food safety legislation is essential in lowering this risk. Urban farming could be promoted to address financial barriers that influence access to healthy diets. Impact on policy/ actions

Our findings strengthened the evidence on urban farming as a source of affordable, healthier foods which has consequently been incorporated into the National Healthy Diets and Physical Activity Resource/Training Manual. The Nairobi County Government has committed to consider i) food hygiene and safety and ii) food vendors as a driver of dietary behaviours, in the ongoing development of the five year county nutrition action plan (CNAP).





# You can't find healthy food in the bush: Lived experience of poor accessibility, availability and adequacy of food in rural Australia

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### Policies and environments (SIG)

Purpose Within Australia, major inequities exist between rural, regional and metropolitan areas including chronic disease risk profiles, access to healthcare and to a fresh, healthy, affordable food supply. We explored living in the food environment of a 7000 square kilometre municipality in rural Australia. Four elements were investigated: whole of community food supply audit; comparative pricing study; a multi-factor evaluation of health promoting food outlets; and an exploration of the impact of life in a largely unhealthy rural food environment.

Methods Multiple validated methods were used to understand the food environment and this lived experience. The Nutrition Environment Measurement (NEMS) tools for stores and restaurants were used to determine food availability. The Australian Standardised Affordability Pricing (ASAP) tool assessed food affordability and comparative pricing. Understanding local food environments utilised complexity and co-design principles informed by community-based systems dynamics. Community readiness to change interviews along with ethnographic research provided insight into the lived experience of local food environments and impacts on individuals and families.

Results The availability of healthy food was very limited and the quality of fresh food was highly variable. Healthier choices, such as wholegrain versus white bread, were usually more expensive. Cross-cutting themes from these multiple methods emerged: community members voiced a demand for healthier foods, suppliers voiced reluctance to supply healthier foods due to concern with falling profit margins and product waste. Separately rural businesses supported each other, for example a supermarket did not supply meat to ensure a viable local butcher. With support of key leaders and co-design principles, catering policies were introduced across local government, health services and agreements with local food retailers to trial healthier options and reduce portion sizes. The creation of a health promoting café inside the health service contributed to a 'therapeutic landscape' that showcased healthy environments. This research further highlighted rural policy inequities.

Conclusion This lived experience of limited choice, higher prices, and poorer quality produce requires stronger policies to underpin change. The loyalty observed for locally owned food outlets provide great opportunities to secure healthier food supply to improve the health of rural communities.





# S.1.04 Beyond the Child Feeding Questionnaire: Recognizing the impact of Leann Birch (1946 - 2019) on food parenting research

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# Development of the Educator Feeding Survey and impact of food insecurity on feeding style outcomes of early childhood educators

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Early care and education (SIG)

Purpose: Early childhood educators' (ECEs') dietary and feeding behaviors have the potential to influence children's health outcomes. To date, there have been limited efforts to validate instruments to measure ECE feeding practices or examine how food insecurity (FI) may affect those practices. This study sought to (a) gather data on the properties and performance of the Child Feeding Questionnaire (CFQ) and Child Feeding Style Questionnaire (CFSQ) in ECEs (b) document rates of ECE Current and Childhood FI in the largest sample to date, and (c) examine relations between ECE FI and feeding practices.

Methods: The combination and modification of the CFQ and CFSQ for ECEs is termed the Educator Feeding Survey (EFS). Between 2015-2017, 634 EFSs were completed in two southern states in the US. Subsequently, seven subscales paralleling the CFQ and two subscales paralleling the CFSQ were assessed. Additionally, ECEs were categorized in four feeding style categories (Authoritarian, Authoritative, Indulgent, and Uninvolved). The FI measure was based on the USDA's Household Food Security Survey Module; current FI and memories of Childhood FI were assessed.

Results: Educators were African American (55%), White (43%), Hispanic (19.8%), or other (2%). EFS mean patterns, ranges, and internal consistency values were consistent with those observed in CFQ/CFSQ samples. Consistent with the CFSQ sample, the majority of ECEs were Authoritarian (35.6%), followed by Indulgent (29.2%), Authoritative (17.9%), and Uninvolved (17.3%). T-tests indicated that ECEs who were Current FI were significantly different from ECEs who were Current FS on scales of perceived responsibility, concern about child weight, restriction, pressure to eat, monitoring, demandingness, and responsiveness (all p>.01). Chi-square tests found that Current FI was associated with a greater occurrence of Authoritarian and less of Indulgent feeding styles; Childhood FI exhibited greater levels of Authoritarian and lesser Uninvolved feeding styles (all p<.001).

Conclusions: Analyses support the use of the EFS for measuring important elements of ECE feeding practices. Additionally, results demonstrate association between FI on ECEs' feeding practices. These results can inform the way classroom-based nutrition programs are developed and how ECEs are supported to lead them.





# The Feeding Practices and Structure Questionnaire: Development and validation of age appropriate versions for infants and toddlers

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### Children and families (SIG)

Purpose: A large range of questionnaires are available to assess parental feeding practices. Most have been developed for children aged two years and older. To measure and better understand trajectories of feeding and their relationship with child eating behaviours and weight in the long term, early assessments are desirable. While questionnaires also exist to measure feeding practices of parents with infants, no questionnaire is available that allows tracking of feeding practices from infancy to later childhood. This study aimed to develop a version of the Feeding Practices and Structure Questionnaire (FPSQ) for parents with infants and toddlers.

Methods: Constructs and items for the FPSQ for infants and toddlers were derived from the existing and validated FPSQ for older children and supplemented by a literature review on infant feeding questionnaires. Following expert review, two questionnaire versions were developed, one for milk feeding and one for (semi-)solid feeding parents. Data from two studies were combined (child ages 0-24 months) to test the derived constructs with Confirmatory Factor Analysis for the milk (N=731) and solid feeding (N=611) version.

Results: The milk feeding version consisting of four factors (20 items) showed acceptable model fit and good internal reliability: 'feeding on demand vs. feeding routine' (Cronbach's  $\alpha$ = 0.87), 'using food to calm' ( $\alpha$ = 0.86), 'persuasive feeding' ( $\alpha$ = 0.71), 'parent-focused feeding' ( $\alpha$ = 0.79). The same four factors showed acceptable model fit for the solid feeding version, likewise with good reliability ( $\alpha$ = 0.74, 0.86, 0.85, 0.84 respectively). Two additional factors (19 items) were created for the solid feeding version that only appeared developmentally appropriate for children aged 12 months or older: 'family meal environment' ( $\alpha$ = 0.81) and 'using (non-)food rewards' ( $\alpha$ = 0.92). The majority of factor-factor correlations were in line with those of the original FPSQ.

Conclusions: The FPSQ milk and solid feeding versions are the first measures specifically developed as precursors to the FPSQ to measure parental feeding practices in children <2 years, particularly those related to responsiveness and structure. Further validation in more diverse samples is required.





# Are parent feeding practices trait-like or state-Like?: Examining variability in parent feeding practices within a diverse population using ecological momentary assessment

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Children and families (SIG)

Purpose: Current measures of parent feeding practices are typically survey-based and assessed as static/unchanging characteristics, failing to account for fluctuations in these behaviors across time and context. The current study uses ecological momentary assessment (EMA) to examine variability in, and predictors of, parent feeding practices within a low-income and diverse sample.

Methods: Children ages 5-7 years old and their parents (n=150 dyads) from six racial/ethnic groups (n=25 from each; African American, Hispanic, Hmong, Native American, Somali, White) were recruited for this mixed-methods study through primary care clinics. Parent feeding practices were measured using the Child Feeding Questionnaire, which was adapted to be used with EMA. Random effect logit models for panel data were applied to examine how categorical predictor variables were statistically related to dichotomous outcome variables. Pairwise comparisons were performed to describe statistical differences between levels of the predictor variables.

Results: Among parents who used restriction (49%) and pressure-to-eat (69%) feeding practices, these feeding practices were utilized about every other day. Contextual factors at the meal associated with parent feeding practices included: number of people at the meal, who prepared the meal, types of food served at meals (e.g., pre-prepared, homemade, fast food), meal setting (e.g., kitchen table, front room), and meal emotional atmosphere (p<0.05). Parents tended to restrict desserts and dairy and pressure children to eat fruits, vegetables, meat proteins, and refined grains (p<0.05). There were some significant differences by race/ethnicity across findings (p<0.01), with Hmong parents engaging in the highest levels of pressure-to-eat feeding practices.

Conclusions: Parent feeding practices varied across the week, indicating they are more likely to be context-specific, or state-like, than trait-like. There were some meal characteristics more strongly associated with engaging in restriction and pressure-to-eat feeding practices. Given that parent feeding practices appear to be state-like, future interventions and health care providers who work with parents and children may want to address contextual factors associated with parent feeding practices.





# S.1.05 International insights and solutions for the relationship between food literacy and food security

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# Associations between household food insecurity and barriers to vegetable utilization in low-income families

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Socio-economic inequalities (SIG)

Purpose: Assuming nutritious foods are available and accessible within a household, additional barriers linked with the transformation or utilization of food into meals including planning, management, selection of foods, preparation and cooking skills may impact dietary intake in food insecure (FI) households. This study examined the association between household food insecurity and barriers to vegetable utilization in low-income families.

Methods: This was a cross-sectional baseline study that analyzed self-reported data from the parents of children in TX Sprouts, a cluster-randomized school-based gardening, cooking, and nutrition intervention. Cooking attitudes and self-efficacy were self-reported by parents via validated questionnaires. Household food insecurity was assessed using the 18-item Household Food Security Survey Module. Binomial logistic regressions were used to investigate perceived barriers to the utilization of vegetables within the household.

Results: Data were available on 1891 parents and included the following demographics: 87% female, 63% Hispanic, and 27% reported household food insecurity. Not having time for preparation was associated with two-fold greater odds of having household food insecurity (p<0.001). Parents who reported the barriers of vegetables being hard to use before spoiling, not knowing simple, easy recipes, and not having assistance in cooking from other family members also had 1.6, 1.9 and 1.9 greater odds of food insecurity (p<0.001), respectively, compared to parents not reporting experiencing that barrier. The barriers of family members not liking vegetables and not knowing how to prepare vegetables were not associated with greater odds of being food insecure.

Conclusions: In addition to improvements in psychosocial behaviors, skill development as part of multi-context or multi-level public health interventions is needed to overcome barriers to utilization of foods to improve diet quality in food insecure households.





# Is food insecurity associated with food skills among grade five boys and girls?

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### Children and families (SIG)

Purpose: To examine the associations between food insecurity and children's involvement in family meal choices and food preparation, used as indicators for children's food skills, among school-aged boys and girls.

Methods: Data from the Children's Lifestyle and School Performance Study (CLASS) were used for this study. CLASS was a population-based survey conducted in 2011 among children in grade five (10-11 years old) in Nova Scotia, Canada. A total of 5,244 children participated. Household food insecurity status was assessed using the 6-item Household Food Security Survey Module (food secure: score 0; food insecure: score 1-6). Children's involvement in family meal choices and food preparation were assessed by (i) asking children how often they helped make family meal choices; and (ii) how often they helped prepare or cook food at home. Mixed-effects multinomial logistic regression models were conducted using Stata/IC 14.

Results: One in four children (24%) lived in a food insecure household.Most children reported being involved in family meal choices (74%) or food preparation (68%) at least weekly, while one in ten (11%) children reported never doing either activity. Overall, boys were less likely to be involved in family meal choices and food preparation than girls. Girls from food insecure households were 33% less likely to help choose family meals once a week than girls from food secure households, although household food insecurity status was not associated with girls' involvement in food preparation. There were no differences in boys' involvement in family meal choices according to household food insecurity status; however, the likelihood of boys assisting with food preparation/cooking four times per week was 65% higher among boys from food insecure households compared with boys from food secure households.

Conclusions: Thesefindings suggest that interventions aiming to address food insecurity by enhancing children's food skills are unlikely to be effective. Among adults in Canada, food preparation and cooking skills are not associated with food insecurity. Likewise, children in CLASS who lived in food insecure households had similar or better involvement in home food preparation than those living in food secure households.





# Food Community: Assessing the potential of community and government initiatives to enhance food security

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### Socio-economic inequalities (SIG)

Purpose: To understand how a novel Systemic Innovation Lab methodology can be used to assess initiatives' capacity to enhance community-level food security.

Methods: This pilot project took place in the South West region of Western Australia. The Systemic Innovation Lab methodology used included a six-stage process: Form, Explore, Map, Learn, Address and Share. A core team and reference group oversaw the project and a launch was held to engage government and community stakeholders (Form stage). Interviews with directors, volunteers, staff and business owners of 52 included initiatives (i.e. food literacy programs) enabled the team to determine possession of 36 desirable characteristics for enhancing complex issues like food security (Explore stage). These characteristics were outlined by the organisation Wicked Lab and reflected existing literature. Characteristics were embedded within nine Focus Areas, relating to supporting communities to move to a new way of working and supporting governments to explore and reuse community initiatives and the Focus Area characteristics they possessed. The online mapping tool was used to identify "windows of opportunity" across Focus Areas; initiatives could be supported to enhance their way of working. An action-planning workshop co-designed strategies to address windows of opportunity to facilitate initiative functioning.

Results: Many initiatives possessed qualities facilitating change towards more effective ways of working, such as through e-newsletters. Few initiatives possessed characteristics that supported a shared understanding of their common goal or used role models. Significant gaps existed in the connection between community and government, particularly in the utilisation of community knowledge.

Conclusions: Significant change is required to ensure greater collaboration between community and government food security initiatives. Governments should create the enabling conditions for community-based food security initiatives to thrive. Project participants were encouraged to utilise common language/branding and involve community and government in project governance to ensure the utilisation of community innovation and knowledge. Participants were referred to a free advocacy course and will be supported through a new "Food Community" website/app currently being developed.





# S.1.06 Patient and health care professional perceptions of physical activity and dietary support across the cancer care continuum

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# Perceptions on the acceptability of a tailored exercise and nutritional intervention for patients with ovarian cancer undergoing chemotherapy

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Cancer prevention and management (SIG)

#### Purpose:

The multicenter randomized controlled Physical Activity and Dietary intervention in OVArian cancer (PADOVA) trial assesses the effectiveness of a combined supervised moderate-to-high intensity exercise and nutritional intervention during chemotherapy. In addition, an extensive process evaluation is conducted to gain insight into how and why this intervention is (in)effective. The purpose of this presentation is to describe the results of semi-structured interviews that were conducted as part of this process evaluation to assessboth intervention participants' and implementers' perceptions on the acceptability of the intervention.

### Methods:

Semi-structured interviews are conducted among both intervention participants (i.e., 122 adult women with primary epithelial ovarian cancer who are scheduled to undergo first-line (neo)adjuvant chemotherapy) and implementers (i.e., oncology physical therapists and dieticians). The first 25% of participants and 18 intervention implementers (n=6 dieticians; n=12 physical therapists) are invited for semi-structured interviews conducted by a researcher. Interviews are transcribed verbatim, and data analysis is performed concurrently with data collection. Thematic analysis is conducted following the 6 steps by Braun & Clarke (2006), using Atlas.ti version 8.4.

### Results:

Physical therapists reported that participants were able to adhere to the exercise protocol better than expected, although they did report the exercise protocol was not achievable for some participants because of physical complaints (e.g., knee complaints). Dieticians were generally satisfied with the dietary intervention protocol, although they stated that the protein intake goal was not always achievable. They suggested to adapt the number of dietary sessions to individual needs and preferences. Participants indicated that the intervention contributed to their recovery, and that they were surprised to experience their body to be stronger than expected. Reasons for not being able to adhere to the intervention were being too sick or too tired. Participants suggested the dietary intervention could be improved by offering face-to-face dietary counselling closer to home.

### Conclusions:

These findings could be helpful in raising awareness about the acceptability and beneficial effects of participation in a combined tailored physical activity and dietary intervention in ovarian cancer patients undergoing chemotherapy.





# Bridging the gap between attitudes and action: Opportunities for supporting exercise counselling and referral to patients by the cancer care workforce

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### Cancer prevention and management (SIG)

Background: The majority of the cancer care workforce have favourable attitudes and opinions of exercise for cancer patients, and report that exercise is safe and beneficial, nevertheless, insufficient time and uncertainty of what to recommend are reported as common barriers to discussing and/or counselling their patients about exercise. The limited research about cancer care clinician's communication with their patients about exercise suggests that a timely discussion about regular exercise can be reassuring, informative and motivational for patients. The purpose of this research was to explore the perceived barriers and facilitators impacting on the cancer care workforce's capacity to implement exercise counselling and an exercise referral pathway for their patients.

Methods: A series of focus groups (N=7) were conducted with cancer care clinicians and practitioners (n=62) (i.e., oncologists, haematologists 22pecializing in cancer, oncology nurses, physiotherapists, exercise physiologists, social workers and psychologists) working with cancer patients throughout Sydney, Australia. The focus group interviews were audio-recorded, transcribed, and analysed using thematic content analysis.

Results: Two overarching themes, and associated subthemes, emerged from the data: 1) Factors impacting the knowledge-to-action gap, highlights the challenges and barriers clinicians and practitioners face in implementing exercise counselling and a referral pathway, inclusive of the funding structure; current referral process (i.e., only available via general practitioner/Medicare); lack of exercise specific knowledge and education to confidently advice/counsel patients; limited access and opportunity for professional development/training specific to exercise for cancer care, and 2) Recommendations for a consistent and efficient way forward, describes an action-orientated exercise counselling and referral pathway approach, inclusive of an oncologist-initiated brief communication exchange; distribution of a variety of cancer-specific, tailored exercise resources for patients (e.g., videos, online, hard copy); access to exercise physiologists with cancer care expertise; initial exercise consultation prompted by exercise physiologist.

Conclusions: This study has identified important factors influencing exercise counselling and referral by the cancer care workforce, and has presented potential approaches for incorporating exercise into usual cancer care. Future testing is required to determine feasibility and practicality of these approaches.





# Yoga, Aerobic walking and Stretching-Toning for cancer survivors: Participant experiences from a 12-week group exercise intervention (STAY Fit Trial)

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### Cancer prevention and management (SIG)

Background: Across the cancer continuum, the importance and health benefits of exercise for cancer survivors are well documented. Health organizations recommend cancer survivors engage in up to 150 minutes/week of exercise however little is known about cancer survivors' experiences with and preferences for exercise programs. Purpose: The STAY Fit Trial is a three-armed randomized controlled trial comparing the effects of a 12-week yoga, walking stretching-toning exercises cognitive function aerobic and on among adult cancer survivors. This abstract presents participant experiences and preliminary data evaluating the feasibility of a group exercise program.

Methods: Sedentary cancer survivors between 30-70 years were invited to participate in the STAY Fit trial. Participants engaged in 150 minutes/week of exercise over 2 or 3 group sessions. After the 12-weeks, participants (N=51, males=5, mean age=54.36  $\pm$ 9.9) completed a program feedback and evaluation to determine perceived benefits of exercise, overall satisfaction and enjoyment with the program, and feedback regarding the suitability of the exercise sessions.

Results: Majority of the participants completed the program feedback and evaluations (42/51). Average attendance ranged between 68-80% and participants reported experiencing a variety of health benefits. These self-reported health benefits included physical outcomes such as improved fitness, flexibility, strength as well as psychological benefits such as improved focus, sleep, body image and reduced pain. On average participants reported being satisfied with the STAY Fit program (4.5/5) and there were no significant differences between the exercise groups. On average participants reported that the dose of exercise was "just right" and neither "too long" or "too short".

Conclusions: The exercise prescription of 150 minutes/week was well tolerated by the study participants. No program related adverse events were reported and participants perceived health benefits over the 12-weeks. Our findings have implications for designing and promoting exercise programs for this population across their lifespan. Exercise adherence can be a challenge for cancer survivors and future studies need to examine barriers to exercise experienced by cancer survivors to maximize adherence and therefore the benefits of exercise.





# S.1.07 Using video resources to support the implementation and scale-up of physical activity interventions

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# Ten meta-analyses to improve your recruitment and implementation using video

<u>Dr. Michael Noetel<sup>1</sup></u>, Dr. Taren Sanders<sup>2</sup>, Prof. David Lubans<sup>3</sup>, Dr. Andrew Bennie<sup>4</sup>, Dr. Myrto Mavildi<sup>3</sup>, Dr. Narelle Eather<sup>3</sup>, Dr. Nicholas Riley<sup>3</sup>, Dr. Jordan Smith<sup>3</sup>, Prof. Chris Lonsdale<sup>2</sup>

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Implementation and scalability (SIG)

#### Purpose

To change behaviour, researchers and practitioners are increasingly using video to recruit for studies and implement interventions. While video production can be both art and science, this presentation aims to outline the science: what top level evidence can researchers use to inform their multimedia design?

#### Method

The first author conducted a rapid review of reviews, searching for meta-analyses of multimedia learning principles. These reviews were qualitatively synthesised, with pooled effect sizes and their moderators as the primary outcomes.

### Results

Video appears to be an excellent media for teaching at scale: the multimedia effect demonstrates moderate effect sizes (d = 0.5) when using both visual and auditory information. This effect is bigger when graphics are used on screen, and words spoken, as opposed to the other way around (modality effect; d = .72). Video works best when key information is presented in the same time and place on screen (spatial and temporal contiguity; d = .7). Videos are more effective at teaching with conversational language (personalization principle; d = .4) with some repetition on screen (redundancy principle; d = .29). They are also more effective when key points are highlighted visually (signalling principle; d = 0.43) and when irrelevant points are omitted (coherence principle; d = 0.3).

#### Conclusions

As video becomes less of a novelty, researchers can direct more attention to crafting videos that motivate their audience and teach them at scale. This presentation will finish with demonstrations including concrete examples of implementing the findings above. I will discuss the implementation of video in projects like 'Internet-based Professional Learning to help teachers support Activity in Youth' (iPLAY), iPLAY for Inclusion (for children with intellectual disability), Thinking While Moving—English, and Internet delivered Teacher professional learning to Enhance student ACHievement (iTEACH). These examples will be used to help researchers implement the concrete strategies in their own practice.





# Using video resources to support the implementation of a physical activity intervention for senior school students: Fidelity, feasibility, and acceptability of the 'Burn 2 Learn' intervention

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Implementation and scalability (SIG)

#### Purpose

The aim of this study was to assess the fidelity, feasibility and acceptability of a teacher-facilitated intervention involving high intensity activity breaks (HIABs) for senior school students.

### Methods

Senior school students (N = 670 participants) and their teachers (N = 45) from 20 schools in New South Wales, Australia were recruited and randomized to the Burn 2 Learn (B2L) intervention or a wait list control group. Teachers allocated to the intervention group were provided with training, resources and support to facilitate the delivery of at least two HIABs/week during lesson-time for two school terms. The integrated professional learning approach included video resources, group discussion, planning and practical activities. Using the video resources, teachers were required to provide a presentation to their school staff focused on the B2L program and cognitive and mental health benefits. They were also required to deliver an interactive student seminar focused on similar content using video resources and distribute two short B2L videos to students' parents using their preferred distribution method. Fidelity was assessed using the SAAFE observation checklist and teacher session logs. Feasibility and acceptability were determined using teacher and student process evaluation questionnaires.

### Results

Based on three SAAFE observations per teacher in the B2L group, intervention fidelity was good and improved over time. On average, teachers reported delivering 1.9 HIABs/week. The majority of teachers (90%) 'Agreed' or 'Strongly agreed' that the video resources were well designed. Similarly, 77% of teachers 'Agreed' or 'Strongly agreed' that the program was easy to implement in their school. The majority of students (65%) rated the video resources as 'Good' or 'Excellent'. A smaller number of students (55%) 'Agreed' or 'Strongly agreed' that the workshop and video resources motivated them to participate. Only 3% of students reported that their parents/care givers watched the B2L videos.

### Conclusions

In general, the intervention was delivered with a high degree of fidelity. The combination of video resources, group discussion and practical activities was well received by teachers and students. However, additional strategies are needed to extend the reach of video resources to parents of senior schools students.





# Training leaders via video to implement physical activity-promoting practices: Lessons learned in America's Heartland

**Professor Richard Rosenkranz<sup>1</sup>**, Ms. Sara Norgelas<sup>2</sup>, Prof. David Dzewaltowski<sup>2</sup> <sup>1</sup>Kansas State University, Manhattan, United States, <sup>2</sup>University of Nebraska Medical Center, Omaha, United States

### Implementation and scalability (SIG)

Purpose: To facilitate the adoption and implementation of evidence-based practices and programs designed to increase physical activity among children, improving the access that adult "group place leaders" have to high-quality training, coaching, and capacity-building is crucial. Video-based leader training offers a potentially cost-effective, sustainable, scalable method to help maximize the adoption, implementation, and dissemination of evidence-based interventions that build the capacity of leaders to provide health-promoting environments and experiences to the children that they serve.

Methods: Drawing on the lessons learned within the Girl Scouts Wellness Project in Kansas and Wellscapes Project in Nebraska, this study describes the evolution of video-based intervention efforts to engage group place leaders from community settings such as scouting, schools, after-school programs, youth sports, and clubs. A series of lowcost, theory-based, scripted and tailored videos, recorded via smartphone, were initially developed, eventually replaced by well-produced videos applying theory and market segmentation.

Results: Early intervention efforts faced barriers such as leaders' access to videos, uncertainty about storage and transmission, and limited technical expertise of research staff. Overcoming such difficulties, our Girl Scouts Wellness project videos improved psychosocial determinants of implementing health-promoting practices. More recent Girl Scouts Wellness efforts have improved leader access, file storage, and have benefited from both theory-based scripting and professional-grade videography. The Wellscapes Project has demonstrated innovation through a three-stage multi-pass model, including videos that: 1) apply theory-based persuasion principles to promote intervention adoption; 2) target leaders of non-active settings, helping them to learn to insert a time block for physical activity; and 3) target leaders who offer active opportunities to learn quality improvement for their physical activity time blocks.

Conclusions: There is ample promise for improving leaders' access to high-quality training, coaching, and capacitybuilding from the process of developing and using videos to promote children's physical activity, but there are numerous technological challenges and human factors that must be considered. Our experiences from these community projects provide key lessons for others considering the use of video resources to promote physical activity.





# S.1.08 Physical activity to boost neuroplasticity in older adults: Opportunities and strategies

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# Impact of urban blue infrastructures on health in older adults

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Ageing (SIG)

Purpose: Blue spaces, including waterways such as river and canals are part of the fabric of most cities in the world, with 50% of the global population living within 3 km of Urban Waterways by 2050. Rapid 27rbanization together with ageing of the population and climate change mean that cities world-wide are faced with increased challenges that affect the health and wellbeing of their older adult citizens and increase the burden of ageing related conditions. "Blue Care" is a programme of research aimed at understanding how urban blue infrastructure can be used for cobenefits between older adults physical and mental health and the environment.

Methods: "Blue Care" is a mixed method research programme that include systematic reviews of the impact of urban blue space on health of older adults, big data analysis of the impact of the regeneration of blue space on physical and mental health of older adults and development of a "blue gym" intervention programme using environmental conservation as a mean to increase physical activity combined with cognitive loading.

Results: The systematic reviews and big data analysis show that there is a clear association between mortality risk, feeling of wellbeing and improvement in cognitive function for those living near or spending time near urban blue infrastructure. They indicate that pathways between exposure to urban blue space and health are potentially physical activity, access to healthier environment and mental restorative properties of blue spaces. There is a potential to use blue spaces as a modality of intervention combining physical activity and cognitive training to boost cognitive function.

Conclusions: There is good evidence that engaging with or living near blue space in urban area increase feeling of wellbeing and is associated with better physical and mental health. The mechanism and how this can be harnessed to fight chronic diseases and in particular cognitive decline amongst older adults is not yet fully understood.





# Active plus intervention, physical activity and cognition: Investigating the effectiveness of a physical activity program on cognitive functioning in elderly people suffering from a broad range of chronic illnesses

<u>Miss Esmee Volders</u><sup>1</sup>, Prof. Renate de Groot<sup>1,2</sup>, Prof. Catherine Bolman<sup>1</sup>, Prof. Lilian Lechner<sup>1</sup> <sup>1</sup>Open University of the Netherlands, Heerlen, Netherlands, <sup>2</sup>Maastricht University, Maastricht, Netherlands

Ageing (SIG)

Purpose: Physical activity (PA) seems to positively influence cognitive functioning (CF). However, elderly people with chronic illness(es) (ECI) often do not meet PA guidelines. PA programs for the elderly exist, but these are not easily accessible to ECI. Also, the beneficial effects of these PA programs on CF have never been specifically tested in ECI. Hence, this RCT tests whether Active-Plus, a proven effective PA intervention, is able to improve CF of ECI or to slow down cognitive decline.

Methods: ECI ( $\geq$ 65 years) with at least one chronic condition are recruited from 7 municipalities. Comparable neighborhoods within a municipality were randomly allocated to the intervention (N=276) or waitinglist control group (N=347). Baseline and follow-up measurements after 6 and 12 months assess objectively measured MVPA min/week, and four CF domains: Learning (RVTL; number of correct words recalled trial 5 – trial 1), inhibition (SST; Stop Signal Reaction Time), shifting (TMT; time part B – part A), processing speed (LDST; number of correct iterations in 60s). Multilevel linear regression analyses were conducted to assess intervention effects on CF on complete cases.

Results: After 12 months, 432 participants completed follow up (dropout =30.7%). Preliminary analyses show a significant intervention effect for shifting (B=674.93, p=.04). Participants in both conditions improved their scores over time for processing speed (B=0.04, p=.01) and shifting (B=-860.18, p<.001), however for learning the scores declined (B=0.04, p=.001). The difference in MVPA between start and 6 months was a significant predictor for processing speed (B=0.46, p=.01), where participants with an improved MVPA scored better on processing speed. However, no clear interventions effects on MVPA were found after 6 months.

Conclusions: The Active-Plus intervention was only able to significantly improve shifting in elderly with chronic illness(es), possibly because the intervention only had limited effects on MVPA in this specific group (contrary to previous studies). More in depth analyses will be presented.





# Cognitive enriched walking interventions: Results from focus groups and walkalong interviews in older adults.

<u>Miss Arwen Vangilbergen<sup>1</sup></u>, Prof. Jannique Van Uffelen<sup>2</sup>, Dr. Melanie Beeckman<sup>1</sup>, Prof. Sebastien Chastin<sup>1,3</sup>, Mr. Pieter-Jan Marent<sup>2</sup>, Prof. Greet Cardon<sup>1</sup>

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### Ageing (SIG)

Purpose: Recent research shows that combined physical activity and cognitive activity might have a synergistic, positive influence on brain plasticity, which is important in the prevention of dementia. The purpose of this study is to investigate how an existing walking intervention for older adults can be enriched with cognitive tasks, so that the intervention is safe and easily accessible to the majority of the older population.

Methods: An iterative development process combining knowledge from scientific literature, experts and feedback from older adult end-users, will be used to define optimal cognitive tasks while walking. Older adults and Healthy Walk coaches will be actively involved through co-creation methods. To have insight into their preferences, concerns and suggestions about how to practically and safely embed cognitive activities into the Healthy Walks, we will use focus groups and walk-along interviews. Each session consists of 2 parts: 1,5 hour of focus group in a local service center followed by a 30 min neighborhood walk with the researcher. While walking, older adults are prompted with questions similar to the focus group but because of the real-time experience, previous ideas can now be evaluated and new themes may emerge. Sessions are repeated with a new group in another neighborhood until no new themes/ideas emerge. Based on previous literature, we expect this will be the case after 6-12 iterations. For the current presentation, the first 6 sessions with groups of 6-8 participants (to be held between February and March 2020) will be analyzed, using NVIVO.

Results: These focus groups and walk along interviews will result in a set of cognitive tasks, considered feasible to perform while walking in older adults.

Conclusions: A set of feasible tasks to cognitively enrich walking is developed. Further study is needed to explore the effects on cognitively enriched walking on cognitive function in older adults.





# S.1.09 Confronting the scale-up challenge in physical activity and behavioural nutrition research

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# From frameworks to indicators: A guide for assessing scale-up of physical activity and behavioural nutrition interventions

### Dr. PJ Naylor<sup>1</sup>, Dr. Heather McKay<sup>2</sup>

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### Implementation and scalability (SIG)

Background: Entering the realm of implementation and scale-up science is a dynamic, important, worthwhile venture. But there are challenges. Amidst a wide array of choices, researchers must identify appropriate frameworks to guide their implementation or scale-up study. What implementation strategies (i.e., methods to enhance adoption, implementation, and sustainability of an intervention) effectively support scaling-up the intervention? What indicators (determinants and outcomes) are best suited to demonstrate effectiveness of the scale-up process? What are core functions and what are the mechanisms through which they operate?

More and more scientists in physical activity (PA) and behavioural (nutrition) seek to understand the science of implementation and scale up. Advancing this science in our disciplines is predicated upon us addressing the questions we pose above, adopting more deliberate implementation and scale-up science approaches and increased efforts to develop a common language and adaptable measures and tools.

In this presentation we share results of a five-round Delphi process, conducted with an international group of PA and nutrition implementation and scale-up scientists. We will present implementation and scale-up frameworks and a minimum data set of indicators they deemed most relevant to those in PA and nutrition research. Finally, we will discuss when, where and how implementation strategies, implementation determinants and outcomes can be incorporated into your research. We animate our presentation with two scale-up case studies that span 5-10 years (Action Schools! BC and Choose to Move) to illustrate how implementation and scale-up science can be applied and how it evolves over the lifetime of a project. We close with a brief synopsis of key research and measurement gaps that need to be addressed to advance implementation and scale-up science in PA and nutrition research.





# Evaluating scaled interventions: Real world challenges and approaches

#### Dr. Andrew Milat<sup>1,2</sup>

<sup>1</sup>University of Sydney, Sydney, Australia, <sup>2</sup>NSW Ministry of Health, Sydney, Australia

### Implementation and scalability (SIG)

Purpose: Choosing an appropriate evaluation approach and executing it effectively is central to generating credible evidence of the effectiveness and sustainability of scaled up health promoting interventions.

Methods: in this presentation we consider the utility of different evaluation approaches, challenges and pragmatic approaches to evaluate scaled up population health interventions.

Results. Selecting the appropriate evaluation approach requires researchers to consider: implementation stage; intervention setting; availability of program monitoring data; budget for and cost of the evaluation; feasibility of conducting the study design and acceptability of the design to stakeholders and participants. Experimental designs offer the most rigorous way of determining whether a cause-effect relationship exists between an intervention and an outcome. However, it is likely not practical (pragmatic) or appropriate to evaluate scaled up population-based interventions using this approach. Specifically, when evaluating scaled up interventions the focus shifts from an emphasis on outcomes to better understanding intervention implementation processes and from a research frame to a focus on measuring implementation at a systems level.

Conclusion: To effectively conduct a pragmatic evaluation during scale-up of health promoting interventions, the approach must balance rigour, practice based knowledge and producing timely data that can be systematically integrated into decision making processes.





# Implementation strategies that promote scale up of PA and behavioural nutrition interventions: Adapting to context

#### Dr. Luke Wolfenden<sup>1</sup>

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### Implementation and scalability (SIG)

Purpose: Most often research trials are conducted under controlled conditions. Studies are designed to test interventions that, should they be delivered at scale in the real world, would require substantial adaptation. In this presentation we seek to describe the frequency and type of adaptations that facilitate scale-up of behavioural nutrition and physical activity interventions; we characterise the impacts of adaptations on intervention effectiveness.

Methods: We will advance the theory and practice of adaptation for scale-up in implementation science. To do so we call upon an array of real-world implementation and scale-up studies to animate the science. Approaches include qualitative studies of end-users, surveys of researchers, and systematic reviews that examine the impact of adaptations on the effects of scaled-up behavioural and nutrition interventions.

Results: Fewer than one third of interventions are not adapted prior to implementation at scale. Most commonly studies are adapted by removing or adding intervention components, modifying the intervention and mode of delivery to the suit the target audience and the delivery context. When implemented at scale, the effects of interventions attenuate. Effects at scale are typically no more than 75% of that reported in 'pre-scale up' evaluations. Researchers of scaled-up interventions had mixed views about the impact of adaptations on the effect of interventions. Some believed that adaptations would strengthen the impact; others believed that adaptation would dilute effectiveness at scale. At present, relationships between specific types of adaptations and effects of scaled-up interventions is unclear (systematic reviews).

Conclusion: Adaptation is a common, and likely necessary part of the scale-up process for behavioural nutrition and physical activity interventions. To realise both benefits and challenges of delivering interventions at scale, we need to better understand the process, evaluation and impact of adaptation.





# S.1.10 Lifestyle interventions focusing on fathers and their children: Do they work and are they feasible? Results from different contexts and populations

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# Feasibility of implementing an adapted version of the 'Healthy Dads Healthy Kids' program for Hispanic families

**Dr. Teresia O'Connor<sup>1</sup>**, Ms. Alicia Beltran<sup>1</sup>, Ms. Oriana Perez<sup>1</sup>, Mr. Edgar Galdamez-Calderon<sup>1</sup>, Ms. Adriana Flores<sup>1</sup>, Prof. Thomas Baranowski<sup>1</sup>, Prof. Elva Arredondo<sup>2</sup>, Associate Professor Ruben Parra-Cardona<sup>3</sup>, Prof. Natasha Cabrera<sup>4</sup>, Prof. Philip Morgan<sup>5</sup>

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### Children and families (SIG)

Background: Healthy Dads Healthy Kids (HDHK) was the first obesity prevention intervention for fathers and had positive outcomes in Australia. The aim was to assess the feasibility of implementing a culturally adapted version of HDHK to Hispanic families in southwestern US.

Methods: A randomized waitlist controlled trial with a process evaluation was conducted to assess the feasibility of implementing the program and study. Fathers, their partner (mother) and 1-3 children were enrolled. A priori feasibility criteria were: a) Recruit 40 Hispanic fathers and their families in  $\leq 4$  m (months); b) Retain 80% of participants for pre- and post-assessments (4 m later); c) Maintain  $\geq$ 70% attendance to program sessions; d) obtain 80% 'excellent'-'good' satisfaction from participants who attended the program; and e) collect anthropometric and behavioral data on  $\geq$ 75% of participants at baseline and follow up.

Results: In <4 months we recruited and screened in-person 42 Hispanic families, and enrolled 36 families who qualified. 64% of fathers had not completed high school, 83% spoke only Spanish at home, and 89% were born outside of the US. Baseline data were collected on 36 fathers, 64 children and 35 mothers, with complete data on 86% (5 families were missing some accelerometer data). 19 families were randomized to the intervention and 17 to the control group. Attendance to the 10 week intervention was 56% for the whole intervention group, and 72% for those that started the program and did not drop out (N=14). 100% of fathers and mothers rated HDHK excellent or good (excellent by 92% of fathers). Almost all the fathers (mean score of 4.6, SD 0.6) and mothers (4.78, SD 0.5) stated they would recommend the program to their friends (strongly agree [5] – strongly disagree [1]). 27 (75%) participated in some aspect of the post-assessment, with 26 (72.2%) having most data collected.

Conclusion: The culturally adapted HDHK reached a high-risk, low-income sample of Hispanic families. The study met some, but not all feasibility criteria. With adjustment to recruitment and retention the program should be evaluated in an efficacy trial





# Implementing and evaluating an intervention for fathers and their children: The Belgian Run Daddy Run intervention and its effects on fathers' and children's (co)-physical activity and -screen time

**Ms. Julie Latomme<sup>1</sup>**, Dr. Ruben Brondeel<sup>1</sup>, Prof. Marieke De Craemer<sup>2</sup>, Prof. Philip Morgan<sup>3</sup>, Prof. Greet Cardon<sup>1</sup> <sup>1</sup>Department of Movement and Sports Sciences, Ghent University, Ghent, Belgium, <sup>2</sup>Department of Rehabilitation Sciences, Ghent University, Ghent, Belgium, <sup>3</sup>Priority Research Centre in Physical Activity and Nutrition, Faculty of Education & Arts, University of Newcastle, Newcastle, Australia, Newcastle, Australia

Children and families (SIG)

Objective: Targeting fathers in lifestyle interventions is a novel approach to improve health behaviours in children, thereby preventing childhood obesity. The Run Daddy Run (RDR) intervention was therefore developed and implemented, targeting Belgian fathers and their primary school-aged children to improve their lifestyle behaviours (i.e. (co-)physical activity (PA) and screen time behaviour) and other health-related outcomes. The aim of the present study is to describe the development and implementation of the RDR intervention, and to investigate its effects on fathers' and children's (co)-PA and screen time behaviours.

Methods: A total of ±100 fathers/primary school-aged child (6-8 years) dyads residing in Flanders (Belgium) were randomly assigned to either the control group (n=50) or the RDR intervention group (n=50). The intervention consisted of 6 two-weekly (inter)active sessions for fathers and their children. The sessions included an informative component and an active component, and were guided by two trained facilitators. Furthermore, fathers and children of the intervention group had access to an online (personal) profile on which they could log PA goals and activities, access tips /ideas for physical activities and exercises. Before and after the intervention, fathers completed an online questionnaire questioning their (co-)PA, (co-)screen time, weight status and other health-related outcomes. Objective measures of PA were obtained from fathers and children using wrist-worn accelerometers (Axivity AX3). Longitudinal analyses were conducted to measure the effects of the intervention.

Results: Currently, no results are available yet as the intervention will take place between February and May 2020. The first results will be available by the end of May. We expect that in the intervention group there will be a larger increase from baseline to follow-up in (co-)PA and a larger decrease in (co-)screen time, compared to the control group.

Conclusions: The findings of this study will allow us to determine whether the RDR intervention is able to improve health behaviours in fathers and children (i.e. (co)-PA and -screen time), which might have important implications for future research and health policy.





# Engaging fathers to increase physical activity, nutrition and parenting; 'Healthy Youngsters, Healthy Dads': A pilot study targeting fathers and their pre-school aged children

**Prof. Philip Morgan<sup>1</sup>**, Dr. Myles Young<sup>1</sup>, Dr. Alyce Barnes<sup>1</sup>, Prof. Clare Collins<sup>1</sup>, Dr. Emma Pollock<sup>1</sup>, Ms. Stevie-Lee Kennedy<sup>1</sup>, Ms. Jacqueline New<sup>1</sup>, Ms. Anna Rayward<sup>1</sup> <sup>1</sup>University of Newcastle, Newcastle, Australia

Children and families (SIG)

Purpose: This study was designed to assess the feasibility of the 'Healthy Youngsters, Healthy Dads' intervention. The program was designed to educate fathers and their young children about strategies to improve their physical activity (PA), dietary and screen-time behaviours.

Methods: Twenty-four father/pre-school child (3-5 years) dyads were recruited from Newcastle, Australia. The 9week intervention included a 'dads-only' information session (evidence-based parenting strategies to improve children's PA, eating habits, social-emotional well-being and fundamental movement skills (FMS)) and eight, weekly dads-and-kids education and practical sessions (covering healthy eating, fitness, FMS, screens, rough-and-tumble play). Primary outcomes (participant attendance and fathers' perceived acceptability; benchmarks set at 80% and  $\geq$ 4 out of 5, respectively) and secondary outcomes (recruitment capability, participant retention, completion of home-based activities, fathers' and children's PA levels, father-child co-PA, BMI, body composition, screen time, children's FMS competency and executive functioning) were assessed at baseline and/or post-intervention.

Results: On average, baseline PA levels of fathers and children were below recommended levels, 67% of fathers were overweight/obese and 20% of children were overweight/obese. All primary outcomes surpassed set benchmarks. Attendance rates were 100% and 86% for the father-only and father-youngsters workshops, respectively, and fathers' mean overall program satisfaction was 4.8 out of 5. Two-thirds of interested fathers were eligible to participate. Retention was excellent with 92% of participants completing follow-up assessments. Completion of home-based activities ranged from 65% to 91%. Changes in other secondary outcomes were generally in a favourable direction between baseline and 10-week follow-up. The practicalities of having preschool aged children wearing pedometers appropriately, having assessments of FMS and executive functioning and being measured anthropometrically were all demonstrated to be achievable.

Conclusion: This study showed high attendance rates and program satisfaction, demonstrating the feasibility of this novel, world-first intergenerational program. Preliminary evidence emerged of program efficacy to improve various aspects of PA levels, body-composition and executive functioning among fathers and their preschool aged children. A larger-scale efficacy trial is warranted.




### S.1.11 Making behaviour change automatic – How to translate dual process theories into physical activity and nutrition interventions

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# Kicking the habit? Identifying behaviour change techniques suitable to breaking bad habits

#### Dr. Benjamin Gardner<sup>1</sup>

<sup>1</sup>*King's College London, London, United Kingdom* 

Motivation and behavior change (SIG)

Many everyday behaviours, including unhealthy dietary consumption, and sedentary behaviour, are thought to be habitual. Habit is a process whereby encountering a situation activates an impulse to act in a given way, based on learned situation-action associations. While people can inhibit their unwanted habits, often they lack the motivation or capability to do so, and so continue to act in unhealthy, habitual ways. Drawing on a fundamental distinction between habit (a process that generates impulses to act) and habitual behaviour (behaviour controlled by the habit process), this talk argues that much of the available research into how to break 'bad' habits has targeted habitual behaviour, rather than the habits that underlie such behaviour. For example, the 'habit discontinuity' approach emphasises that removing people from the environments that support their unwanted habitual actions, or capitalising on natural disruptions to such environment, can lead people to abandon old unwanted habits and adopt more desired, healthy actions. Yet, this approach leaves open the possibility that, even if the habitual behaviour has apparently been discontinued, the underlying habit may remain, and may retain its potential to automatically reactivate the unwanted action when a person is re-exposed to their old environments. This talk points to the different ways in which habit can be purposefully disrupted: habit discontinuity (discontinuing exposure to habitfacilitating environments) and habit inhibition (obstructing the translation of a habit impulse into action) target habitual behaviour, whereas habit substitution (learning a new, wanted habitual response as a direct replacement for an unwanted response) targets the underlying habit association. Although habit substitution may offer the 'truest' form of habit change, the pros and cons of each of these habit disruption strategies, the settings in which each might be most usefully adopted, and the techniques conducive to targeting each strategy, are set out.





### How to assess change in automatic processes throughout an intervention

#### Dr. Amanda Rebar<sup>1</sup>

<sup>1</sup>Central Queensland University, Rockhampton, Australia

#### Motivation and behavior change (SIG)

Interest in targeting automatic processes such as habits and automatic evaluations is increasing as a result of the building body of evidence supporting dual process theories. Dual process theories postulate that behaviour is regulated through two forms of motivation: reflective (i.e., slow, deliberate influences that require self-regulation) and automatic (i.e., spontaneous, unintentional influences that are not reliant on self-regulation). To this point, most physical activity and nutrition interventions have targeted and assessed only reflective processes (e.g., expectations, beliefs, intentions). As a result, it remains largely unknown (1) whether automatic processes can be effectively targeted in physical activity and nutrition interventions, and (2) if changes in automatic processes lead to short- or long-term behaviour change. One major barrier to the advancement of understanding the role of automaticity in behaviour change interventions is measurement. Reflective processes are most often assessed through self-reported text-based surveys, meaning they can be easily administered to large populations, quickly and cost-effectively. With exception to self-reported habit measures, however, automatic processes are often measured implicitly. Implicit measures are indirect assessments that do not require participants' subjective assessment. Common implicit measures of automatic processes include response-timed categorization tasks that assess implicit associations between concepts and attributes (e.g., Implicit Association Tests, priming tasks). Given recent technological advancements and wider accessibility to internet and smartphones or computers, researchers now have opportunities to measure automatic processes throughout interventions and provide essential evidence regarding automatic processes. Authors of published automaticity measurement tools have made them freely available and accessible to all researchers on open science framework repositories. I will present examples of two such measures, describe the concepts underlying their construct validity, and provide scoring data options. Now, measuring automatic processes amidst interventions is easy to administer to large populations, quickly, and cost-effectively.





# Dual routes to persuasion: Using the Elaboration Likelihood Model to inform interventions

#### Dr. Camille Short<sup>1</sup>

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#### Motivation and behavior change (SIG)

According to the Elaboration Likelihood Model, there are two routes to persuasion, the central route and the peripheral route. Central route processing involves in-depth and thoughtful consideration of the information presented. Information is processed via this route when participants have the ability, opportunity, resources and motivation to process information elaborately. Conversely, information processed via the peripheral route relies on the use of simple processes, such as heuristics, biases, and affective judgments, and thus requires fewer resources and less motivation. The peripheral route can be thought of, in part, as persuasion by more automatic means. With the exception of fear appeals, health promotion campaigns have typically not capitalized on peripheral route processing mechanisms and instead relied on educational approaches more reliant on central route processing. Personal relevance has emerged as an important mediator of effectiveness for these types of campaigns, presumably because it increases motivation to process information elaboratively via central pathways. This has seen a rise in computer-tailored interventions, and advocacy for behaviour change interventions to deliver tailored (individualized) or at least targeted (matched to a particular subgroup) information. The predominant reliance on central route persuasion strategies seems to assume that persuasion via this route will be longer lasting, since attitude change that occurs via the central route should be relatively enduring and resistant to counter persuasion compared to attitudes formed based on peripheral cues. However, this ignores that people can hold automatic attitudes that may not align with their deliberative ideas, and that we are bombarded by peripheral cues that may be counter to our goals on a daily basis. Persuasion via the peripheral route may be needed to influence these more automatic attitudes (e.g., automatic evaluations), and indeed to make health topics seem relevant to the target audience in the first place. There have been several computer-based strategies developed and tested in lab-based settings to change automatic processes involved in peripheral route processing. Now with the wide-spread availability of smart-phones there are new opportunities to implement them at scale and just in time in response to contextual cues.





# S.1.12 Urban design and transport policies to create healthy, active cities across the world: What are they and how can we measure them?

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### Creating healthy liveable active cities: What gets measured gets done

**Prof. Billie Giles-Corti<sup>1</sup>**, Prof. Anne Vernez Moudon<sup>2</sup>, Dr. Melanie Lowe<sup>3</sup>, Prof. Mark Stevenson<sup>4</sup>, Dr. Deepti Adlakha<sup>5</sup>, Dr. Jonathan Arundel<sup>1</sup>, Professor Ester Cerin<sup>3</sup>, Professor Erica Hinckson<sup>6</sup>, Dr. Deborah Salvo<sup>7</sup>, Dr. Carl Higgs<sup>1</sup>, Prof. Geoff Boeing<sup>8</sup>, Dr. Shiqin Liu<sup>9</sup>, Prof. James Sallis (Global Healthy Liveable City Indicators Study)<sup>3, 10</sup>

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#### Policies and environments (SIG)

Purpose: Designing pedestrian- and cycling-friendly cities that promote active lifestyles will produce co-benefits for health equity and the environment and is consistent with the World Health Organisation's Global Action Plan for Physical Activity and the UN Sustainable Development Goals. We investigated whether policy-frameworks and transport and planning interventions are in place to achieve these aspirations and whether inequities exist in access to infrastructure in cities worldwide.

Methods: The Lancet 2016 series on Urban Design, Transport and Health proposed city planning indicators to monitor implementation of urban and transport interventions that would enhance health and reduce non-communicable diseases. To assess and apply these indicators in cities across the globe, collaborators were recruited at international conferences and through the International Physical Activity and the Environment Network (IPEN). Working with local policymakers, collaborators were guided to undertake a policy review and identify local geospatial data that could be used to populate the indicator framework. These data were managed and analysed centrally, with local teams validating and interpreting results, and disseminating findings to academic and local audiences.

Results: The study includes 25 cities varying in size and from high-, low- and middle-income countries. All 25 cities have provided policy data and 14 geospatial (GIS-based) indicators. Data are currently being analysed. Our results will focus on whether these cities have urban and transportation legislation, policies and investments and spatially-derived policy outcomes that will foster active living and reduce health inequities.

Conclusions: Building on decades of research showing associations between the built environment and active living, this study provides policy-relevant evidence and recommendations for strengthening city planning policies and interventions to create healthy, active and liveable cities.





## Urban policy to create healthy, active cities: Measuring policy indicators in 25 cities worldwide

**Dr. Melanie Lowe<sup>1</sup>**, Dr. Deepti Adlakha<sup>2</sup>, Dr. Jonathan Arundel<sup>3</sup>, Professor Ester Cerin<sup>1</sup>, Prof. Erica Hinckson<sup>4</sup>, Dr. Deborah Salvo<sup>5</sup>, Prof. Mark Stevenson<sup>6</sup>, Prof. Anne Vernez Moudon<sup>7</sup>, Dr. Carl Higgs<sup>3</sup>, Prof. Billie Giles-Corti (Global Healthy Liveable City Indicators Study)<sup>3</sup>

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#### Policies and environments (SIG)

Purpose: Urban systems policies in domains such as transport, land use and urban design, housing, public open space, employment and social infrastructure help to shape urban and transport planning and design interventions. These, in turn, determine transport mode choices and lifestyles, and ultimately exposure to health risks, such as physical inactivity. This research assessed the extent to which policy and governance practices support the creation of healthy, active neighbourhoods in cities worldwide.

Methods: A recent Lancet paper (Giles-Corti et al 2016) proposed a set of indicators which could be used to measure progress towards creating healthy, active cities. This study created the policy indicators outlined in that paper, for 25 cities worldwide. Collaborators were recruited through the International Physical Activity and the Environment Network (IPEN) and presentations at international conferences. Policy data were collected via an online survey in participating cities, by local researchers and urban policymakers. Content analysis was used to assess the presence/absence of policies for key urban systems (e.g. open space, public transport), and their strengths and limitations, including whether the policies aligned with evidence on healthy cities, and whether they were specific and measurable.

Results: The 25 cities were of varying sizes and were spread across high-, low- and middle-income countries. There were significant challenges in coordinating the collection of comparable policy data across cities, with diverse policy contexts and different languages. Policy standards varied significantly across cities, with some cities much further advanced in creating evidence-based policy for healthy, active cities. While most cities had policy aspirations to create healthy neighbourhoods, these were often not supported by specific policy actions or measurable policy targets. Policy gaps were more common in lower resource settings.

Conclusions: This study demonstrates a method of measuring evidence-based urban policy indicators focused on healthy built environments, in diverse cities worldwide. Specific policy recommendations developed from this research could support policymakers in their efforts to create healthy, active cities.





## Using open data to measure policy-relevant geospatial indicators of healthy, active urban environments in 25 global cities

<u>Dr. Carl Higgs</u><sup>1</sup>, Dr. Shinqin Liu<sup>2</sup>, Prof. Geoff Boeing<sup>3</sup>, Dr. Jonathan Arundel<sup>1</sup>, Dr. Melanie Lowe<sup>4</sup>, Prof. James Sallis<sup>4, 5</sup>, Prof. Ester Cerin<sup>4</sup>, Prof. Anne Vernez Moudon<sup>6</sup>, Prof. Erica Hinckson<sup>7</sup>, Dr. Deepti Adlakha<sup>8</sup>, Prof. Billie Giles-Corti (Global Healthy Liveable City Indicators Study)<sup>1</sup>

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#### Policies and environments (SIG)

Purpose: Cities in diverse contexts across the globe share aspirations of urban liveability. Monitoring and comparisons of global cities' progress towards urban design and transport policies that support healthy and sustainable lifestyles often focus on headline indicators. However, city-scale summaries ignore within-city variation in living conditions. Hence, they provide limited information to guide targeted interventions. Methods for using open source software and open data to calculate and map policy relevant geospatial indicators for healthy liveable cities were developed to compare cities and evaluate the degree to which policies to support active living: 1) are being implemented and for whom; and 2) whether they can measured using open data.

Methods: Collaborators from the International Physical Environment Network (IPEN) and others nominated cities for calculation and analysis of policy-relevant geospatial indicators related to urban design and transport. Official data on cities were solicited from collaborators via an online portal. Sources of globally consistent data were identified including: study region boundaries, population and urban grids, street networks and destinations, and public transport schedules. Routable pedestrian-appropriate transport networks and assets were derived using OSMnx. An audit of destinations identified within each city's buffered study region was undertaken, which was reviewed and validated by collaborators. Spatial indicators were calculated, analysed and 41isualized using open data sources, and validated using official sources where available. These included street connectivity, population density, public transport (any, and frequent) access, 'daily living'-amenities access, walkability, and public open space access.

Results: Within- and between-city comparisons of achievement of shared goals for liveable neighbourhoods for 25 diverse cities across six global regions will be presented. The potential impact of regional geospatial context on indicator performance, associations with physical activity and other health outcomes, and the degree to which these can be validly measured using open data will also be considered.

Conclusions: Sustainable healthy urban development is a universal aspiration. However, further progress on evidence-based indicators is required for this to be achieved and to ensure there is equitable access to health-promoting land use and transport interventions within cities.





# S.1.13 Harmonising data across studies: Approaches, strengths, limitations and future directions

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### Harmonising physical education and organised physical activity variables from the International Children's Accelerometry Database (ICAD) project

**Dr. Erika Ikeda<sup>1</sup>**, Dr. Andrew Atkin<sup>2</sup>, Prof. Ulf Ekelund<sup>3</sup>, Associate Professor Bjørge Hansen<sup>3,4</sup>, Dr. Lauren Sherar<sup>5</sup>, Dr. Esther van Sluijs<sup>1</sup>

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: The current global prevalence of physical inactivity in children calls for prompt political and practical action. Children's physical activity (PA) can be accumulated through different forms of daily activities such as active travel, physical education (PE) and organised PA. Understanding activity patterns and their contribution to overall PA can inform future behavioural change interventions. Pooling individual data from existing studies enables enhanced exploration of variation in behaviour and increases the statistical power for analyses. Due to the heterogeneity in methodology across contributing studies, this strategy also requires harmonising the data to be comparable across the studies. This presentation will describe the procedure of harmonising data from the International Children's Accelerometry Database (ICAD) particularly focusing on PE and organised PA variables.

Methods & Results: At present ICAD includes longitudinal and cross-sectional data from 23 studies conducted in Europe, United States, UK, Australia and Brazil. Out of 23 studies, three studies included both PE and organised PA variables, and 13 studies had only organised PA data. Across studies, PE participants were measured across 1-3 waves, with a range of 1-10 items per assessment. Organised PA was assessed at 1-6 waves, with a median of 3 (ranging from 1-457) items per study wave. Questionnaires were completed by children and/or parents, and centred on the involvement, frequency and duration of weekly PE classes and/or specific sports and physical activities. The level of comparability of items across waves in eight studies (with two or more waves) was low, where only two studies utilised the same questionnaire across all waves. All data have been collated into a single repository for cataloguing and harmonisation. This presentation will outline the harmonisation methods applied to this data, and discuss strengths and limitations of the harmonised constructs.

Conclusions: Data pooling across studies can provide large and heterogeneous samples and statistical power to explore differential contribution of activity patterns, but requires complex harmonisation procedures. The development of a rigorous, transparent and systematic process of retrospective data harmonisation is a vital to perform pooled analyses.





# Prospective and retrospective data harmonisation in the Prospective Physical Activity, Sitting, and Sleep consortium (ProPASS)

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Retrospective individual participant meta-analyses and prospective meta-analyses have various advantages over traditional meta-analysis and providing invaluable opportunities to advance scientific knowledge. Such pooled analyses require large consortia of harmonised data. The Prospective Physical Activity, Sitting, and Sleep consortium (ProPASS) is a new platform for retrospective and prospective pooling of cohorts that use thigh-worn accelerometry to measure physical activity, sedentary behaviour, posture, and sleep. The ultimate scientific objective of ProPASS is to explore the associations of physical activity, posture, and sleep patterns with long-term health outcomes. As of October 2019, ProPASS is supported by 12 international cohorts comprising over 70,000 participants. A key innovation in ProPASS is methodological flexibility that allows for inclusion of data from any accelerometry device that outputs raw acceleration and are is worn on the thigh.

Methods & Results: This talk will describe early outcomes and plans of ProPASS with focal point on the principles and methods that will underpin data harmonisation across 4 axes: retrospective harmonisation of nonaccelerometry data, prospective harmonisation of non accelerometry data, and (retrospective and prospective) harmonisation of accelerometry data. The talk will also provide data on the most recent developments (including the empirically validated comparison of different accelerometers) and will describe future ProPASS plans. The challenges and collaborative work opportunities that have arisen during the harmonisation processes will be given particular emphasis.

Conclusions: Consortia of accelerometry data are the future of the evidence on physical activity - related behaviours and health. Carefully conducted and efficient harmonisation methods are a key to their long-term success. It provides an opportunity to increase study power through maximizing sample size and heterogeneity in exposures/outcomes, and permits more sophisticated statistical analyses to answer novel research questions that could not be addressed using a single study.





# Need for standardization in the global surveillance of physical activity of children and youth

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: The objective of this work is to present findings from the available global surveillance systems of physical activity (PA) for children and youth (0-17 year-old), and to highlight research gaps and needs for their improvement.

Methods: This is a narrative review of the international surveillance systems, studies, and global initiatives collecting or compiling evidence on the PA among children and youth. It was informed by a literature search in PubMed, the screening of references from relevant publications, and grey literature. The location, target population, frequency, description, and main findings in terms of the prevalence of physical (in)activity of the identified surveillance systems, international studies, and global initiatives were extracted.

Results: PA surveillance systems lack standardization and are not conducted regularly. Surveillance data are mostly focused on older children and adolescents and are especially scarce for PA trends over time, vulnerable populations, and in resource-limited low-middle-income countries. The PA levels of 5-17year-old children and youth varies depending on the data source but is consistently low across international data. Variation in the geographic patterns of PA levels are observed between studies, which could be attributed to the diversity of approaches used to measure PA. Currently, several international studies and initiatives including both objectively and subjectively measured PA data indicate that children and youth are more active in countries from Africa and Northern/Eastern Europe, while they are less active in North America, the United Kingdom, China, and India; however the opposite was observed in the Health Behaviour in School-aged Children survey.

Conclusions: Systematic surveillance of the PA of children and youth is still emerging or at very early stages in many countries. There is a need for globally accepted and standardized measurement, reporting, and accountability protocols that countries can universally follow in order to have meaningful progress in the global surveillance and promotion of PA among children and youth. The lack of standardized and validated globally-relevant surveillance tools for PA creates a predicament for accurate comparisons but also presents an opportunity for the development, trial, and implementation of universal surveillance mechanisms.





### S.1.14 Food insecurity: Who does it impact and how?

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# Food environment as a moderator in the association of household SNAP participation with children ietary pattern and food insecurity

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<sup>1</sup>College of Health Solutions, Arizona State University, Phoenix, United States, <sup>2</sup>Department of Health Sciences, College of Health & Human Services, Northern Arizona University, Flagstaff, United States

Children and families (SIG)

Purpose: We investigate the role of community food environment as a moderator in the associations of household Supplemental Nutrition Assistance Program (SNAP) status with (1) children's dietary patterns and (2) household food insecurity.

Methods: Data were collected from 2,211 households with 3-18 year olds in four high poverty, high minority cities. Information was collected on household demographics, SNAP participation, and food insecurity status. Dietary data for one randomly selected child was collected using validated measures. Food environment was assessed as the presence of different types of retail stores (convenience stores, upgraded convenience stores, supermarkets, and small grocery stores) within close proximity (¼ and ½ mile) of a child's home. Multivariable models with interaction terms examined associations between key exposure (SNAP participation) and outcome variables and investigated whether these associations were moderated by the food environment.

Results: More than a third of the children lived in SNAP participating households and a fifth were food insecure. In multivariable analysis, there were no differences in consumption patterns of children from income-eligible households based on SNAP participation status. Children from income-ineligible households consumed sugary beverages 22% less frequently (p<0.001) and energy-dense snacks 16% less frequently (<0.05) than children from SNAP households. Proximity to a small grocery store selling a selection of healthy items was associated with higher fruit consumption, but only for children from SNAP-participating households(18% higher, p<0.05); fruit consumption was not different based on proximity to healthy stores for children from income-eligible non-SNAP households or for those from income-ineligible households. SNAP-participating households were less food-secure than income-ineligible households (p<0.001), but there were no differences between income-eligible households by SNAP participation status. These relationships were not modified by proximity to different types of food outlets.

Conclusions: Compared to all non-participating children, children from SNAP households consumed more fruit when they lived close to a healthy food outlet. Programs promoting access to healthy foods among SNAP household may yield positive outcomes.





### Beyond food insecurity: Challenges college students face in meeting basic needs

#### Dr. Lorrene Ritchie<sup>2</sup>, Dr. Suzanna Martinez<sup>1</sup>

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#### Children and families (SIG)

Purpose: Conflicting relationships exist between children's food insecurity and adiposity and there is limited understanding of how this may vary based on child demographics in the U.S. This study assessed the relationship between household food insecurity and child adiposity-related outcomes, measured as body mass index z-score (BMI-z), weight status, and waist circumference, and diet outcomes, and examined if the associations differ by age, sex, and race/ethnicity.

Methods: Data collected in 2013-2015 from 5,138 US schoolchildren ages 4-15 years from 130 communities in the cross-sectional Healthy Communities Study were analyzed. Household food insecurity was self-reported using a validated 2-item screener. Dietary intake was assessed using the 26-item National Cancer Institute's (NCI) Dietary Screener Questionnaire (DSQ), and dietary behaviors were assessed using a household survey. Multilevel statistical models were used that included tests for interaction by age, sex, and race/ethnicity.

Results: Compared to children from food secure households, children from food insecure households had higher BMI-z ( $\beta$ =0.14, 95% CI: 0.06, 0.21), waist circumference ( $\beta$ =0.91 cm, 95% CI: 0.18, 1.63), and odds of being overweight or obese (OR=1.17 95% CI: 1.02, 1.34), consumed more sugar from sugar-sweetened beverages ( $\beta$ =1.44 g/day; 95% CI: 0.35, 2.54), and less frequently ate breakfast ( $\beta$ =-0.28 days/week; 95% CI: -0.39, -0.17) and dinner with family ( $\beta$ =-0.22 days/week; 95% CI: -0.37, -0.06). When examined by age group (4-9, 10-15 years), significant relationships were observed only for older children. There were no significant interactions by sex or race/ethnicity.

Conclusions: Household food insecurity was associated with higher child adiposity-related outcomes and several nutrition behaviors, particularly among older children, 10-15 years old.





# Household food insecurity is associated with higher adiposity among U.S. schoolchildren ages 10-15 years: The Healthy Communities Study

<u>Dr. Lauren Au<sup>1</sup></u>, Ms. Sonya Zhu, Ms. Lilly Nhan, Ms. Kaela Plank<sup>1</sup>, Dr. Edward Frongillo, Dr. Barbara Laraia, Ms. Klara Gurzo, Dr. Lorrene Ritchie<sup>1</sup>

<sup>1</sup>Nutrition Policy Institute, Division of Agriculture and Natural Resources, University of California, Berkeley, United States

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Conclusions: Household food insecurity was associated with higher child adiposity-related outcomes and several nutrition behaviors, particularly among older children, 10-15 years old.





# S.1.15 Addressing food insecurity across the United States: Innovative policy, system, and environment solutions for an age-old problem

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# Double up food bucks at farmers markets in Michigan: Growth and impact of a nutrition incentive program

**Dr. Courtney Parks<sup>1</sup>**, Ms. Hollyanne Fricke<sup>1</sup>, Miss Holly Parker<sup>2</sup>, Dr. Oran Hesterman<sup>2</sup>, Dr. Amy Yaroch<sup>1</sup> <sup>1</sup>Gretchen Swanson Center for Nutrition, Omaha, United States, <sup>2</sup>Fair Food Network, Ann Arbor, United States

Socio-economic inequalities (SIG)

Objective: Double Up Food Bucks (DUFB) is a nutrition incentive program aimed at doubling the value of benefits spent at participating farmers markets (FMs) and grocery stores on fruits and vegetables (FVs) among low-income consumers participating in the largest federal nutrition assistance program in the United States (U.S.), the Supplemental Nutrition Assistance Program (SNAP). Nutrition incentive programs aim to address food insecurity and poor dietary quality by increasing access/affordability of FVs. The purpose of this study is to report overall use of DUFB, trends in sociodemographics, impacts on food insecurity, FV purchasing, and consumption.

Methods: A repeated cross-sectional survey was conducted at FMs and grocery stores among DUFB participants in 2016, 2017, and 2018. The survey assessed: sociodemographics; FV screener (10 items); food insecurity (USDA 6-item module); use of the program (length of time).

Results: Across three years, surveys (N=1,521) were collected at a subsample of FMs (N=52) and grocery stores (N=61). The majority of respondents were white (47.4%), black (42.6%), and other (10.0%); female (75.1%); with the largest proportion reporting being 25-44 years old (48.2%). Over half of respondents reporting having children in their household (56.1%) and being food insecure (55.2%). Over the three years, there was a reduction in food insecurity (Y1=63.5%; Y2=52.5%; Y3=50.0%) and fewer people reporting it was their first time using the program (Y1=34.1%; Y2=36.3%; Y3=13.5%). There was a trend towards participants reporting purchasing FVs more frequently (4 times/month or more) after participating in DUFB (pre=34.8%, post=56.0%). Those that participated in DUFB for more than a year reported greater consumption of FVs when compared to those that participated for 1-12 months (3.12 and 2.77 cups daily respectively).

Conclusions: Over the 3-year study, there was longer engagement in DUFB, improvements in food insecurity, FV purchasing, and consumption. These results demonstrate the positive trajectory of an established nutrition incentive program and have positive implications for program implementation and policy in the U.S. and globally.





# Client-driven modifications to food assistance and related resources for households affected by Type 2 diabetes

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#### Socio-economic inequalities (SIG)

Objective: The Community Food Bank of Southern Arizona (CFB) provides emergency food assistance to 33,500+ households across 5 counties monthly; 41.7% of CFB households have reported >1 member with Type 2 diabetes (T2D). The objective of this study was to identify CFB clients' perspectives regarding whether and how modifications to food assistance boxes (5-7 items including canned/dried legumes, vegetables, and grains) should occur, and if additional resources were needed to support diet quality in food-insecure households with T2D.

Methods: Twenty food bank clients with T2D or living with a person with T2D were recruited to participate in one in-depth interview. Eligible participants spoke and understood English or Spanish and received food assistance currently. A semi-structured script was used to guide participants as they examined food items typically offered by CFB and discussed how they utilized them. Participants were asked to select two foods to hypothetically remove from current offerings and, suggest two new foods to include. Interviewers probed for additional information regarding what constituted appropriate foods (e.g., utility, cultural relevance, preferences, health concerns). Interviews were conducted in English (n=10) and Spanish (n=10), audio-recorded, and transcribed. Transcripts were independently coded by two researchers. A code book was developed based on the interview script and verified by a senior researcher. Themes were identified using data-driven analysis in NVivo.

Results: Participants were majority female, Hispanic, 64.9-years-old, and at risk of food insecurity. Participants reported utilizing most foods provided by CFB. There was high agreement regarding which foods to remove (e.g., split peas and black beans) and the rationale (e.g., lack of knowledge, cultural incongruence). Participants also agreed on substitutions (e.g., whole oats, cooking oil) citing health and/or flexibility and cost. Additional resources suggested by participants to manage T2D included monthly classes, recipes, help obtaining medical supplies, and access to health providers.

Conclusions: Client-suggested modifications of food assistance and related resources included increased cultural responsiveness of foods, greater instrumental support with regard to meal preparation, medical management of T2D, and improved access to care.





### The UnProcessed Pantry Project (UP3): A multi-level approach to address ultraprocessed foods in the emergency food system

<u>Dr. Carmen Byker Shanks</u><sup>1</sup>, Mr. Christopher Coburn<sup>2</sup>, Ms. Jill Holder<sup>3</sup>, Mr. Nick Johnson<sup>1</sup>, Ms. LeeAnna Larison<sup>1</sup>, Ms. Hannah Larson<sup>1</sup>, Mr. Michael McCormick<sup>4</sup>, Dr. Courtney Parks<sup>5</sup>, Mr. Karl Vanderwood<sup>6</sup>, Ms. Beryl Wytcherley<sup>1</sup>

<sup>1</sup>Montana State University, Bozeman, United States, <sup>2</sup>Bozeman Health, Bozeman, United States, <sup>3</sup>HRDC INC., Bozeman, United States, <sup>4</sup>Livingston Food Resource Center, Livingston, United States, <sup>5</sup>Gretchen Swanson Center for Nutrition, Omaha, United States, <sup>6</sup>Healthy Gallatin, Bozeman, United States

#### Socio-economic inequalities (SIG)

Objective: Food insecure populations suffer a greater burden of chronic diseases than the general population, are more likely to consume ultra-processed food, and less likely to meet dietary recommendations. Ultra-processed food has increased in availability and consumption across the globe, especially among low-income populations and can lead to deleterious health effects (e.g., chronic diseases). Food pantries serve low-income and food insecure populations and offer food that ranges from ultra-processed to unprocessed. For many pantries, the nutrient quality of the food supply is not consistent. The UnProcessed Pantry Project (UP3) was designed to promote a food supply at pantries that limits ultra-processed food, increase the availability of nutritious perishable and non-perishable food through acquisition and policy, and support food justice.

Methods: A single group design was used with 45 food pantry clients at two pantry sites recruited to participate in a pilot study for UP3. Participants were supplied with 50% of their household food needs each week. A curriculum provided education focusing on knowledge, attitudes, and skills to decrease ultra-processed food consumption. Environmental supports included weekly check-ins with participants, recipes, increased un-processed food in the food supply, and staff to assist with food procurement. Dietary quality measured by the Healthy Eating Index (HEI), psychosocial and psychosocial factors, HbA1c, blood pressure, cholesterol, BMI, waist circumference assessed changes from pre-to-post.

Results: In total, 37 participants completed UP3. Dietary quality significantly improved with a HEI of  $47.18 \pm 12.20$  at pre and  $54.53 \pm 13.18$  at post (p = 0.10). BMI (p = 0.004), waist circumference (p = 0.000), and cholesterol (p = 0.024) significantly improved from pre to post. Participants significantly (p< 0.05) improved their knowledge, attitude, and behavior around ultra-processed food consumption. No significant changes in blood pressure or HbA1c occurred from pre to post although a positive trend was observed.

Conclusions: This pilot study indicates that UP3 is a tool that can be applied in food pantries to guide access to promote consumption of nutritious food and ultimately reduce risk of chronic diseases among health disparate populations.





### S.1.16 Implementation of workplace interventions for health promotion

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# Translating research to practice: Implementation and scale-up of physical activity, sedentary, and behavioral nutrition interventions at worksites in Kansas

**Dr. Elizabeth Ablah<sup>1</sup>**, Ms. Allison Honn<sup>1</sup>, Mr. Mason Rohleder<sup>1</sup>, Ms. Melinda Kellogg<sup>1</sup>, Mr. Jeff Usher<sup>2</sup>, Ms. Virginia Barnes<sup>3</sup> <sup>1</sup>University of Kansas School of Medicine, Wichita, United States, <sup>2</sup>Kansas Health Foundation, Wichita, United States, <sup>3</sup>Blue Cross and Blue Shield of Kansas, Wichita, United States

Policies and environments (SIG)

#### Purpose

The objective of this session is to describe how research can be translated into practice by describing a process of implementation and scale-up of physical activity, sedentary, and behavioral nutrition interventions for hundreds of worksites across Kansas, a rural state in the United States.

#### Methods

WorkWell KS has a 10-year history of developing and implementing evidence-based participatory interventions, resulting in four iterations: Phases I through III and Pathways to a Healthy Kansas. For each iteration, we identified evidence from research regarding strategies that improve physical activity, sedentary, and behavioral nutrition in worksites. These intervention strategies were implemented, evaluated, and updated based on data about the interventions' reach, effectiveness, adoption, implementation, and maintenance (RE-AIM).

#### Results

A total of 816 worksites and 2,983 worksite contacts have completed at least one iteration of WorkWell KS. Implemented worksite changes impacted up to 211,865 employees and another 245,618 dependents. Effectiveness, adoption, and maintenance of the interventions were assessed through standardized employee-level assessments (at baseline and one-year follow-up), WorkWell KS assessments developed to measure evidence-based practices (at baseline and one-year follow-up), and participant feedback (at baseline, post-workshop, and one-year follow-up). As the same individual facilitated all WorkWell KS workshops and curricula, fidelity to the protocol was strong.

#### Conclusions

Worksite wellness research can be translated into practice by establishing and evaluating processes and systems using the RE-AIM framework, expanding worksites' capacity through participatory processes, and emphasizing organizational-level changes.





# Examining culture, context and systems in the development and implementation of the Stand Up for Health programme

Dr. Divya Sivaramakrishnan<sup>1</sup>, <u>Ms. Jillian Manner<sup>1</sup></u>, Prof. Ruth Jepson<sup>1</sup>, Dr. Graham Baker<sup>1</sup>, Mr. Richard Parker<sup>1</sup>, Mr. Andrew Stoddart<sup>1</sup>, Mr. Scott Lloyd<sup>2</sup>

<sup>1</sup>University of Edinburgh, Edinburgh, United Kingdom, <sup>2</sup>Public Health South Tees, Edinburgh, United Kingdom

#### Implementation and scalability (SIG)

**Purpose:** Contact centres have been described as ?constrained? work environments with rigid organisational and environmental structures, where staff members may experience limited autonomy over their working practices. Organisational pressures to maintain high levels of productivity and meet targets often work against investment into health and physical activity programmes within some contact centres. To maximise effectiveness and sustainability, it is essential that to consider these cultural, contextual and system factors while developing health promoting interventions for this sector. Stand Up for Health (SUH) is a workplace intervention developed to target sedentary behaviour in contact centres. In this symposia, we will examine the development and implementation of the SUH intervention, and the significance of culture, context and systems in this process.

**Methods:** Development: The 6SQuID model was used to develop the intervention. This included working closely with a pilot contact centre to understand the problem as well as identify cultural and organisational factors to be considered during intervention development; identifying modifiable factors and developing a theory of change.

Implementation: A feasibility study is underway to test the acceptability and feasibility of implementing the Stand Up for Health intervention in contact centres. Eleven contact centres have been enrolled in the study. The centres are diverse with respect to culture (private and public ownership), contexts (size of centre, geographical locations), and systems (shift patterns, layout).

**Results:** The SUH intervention has been developed with due consideration given to complex, interacting elements within a contact centre. Over the course of development and delivery, a number of programme components have been identified that have enabled effective implementation and sustainability of the intervention: (i) Coproduction (ii) Fidelity to theories of change rather than activities that catalyse change (iii) Ownership (iv) Importance of organisational change (v) Communication.

**Conclusion:** The SUH programme highlights the importance of cultural, contextual and systemic factors for successful implementation and sustainability of interventions. It is a seminal case study illustrating the consideration of these factors in the development of any health promoting interventions for the workplace.





# Implementation of a digital workplace health application targeting sedentary office workers: Lessons learned in co-production

<u>Mr Bradley Macdonald</u><sup>1</sup>, Ms. Caitlin Haile<sup>1</sup>, Dr. Nicola Cogan<sup>1</sup>, Dr. Xanne Janssen<sup>1</sup>, Dr. Ann-Marie Gibson<sup>1</sup>, Dr. Alison Kirk<sup>1</sup>, Dr. Sotirios Terzis<sup>1</sup>, Dr. Marc Roper<sup>1</sup>

<sup>1</sup>University of Strathclyde, Glasgow, United Kingdom

#### Implementation and scalability (SIG)

Purpose: The implementation of interventions targeting sedentary office workers at scale is a major challenge. Digital based interventions have the potential to reach large populations at a low cost. With limited resources, partnerships with industry stakeholders in workplace health should be considered to design sustainable interventions. Drawing on implementation science, and using a "research/industry" co-production case study, this presentation will explore the development, and implementation of a digital workplace health application targeting sedentary office workers. Specifically, the presentation will:

- 1) Explain the process of working with industry to co-produce and pilot test for both effectiveness and scalability.
- 2) Outline the journey and lessons learned from co-production.

Methods: A co-production approach between a business and academics was followed to develop a workplace digital health application targeting several health behaviours using a nudge based technology. Co-production of the content of the application was conducted in a three step process of: 1) hypothesis validation; 2) content validation, creation, and analysis; and 3) product testing. Subsequent to this, a second pilot phase was initiated to test the products effectiveness and scalability in four real-world office settings. To inform scalability, the RE-AIM QuEST mixed methods framework was 53 tilized evaluating the intervention across additional indicators.

Results: Preliminary results indicate that, introducing a pilot testing phase specific to scalability has informed the research teams understanding of the potential for scale-up at an early phase of the research process. Based on the co-production process the research team learned valuable lessons about working with a start-up company and specific recommendations for researchers to employ, will be shared.

Conclusion: The co-production of sustainable interventions with industry stakeholders may be an important way forward to reducing sedentary behaviour in large populations of office workers. Understanding the challenges of working with stakeholders has the potential to foster the mutually beneficial relationship needed for success.





## S.1.17 Is it now time to recommend a 'safe' dose of sedentary time for public health guidelines?

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## Is there sufficient evidence for sedentary (screen) time recommendations in youth?

#### Dr. Teatske Altenburg<sup>1</sup>

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Children and families (SIG)

Purpose: Due to the increased use of screens (smartphone, TV, computer), sedentary (screen) behaviour has become increasingly visible in the lives today's children and adolescents. The assumption that this has adverse health effects has led to screen time recommendations accompanying an explosion of preventive interventions targeting the reduction of screen and sedentary time. But, is there sufficient evidence justifying a quantitative recommendation for sedentary (screen) time in children and adolescents?

Methods: A scoping review was conducted in PubMed, summarizing studies on the association between sedentary behaviour and health indicators in children and adolescents (0-18 years). A broad search was conducted, including studies with various designs (cross-sectional, prospective, experimental) and with various physical and mental health outcomes. Findings are evaluated by critically considering the methodological quality of included studies.

Results: A number of methodological issues should be considered when examining the literature on potential adverse health effects of sedentary behaviour in children and adolescents. First, evidence is predominantly based on cross-sectional studies, that are obviously not able to distinguish cause and effect. Second, self- or proxy-reported TV viewing time is often used as an indicator of overall sedentary behaviour, while TV viewing is only one of the many sedentary behaviours that children and adolescents engage in. Third, mostly only total time spent in sedentary behaviour is considered – whether or not adjusting for physical activity, ignoring the pattern in which sedentary behaviour and physical activity are accumulated and alternated throughout the day and week. Prospective studies or studies using device-based sedentary behaviour report less consistent findings compared to cross-sectional studies and self- or proxy-reported sedentary behaviour.

Conclusions: The evidence regarding associations of childhood sedentary behaviour and health is inconsistent and varies across study design and type, measurement and analysis of sedentary behaviour. Future youth public health guidelines may need to address the accumulation and alternation of sedentary behaviour and physical activity throughout the day and week.





# Sedentary behavior in adults: Are we ready for more prescriptive recommendations?

#### Professor David Dunstan<sup>1,2</sup>

<sup>1</sup>Baker Heart and Diabetes Institute, Melbourne, Australia, <sup>2</sup>Mary McKillop Institute for Health Research, Australian Catholic University, Melbourne, Australia

#### Disease prevention and management

Purpose: While current sedentary behavior recommendations are typically stated in broad terms, the interplay of emerging evidence from observational and experimental studies may inform more sophisticated messaging, particularly with respect to chronic disease prevention and management. The purpose of this presentation will be to examine the collective evidence in adults, with a specific focus on population groups with heightened chronic disease risk.

Methods: The presentation will be informed by the evidence synthesis undertaken by the 2018 Physical Activity Guidelines Advisory Committee for the 2ndEdition of the Physical Activity Guidelines for Americans, along with recent reviews we have published that have emphasized the importance of integrating evidence from observational and experimental research to better inform public health strategies. An example of how this evidence triangulation has led to new specific recommendations in the context of type 2 diabetes (T2D) management will be provided.

Results: There is strong evidence that exposure to high volumes of sitting time can significantly increase risk for allcause and cardiovascular mortality, and incident CVD and T2D. The association between sedentary behavior and allcause mortality can vary by the amount of moderate-to-vigorous physical activity, being much more pronounced in those who are inactive (i.e., not meeting physical activity guidelines). Interactions of sedentary behavior with physical activity for other health outcomes are not well understood. The concept of 'breaks in sitting time', shown in the early observational studies to have beneficial associations with cardiometabolic risk biomarkers, has since been pursued in laboratory trials comparing prolonged sitting to 'sitting interruptions' involving brief periods of postural change and/or physical activity. Notably, this experimental evidence has identified cardiometabolic risk benefits to be amplified in those with/at risk of developing T2D. The American Diabetes Association now recommends that at least in adults with T2D, 'prolonged sitting should be interrupted with bouts of light activity every 30 minutes for blood glucose benefits'.

Conclusion: Readiness for inclusion of more prescriptive ST recommendations is more advanced for clinical guidelines than for public health guidelines. Addressing the interplay between physical activity and sedentary behaviour will be key for future guideline development.





# Sedentary behaviour and healthy ageing: How much sitting is "too much" for older adults?

#### Dr. Jennifer Copeland

<sup>1</sup>University of Lethbridge, Lethbridge, Canada

#### Ageing (SIG)

Purpose: Older adults are the fastest growing segment of the population, are the least likely to achieve minimum recommendations for physical activity, and accumulate the most sedentary time of any other age group. The purpose of this presentation is to examine the relationship between sedentary time (ST) and health, with a focus on outcomes of particular relevance to an older adult population.

Methods: The primary source of data for this presentation is a critical inspection of the literature, including an update to a published review (BJSM, 2017). Cross-sectional, longitudinal observational, and intervention studies were compared to determine if there is consistent evidence of a dose of ST that is associated with significant and meaningful outcomes. In light of estimates that > 65% of older adults have at least two chronic conditions, the outcomes of focus during this presentation will be cognitive function and mobility, as these are highly relevant to longevity and quality of life, even among those with multi-morbidity. Associations with time spent in different sedentary behaviours and breaks in ST were examined and the presentation will consider whether guidelines should focus on specific behaviours, total ST, or patterns of ST.

Results: ST poses a unique problem for older adults by impacting mobility and cognitive function, thus increasing risk for disability in activities of daily living. There is evidence that suggests reducing ST by 1 hour/day could have clinically meaningful effects on health and mobility. Breaks in ST are positively associated with physical function among older adults, although the evidence is primarily cross-sectional. The type and context of ST may be important; some cognitively engaging sedentary behaviours appear to be associated with less risk of both physical and cognitive impairments compared to passive ST. The impact of ST is most significant among older adults with low physical activity.

Conclusion: Including ST in activity guidelines may be especially important for older adults given their relatively lower participation in physical activity. While guidelines for an optimal pattern of ST may be most appropriate based on the evidence, complicated public health messages have disadvantages that must be considered.





# S.1.18 Integrating complex systems modeling methods to advance community-level obesity prevention interventions: Insights from recently completed research trials

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## Application of systems science and systems modeling approaches in large-scale community-based obesity prevention trials in Australia

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#### Implementation and scalability (SIG)

Purpose: In this presentation we will present examples of the application of systems modeling techniques in intervention design, describe how these fit in the trial design of interventions across large regional areas, and pose questions and challenges for evaluation and interpretation of results using systems informed process and outcome data.

Method: The Global Obesity Centre (GLOBE) along with community partners have multiple active trials of childhood obesity prevention in 24 Victorian communities reaching more than 45,000 children. These trials have a stepped wedge cluster randomized design, supporting a traditional intervention measurement approach to evaluation. The intervention design, implementation and process evaluation adapt and apply techniques arising from the COMPACT collaboration to test their efficacy and capacity building impacts. System dynamics (causal loop diagrams and simulation modelling), social network analysis and agent-based modelling have been applied in practical implementation of community-based obesity prevention efforts. Partners to these interventions include departments of health and education, health services, civic leaders in government and representatives from retail, education, sport and recreation sectors.

Results: Promising initial changes have been observed in obesity rates alongside the trial and in light of higher than expected prevalence figures. Longer term behaviors changes have been observed. Communities have been able to develop causal loop diagrams, social network analysis has been used to inform trials and understand relative contribution to implementation, and knowledge and engagement information have been collected to further inform computational modelling of diffusion.

Conclusions: We found applying the principles underpinning complex systems modeling as well as formal system modelling methods congruous with community-based interventions. Participating communities demonstrated variance in their uptake of these methods and in the ability to build capacity to apply them. Practical application and implementation of these key methods for addressing the challenges posed by the complexity of obesity remains a critical area for future research.





### From systems mapping to agent-based modeling: Integrating complex systems methods to advance obesity prevention intervention research

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#### Implementation and scalability (SIG)

Purpose: Addressing complex problems such as obesity requires engagement of actors and organizations across multiple levels of action. Whole-of-community interventions - those that are multilevel, multicomponent and implemented through multiple sectors and settings of an entire community - have been recommended and show promise for prevention. However, less is known about mechanisms underlying their success or failure. A growing call to integrate systems science into implementation science hopes to address these gaps—successful implementation is more likely to be effective when efforts are informed by both knowledge of the intervention levers likely to have the most impact and appreciation of the system in which the intervention is implemented. The utilization of tools to help understand complex systems has been gaining traction within implementation science as a means to identify potential predictors of implementation success, such as stakeholders' social networks. However, most applications to date employ only a single complex systems method. Approach: We illustrate the retrospective qualitative development of a systems map representing community change dynamic within the Shape Up Somerville intervention. We then describe how this systems map, and complementary work of other successful interventions(Romp & Chomp intervention) informed the COMPACT (childhood obesity modeling for prevention and community transformation) study. COMPACT's design aligns complex systems science principles and community-engaged research to better understand stakeholders' leadership roles in whole-of-community interventions. We provide an overview of the complex systems tools used in COMPACT: agent-based modeling (ABM), group model building (GMB) and social network analysis (SNA), and describe how whole-of-community intervention stakeholders ("agents") use their social networks to diffuse knowledge about and engagement with childhood obesity prevention efforts, laying the groundwork for community readiness for sustainable change.

Conclusion: Complex systems approaches appear feasible and useful to study whole-of-community obesity prevention interventions and provide novel insights that expand upon those gained from traditional approaches. The specific multi-method research process described—qualitative domain-specific systems mapping, theory-building by an interdisciplinary team informed by multiple fields of science, and quantitative tools like SNA and ABM—may provide a roadmap for future applications in implementation science.





# Using agent-based modeling to understand how stakeholder-driven interventions can successfully reduce childhood obesity in communities

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#### Implementation and scalability (SIG)

Purpose: Successful whole-of-community childhood obesity prevention interventions tend to involve community stakeholders in spreading knowledge about and engagement with obesity prevention efforts through the community. We refer to this process as stakeholder-driven community diffusion (SDCD). We will describe how we have used agent-based modeling (ABM) in conjunction with data collected from interventions deployed in multiple sites to understand how SDCD operates and under what conditions it has the potential to effect substantial, sustainable changes in communities. Methods: In collaboration with intervention experts, we designed an ABM that simulates the SDCD process in communities of socially connected individuals. We have used this model to retrospectively simulate multiple interventions in communities in the United States and Australia. We utilize stakeholder survey data, intervention records, and expert estimates to accurately represent each intervention that we simulate. We then compared model output to real-world observations to test hypotheses about SDCD. Results: Across settings, we find that increases in knowledge about and engagement with childhood obesity prevention interventions produced by our simulation model could match those observed in the real world. This was neither a "knife edge" result produced only under a small set of parameter combinations nor a "hard-coded" outcome that occurred regardless of model parameters. Thus, our findings allow us to make statements about the role of SDCD in driving intervention outcomes as well as how SDCD operates. Conclusions: We found strong suggestive evidence in support of a hypothesis that SDCD was a key driver of the success of multiple interventions. Model exploration also provided additional insights about salient aspects of how SDCD operates across settings. We will discuss the important implications that this has for the design and implementation of future interventions, as well as what additional data collection in conjunction with those interventions might prove most beneficial to gaining a better understanding of how communities can effectively address childhood obesity.





### S.2.19 Fathers' food parenting research: Tools to move the field forward

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### Fathers' food parenting: A scoping review

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#### Children and families (SIG)

Objective: Food parenting, or strategies that parents use to shape children's dietary behaviors, is a robust area of inquiry with over 500 published studies to date. The majority of this research, however, has focused on mothers. Given the diversity of family structures today, and increases in the time fathers engage in caregiving, fathers' food parenting and its impact on children warrants attention. This study presents results from a scoping review of research on fathers' food parenting, summarizes knowledge gaps and recommends future directions.

Methods: Consistent with scoping review guidelines, we searched multiple databases (PubMed, PSYCHINFO, CINAHL, EDSCO) using a standard search string. Eligible studies (a) were peer-reviewed and published in English, (b) measured food parenting practices, and (c) reported results for fathers separate from mothers. Clinical studies and those focused on the pre-weaning period (0-6 mons) or adult children (>18 years) were excluded.

Results: Sixty six eligible studies were identified. The majority of studies (N=46, 70%) were published in 2011 or later. More than half of studies (N=41) were conducted in the United States, followed by 11 studies in Europe. Twenty one studies were published in Appetite compared with 2 studies in IJBNPA. While all studies included data on fathers, only 27% focused on fathers. Studies included a range of ages of the referent child and the racial/ethnic make-up of participants was varied. Fathers self-reported their food parenting practices in most studies (74%) compared with maternal report (9%), child report (5%) or behavioral observation (6%). The vast majority of studies were cross sectional (N=62, 94%), utilized quantitative methods (81%) and included residential fathers (65%); 14% included non-residential fathers and 21% did not report fathers' residential status.

Conclusion: Strengths of the literature include a reliance on father self-report of food parenting practices (versus proxy reporters) and the varied age range of children and racial/ethnic groups considered. The relative lack of longitudinal studies that explicitly focus on fathers and include non-residential and/or social fathers are gaps in the literature to address in future research.





# What children bring to the table: The association of temperament and child fussy eating with maternal and paternal mealtime structure

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#### Children and families (SIG)

Purpose: Parents of children with difficult temperaments may need to implement a variety of behavioural management strategies, particularly during mealtimes. Fussy eating is a nuanced, mealtime-specific behavioural outcome associated with difficult temperament but has been rarely examined with respect to a positive, structured mealtime environment. The aim of the study was first, to examine associations between child temperament and mothers' and fathers' structure-related food parenting practices and, second, to explore whether these associations were mediated by child fussy eating.

Methods: Cohabiting mother-father pairs (N=205) of children aged between 2- to 5-years residing in a socioeconomically disadvantaged Australian city completed self-reported, validated measures of child temperament, food fussiness and structure-related food parenting practices (structured meal timing, structured meal setting and family meal setting). Key variables were compared across parent gender before associations were examined. All models were tested separately for mothers and fathers and where appropriate adjusted for covariates.

Results: Fathers perceived their child as having a more difficult temperament (P=0.016) and reported using lower levels of structured meal timing (P=0.003) than mothers. Structured meal timing was not significantly associated with food fussiness for either mother or father reports and therefore was not examined further. Child temperament was associated with maternal and paternal structure-related food parenting practices, such that more difficult temperament was associated with less mealtime structure. Food fussiness fully mediated the relationship between mothers' reports of child temperament and family meal setting. Father's reports of child temperament was only associated with structured meal setting and family meal setting through the effect of child fussy eating.

Conclusions: For both, mothers and fathers, perceptions of child food fussiness may explain why parents use less structure at mealtimes with more difficult children. This suggests that, when designing interventions to manage child fussy eating both mothers and fathers would benefit from similar approaches. Promoting mealtime structure to facilitate parents' appropriate responses to food refusal or difficult behaviour at mealtimes is indicated.





### Dads' food parenting practices – Is it really that different than mothers?

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#### Children and families (SIG)

Food parenting practices are an important determinant of childhood obesity, but published research exploring the influence of parenting practices on children's eating behaviours has mainly focused on the parenting practices of mothers. Little is known about whether mothers and fathers use similar food parenting practices to encourage their children in adopting healthy eating practices. This study examined invariances in psychometric properties of food parenting practices by parent's gender and whether Canadian mothers and fathers use different food parenting practices.

Methods. Parents of 5-12 year children (n=799) were recruited by a Canadian marketing research company to complete the food parenting practice item banks (86 items) measuring 11 constructs. A quota sampling approach was used to ensure adequate representation by gender of parents and to match the income and ethnicity distribution of the Canadian population (50% mothers, 51% white/Caucasian, 22% reporting an annual household income < \$50,000 CAD). Measurement invariance was first established using Item Response Modeling Differential Item Functioning analyses to ensure the 11 constructs can be validly compared between mothers and fathers. Differences in scores were then assessed using Student's T tests (for normally distributed variables) and Mann Whitney U tests for non-normally distributed variables. Multivariable regression analyses were then conducted to examine differences in food parenting practices after adjusting for children's age, sex, parental ethnicity, education attainment, and household income.

Results. The psychometric properties of the food parenting practices constructs were found to be invariant by parents' gender. After adjusting for covariates, parents' gender was associated with directive control practices. Mothers reported using less directive control compared to fathers (standardized  $\beta$ =-0.14 from covariate adjusted models, p=0.001). None of the other food parenting practices examined (involvement, scaffolding healthy eating, restriction for weight, nondirective support, healthy opportunities, rules and limits, routines, redirection, healthy environment and permissive) differed by parents' gender.

Conclusion. Canadian mothers and fathers have generally similar food parenting practices, but mothers exert less directive control compared to fathers. Since controlling parenting practices have been associated with poor self-regulatory skills in children, intervention messages need to particularly reach fathers.





### S.2.20 Identifying points of intervention for youths' physical activity

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# Tracking physical activity, sedentary behavior and fruit and vegetable consumption from childhood to adolescence: The Fun 5 cohort study

#### Dr. Claudio Nigg<sup>1</sup>

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Childrens' health behaviors during may track to adolescent health behaviors, but longitudinal research rarely has examined this in a multicultural population in Hawaii to date. This study investigated if childhood moderate-vigorous physical activity (MVPA), fruit and vegetable consumption (FVC), and sedentary behavior (SB) is related to adolescent MVPA, FVC, and SB.

Methods: Three cohorts of public elementary school children (4<sup>th</sup>-6<sup>th</sup> graders) who participated in a state mandated afterschool program completed baseline (Y1) and 5-year follow-up surveys (Y5; demographics, MVPA, FVC, SB [watching television, playing video games and using internet – not for homework/work]; combined follow-up n=334; 14.76±0.87 years old; 55.1% female; 53% Asian, 19.8% Native Hawaiian/other Pacific Islander, 15.3% White, and 11.9% other).

Results: At Y1 participants engaged in 45.42 (SD=31.20) min/day of MVPA, consumed 6.96 (SD=4.54) servings/day of FV, and 3.85 (SD=2.85) hours/day of SB. At Y5 participants engaged in 47.22 (SD=27.04) min/day of MVPA, consumed 4.63 (SD=3.03) servings/day of FV, and 3.09 (SD=1.98) hours/day of SB. Paired-samples t-tests revealed that Y1 and Y5 PA did not differ (t(307)=-1.27, p=.20), whereas FVC and their SB significantly decreased from Y1 to Y5 (t(309)=8.42, p<.001; and t(329)=4.17, p<.001; respectively). No cohort or ethnicity differences were evidenced, although males did more PA and more SB than females (p<.05). However, there were no significant interactions of the demographics by behaviors (ps>.05).

Conclusions: Results indicate that the Fun 5 cohort maintained PA levels which on average did not meet the recommended guidelines of 60 minutes of MVPA/day. They were also below the recommended guidelines and further decreased their SBs over time. Whereas they met the FV guidelines of 5 servings/day in childhood but fell below the guidelines in adolescence. Analysis like these point to intervention priorities of increased behavioral risk factors over time.





# A multiple cross-sectional examination of social disparities in fruits/vegetable intake, physical activity, and sedentary activity in adolescents, 2005-2017

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Several population-level interventions have been initiated in the last 20 years to address obesogenic behaviors and reduce health disparities for youth. Given these investments, the purpose of this paper is to determine the social disparities in fruits and vegetables intake, physical activity, and non-sedentary activity in adolescents in the U.S. in the last 13 years.

Methods: Data were obtained from the Youth Risk Behavior Surveillance System for odd years between 2005 and 2017. Overall disparities ratios and characteristic-specific disparities ratios (sex, age, race/ethnicity) for meeting fruits and vegetables and physical activity recommendations, and non-sedentary activity were calculated using the Extended Gastwirth Index Method. Test of associations and linear trends for characteristic-specific contributions to overall disparities were computed.

Results: Overall and characteristic-specific disparities for obesogenic behaviors fluctuated across the years. For both physical and non-sedentary activity, there was a decrease in sex-specific and an increase in age-specific contribution to overall disparities across the years. Sex-specific contribution to overall disparities increased for fruits and vegetables across the years. Race-specific contribution to overall disparities decreased for fruits and vegetables, physical activity, and non-sedentary activity across the years.

Conclusions: These results confirm that disparities for obesogenic behaviors are still an ongoing concern, and in some instances growing, despite efforts from multiple entities to improve adolescents' behaviors. The methodology allowed for a meaningful disparities ratio that allowed for comparison of categorical characteristics across the years. These calculations are a useful tool for identifying groups that should be targeted for population health interventions to reduce disparities.

Funding: This work was supported by the National Institute of Health [grant number 1K12HD092535].





# Investigating socio-ecological physical activity predictors across adolescence and young adulthood – The MoMo study

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#### Motivation and behavior change (SIG)

Purpose: Considering current youth physical inactivity levels, it is essential to examine predictors of physical activity (PA) behavior. However, little is known about how PA determinants might change when looking at the transition from adolescence to young adulthood. Thus, the purpose was to investigate and compare socio-ecological predictors of PA in from adolescence to young adulthood.

Methods: Data was obtained of the German national representative Motorik-Modul Study (MoMo) waves 1 and 2 (w1: 2009-2012; w2: 2015-2017). Participants filled in validated questionnaires on PA enjoyment, physical self-concept, social support, PA environment, demographics (age, gender, community size, educational background), and moderate to vigorous PA (MVPA). Multiple regression analysis was used with SPSS 25.

Results: At w1, participants (N = 696, 55.5% female) were 11-17 years old (mean age = 15.16 [SD = 1.59], MVPA/week = 303.10 [SD = 202.69] min.) At w2, participants were 18-25 years old [mean age = 20.56 [SD = 1.66], MVPA/week = 206.10 [SD = 201.80] min.). In adolescents, the predictors explained 30% of the variance in MVPA (F [8, 394] = 22.52, p < .01). Significant predictors were gender (b = -.13), PA enjoyment (b = .19), physical self-concept (b = .21), and social support of family (b = .13) and friends (b = .12) (all p's < .01). For young adulthood, the predictors explained 33% of the MVPA variance (F [8, 393] = 22.81; p < .01). Significant predictors in young adulthood were: age (b = -.09, p < .05), BMI (b = .13, p < .01), PA enjoyment (b = .19; p < .01), physical self-concept (b = .33; p < .01), social support of family (b = .09) and friends (b = .12; both p < .05).

Conclusion: Although there are some important demographic differences developmentally speaking from adolescence to young adulthood, the psychosocial predictors of PA remain important during this transition. Surprisingly, the environment or community size seems to have little to no direct effect during these developmental periods. Thus, social-ecological interventions in this age range should emphasize psychosocial variables.





# S.2.21 New ways of purchasing (fast) food: Are we transitioning away from tradition?

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### The online food environment and its interaction with individual food purchases: The development of a conceptual model

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Policies and environments (SIG)

Purpose: Traditionally, food environment exposures are expressed as the availability or accessibility of food outlets (e.g., fast-food restaurants) in people's living environment, the characteristics of these outlets (e.g., distance, opening-hours) and the products for sale at these outlets (e.g., nutritional value, shelf-space, price). The online environment, however, has changed the way food is now available and promoted, and how people interact with the food environment. The primary objective of this study is to present a conceptual framework, relevant for researchers and policymakers, which depicts key relationships between the online food environment and food purchases.

Methods: Based on the current literature, by means of a concept mapping exercise and expert concensus, a conceptual model is currently being developed.

Results: At this stage, the conceptual model provides conceptual insights into how food purchases are influenced by online food environments. To illustrate, the conceptual model depicts how individuals are exposed to food online (e.g., via apps, social media, websites, and email), the mechanisms via which the online environment shapes food purchasing decisions (intention) and directly and through interactions with the "brick-and-mortar" environment influences food purchases (adoption). In addition, the model incorporates potential mechanisms via which the online food environment may shape determinants of food choices (e.g., social norms, knowledge, values) and mechanisms shaping online food purchase behaviors (e.g., convenience, time-stress).

Conclusions: The proposed conceptual model will help advance research on possible multidimensional influences of online food environments on food purchases. Specifically, the model suggests multiple new lines of research that may identify new interventions and policies to improve population health. It is, however, vital that researchers, public health professionals and policy makers become aware of this online component of the food environment.





# A narrative review of Online Food Delivery platforms: Implications for public health policy

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#### Policies and environments (SIG)

Purpose: The food environment is widely acknowledged as a driver of an increase in non-communicable diseases. Online Food Delivery (OFD) platforms are a recent addition to this environment offering consumers convenient and fast delivery of a wide variety of food and drink options. Given evidence that meals prepared by away-from-home food outlets tend to be less healthy than meals prepared at home, the aim of this narrative review was to describe and discuss the OFD sector in Australia and the implications for public health policy.

Methods: Sources of peer-reviewed (e.g. PubMed) and grey literature (e.g. Australian federal websites) were searched (January 2009 - February 2019) using search terms related to "online food delivery", "meal delivery", or "takeaway". Articles about the nature and use of OFD platforms in Australia and existing public health policy targeting the food environment as well as their current and potential application to OFD platforms were identified.

Results: There are three main OFD platforms with thousands of food outlet partnersand they have experienced rapid growth, which is predicted to continue. Policies to improve the healthiness of foods and drinks for sale in Australia include kilojoule menu labelling, health star rating system and the healthy food partnership. With the exception of kilojoule menu labelling, which is applicable to some food outlets only, we were unable to find evidence that current policies specifically apply to or target OFD platforms. This lack of consistency could undermine these policies. We discuss the benefits, limitations and practical challenges of extending these policies. For example, the technological feasibility is high for OFD platforms to provide consumers with nutritional information for all partners, however, a requirement to provide this in order to be an OFD partner may disadvantage smaller independent businesses less able to generate this information.

Conclusions: OFD platforms are disruptors to the away-from-home food retail sector; they are altering the way that the population chooses and orders takeaway meals, could potentially have a significant impact on the food environment, dietary choices and diet-related health, and thus present unique challenges and opportunities for public health policy.





# Online food delivery service use and associated sociodemographic characteristics: A cross-sectional, multi-country analysis

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#### Policies and environments (SIG)

Purpose: Foods prepared away-from-home, in fast-food outlets and restaurants, are characteristically high in energy, fat and salt. Foods are often purchased in person, however, online food delivery services like Just Eat (Menulog) offer an alternative and could influence purchasing. It is not well known how much, or by whom, online food delivery services are used. We aimed to describe the prevalence of online food delivery service use, and correlated sociodemographic characteristics of users, across five countries.

Methods: We used cross-sectional, self-reported, online survey data (n=17,573) from Canada, Australia, the UK, USA and Mexico, collected in 2018 through the International Food Policy Study. We identified respondents who used an online food delivery service to order at least one meal prepared away-from-home in the past 7 days and calculated the number and proportion of meals ordered. We used adjusted logistic regression to investigate whether odds of online delivery service use varied according to sociodemographic characteristics.

Results: Overall, 2,580 (14.7%) respondents reported online food delivery service use. Prevalence of use was highest in Mexico (n=839 (25.8%)) and lowest in Canada (n=304 (8.8%)). In total, 5,526 meals; 11.1% of all meals purchased away-from-home.

Odds of online food delivery service use decreased as age increased (per year, OR: 0.47; 95% CI: 0.44, 0.50), and was associated with being male (vs female, OR: 1.50; 95% CI: 1.34, 1.67), from an ethnic minority (vs majority, OR: 1.66; 95% CI: 1.45, 1.89), more educated (highest vs lowest, OR: 1.56; 95% CI: 1.35, 1.79), and living with children aged under 18 (vs not, 2.45; 95% CI: 2.17, 2.77), but not body weight. Similar patterns were observed across countries.

Conclusions: Prevalence of online food delivery service use varied by country. Typically, younger, male, adults, those from an ethnic minority, with greater education, and living with children under 18 years had greater odds of use. Further work to understand why fast food is ordered online, how it could displace other order modes, nutritional quality of food available and overall impact on diet and health is required.





# S.2.22 Implementing interventions in real world settings – experiences from four interventions addressing physical activity and healthy eating

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### Embedding process, implementation and research-community partnership evaluation into the design of a 69 perational controlled trial 69 perationaliz public transport for physical activity gain: A real-world perspective from the trips4health study

<u>Dr. Verity Cleland</u><sup>1</sup>, Dr. Melanie Sharman<sup>1</sup>, Ms. Gudrun Wells<sup>1</sup>, Prof. Kylie Ball<sup>2</sup>, Prof. Alison Venn<sup>1</sup>, Prof. Stephen Greaves<sup>3</sup>, Prof. Leigh Blizzard<sup>1</sup>, Prof. Andrew Palmer<sup>1</sup>, Dr. Kim Jose<sup>1</sup>

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Implementation and scalability (SIG)

Purpose: To describe 'how to' embed process, implementation and partnership evaluation into a real-world randomised controlled trial (RCT) incentivising public transport to increase physical activity (PA). Intervention participants receive public transport credit for achieving weekly travel targets, and weekly text messages over four months. This trial was developed in partnership with a public transport provider, local government and state government.

Methods: Evaluation was guided by three frameworks. Process evaluation elements included feedback from pilot study participants assessing participation experiences; individual interviews with partner organisation staff before, during and after trial implementation; and individual interviews with intervention group participants post-trial. Implementation evaluation elements included assessment of fidelity, dose and reach; development of a logic model; and consideration of significant weather events and policy, administrative or service-related changes to assess context. A partnerships analysis tool enabled reflection and strengthening of new and existing partnerships.

Results: Pilot study feedback (process evaluation) resulted in clarification of instructions for technology-based study measures, refinement of travel behaviour measures, and clearer guidance on study time commitments. Feedback from interviews with partner organisation staff resulted in refinements to data capture and exchange systems, and identification of contextual factors of potential. Since commencement (September 2019), implementation evaluation shows that of 179 people who read online study information, 99 were ineligible, and of the 80 who were eligible, 65 have consented and 24 of these have been randomised into the study. The number of partnerships (partnership evaluation) increased from four to 11 between 2018 and 2019.

Conclusions: Unlike traditional RCTs, this study is being conducted in a real-world setting through a researchcommunity partnership. Many potential issues associated with moving an intervention from the research setting to the real-world setting have been negotiated throughout the study design and development process. Factors identified as important in implementation science frameworks, such as leadership motivation and engagement, communication, engaging intervention staff, reflecting and evaluating, and empirical evidence, were critical for successful rollout. Embedded implementation, process and partnership evaluation measures have already been





useful for refining and strengthening the study design, participant experience, partnerships and potential for scalability.





# The "how to" of implementation: Use of the PRACTIS guide to support the statewide implementation of INFANT across Victoria, Australia

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#### Implementation and scalability (SIG)

**Purpose:** Obesity prevention in early life is critical, however few effective interventions have been scaled up and integrated into routine service delivery to achieve population level impact. The **in**fant **f**eeding, **a**ctive play and **n**utrition (INFANT) initiative is a previously trialled efficacious healthy lifestyle program delivered via first time parent groups in the first 12 months of the infants' life utilising a universally delivered maternal and child health service. From 2020, INFANT will be available to all (n=76) local governments across Victoria, Australia. This paper reports on key lessons learnt regarding implementation establishment for the delivery of INFANT 'at scale' within real-world settings.

**Methods:** This is a 5-year implementation research project involving 10 practice and policy partners ensuring reach to vulnerable communities across Victoria, Australia. Implementation establishment is described using the PRACTIS guide (Koorts et al 2018). Implementation evaluation uses a mixed methods approach using the RE-AIM framework (Glasgow et al 2019).

**Results:** PRACTIS guide steps were iterative in nature, with characterisation of the implementation setting and stakeholder engagement occurring concurrently. Evidence from INFANT efficacy trials and 'small scale' implementation studies expedited the describing of features and processes of adoption and implementation. The establishment of an implementation advisory group and the use of a co-design approach has been essential to refine implementation strategies. Baseline organisational readiness (RR 53.2%) showed high levels of motivation, commitment and efficacy for implementation. Levels of change capacity however were low with concerns about adequate funding and staffing to enable and sustain INFANT implementation. These and other contextual barriers and enablers explored over the duration of the research project will inform adoption and implementation to maximise opportunities for integration into existing delivery systems.

**Conclusions:** The PRACTIS guide was a useful tool to plan and operationalise the adoption and implementation of INFANT within a 'real world' context. Engaging practice and policy partners early in these processes has enabled early identification of important barriers and co-design of appropriate solutions, strengthening implementation and scale-up efforts.




# Implementing changes to the built environment to increase children's physical activity

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# Implementation and scalability (SIG)

Purpose: Changing the built environment is one way to promote physical activity among children. However, creating and implementing effective environmental changes is challenging and requires involvement of many different actors. Also evaluating the effect of environmental changes is challenging and e.g. involves using a mixed methods approach using the RE-AIM framework (Glasgow et al 2019). We will present lessons learnt from three projects, 'When Cities Move Children', the 'Activating Schoolyards Study' and the 'Move the Neighbourhood study'.

Methods:When Cities Move Children was a natural experiment with a repeat-cross-sectional graded exposure design, The Activating Schoolyards Study and the Move the Neighbourhood study were quasi-experimental mixed methods studies with a pre-post design. Participants wore an accelerometer (ActiGraph GT3X) and a GPS (Qstarz BT-Q1000XT) for seven days to determine the changes in physical activity levels. Participant observation and goalong group interviews were conducted to be able to understand what influenced. Interviews with children, teachers and designers were used to assess adoption, implementation and maintenance.

Results: In When Cities Move Children and the Activating Schoolyards Study participants increased time spent being physically active in the built environments that had been changed. However, there were significant differences by school, gender, type of facility and the overall activity level of the students. In the Move the Neighbourhood study, children spent 15 minutes more in the space post-intervention. However, the space was used fewer days and by fewer children, being less physically active after the intervention. The qualitative findings revealed larger effects at schools where the students experienced their wishes for renewal had been carried out. Our evaluation highlighted challenges associated with how the children were involved, and that a lack of maintenance after the intervention ended impacted activity levels and use.

Conclusions: The results from these three studies show that changing that built environment can lead to device measured changes in children's physical activity behavior. However, there are large local and individual variations, and much of these differences could be explained by differences in implementation during the design and construction phase of the projects.





# S.2.23 The role of behavioural scientists in knowledge translation: A debate

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# In favour of increasing implementation and feasibility studies

### Dr. Rebecca Liu<sup>1</sup>

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Implementation and scalability (SIG)

#### Purpose:

This presentation will take the stance that clinical scientists have a responsibility to assess implementation and feasibility of interventions. This aim would require immediate funding efforts to support knowledge translation of lifestyle behaviour research and guidelines. As many countries have developed evidence-based guidelines for lifestyle behaviours, the next step for research should be determining how to implement these recommendations, and whether guidelines themselves are feasible.

#### Methods:

First, a literature review of recent implementation and feasibility registered trials and their funding source will be presented for nutrition, exercise and sleep interventions. This will be done by searching clinical trials and health interventions that have been registered within the last 5 years. Next, global statistics for meeting physical activity, sleep and nutrition guidelines will be summarized for the general child/youth and adult populations. Finally, benefits of collaborating with industry and non-profit agencies will be summarized with examples of successful collaborations.

### Results:

Over the past 5 years, despite an increase in the availability of evidence-based guidelines for lifestyle behaviours, majority of researchers are studying the clinical effects of exercise, nutrition and sleep in comparison to feasibility or implementation. This is of concern because global health statistics have remained stable for the lack of activity performed by populations, poor sleep and nutrition habits suggesting that despite an increase in knowledge for the clinical health effects of lifestyle habits and behaviours are not improving. This may be evidence for the lack of research funding being allocated to support implementation and feasibility science. It is possible that an evidence disconnect exists between clinical scientists and their role for knowledge translation. It is time to demand more than publications of research findings from experts.

#### Conclusion:

As experts behind clinical trials, researchers may be in the best position to contribute to implementation and feasibility of lifestyle behaviour-related guidelines. Clinical scientists should be encouraged to include implementation and feasibility testing as a part of their research efforts. This may be done by collaborating with various, and possibly unlikely partners, like industry and non-profit organizations.





# Opposing implementation and feasibility as the focus for behavioural scientists

### Dr. Taniya Nagpal<sup>1</sup>

<sup>1</sup>University of Ottawa, Ottawa, Canada

### Implementation and scalability (SIG)

#### Purpose:

Academics have a responsibility to conduct high-quality research that informs the development of evidence-based guidelines for population health. International guidelines have been developed for physical activity, nutrition, and sleep for general and specific population groups. These guidelines; however, highlight many areas of research that are lacking, and clinical trials are needed to better understand the effects of lifestyle behaviours on a variety of health outcomes and for specials populations. This presentation takes the stance that researchers have a commitment to clinical research and developing practical guidelines. Furthermore, science is lacking an understanding of the long-term effects of lifestyle behaviours as mostly only short-term results have been reported.

#### Methods:

The children and adult Canadian 24-hour Movement Guidelines will be used as an example describing the need for clinical trials to inform the effect of lifestyle behaviours over the lifecourse. A literature review summarizing the limitations in current clinical trials, including the lack of long-term follow up will be conducted and areas for future research will be provided. Finally, the importance of practical guidelines will be discussed and the need for scientists to focus on research outcomes will be argued.

#### Results:

Clinical investigations have not yet evaluated the long-term effects of lifestyle behaviours; consequently, scientists need to conduct high-quality trials to further inform practical guidelines. An example includes the lack of information on the effects of exercise on long-term health outcomes as most trials do not include extended follow-up periods. Furthermore, many more specialized groups, requiring tailored guidelines have not yet been investigated. High quality clinical trials with long-term follow up explaining the effect of lifestyle behaviours on health outcomes are needed.

### Conclusons:

The focus for scientists should be on producing high quality clinical trials to address research gaps for lifestyle behaviours, especially focusing on the long-term effects. By presenting high quality, practical guidelines that address the long-term effects of exercise, nutrition and sleep, future efforts for implementation may be made easier as we can say with evidence that implementing lifestyle interventions can have long-term health effects.





# S.2.24 Working with faith-based organizations and communities to develop and test physical activity and nutrition interventions to reduce health disparities

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# A mixed-methods feasibility study to adapt the DPP with Samoan and Tongan church communities

<u>Dr. Courtney Pinard</u><sup>1</sup>, Dr. Sela Panapasa<sup>2</sup>, Dr. Ken Resnicow<sup>2</sup>, Ms. Hollyanne Fricke<sup>1</sup>, Dr. Amy Yaroch<sup>1</sup> <sup>1</sup>Gretchen Swanson Center for Nutrition, Omaha, United States, <sup>2</sup>University of Michigan, Ann Arbor, United States

Implementation and scalability (SIG)

Purpose: To determine baseline characteristics of a group of Samoan/Tongans in the U.S. at risk for Type 2 Diabetes Mellitus (T2DM) and identify specific barriers and cultural factors to addressing a culturally tailored Diabetes Prevention Program (DPP) for this population.

Methods: Paper-pencil surveys (N=47) assessing sociodemographics, acculturation, food insecurity, health (e.g., BMI, diagnosed conditions), and psychosocial variables (e.g., self-efficacy) were collected during pilot sessions of the DPP. Survey respondents also participated in focus groups (N=4) to gather in-depth feedback on attitudes towards curriculum, opportunities for tailoring, and barriers to achieving healthy weight.

Results: Participants were on average 42 years old, just over half female (57%), and identified as Samoan (65%) or Tongan (35%). Respondents reported being diagnosed with diabetes (43%), having high blood pressure (28%), and 98% had a BMI that was overweight/obese. The average household size was 8 individuals and 45% reported food insecurity. Under half of respondents reported being born in the U.S., and while majority reported speaking some English at home (72%), some reported poor/fair English proficiency (28%). Psychosocial findings were in the expected directions; internal locus of control and higher self-efficacy were related to lower BMI and food security (p's<.001). Those with higher English skill levels were more likely to be food secure (p<.001) and have lower BMIs (p<.001). Focus group results revealed that the Samoan/Tongan communities identify as an invisible minority group which a lack of culturally relevant programs to address rising concerns of obesity and chronic disease. Specific barriers identified included: traditional foods (e.g., recipe modifications); stress and lack of sleep (e.g., relying on "comfort" foods); body image (e.g., culture that values larger body size); lack of nutrition knowledge (e.g., especially with traditional foods).

Conclusions: This pilot is a first step towards developing culturally specific interventions for an often overlooked Samoan/Tongan population, which has a "ready-made" setting to conduct interventions (i.e., church-based). Findings help to identify the relevant historical, political, and structural contexts of this population needed for tailoring health behavior change programming.





# The relationship between physical activity, alcohol use and obesity in African American church members

### Dr. Natalia Heredia<sup>1</sup>, Ms. Nga Nguyen<sup>1</sup>, Dr. Lorna McNeill<sup>1</sup>

<sup>1</sup>The University of Texas MD Anderson Cancer Center, Houston, United States

### Cancer prevention and management (SIG)

Purpose: African Americans have the highest incidence and mortality from obesity-related cancers. While physical activity and minimizing alcohol intake are two important cancer prevention behaviors, physical activity is also a firmly established obesity prevention behavior. In Non-Hispanic Whites, low-to-moderate alcohol use has been negatively associated with obesity, though the limited research with African Americans indicates that any alcohol use is positively associated with obesity. The purpose of this study is to assess the relationship between alcohol intake and physical activity, and assess the association of both of these variables with Body Mass Index (BMI) in African Americans.

Methods: This is a secondary analysis using data from Project CHURCH, a cohort of African American churchgoing adults residing in the Houston area. Participants completed self-reported questionnaires, including measures on physical activity, alcohol intake, and BMI, along with demographic and other behavioral measures. Bivariate and multivariate analyses were conducted to assess the association between physical activity (minutes of per week), alcohol intake (drinks per week), and obesity (BMI), controlling for age, gender, education, income, employment, marital status, general health status, smoking, and dietary intake.

Results: The sample (N=1040) is mostly female, employed, and college graduates. Most reported meeting physical activity guidelines (74%) and low/moderate drinking (73%). There was a weak positive association between physical activity and alcohol use (Pearson's r= 0.15, p<.001), controlling for covariates. As expected, there was a significant inverse association between physical activity minutes/week and BMI (Beta= -0.001, p<0.001), though there was no statistically significant association between number of alcoholic drinks per week and BMI. There was no interaction between physical activity and alcohol use on BMI.

Conclusions: In this faith-based sample of African Americans, physical activity and alcohol use were positively associated, and physical activity and BMI were negatively associated, mirroring results with Non-Hispanic White samples. However, alcohol use and BMI were not significantly associated among African Americans. Cancer and obesity prevention interventions with this African American cohort should emphasize physical activity promotion while continuing to include messaging on minimizing alcohol intake.





# Adherence to multiple health behaviors in rural cancer survivors and associations with self-rated health

### Dr. Scherezade Mama<sup>1, 2</sup>, Ms. Nishat Bhuiyan<sup>1</sup>, Dr. Kathryn Schmitz<sup>1, 2</sup>

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Implementation and scalability (SIG)

Purpose: This study explored multiple lifestyle behaviors in rural cancer survivors in central Pennsylvania to understand modifiable behavioral risk factors associated with health status and to identify target behaviors for future intervention efforts.

Methods: Cancer survivors in central Pennsylvania were recruited to the Partnering to Prevent and Control Cancer (PPCC) study via an academic-community partnership comprised of churches, cancer support groups, and other community organizations (e.g., YMCA, community centers). Participants completed a cross-sectional survey assessing healthy lifestyle behaviors, including physical activity, sitting time, fruit and vegetable intake, fat intake, and alcohol consumption, body mass index (BMI), self-rated health status, and sociodemographic characteristics. Logistic regression analyses were used to explore associations between adherence to health behavior guidelines and health status (poor/fair or good/excellent).

Results: Participants were in their mid-60s (M age=64.4 $\pm$ 12.2 years) and were mostly women (60.7%), college graduates (50.5%), and reported an annual household income  $\geq$ \$80,000 USD. Most were breast (22.8%) or prostate (20.5%) cancer survivors and had completed cancer treatment (90.3%) but were less than 5 years post-treatment (90.8%). Adherence to health behavior guidelines was highest for alcohol intake (91.3% reported low or no alcohol intake) and lowest for fruit and vegetable intake (10.5% reported <5 servings/day). Roughly 40% of cancer survivors reported engaging in  $\geq$ 150 minutes/day of moderate-or-greater intensity physical activity, and 29.6% were classified as healthy weight (BMI <25 kg/m2). Cancer survivors who met physical activity guidelines were more likely to self-report their health as good/excellent (OR=18.1, 95% CI: 4.1-80.3), and those who were classified as obese (BMI  $\geq$ 30 kg/m2) were less likely to report their health as good/excellent (OR=0.2, 95% CI: 0.1-0.8).

Conclusions: Adherence to multiple lifestyle behavior guidelines is low among rural cancer survivors. Rural cancer survivors who meet physical activity and healthy weight recommendations are more likely to report better health compared to those who do not adhere to guidelines for cancer survivors.





# S.2.25 Adults' physically-active and inactive travel behaviours: Methods, evidence and implications from travel surveys in Japan, Belgium and Australia

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# Evaluating a comprehensive transport intervention plan using 3-yearly transport surveys

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Policies and environments (SIG)

Background. Active transport has huge potential to increase daily physical activity; especially among residents of areas where many local destinations (e.g. shops) are available. Also public transport can increase physical activity levels, since it is often a more active alternative to private motorized transport. However, to change people's transport behavior, transport infrastructure needs to be adequately adapted. In this study, we will evaluate the change in travel behavior due to a comprehensive transport intervention plan introduced in April 2017 in Ghent, Belgium. The plan focused on limiting car accessibility in the city center while promoting active and public transport modes. Secondly, we will evaluate potentially increased social disparities in active transport use.

Methods. An independent partner of the city council collected transport surveys in 2012 (N = 2227), 2015 (N = 1870) and 2018 (N = 2118) from residents of Ghent, Belgium. The travel surveys included questions on personal characteristics (e.g. age), regular transport behavior, and a detailed transport diary for one complete day. From the transport diary, following variables will be analyzed (all in minutes per day): active transport use (walking and biking), physically-active and non-active time during public transport, and time in private motorized transport. Social disparities in physically-active transport will be measured by mean household income and educational level of the residential area.

Results. Preliminary results show the following transport mode shifts between 2015 and 2018 among the general population: a decrease in walking trips (15% to 13%), an increase in bicycle trips (30% to 35%), an increase in public transport trips (5% to 9%) and a decrease in private motorized trips (40% to 33%). Analyzing the changes between 2012 and 2015 will provide information on the 'normal' evolution of travel behavior. Future analyses will indicate if the changes in transport behavior coincide with increased social disparities.

Conclusion. Potentially, we will find growing social disparities in active transport use. This could be important information for policy makers in Ghent for setting priorities in future mobility plans.





# Physically-active and inactive travel behaviours of Australian adults in satellite and regional cities

#### Prof. Takemi Sugiyama<sup>1, 2, 3</sup>, Dr. Rachel Cole<sup>4</sup>, Dr. Masaaki Sugiyama<sup>1, 5</sup>, Prof. Neville Owen<sup>2, 3</sup>

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### Policies and environments (SIG)

Background. Promoting physically-active travel is a public-health objective. Travel surveys are a resource to understand how people move in and around their localities. However, such surveys tend to focus on major cities, and little is known about how residents of other regions travel. Data from large-scale household travel surveys in Queensland, Australia were used to examine geographical variations in physically-active and inactive travel behaviours among adults who live in satellite and regional cities, compared to the major (state capital) city.

Methods. Study participants were adults who reported any trip on the survey day in a 24-hr travel diary in five Queensland Travel Surveys conducted between 2009 and 2014 (N=36,329). They were grouped according to place of residence: major city (Brisbane: N=11,762); satellite cities (Gold Coast, Sunshine Coast: N=11,109); and regional cities (Cairns, Townsville, Mackay, and Rockhampton: N=13,458). Logistic regressions examined the odds of participating in active and inactive travel behaviours, according to city category.

Results. Overall, 14.8% of participants reported any walking, 7.3% walked over 30 min/day, 4.7% used public transport (PT), and 42.3% used cars over 1 hr/day. Compared to Brisbane residents, those in satellite and regional cities were less likely to walk and use PT. The odds ratios (ORs; all p<0.01) of any walking, walking over 30 min/day, and PT use were 0.58, 0.64, and 0.24 for satellite cities, and 0.60, 0.82, and 0.12for regional cities, respectively. Regional city residents were less likely to use cars over 1 hr/day (OR: 0.82) relative to those in Brisbane.

Discussion. Residents of regional cities in Queensland were less likely to walk and to use PT compared to those of Brisbane, potentially due to poorer access to local destinations and PT stops. However, they were less likely to use cars for a prolonged period. Residents of satellite cities were the least physically active for travel. Physical activity initiatives addressing lower levels of active travel for Australian satellite and regional cities may require different strategies than those used in the major cities.





# Travel behaviours in a regional centre and its suburbs in Japan

### Dr. Takumi Abe<sup>1, 2, 3</sup>, Dr. Akio Kubota<sup>4</sup>, Prof. Neville Owen<sup>5, 6</sup>, Prof. Takemi Sugiyama<sup>2, 5, 6</sup>

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### Policies and environments (SIG)

Purpose. Travel surveys have been used to understand variations of physically-active and inactive travel behaviours. However, most existing studies have used data from North America, Europe, and Australasia. No research appears to have used travel survey data collected in Asian cities from a health perspective. This study examined the distribution of active and inactive travel behaviours in a regional centre and its suburbs in Japan.

Methods. This study used travel survey data of Shizuoka city (population: 700,000) and adjacent three municipalities (total population: 380,000). Study participants were 42,713 adults aged 20–74 years who reported any trip on their survey day (mean age 51 years, 51% women). The outcome variables were the prevalence of walking, walking over 30 minutes/day, cycling, use of public transportation [PT], car use, and prolonged car use ( $\geq 1 \text{ hr/day}$ ). Multilevel logistic regression analysis was performed to examine the difference between Shizuoka and its suburbs.

Results. The prevalence of each travel behaviour was 25% for walking, 11% for walking over 30 minutes/day, 19% for cycling, 11% for PT use, 64% for car use, and 27% for prolonged car use. Relative to residents of Shizuoka, those living in its suburbs had a lower odds of walking (OR=0.53 [95%CI: 0.46, 0.61]), walking over 30 minutes/day (OR=0.60 [0.51, 0.69]), cycling (OR=0.40 [0.33, 0.49]), PT use (OR=0.67 [0.58, 0.77]) after adjusting for demographic covariates. In contrast, suburb residents had a higher odds of car use (OR=2.53 [2.24, 2.85]) and prolonged car use (OR= 1.42 [1.29, 1.55]) than Shizuoka residents (all Ors significant at p<0.001).

Conclusions. We used travel survey data from a region of Asia for the first time in relation to public health and found low prevalence of walking and high prevalence of car use: only a quarter of participants engaged in walking and more than quarter of them used cars over 1 hr/day. Suburb residents especially tend to rely on cars for daily travel. Inactive lifestyles may be a public health concern in this part of Japan.





# S.2.26 Is sedentary behaviour a novel risk factor for cognitive decline?

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# Impact of a randomised controlled trial in frail older adults: REduce Sitting to improve Cognitive fUnction in Elders (RESCUE)

<u>Dr. Paul Gardiner<sup>1</sup></u>, Ms. Lily Grigsby-Duffy<sup>1</sup>, Mr. Adam Novic<sup>1</sup>, Dr. Maike Neuhaus<sup>1</sup>, Dr. Mia Schaumberg<sup>7</sup>, Dr. Lucy Lewis<sup>2</sup>, Dr. Amber Watts<sup>3</sup>, Prof. Nicola Lautenschlager<sup>4</sup>, Prof. Kaarin Anstey<sup>5</sup>, Dr. Dori Rosenberg<sup>6</sup>

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Ageing (SIG)

Purpose: This study aimed to evaluate the impact on cognitive function of an intervention targeting reducing and interrupting prolonged sitting compared with usual practice.

Methods: 42 inactive pre-frail/frail older people were recruited from a seniors centre and randomized to intervention or usual care. The 12-week REduce Sitting to improve Cognitive fUnction in Elders (RESCUE) program was delivered by a health coach in one face-to-face and five telephone sessions. The intervention group completed a workbook during the sessions with the health coach and received printed feedback on device-measured sitting at their initial session. Primary outcome was cognitive function (California Verbal Learning Test and Trail Making Test) with secondary outcomes of sitting, standing, stepping (activPAL). Analysis was by linear mixed models.

Results: At baseline, participants (88% women; mean $\pm$ SD age = 80 $\pm$ 7 years; MMSE = 29.1 $\pm$ 1.0) sat for 607 $\pm$ 135 minutes, stood for 258 $\pm$ 104 minutes, and stepped for 68 $\pm$ 28 minutes of their waking hours. Nineteen participants completed each condition. There was no intervention effect for the California Verbal Learning Test -0.3 (95%CI: -1.7, 1.0) words. Intervention effects, favouring intervention group, were observed for Trail Making A test -7.3 (-13.7, -1.0; baseline = 43.4 $\pm$ 17.7) seconds; Trail Making B test -20.2 (-37.9, -2.5; baseline = 131.3 $\pm$ 57.5) seconds; daily sitting accrued in bouts longer than 30 minutes -57.8 (-111.3, -4.2) minutes/day, standing 36.7 (7.3, 65.7) minutes/day; and, stepping 8.5 (2.8, 14.3) minutes/day.

Conclusions: RESCUE successfully reduced prolonged sitting time and positive changes were observed for visual attention and task switching but not verbal learning and memory. While these findings provide preliminary evidence that reducing prolonged sitting results in improvements in some domains of cognitive function, more research is needed to evaluate the impact on other domains of cognitive function, and over a longer period, and whether changes in sitting time and cognitive function are maintained.





# Associations of sedentary behaviour with executive function in mid age and older adults: A systematic review

<u>Ms. Kirsten Dillon</u><sup>1</sup>, Ms. Lily Grigsby-Duffy<sup>2</sup>, Mr. Adam Novic<sup>2</sup>, Dr. Harry Prapavessis<sup>1</sup>, Dr. Paul Gardiner<sup>2</sup> <sup>1</sup>The University of Western Ontario, London, Canada, <sup>2</sup>The University of Queensland, Brisbane, Australia

### Ageing (SIG)

Purpose: Higher levels of sedentary behaviour are associated with lower cognitive function, however the association with executive function needs to be further elucidated. We aimed to identify any associations of sedentary behaviour with executive function in mid age and older adults, overall and by SB domain.

Methods: EMBASE, Web of Science, PsycINFO, CINAHL, SciELO, SPORTDiscus, PubMed and Scopus were systematically searched using medical subject headings and key words. Studies were screened by two researchers and included if they reported sedentary behaviour time, had participants with a mean age 40 years or older, had executive function as an outcome and were published in English. Data on specific study characteristics were extracted and studies were assessed for quality using a standardised measure.

Results: Fourteen studies (n=22,072) met the inclusion criteria, nine of which measured sedentary behaviour with a device and only one of those assessing posture. Five studies were longitudinal, eight cross-sectional and one was a randomised two-condition crossover trial. Mean quality score was 20/24 (83%). Participants on average were 56% female with a mean age of 64 years. Executive function was measured with twelve different tests, the most common being the Trail Making Test (k=4). With respect to relations between overall sedentary behaviour and executive function, two longitudinal and four cross-sectional studies reported detrimental associations, one study reported both beneficial and no association, and four studies reported no association. Three studies (two longitudinal, one cross-sectional) examined television (TV) time as a specific domain; all three found an association of increasing TV time with poorer executive function.

Conclusions: There is more consistent evidence for higher domain-specific sedentary behaviour, i.e. TV time than higher overall sedentary behaviour being associated with poorer executive function. Future studies should include a more valid measure of sedentary behaviour and include a longer follow up period. More studies are needed to determine whether other sedentary behaviour domains are related to executive function. From an intervention perspective, investigating how reducing sedentary behaviour, specifically TV time can impact executive functioning in mid age and older adults is recommended.





# The short-term effects of sedentary behaviour on cerebral hemodynamics and cognitive performance in older adults: Potential impact of mental and/or physical activity

<u>Ms. Carlijn Maasakkers</u><sup>1</sup>, Dr. René Melis<sup>1</sup>, Prof. Roy Kessels<sup>1, 2</sup>, Dr. Paul Gardiner<sup>3</sup>, Prof. Marcel Olde Rikkert<sup>1</sup>, Prof. Dick Thijssen<sup>1, 4</sup>, Dr. Jurgen Claassen<sup>1</sup>

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# Ageing (SIG)

Purpose: Sedentary behaviour might be a potential risk factor for cognitive decline. However, the short-term effects of sedentary behaviour on (cerebro)vascular and cognitive performance in older people are unknown.

Methods: We used a cross-over design with 22 older adults (78 years, 9 females) to assess the short-term hemodynamic and cognitive effects of three hours uninterrupted sitting and explored if these effects can be influenced with regular (every 30 minutes) two-minute walking breaks. In addition, we investigated if low versus high mental activity during the 3 hours of sitting modified these effects. Before and after each condition, cerebral blood flow velocity (CBFV; Transcranial Doppler) and blood pressure (Finapres) were measured in rest and during sit-to-stand and CO2 challenges to assess baroreflex sensitivity, cerebral autoregulation (CA), and cerebral vasomotor reactivity (CVMR). Alertness, executive functioning, and working memory were assessed with the Test of Attentional Performance battery. A mixed model analysis was performed with separate terms for time, and the interaction between time and sit/break and mental activity respectively.

Results: Blood pressure and cerebrovascular resistance increased over time (8.6 mmHg (5.0;12.1), p<0.001), and 0.23 in resistance (0.01;0.45), p=0.04). However, these effects were not mitigated by mental activity or by short walking breaks to interrupt sitting. No short-term differences were observed in CBFV, baroreflex sensitivity, CA, CVMR, or cognitive performance across time, or between conditions.

Conclusions: In older individuals, three hours of sitting increased blood pressure and cerebrovascular resistance, which are known to negatively impact brain health in the long-term. Importantly, we found that these effects in older individuals cannot be mitigated by higher mental activity and/or regular walking breaks. Therefore these findings have important implications for the current ideas about preventing the negative effects of sedentary behaviour in older adults.





# S.2.27 Making childhood great again: Investigating the impacts, barriers and measurement issues surrounding play

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# Feasibility of video assessment to measure motor competency in school children

### Prof. Nick Draper

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Implementation and scalability (SIG)

Purpose: Children with higher levels of motor competence appear to maintain higher levels of physical activity across their lifespan. An increasing attrition rate in youth sports and a shift towards unstructured play and recreation means shifting towards a more inclusive way to measure movement beyond sport skills alone. A valid and reliable assessment tool called the Dragon Challenge (DC) is a circuit of fundamental movement skills created to measure both product and process-oriented aspects of motor competency. Although the DC takes 1.5 to 3 min per individual assessment, the purpose of this study was to determine the feasibility of it to be conducted using video recordings in the physical education setting where too few staff are able to execute live scoring (at least 3 are required).

Methods: Thirty-six video recordings of children performing the DC, 14 girls (Mean  $\pm$ SD age = 10.6  $\pm$ 0.84 years) and 22 boys (Mean  $\pm$ SD age = 11.55  $\pm$ 0.8 years), were taken during an otherwise standard DC assessment session. Video recordings were taken using two cameras placed diagonally across the test court. The DC was delivered and assessed in accordance with the DC manual and testing overseen by a gold standard assessor. After live scoring, each participant was also scored by three assessors using the video recordings.

Results: Intra-rater reliability between live and video-recorded assessment scores was excellent (ICC = 0.923; 95%, [CI] 0.850 - 0.961) with no significant differences. The results of a Bland-Altman plot indicated good levels of agreement.

Conclusions: The use of video recording to assess DC performance appears to provide a valid, reliable and timesaving alternative to live assessment and reduces the number of assessors required. Perhaps video recording DC could present a viable assessment tool which provides results that are more indicative of general motor competence for children engaging in all types of physical activities.





# The relationship between outdoor nature play and New Zealand children's physical, social and academic performance

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Early care and education (SIG)

#### Introduction

The benefits of outdoor, risky play are holistic, numerous, and extend beyond health. We are conducting a programme of work, in collaboration with the Department of Conservation (DoC) and their children's programme, Toyota Kiwi Guardians (TKG), to understand characteristics of individuals most likely to spend time in nature, what the barriers are and what benefits may be associated with doing so.

#### Methods

A survey of caregivers whose children had engaged in nature play was conducted. Questions included demographics, motivators and barriers to getting to TKG sites across New Zealand. We are also planning a cross-sectional pilot study that will assess the relationship between primary school children's exposure to nature and wellbeing, physical literacy, psycho-social development, behaviour and academic performance. Chi-squared tests and regression analyses will be used to draw associations between participation in TKG, exposure to nature and the outcomes of interest.

#### Results

Preliminary results reveal that families earning more than the median national income, with easy access to outdoor activity sites, were most likely to take part in TKG. Having a positive experience with TKG encouraged families to visit other non-TKG sites such as national parks and beaches. Results from the cross-sectional study will be analysed by March 2020.

#### Conclusion

TKG provides a fun and motivating opportunity for families to spend time together in nature. However, there are barriers to engaging, particularly for those from more deprived areas. We will provide preliminary evidence from New Zealand to demonstrate whether children benefit from spending time in nature. Ways to encourage teachers and parents in engaging more with outdoor education and natural spaces will be identified. Further research should implement interventions so that the causal effects of outdoor, risky play can be empirically demonstrated.





# PLEY-School: Evaluation of an early-elementary school-based outdoor loose parts intervention for its impact on the health of children

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### Early care and education (SIG)

#### Introduction:

Unstructured, active outdoor play is fundamental to children's physical, cognitive, and social-emotional development. The Physical Literacy in the Early Years (PLEY) project explored how unstructured outdoor play with loose parts in Nova Scotia (NS) childcare settings improved children's physical literacy: the motivation, confidence, competence, knowledge and understanding to be active for life. Loose parts are materials that can be manipulated and combined in various ways (e.g. wooden planks, buckets, tubes), and provide children with more affordances in how they play outdoors. These materials encourage collaboration, problem solving, creative thinking, and sensory awareness. They also help refine motor skill development and encourage risk taking, which helps children develop physical literacy.

### Purpose:

To date, there is limited evidence exploring the value of outdoor loose parts play in Canadian school environments. Most evidence comes from the United Kingdom and Australia, however none of these school-based loose parts initiatives have done a rigorous, mixed-methods evaluation of the benefits of outdoor loose parts play to children's physical literacy and cognitive development. PLEY School, an upcoming school-based outdoor loose parts play project, will scale up and extend the outdoor loose parts intervention into the early elementary school environment (grades pre-primary to one) and evaluate its impact on children's physical and cognitive health.

### Methods:

Children's physical literacy and cognitive development will be evaluated, comparing measures at the beginning and end of the school year, and to control schools. Children will be engaged in documenting their loose parts play through go-along interviews and photo-elicitation. Educators and parents will be engaged in dialogue to explore their experiences supporting outdoor play and associated benefits and challenges. Anticipated Results:

Preliminary findings from the PLEY project demonstrate that outdoor loose parts play provides physical, cognitive, social, and emotional health benefits for NS preschool-aged children. Similar findings are expected for PLEY School.

### Conclusion:

The early years are the most advantageous time for establishing habits that maintain health across the lifespan. This work will be a critical step toward ensuring schools across NS provide an environment where children's health and development are optimized.





# S.2.28 Determinants of feeding behaviours among mothers of infants and pre-school aged children

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# Associations between feeding practices and child diet quality, and the potential influence of child eating behaviours on these associations

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Children and families (SIG)

Purpose: Parents' feeding practices influence children's food intake. Little is known about how children's eating behaviours (fussiness, enjoyment of food, food responsiveness, satiety responsiveness) influence these associations or feeding practices. This study examines associations between feeding practices and pre-school children's diet quality and whether children's eating behaviours influence these relationships. Furthermore, this study examines the associations between feeding behaviours.

Methods: In 2018, 1400 Australian mothers of children aged 2-5 years completed an online survey including validated measures of feeding practices (n=9), child eating behaviours (n=4) and diet quality. Fourteen items were summed as a measure of diet quality; higher scores indicate better quality. Linear regression assessed associations between feeding practices and diet quality, including interactions between feeding practices and child eating behaviours.

Results: The feeding practices positively associated with diet quality were; structured meal timing, monitoring, covert restriction, modelling healthy eating and structured meal setting (coefficients: 0.64 to 2.68). The feeding practices negatively associated with diet quality were; overt restriction, persuasive feeding, reward for eating and reward for behaviour (coefficients: -0.91 to -1.84). Child eating behaviours were associated with feeding practices. Child eating behaviours moderated associations between three feeding practices and diet quality. The findings suggest that enjoyment of food and fussiness moderated the association between structured meal setting and child diet quality. The models also suggest that enjoyment of food and food responsiveness moderated the associations between monitoring and child diet quality. Lastly, satiety responsiveness moderated the associations between modelling and child diet quality.

Conclusions: Some associations between feeding practices and child diet quality appear to be moderated by children's eating behaviours and child eating behaviours influence most feeding practices. Additionally, child eating behaviours were associated with feeding practices. Therefore, nutrition promotion programs may need to be tailored for parents with different feeding practices and children with differing eating behaviours.





# Maternal food waste concern is linked to child feeding practices

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### Children and families (SIG)

Purpose: Increased environmental awareness has led to growing concerns about food waste in the home. Research suggests that concerns about waste influence the size of portions parents serve their children; however, links between food waste concern and other food related parenting practices are understudied.

Methods: Mothers of preschool children (mean age  $32.25\pm5.80$  years) completed an online survey and were divided into 3 groups using a 2-item, 5-point scale: low food waste concern (score<2.5; n=125), moderate food waste concern (score>2.5 to -3.5; n=286) and high food waste concern (score>3.5; n=137). ANCOVA, with Hager's 2-item Food Insecurity screener score as a covariate, and Tukey post hoc procedures were used to examine significant (P<0.01) links between food waste concerns and maternal feeding practices.

Results: Mothers who were the most concerned about food waste were significantly more likely to pressure children to eat, restrict children's food intake, use food and non-food rewards, overtly control when children ate, and control children's unsupervised access to both healthy and unhealthy foods than mothers with moderate and low food waste concern. Similarly, moderate concern mothers were significantly more likely to restrict children's food intake, use both food and non-food rewards for healthy eating, and control when children ate. Mothers in the lowest concern group had significantly higher BMIs than mothers in the other groups. Child BMI did not differ significantly by mother's food waste concerns.

Conclusion: These findings suggest that mothers with high food waste concern are more likely to utilize child-feeding practices that do not align with current best practice guidelines (i.e., pressuring children to eat, restricting child intake, using food and non-food rewards, and covertly controlling child intake). Future studies aiming to improve child-feeding practices may benefit by teaching mothers strategies for minimizing food waste that are in line with recommendations for child feeding.





# Understanding feeding goals and values during the first 1000 days of life among Hispanic women

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# Children and families (SIG)

Purpose: Parental feeding styles and practices are driven by parental goals and values; yet, little research has focused on these antecedents. The goal of this study is to understand, the global- and feeding-specific goals and values of women during the first 1000 days of life, and how feeding goals and values evolve over time, and in response to contextual factors.

Methods: A purposive sample of Hispanic mothers were recruited from community programs (home visitation, WIC) via direct contact, word of mouth, etc. We attempted to recruit mothers who were pregnant (3<sup>rd</sup> trimester) or had children ages (months) 0-6, 6-12, 12-18 and 18-24. Semi-structure interviews with n=36 mothers were conducted by two research assistants, predominantly in Spanish, and audio recording transcribed. An inductive and deductive coding was completed. Transcripts were reviewed and initial themes identified based on a priori topics and themes that emerged integrated. Mothers completed a brief survey to asses their beliefs toward specific feeding practices.

Results: Mothers were on average 29 years old. Overall, mothers across all stages identified having a happy, healthy child, devoid of illness as one of their primary goals. Other global goals and values included being a good mother, being educated, and sharing traditions and culture. Feeding-specific goals and values did not initially emerge when asked about their primary goals and values for their child, but upon probing mothers did share these. Similarities across stages included not wanting a "picky eater" and having a healthy eater, specifically "a child that likes vegetables". Differences across stages included a focus on the ability to breastfeed or provide enough milk for infants (pregnant mothers) vs. limiting exposure to unhealthy foods (mothers with older infants).

Conclusions: Parents primary goals and values are not directly tied to feeding. When asked specifically about feeding, there were some clear goals, particularly around not wanting a picky eater. Better understanding of these parental goals and values and how they are similar and different across key development milestones can potentially help inform effective interventions to support parents and reduce disparities in obesity.





# S.2.29 Local food strategies to enhance collective efficacy and community health & wellbeing

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# Building CBPR and indigenous food sovereignty principles into a Native American obesity reduction program: The OPREVENT2 experience

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Implementation and scalability (SIG)

Purpose: With Native American communities suffering the highest rates of food insecurity and diet-related chronic disease in North America, culturally appropriate and effective solutions are desperately needed. Indigenous Food Sovereignty (IFS) represents a potential approach to address these problems based on four main principles: sacred food knowledge, community participation, self-determination, and policies to reconcile traditional food practices with mainstream economic activities. Despite the promise inherent in this approach, few intervention trials have incorporated these principles; nor have they been aligned clearly with community based participatory research approaches.

Methods: For the OPREVENT2 trial, we implemented a multicomponent obesity reduction intervention targeting adults in collaboration with six Native American communities, using a community engaged approach that respected indigenous food sovereignty principles. The program worked with worksites, food stores, schools (grade 2-6), through social media and mailings, and with a local community action committee (CAC). We conducted a process evaluation to assess implementation of each intervention component in terms of reach, dose delivered and fidelity. Standards were set to assess how well program components met implementation targets.

Results: A series of community meetings were conducted, and selected intervention strategies and materials from existing possibilities, generating new initiatives and policies that valued traditional foods, and leading to a system of interacting and mutually reinforcing intervention strategies. The school and worksite components were implemented with high reach, dose delivered and fidelity, with improvement over time. The school program had only moderate reach and dose delivered, as did the social media component. The CAC achieved high reach and dose delivered.

Conclusions: Designing interventions for Native communities by combining CBPR and food sovereignty principles is a promising strategy for building community engagement support for complex multicomponent food systems interventions, and may lead to improved implementation and impacts.





# The influence of the Children's Healthy Living Program's multilevel food related intervention activities on child health behaviors and health outcomes in the Pacific region

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# Implementation and scalability (SIG)

Purpose: Examine whether the effectiveness of the multilevel Children's Healthy Living (CHL) intervention was achieved through modification of specific levels of the food system by examining CHL food related intervention activities which focused on decreasing sugar sweetened beverages and increasing water, fruit and vegetable intake.

Methods: The two year CHL community randomized intervention trial was designed and implemented with 9 intervention and 9 control predominantly indigenous communities in 5 jurisdictions of the US Affiliated Pacific (Alaska, American Samoa, Commonwealth of the Northern Mariana Islands, Hawaii). Of 19 intervention activities, 11 were food related and included each of the five levels of the Social Ecologic Model (SEM- child, caregiver, organizational, community, policy). Each jurisdiction reported monthly on CHL intervention activities in their community. A hierarchical model tested the influence of the number of CHL intervention activities on the behaviors and health outcomes by each of the five levels of the social ecologic model (SEM).

Results: None of the food target intervention activities aimed at the child or caregiver SEM level were effective in eliciting child food behavior change in intervention communities, relative to control after adjusting for organization, community and policy SEM level. The higher SEM levels (organization, community and policy) effected the observed changes. When examining food related activities and the outcome of child overweight and obesity prevalence change, water activities overall decreased child overweight and obesity in intervention communities relative to control communities, though caregiver and community water activities modestly protected against child overweight and obesity at the same SEM levels. Fruit, vegetable and sugar sweetened beverage activities significantly decreased prevalence of acanthosis nigricans, with the highest levels of the social ecologic model showing the strongest effect.

Conclusion: CHL intervention also targeted physical activity, screen time, sleep hours and sleep disturbance behaviors, which also contributed to effects seen. Multiple levels and components of the CHL intervention were needed and were likely interactive, in order to nudge improvements.





# A whole of community approach to food systems transformation in the Sydhavn local community of Copenhagen

### Prof. Bent Egberg Mikkelsen

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# Implementation and scalability (SIG)

Purpose: Climate change, obesity and malnutrition has been identified by the EatLancet commission as serious challenges that needs to be addressed through a profound food systems transformation. Building on insights from the SoL community project a framework was developed for the neighborhood of Southern Harbor, Copenhagen. Vision is to foster better physical and mental health through participatory and multifaceted local food systems transformation. Short term goal is to demonstrate an increased uptake of plant foods among citizens by building on the resources and commitment of a broad range of community stakeholders. Intervention is informed by insights from the concepts of Alternative Food Networks (AFN), Community Supported Agriculture (CSA) and Nature-based solutions (NBS).

Purpose of paper is to summarize the insights from the formative research that is the foundation for the development of the specific components of the program.

#### Methods:

The study was founded on the principles of Action Research (AR) that aims at co-creating solutions to problems in a partnership between researchers and local stakeholders as well as providing data for an empirical study. Using the AR approach co-creation is staged around Living Labs and are required to meet following criteria: Should be building on resources already present in community. Should be compliant with scientific evidence. Should by co-constructed by researchers and community stakeholders. Data for the formative research was collected through in depth interviews, document analysis and participant observation from stakeholder consultations. Informants were representatives from local government, local housing providers, kindergartens schools, local growers, food retailers, food suppliers in the peri-urban area, informal community leaders and citizens.

#### Results

Develop components can be grouped under 5 headings: Coordinated local growing strategies. Shorter food supply chain design. Enhanced digital connectivity between food and citizens. Participatory food systems governance. Enhanced learning about food through innovation labs.

#### Conclusion

There is a broad interest in local food systems transformation from a broad range of stakeholders. The co-creative design process has revealed operational blueprints that can be used in the implementation. Next step is to draw up the evaluation protocol for the impact assessment.





# S.2.30 Prenatal physical activity interventions: Is it time to question the ethical implications of having a no treatment control group? A Debate Symposium

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# **Opposing argument for standard Randomized Controlled Trials**

**Dr. Kristi B. Adamo<sup>1</sup>**, Dr. Taniya Nagpal<sup>1</sup>, Dr. Michelle Mottola<sup>2</sup>, Dr. Harry Prapavessis<sup>2</sup> <sup>1</sup>University of Ottawa, Ottawa, Canada, <sup>2</sup>Western University Canada, London, Canada

#### Other

Purpose: As there is an abundance of research to support the health benefits of exercise during pregnancy for both mother and growing fetus, the opposing presentation will propose providing standard exercise guidelines to control groups within randomized controlled trials (RCT). Furthermore, as there are harmful effects of inactivity and sedentary behavior, this presentation will challenge the ethical implications of having a non-intervention control group and propose alternative study methodologies including superiority trials and cross-sectional designs.

Methods: A literature review of international guidelines will be completed and general summaries will be provided to highlight overall recommendations for exercise during pregnancy. A summary of systematic reviews and metaanalyses will be presented that will provide evidence for the benefits of exercise during pregnancy and potential harms as a result of inactivity. Finally, alternative study designs to the standard RCT will be proposed.

Results: International guidelines for exercise during pregnancy all recommend that pregnant women without any contraindications should engage in exercise throughout all trimesters. A specific example includes the Canadian Guideline document that recommends 150 minutes of moderate exercise, at least 3 times per week, spread throughout the week. Research has shown that exercise during pregnancy has a preventative effect for a number of pregnancy complications including gestational diabetes and hypertension, and can protect the growing fetus from later-life chronic conditions including obesity. Instead of RCT-based studies where a control group is denied potential exercise benefits, future studies should provide at minimum the exercise guidelines and explore alternative methodologies.

Conclusions: Alternative methodologies instead of standard RCTs may allow research related to exercise during pregnancy to advance. By prioritizing alternative study designs to traditional RCTs with no treatment controls, researchers may be able to answer novel questions related to exercise during pregnancy including determining strategies to bolster adherence to exercise. Furthermore, alternative designs will also assure that all women are receiving some form of exercise within a study, and as a result more women will gain the benefits of leading an active lifestyle during pregnancy. Standard care should include at minimum, access to exercise guidelines during pregnancy.





# In favor argument for using standard Randomized Control Trials

Dr. Michelle Mottola<sup>1</sup>, Dr. Taniya Nagpal<sup>2</sup>, Dr. Harry Prapavessis<sup>1</sup>

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Other

Purpose: Randomized controlled trials (RCT) provide a structured research approach to test the health effects of exercise during pregnancy. The purpose of this presentation will be to detail areas of research that lack evidence for the health benefits of exercise during pregnancy and how RCT-based research is required to fill in these gaps. Furthermore, this presentation will discuss the limitations within previous RCTs that should be addressed before moving forward to other methodologies.

Methods: A literature review of international exercise during pregnancy guidelines will be completed to provide a summary of research areas that still require further investigation. Additionally, the quality of RCTs that have been evaluated among guidelines will be summarized and presented. Finally, a list of limitations among previous standard RCTs will be summarized.

Results: A large proportion of the pregnant population has not been included in previous RCTs that include a standard no-treatment control arm, and therefore there are many areas of research that require further investigation before recommending that all women should receive an exercise intervention. Examples include: women with twin or more pregnancies, a body mass index >40.0kg/m2, previous incidence of miscarriages, high blood pressure or diabetes, and a history of eating disorders. Standard non-contact control groups are still required to test the effect of exercise during pregnancy among these population groups to assure standard guidelines are safe and effective. Furthermore, improving the quality (rigor) of these studies also is required before conclusions can be made regarding the effectiveness and efficacy of exercise treatment. Common limitations of previous RCTs include low adherence, a lack of validated and objective measures of physical activity, incorrect use or lack of blinding for evaluating study results and limited follow-up periods. In addition, in order to determine specific mechanistic pathways on the effects of exercise, a non-intervention control group is required.

Conclusion: Before moving away from standard RCT based studies to evaluate exercise during pregnancy, areas of research that require further investigation and previous study limitations need to be addressed.





# S.2.31 Adopting, implementing, and sustaining school-based physical activity interventions

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# HOPP – the Health Oriented Pedagogical Project

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Implementation and scalability (SIG)

Purpose: Worldwide lifestyle-related diseases are increasing. A pedagogical system combining physical activity with learning has shown promising results. Studies show that active learning may contribute to reduction in risk factors for cardiometabolic diseases and improve academic performance. Other studies fail to show similar results, as small sample sizes and short study periods implies uncertainty regarding the effect. Horten municipality in Norway took initiative to implement active learning in all elementary schools as a part of a long term health promotion campaign for children to prevent future lifestyle related diseases.

Methods: HOPP, with seven intervention and two control schools (n=2300), aims to increase physical activity through active learning pedagogy during a school day by 45 minutes. Uniquely, teachers are trained to implement the program by the municipality. Annual measurements of anthropometrics, risk factors, physical activity, aerobic capacity, physical fitness, blood values, QoL, diet habits, executive function and academic performance are collected between 2015-2021.

Preliminary results: In HOPP's fifth year, no longitudinal effect has been analysed. Several papers on baseline data and one-year effect have been published. No one-year effect was found. Reference values for serum lipids, hand-grip strength and anthropometrics were established, in addition to factors affecting running performance. Waist-to-height ratio (WHtR) was found to predict fitness in children, however, no clustering of cardiometabolic risk factors in 6-12 year old children was shown, although 14% were overweight. A weight increase in Norwegian children has subsided, however, WHtR and waist circumference have increased compared to a decade ago, indicating more abdominal adiposity. Physical activity level is well above 60 minutes of MVPA a day. However, a tendency of diminishing activity with age is evident, with a 4-minute decline per year. QoL in Norwegian children is high, and increasing with age, however, parents by proxy score their children lower overall, and decreasing with age.

Conclusion: Data from HOPP has given important knowledge of a wide range of children's physical and mental health. There is yet a large proportion yet to be explored from a database now spanning across five years.





# Partner supported dissemination and adoption of Transform Us! In the first 12months

<u>Mr. Samuel Cassar<sup>1</sup></u>, Prof. Jo Salmon<sup>1</sup>, Prof. Anna Timperio<sup>1</sup>, Dr. Harriet Koorts<sup>1</sup> <sup>1</sup>Deakin University, Geelong, Australia

# Implementation and scalability (SIG)

Purpose: Exploring the adoption of interventions is critical to better understanding the scale up process needed for population-wide impact. Uptake of school-based programs is a slow and challenging process, with intervention characteristics and 96 egitimizing961 culture particularly important. It is suggested interventions supported by educational stakeholders play is important in 96 egitimizing programs and supporting adoption. In partnership with 16 organisations, Transform-Us! Is being disseminated to all Victorian primary schools (n=1,794) as a 'real-world' program embedded into education practice and policy. We investigated the experiences and learnings of partner organisations disseminating the program to their educational networks in the first 12 months.

Methods: Partner consultation has been ongoing since 2017 with 16 organisations ranging from government departments (n=4), professional societies (n=3), educational bodies (n=3), advocacy organisations (n=2), community organisations (n=2), sporting clubs (n=1), and charities (n=1). Semi-structured interviews were performed with representatives of each partner following 12 months of dissemination. Interviews were audio-recorded, transcribed and coded anonymously. Thematic analysis was performed independently by two researchers. Descriptive statistics of adopting schools stem from an online survey school leaders and teachers completed at registration. School level characteristics were compared between adopting and non-adopting schools using the MySchools database.

Results: Partners reported multiple dissemination channels to increase adoption (web links, email listserves, newsletters, professional networks, conferences, and workshops). Partners outlined several local, regional and state organisations to partner with and provided comment on the preferred content and timing of dissemination activities for their networks. Suggestions relating to content, timing and channels resulted in a detailed dissemination plan. Dissemination activities resulted in 191 schools (Government 78.1%, Catholic 19.5%, Independent 2.4%) and 293 individual teachers adopting Transform-Us! In the first 12 months from inner regional (15.9%), major cities (73.2%), outer regional (8.5%), and remote areas (2.4%) of Victoria.

Conclusion: Experiences of targeted dissemination activities of key partner organisations to scale the Transform-Us! Program provides valuable information regarding the challenges and successes of embedding research within government and school systems for preventative programs.





# Implementation and scaling of SWITCH (School Wellness Integration Targeting Child Health): Insights from a 10 year journey from efficacy to dissemination

<u>Dr. G J Welk<sup>1</sup></u>, Dr. G M McLoughlin<sup>1</sup>, Dr. L Lanningham-Foster<sup>1</sup>, Dr. S Vazou<sup>1</sup>, Dr. P Dixon<sup>1</sup>, Dr. D A Gentile<sup>1</sup>, Dr. J A Lee<sup>2</sup>, Dr. S Chen<sup>3</sup>, Dr. R R Rosenkranz<sup>4</sup>, Dr. D A Dzewaltowski<sup>5</sup>

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# Implementation and scalability (SIG)

Purpose: Schools provide an ideal setting for promoting healthy lifestyles in youth, but it has proven difficult to widely disseminate evidence-based programs in a cost-effective way. Through a USDA-funded project called SWITCH, we adapted and utilized an established implementation framework to help schools develop strategies to plan, implement, and operate school wellness programming on their own. We studied various facets of the implementation process over time to identify factors that facilitated or inhibited school wellness programming, and will share how these steps enhanced the planned dissemination.

Methods: The SWITCH implementation framework was based on an established training and implementation model, but adaptations and refinement were needed prior to broad dissemination efforts with the project. Effective dissemination also necessitated the development of a robust web-based platform to provide a structure for school-wellness programming efforts. Over the course of three years, we conducted several planned implementation studies to test and refine various aspects of the implementation framework and the integrated web-based platform.

Results: The sequential evaluation steps helped to refine the implementation process over time. An early evaluation documented the utility of the web-based self-monitoring system for promoting behavior change. A subsequent cluster randomized trial compared two distinct implementation strategies to clarify the best options for broader dissemination. Finally, a detailed process evaluation and mixed method approach provided insights about the capacity-building process and the challenges and barriers faced by schools in creating system changes. Schools have been able to plan and carry out programming on their own, but results have documented the importance of building capacity and the value of supplemental support provided by county extension coordinators that can work locally with schools.

Conclusions: The incremental adaptations informed by our ongoing analyses have helped to refine the SWITCH process and have facilitated the planned transition to sustained delivery through the 4H Youth Development arm of the state-wide Cooperative Extension system. We have gradually enrolled larger samples of schools over time (expanding from 6 to 60+) while laying the foundation for planned multi-state expansion through other state extension networks.





# S.2.32 How does university impact students' dietary intake? Evidence from current review and intervention studies

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# A food bundling service, short recipes and instructional videos on digital platforms, addressing barriers to purchasing and cooking with vegetables in young adults

**<u>Dr. Rajshri Roy<sup>1</sup></u>**, Dr. Joya Kemper<sup>1</sup> <sup>1</sup>The University of Auckland, Auckland, New Zealand

Other

Purpose: Vegetable intake is worst among young adults aged 18-34, and several different factors dissuade University students from eating vegetables - a lack of time to shop and to cook, a lack of money, limited experience, limited information and low confidence in cooking vegetables. This study involves identifying whether improvements in attitudes and motivation resulting from recipes and instructional cooking video viewing translate to improvements in vegetable purchase in young adults.

Methods: The method involves reducing barriers for cooking vegetables in young adults by: (1) using a food bundling service to make it easier, cheaper, and more convenient for students to purchase vegetables on campus; (2) providing students with accessible information about how to cook shown via short recipes and instructional cooking videos delivered through the bundling service website and social media platforms. Questions exploring enablers of home cooking and feedback on the digital content were collected through a survey, and three focus group discussions. Feedback on the digital content will be used to modify the recipes and videos. This co-designed digital content will be included as educational components of a 20-weeks study for improving vegetable intake in a more diverse sample of young adults using a social media marketing campaign and a food bundling service.

Results: Preliminary testing of recipes and cooking videos suggested that they were an effective medium for reducing the perception of barriers to cooking with vegetables among young adults. Researchers are currently using a codesign approach to re-design the recipes and videos based on the focus group data analysis. The researchers will then run a digital campaign via Facebook and Instagram pages, track social media engagement, and monitor the sales of the vegetable boxes.

Conclusions: This intervention is using the COM-B behaviour change framework, with recipes, cooking videos and a food bundling service to improve capability by improving accessibility, building skills, increasing motivation and thereby increasing vegetable purchase.





# Evaluating the nutritional quality of foods available in vending machines and the effectiveness of nutrition interventions in vending machines in the university setting

<u>Dr. Melinda Hutchesson</u><sup>1</sup>, Dr. Megan Whatnall<sup>1</sup>, Dr. Amanda Patterson<sup>1</sup> <sup>1</sup>The University of Newcastle, Callaghan, Australia

Other

Purpose: University food environments typically offer an abundance of unhealthy food choices, including through vending machines. Two studies are presented here, with the aims being to; determine the nutritional quality of items available in vending machines at an Australian university (study 1), and evaluate the effectiveness of nutrition interventions in vending machines in the university setting (study 2).

Methods: Study 1 included an audit of all vending machines at the three major campuses of the University of Newcastle, Australia, completed in 2019. The number of slots and name, weight/volume and cost of food/drink items were recorded. The nutritional quality of items was assessed using the Health Star Rating (HSR) system (0.5-5 stars, least-most healthy). The proportion of healthy (HSR  $\geq$  3.5) and unhealthy items and their mean cost was calculated. Study 2 included a systematic review. Ten databases were searched for experimental studies published up to July 2019, which evaluated nutrition interventions that aimed to encourage the purchase or consumption of healthy foods/drinks in vending machines in the university setting.

Results: Study 1; 61 vending machines were audited, containing 2158 slots of which 1787 contained unhealthy food/drinks (83%). The mean (SD) cost of healthy items was \$3.15 (1.47) and unhealthy items \$3.57 (0.59). Study 2; the search identified 398 articles, and 11 studies were included. Studies were RCTs (n=5), pre-post test studies (n=5), or non-randomised controlled trial (n=1), and predominantly from the USA (n=8). Six interventions (55%) reported positive change in outcomes, including increased number/proportion of sales or revenue from healthy items (n=4), improved adherence to guidelines for the ratio of healthy/unhealthy products (n=1), and improved consumer perception of items available (n=1). Effective interventions were those which involved promoting, increasing availability and/or optimising positioning of healthy items within vending machines.

Conclusions: Strategies to improve the nutritional quality of food and drinks in vending machines are warranted. Studies demonstrate that this can be achieved by making healthy options more available and increasing their promotion.





# Factors influencing the diets of international tertiary students studying abroad

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Other

Purpose: Each year many young people leave their home country to attend University abroad. Their major destination is the United States but countries such as Canada and Australia are increasing in popularity. Education of international students in Australian universities is now the number three export industry and important to the national economy. Therefore, it is essential that due attention is provided to meet the health and wellbeing needs of these students. It is clearly documented that poor dietary habits, frequent meals from take-away and fast-food restaurants, excessive alcohol consumption and weight gain occur in University student populations. However, less is known about the impacts for students coming from overseas to study. This study aimed to identify and synthesize the existing body of literature to determine how international students' diets change when they begin tertiary study in a foreign country.

Methods: In order to inform future programs and policy, a scoping review was conducted following the methods of Arksey and O'Malley. The population of interest encompassed international students studyingto gain post-secondary qualifications in any country that was not their permanent home. Important determinants of the dietary changes assessed were considered and included the social and economic drivers of changes in their diets. We also aimed to identify problems of food literacy; food accessibility; food preparation facilities; and cooking skills. The impact of dietary changes on weight, diet quality, academic, and psychological outcomes were evaluated. Databases searched included MEDLINE, CINAHL, ERIC, Global Health and PsycINFO and available dissertations and theses but only those in the English language could be considered. Both quantitative and qualitative research was included.

Results: The data collated includes country of study and home country, nationality and age of participants, length of stay in the host country, changes in dietary behaviours, changes in food patterns, determinants of dietary intake and barriers to eating healthily. After mapping the data, the findings of the review will be used to inform a national survey of foreign students in Australian tertiary education facilities.

Conclusions: The ultimate aim is to optimize services (policy and practices) for international students in Australia.





# S.2.33 What can we achieve by measuring fine-grained patterns of physical activity behaviour?

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# Using WalkScore to explain the temporal and spatial patterns of adolescent mobility and physical activity

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### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: To expand our understanding of the environmental determinants of physical activity, more fine-grained measures of individual behaviour are needed. Advances in measurement and data processing methodology enable the exploration of detailed temporal and spatial patterns of physical activity behaviour. This study examined how the isolation of specific activity behaviours in time and space were associated with an objective measure of neighbourhood walkability (WalkScore).

Methods: 200 adolescents (12–18 years old) wore a portable GPS receiver and an accelerometer for one week. The data were merged using the Human Activity Behavior Identification Tool and data Unification System (HABITUS). Each 15-second epoch of data were classified into one of four domains: home, school, transportation, or leisure, using the 'palmsplusr' R package. Activity in the transportation domain was further 101 ormalized 101 into walking, cycling, or vehicle travel. WalkScore was calculated from each participant's address. The association between WalkScore and (1) domain-specific activity measures (time spent in a vehicle, and distance walked) and (2) non-specific activity measures (total moderate-vigorous physical activity) was estimated using local polynomial regression.

Results: The highest proportion of time was spent at home (40.1%), followed by school (32.2%), leisure (16.9%) and transportation (9.9%). However, the highest proportion of moderate-vigorous physical activity was observed in the transportation domain (40.7%), followed by school (23.5%), home (18.5%) and leisure (16.1%). A stronger association was observed between WalkScore and distance travelled in a vehicle ( $R^2 = 0.68$ ) and distance walked ( $R^2 = 0.34$ ), compared to total moderate-vigorous physical activity ( $R^2 = 0.16$ ).

Conclusions: Measuring the temporal and spatial patterns of behaviour enabled the creation of context-specific variables. Although our regression models are not directly comparable, our results suggest that WalkScore was able to explain domain-specific physical activity measures (i.e. transportation behaviour) better than non-domain-specific measures (total moderate-vigorous activity). These techniques could be used to obtain a more fine-grained understanding of the environmental determinants of health.





# How do patterns of movement behaviour vary among distinct work groups?

<u>Mr. Anantha Narayanan<sup>1</sup></u>, Dr. Tom Stewart<sup>1</sup>, Dr. Lisa Mackay<sup>1</sup> <sup>1</sup>School of Sport and Recreation, AUT University, Auckland, New Zealand

# Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Improved sensitivity to detect activity type and the transitions between them will extend our understanding of the physical demands of various occupations. This will support appropriate and tailored workplace health promotion strategies. Using a novel two-accelerometer methodology, this study examined how patterns of behaviour (e.g. sitting, standing) and their transitions (e.g. sit-to-stand) varied across distinct work groups during their working hours.

Methods: Adult employees (n = 100) from four diverse work groups in the New Zealand aviation industry (25 in each of: Office workers, Cabin crew, Airport front house, Airport back house) wore two Axivity AX3 accelerometers on their thigh and lower back for seven days. Activity type and the transitions between them were estimated using published machine learning methods and then 102ormalized to total working hours. The activity profiles of each work group were compared using the Kruskal Wallis method with Nemenyi post-hoc pairwise comparisons.

Results: Office workers had significantly more sitting minutes during working hours (47.1 min/h) compared to the other three work groups (mean 27.3 min/h, p < 0.001). Cabin crew performed the most standing (28.7 min/h) and sit-to-stand transitions (4.5 times/h) compared to the other groups (all p < 0.05). Interestingly, front house and back house workers had frequent stand-to-walk transitions (21 and 22/h, respectively), significantly more than office workers (7.3/h) and cabin crew (14.3/h); all p < 0.05. Back house workers spent the most time walking (9.4 min/h) and had more sit-walk transitions (4.0/h) compared to the other work groups (mean = 1.1/h); all p < 0.05.

Conclusions: These results show distinct patterns of behaviour across different work groups, indicative of the demands associated with each job type. We also observed that patterns of transition could vary between groups irrespective of the total time spent in each behaviour. This may indicate that transitions are an important consideration when understanding patterns of behaviour. The next step is to investigate how these patterns are related to health, productivity, and wellbeing.





# Accessibility to public transport and patterns of walking among older adults: Combining accelerometer, GPS, and travel survey data

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<sup>1</sup>Ghent University, Ghent, Belgium, <sup>2</sup>Research Foundation Flanders, Brussels, Belgium

### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: When other transport modes become hard to use for older adults, public transport can be an important asset for them to stay independent and socially active. Public transport can also be an important source of physical activity. Among people that are no longer active in the work force, walking to and from public transport hubs can form a large portion of their daily physical activity. The aim of this study is to analyse the relationship between accessibility and use of public transport among older adults (65+) in the city of Ghent, Belgium.

Methods: Travel survey data is available at a trip stage level (unimodal parts of a trip) for 850 older adults residing in Ghent. Physical activity indicators (e.g. MVPA) linked to this travel behaviour will be predicted using a random forest model based on GPS and accelerometer data from people living in Ghent (n=75). Public transport accessibility will be measured using OpenStreetMap data (e.g. distance to closest public transport hub). The associations between physical activity and public transport accessibility will be assessed with generalized additive mixed models.

Results: Preliminary results show the following transport mode shifts between 2015 and 2018 among the general population: a decrease in walking trips (15% to 13%), an increase in bicycle trips (30% to 35%), an increase in public transport trips (5% to 9%) and a decrease in private motorized trips (40% to 33%). We also expect an increase in public transport use among older adults. To unravel more precise information on the health implications of these mode shifts, physical activity indicators (e.g. daily MVPA due to transport) will be used instead of mode share. Finally, we expect that the health benefits are more pronounced among older adults living in areas with better accessibility to public transport.

Conclusions: Assessing precise patterns of mobility among older adults will allow us to quantify the effect of transport accessibility on physical activity. More broadly, it will help explain the spatial disparities in public transport use in the city. This could have important implications for future transport policies in the city of Ghent.





# S.2.34 Evaluation of policy interventions in complex systems: The example of sugary drinks taxes

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# An assessment of the impacts of the introduction of South Africa's Health Promotion Levy

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Policies and environments (SIG)

#### Purpose

To assess the impacts of South Africa's recently implemented tax on sugar-sweetened beverages, the Health Promotion Levy, on dietary and other domains.

#### Methods

We apply a multidisciplinary approach to evaluating the impact of the introduction of the Health Promotion Levy on relevant consumer responses, such as dietary and health outcomes, and on producer responses including reformulation, pricing, and marketing. Qualitative studies interrogate in greater depth the knowledge, attitudes and responses of key demographic groups undergoing lifestyle change to the adoption of this policy. As well as evaluating the impact of the policy on its desired outcomes, we study the nature of the political and legislative processes through documentary analysis of submissions made during parliamentary hearings and calls for comment with an eye to understanding the positions and strategy of those in favour and against the adoption of the levy.

#### Results

A summary of the integrated research program both qualitative and quantitative will be presented for the first year following legislation of the SSB tax, emphasizing the relevance of our findings to understanding the intermediate pathways to the ultimate dietary and health outcomes.

#### Conclusions

Precedence from other settings together with local economic modelling evidence played a critical role for national policymakers in Treasury and the Health Department. Following a two year process of consultation by Treasury with simultaneous strong advocacy by civil society, public acceptance was high. However, the political economy played a critical role in a setting with high unemployment and concerns about state capture. The final design of the policy resulted in higher prices and reformulation of carbonated beverages. Future regulation in South Africa for population level interventions to address commercial determinants of health will need to consider a comprehensive, integrated approach to anticipate interference by industry.





# Uncovering heterogeneous responses to and impacts of Mexico's sugary drink tax

#### <u>Dr. Shu Wen Ng<sup>1</sup></u>

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Policies and environments (SIG)

#### Purpose

To illustrate how considering different stakeholders' responses can help uncover potential heterogeneities in impacts of Mexico's sugary drink tax.

#### Methods

Multiple data and methods have been used in assessing Mexico's sugary drink tax. Each approach has its strengths and limitations. We will describe how these data and methods can allow us to evaluate whether and to what extent responses can vary. These include understanding differential firm responses in price pass-through (across locations, beverage types, package sizes and based on firm market share), as well as consumer responses via changes in purchases based on their pre-policy purchase levels and income levels in the shorter term and medium term. We will also describe how structural models that take into account these supply and demand responses, validated from the empirical evidence to date, can be used to test new or higher tax policy designs. Finally, we will show how these empirical and simulated outcomes on purchases can be translated to changes in health outcomes, their resultant healthcare cost savings over time and costs-benefits borne by various stakeholders.

#### Results

We will present past and new findings to date on the Mexico sugary drink tax on variability in price-pass-through and purchase changes based on characteristics of beverage firms and Mexican households and where they are consistent or divergent with each other. Additionally, we will show the importance of considering issues like simultaneously accounting for supply and demand responses, time horizons of interest, and whose point of view to include in assessing costs and benefits of sugary drink taxes, particularly as they relate to policy decisions.

### Conclusions

There is a need to integrate multiple disciplines and use multiple data and methods in assessing how and to what extent various stakeholders respond to sugary drink taxes and in helping inform improvements in tax designs.





# Evaluation of the UK Soft Drinks Industry Levy

### Prof. Martin White<sup>1</sup>

<sup>1</sup>MRC Epidemiology Unit, University of Cambridge, Royston, United Kingdom

Policies and environments (SIG)

#### Purpose

To evaluate the systemic impacts of the UK Soft Drinks Industry Levy (SDIL)

#### Methods

We are undertaking a multi-method, longitudinal study of the impacts of the SDIL over a 6 year period on population health outcomes and across key sectors. Analyses are underpinned by a conceptual map of the systems on which the SDIL has its impacts. Quantitative evaluation uses controlled, interrupted time-series analyses of changes in formulation, price and volume of sugary drinks, purchasing and consumption of drinks, and proximal and distal health outcomes in the short term. Health outcomes will be modelled over 5-15 year time horizons. An economic evaluation is exploring the impacts of the SDIL on food and other industries and on the UK economy. Qualitative studies are evaluating the perceived effects of the levy among key stakeholder groups, including the public, the food industry and policymakers using analysis of parliamentary documents, trade and public media, telephone interviews and focus groups. Interpretation of the findings of all analyses will make use of methods and frameworks for integration

### Results

The latest findings from key analyses will be presented, including those on reformulation, changes in volume and price, purchasing and consumption, and economic impacts from one and two years post implementation of the SDIL, as well as key qualitative data. We will focus in particular on the results of integrative analyses and interpretation of findings from the multiple strands of analysis.

### Conclusions

Analyses of multiple data sources and outcomes tell different stories about the impacts of the SDIL on people, the food system and society. Making sense of these wide ranging findings as a whole requires a systemic perspective, an underpinning theory of change, a willingness to consider each finding in a wider context, and regularly revisiting a conceptual map so as to draw reasonable causal inference about the impacts of the levy, including the reactions and counteractions of key stakeholders over time.





# S.2.35 Measuring policy actions for healthy and sustainable food and physical activity environments

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# Challenges facing the food policy environment for supporting sustainable and healthy behaviours for food production and consumption: Learnings from INFORMAS and PEN (Policy Evaluation Network)

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# Policies and environments (SIG)

Background: Food environments are the collective physical, economic, policy and sociocultural surroundings, opportunities and conditions that influence people's food and beverage choices and nutritional status. Applying a systems approach to improving food environments through food policy takes the entire system into consideration and can facilitate the identification of true solutions, understand the indirect effects and unintended consequences of actions and inform the 107hysical107tion107 of data collection. Urban cities host over half the world's population with the projection increasing further in the foreseeable future. In the context of a rapidly urbanizing world, the global food systems challenges have become serious challenges for cities. Thus, cities have a key role in addressing these challenges for their own populations and for the global community. Indeed, the UN Sustainable Development Goals blueprint highlights the need to 'make cities and human settlements inclusive, safe, resilient and sustainable. To confront these issues many urban cities and local governments are moving to developing urban food policies.

Method: To truly develop an urban food policy which acknowledges that cities have a role to play in developing sustainable food systems and promoting healthy diets, requires an understanding and evaluation of policy activity at a national and supranational level. The Food EPI (environmental policy index) provides a mechanism by which to contextualise national level policies and to assess the extent of implementation of policies and infrastructure support for creating healthy food environments by (national) governments compared to international best practice. Through the INFORMAS and PEN networks over thirty countries worldwide are conducting Food Environment Policy Index audits at national level and through PEN the tool has been adapted at a supranational level to evaluate European level policies.

Challenge: The challenge that remains is how to apply the learning from INFORMAS and PEN to contextualise and assess policy-level action at municipal level? Achieving this will enable translation of evidence to actionable knowledge to inform the development and implementation of urban food policies to support healthier, more sustainable and resilient food systems at local levels.




# ASAPa – The Australian systems approach to physical activity – A policy framework for physical activity

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### Policies and environments (SIG)

This session describes the 2-year ASAPa project, the Australian systems approach to physical activity (PA). Australian PA policy advanced well in the decade following the release of the first US Surgeon General Report in 1996 but foundered thereafter. It would take another decade before, positive developments emerged at the national level with the Federal Government's release of Sport 2030, presenting a vision and plan for sport and PA and partnering with Australia's sporting, PA, technology, education and corporate community. ASAPa also commenced its work in the same year.

ASAPa was set up to map policies, programs and prevalence metrics across Australia, at the state and federal level. Initial actions were to host two national workshops in 2018 with stakeholders from all relevant jurisdictions and sectors, with a focus on identifying policies and programs for PA among adults. These workshops enabled the development of a systems-focussed policy framework for PA in Australia.

A review of the policies identified, found considerable action related to the planning and transport sectors to promote more active environments, and indications of multi-sectoral engagement in policy development and implementation. However, most policies did not describe any clear arrangements for funding or indicators to support and monitor their implementation. A review of programs found that most were aimed at sport and recreation domain, with far fewer programs directed at the planning and transport domains or using environmental or transportation interventions. Data obtained about program reach and implementation suggest limitations in current evaluation practices. The reviews have highlighted areas of opportunity where current policy and practice could be strengthened.

In addition, a review of state-based surveillance systems indicated substantial differences in the measures used to monitor PA amongst Australian adults, which lead to substantial prevalence variation across jurisdictions. Furthermore, changes to the questions within jurisdiction led to remarkable acute changes in the proportion meeting PA recommended levels in some jurisdictions, without clear explanation of these findings. These data point to a clear need for 108hysical108tion108n and 108hysical108tion of PA surveillance systems across Australia, in order to monitor trends over time in a systematic way.





# A comparative analysis of physical activity policy in four EU PEN countries

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### Policies and environments (SIG)

Background: This study is part of an effort to employ tools to gather empirical data on national physical activity policies. It was conducted as part of the Policy Evaluation Network (PEN; see <a href="https://www.jpi-pen.eu/">https://www.jpi-pen.eu/</a>), a project consortium composed of 28 research institutions from seven European countries and New Zealand that was funded by the Joint Programming Initiative on a Healthy Diet for a Healthy Life (JPI HDHL; see <a href="https://www.healthydietforhealthylife.eu/">https://www.healthydietforhealthylife.eu/</a>). PEN's vision is to provide Europe with tools to identify, evaluate and benchmark policies designed to directly or indirectly address insufficient physical activity, unhealthy diets and sedentary behaviour while accounting for existing health inequities.

Method: Four countries were selected as case examples from the total of eight PEN countries to ensure a level of variation regarding geography (Western and Central Europe), population size (small, medium and large), and system of government (centralist vs. federalist). Data were collected using Version 2 of the Policy Audit Tool, a standardized instrument to assess national policy approaches to physical activity. In all four countries, data collection was academia-driven and coordinated by the participating PEN scientists.

Results: Data were collected between March and October 2019. Results present evidence of the presence of legislation, policy and action plans by sectors for each country, information on most influential policies and the role of an evidence-base of policies. The comparative analysis of national policy documents shows that the health, sport, education, transport, and environment/urban planning sectors are most relevant when it comes to promoting physical activity in the four countries. Health was the main focus with sustainability mentioned less often.

Conclusion: This study has obtained a number of interesting and potentially relevant results that provide an in-depth view of the status of physical activity policy in European countries with different backgrounds, it highlights similarities and differences, and showcases important policy and context variables. As such, it may be useful as a basis for the development of more advanced tools to benchmark 109hysical activity policies and provide policy advice on health and sustainability to governments in the future.





# S.2.36 Tackling the obesity epidemic while saving the planet, for all!

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# Characterising "healthy", "sustainable" and "choice" in the face of household food insecurity

#### Prof. Danielle Gallegos<sup>1</sup>

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Socio-economic inequalities (SIG)

Purpose: In high income countries household food insecurity it affects between 10-25% of the population depending on income. There are three pillars; availability (foods are available for consumption either through production or purchase), access (foods are accessible economically and physically) and utilisation (resources are available to convert foods to meals). This presentation will explore the systemic changes needed across all socio-ecological dimensions in order to promote sustainable, healthy food choices for food insecure families.

Methods: Using the Global Systems Framework, a narrative review was undertaken to identify systemic dimensions that could directly influence the alleviation of household food insecurity in high income countries. The search strategy focused on articles published in English in peer-reviewed journals during the past 10 years.

Results: Three key areas were identified:

Poverty reduction and sustainable livelihoods. Household food insecurity in high income countries largely affects those on lower incomes and particularly those receiving welfare. Welfare and food safety nets vary from country to country but ensuring adequate income and developing the means to build and maintain an adequate income are pivotal to accessing healthy diets. Focussing on this governance approach impacts on three of the global outcomes: social equity, human health and wellbeing and economic prosperity.

Alternative food systems that promote dignity. In most high income countries access to healthy foods is limited in disadvantaged areas, thereby limiting choice. Emergency food relief has arisen as a market-driven alternative food system that increases accessibility to low-value foods with a negative impact on health. Strengthening the influence of local government levers to enhance changes to food access and availability within macro- and meso-systems is necessary to ensure the right to food.

Developing individual agency. Essential to the utilisation pillar of household food security is building the capacity to enhance the food literacy of the population. A systems approach would be enhancing food citizenship across meso-and micro-systems.

Conclusions: A focus on these elements will change structures increasing the availability of healthy food, providing the means for families to access these foods and leading to agentic choice for food insecure households.





# Which determinants are crucial to create healthy and sustainable food choices among all parents?

**Prof. Wendy Van Lippevelde<sup>1</sup>**, Miss Marjolijn Vos<sup>1</sup>, Dr. Nathalie Michels<sup>1</sup>, Prof. Maggie Geuens<sup>1</sup>, Prof. Benedicte Deforche<sup>1</sup> <sup>1</sup>Ghent University, Ghent, Belgium

## Socio-economic inequalities (SIG)

Purpose: Parents have been identified as the most important actors in affecting children's dietary behaviours, especially via food parenting practices. Families from lower socio-economic status (SES) tend to have a less optimal diet and less supportive home environment for healthy and sustainable eating compared to higher SES counterparts. Consequently, we need to identify interventions to improve food parenting practices in all SES families to change children's diets towards more healthy and sustainable patterns. Healthy and sustainable food choices of parents are a key antecedent for developing optimal food parenting practices, as food shopping constitutes a large portion of the food available at home and eaten by the family. However, insight is needed on how to change food choices in both lower and higher SES parents. This study will identify critical individual and environmental determinants of parental food choices.

Methods: Focus group research has been conducted with parents of 6- to 12-year-olds from lower and higher SES until data saturation has been reached. Recruitment of (merely) higher SES parents occurred through primary schools, lower SES parents were recruited through community healthy centers. Focus group sessions have been audiotaped and transcripts have been made. A qualitative inductive content analysis has been conducted by two independent researchers to guarantee the reliability of the study results, Nvivo version 12 was used for the data analysis.

Results: The results of the data analysis will be presented in the symposium.

Conclusion: This study will provide new insights into effective ways (which determinants to tackle?) to promote healthy and sustainable food choices among parents from all socio-economic backgrounds and thus create a more healthy and sustainable home food environment for their children. The study is unique for two reasons. To our knowledge, the determinants of parents' food choices that fit within both a healthy and sustainable diet are currently unknown. Additionally, the socio-economic distribution of these determinants has not been investigated yet.





# Inequities in healthy and sustainable food environments and the implications for obesity prevention policy

### Prof. Kathryn Backholer<sup>1</sup>, Miss Christina Zorbas<sup>1</sup>

<sup>1</sup>1Global Obesity Centre, Institute for Health Transformation, Deakin University, Melbourne, Australia

### Early care and education (SIG)

Purpose: An urgent transformation of our food system is required to sustain human and planetary health. This will require effective and equitable policy action to shift diets away from highly processed, pre-packaged foods. This presentation will describe a program of research examining socioeconomic differences in exposure to, and influence of, unhealthy and unsustainable food environments and the implications for policy and practice.

Methods: Systematic review of peer reviewed and grey literature examining the differential exposure and likely impact of food advertising to children according to socioeconomic position (SEP) or race and ethnicity; analysis of New Zealand panel purchase data, including >1.9 million food and beverage purchases; weekly data collection and analysis of online food and beverage price promotions for >3000 products across 52 weeks, available online at the two major Australian supermarkets; thematic analysis of 18 high-income country food policy strategies using Bacchi's 'What's the problem represented to be?' theoretical framework.

Results: Food advertising and the prevalence of price promotions were greater for foods and beverages known to be detrimental to human and planetary health compared to healthier and more sustainable food and beverage types. Lower income households were more likely to be exposed to, and engage with, these marketing practices. Whilst overarching food plans and/or strategies in many high-income countries acknowledged the importance of equitable food policy action, few demonstrated how equity goals can be sufficiently embedded within national actions.

Conclusion: Minority and socioeconomically disadvantaged children and households are disproportionately exposed to, and engage with, unhealthy and unsustainable food marketing practices. Political commitment and action to reduce these inequities is weak but urgently required if we are to witness the transformational change in our food system necessary to sustain human and planetary health.





# **S.3.37 Understanding the impact of natural experiment interventions to promote active travel and physical activity**

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# Built environment changes and active transport to school among adolescents: BEATS Natural Experiment

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# Policies and environments (SIG)

Purpose: Natural experiments are considered a priority for examining causal associations between the built environment (BE) and physical activity (PA) because the 113andomized controlled trial design is rarely feasible. Following the original 2014-2015 Built Environment and Active Transport to School (BEATS) Study conducted in Dunedin, New Zealand, cycling infrastructure construction has occurred in some neighbourhoods, including those of six secondary schools. Pedestrian-related infrastructure changes began in 2018. The BEATS Natural Experiment (BEATS-NE) will examine the effects of these recent cycling and pedestrian infrastructure changes on adolescents' active transport to school (ATS).

Methods: BEATS-NE is guided by ecological models for active transport that account for individual, social, environmental, and policy factors. Follow-up data for BEATS-NE will be collected in 2020-2021 and will include an online survey (1,600 adolescents), accelerometers (420 adolescents), school route mapping (750 adolescents), focus groups (10 sessions; 62 adolescents), Geographic Information Science analysis of the BE, environmental scans of school neighbourhoods (MAPS Global; 12 schools) and participatory mapping (200 adolescents).

Results: At baseline (2014/2015), only 17.9% of adolescents met minimal PA guidelines, 24.2% used ATS and the average distance to school was 6.2±7.4 km. Common ATS barriers included long distance, personal factors (e.g. sweating), lack of social support, convenience of being driven, the weather, BE factors, and traffic safety concerns. School neighbourhoods' intersection density, land use mix and walkability correlated with adolescents' perceptions of traffic volume, crossings, walking/cycling safety, and pedestrian/cycling infrastructure along the school route. Adolescents' perception of safety of walking to school was the strongest correlate of ATS. Compared to walking, cycling to school was less common, perceived as less safe, and received less social and infrastructure support. The six 'exposure' and six 'control' schools are similar with respect to the number of students enrolled ['exposure' vs.





'control' school: 658 (360-869) vs. 514 (388-872)], school-level baseline ATS rates [24% (10%-45%) vs. 21%(14%-31%)] and topography (3 schools on a hillside and 3 on the flat in each group).

Conclusions: Natural experiment design and comprehensive data collection will extend current knowledge to inform planning of future school-, neighbourhood- and city-wide BE changes to encourage ATS in adolescents.





# Te Ara Mua – Future Streets – Examining impacts of community-wide changes on mobility and physical activity

<u>Associate Professor Melody Smith<sup>1</sup></u>, Dr. Alexandra Macmillan<sup>2</sup>, Mr. Bert van der Werf<sup>1</sup>, Prof. Karen Witten<sup>3</sup>, Dr. Adrian Field<sup>4</sup>, Ms. Rebekah Thorne<sup>5</sup>, Dr. Jamie Hosking<sup>1</sup>, Prof. Alistair Woodward<sup>1</sup>, Dr. Hamish Mackie<sup>5</sup>

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## Policies and environments (SIG)

Purpose: Te Ara Mua – Future Streets is the first study of its kind – an area level 115andomized, controlled before and after community intervention study with the goal of making streets safer and easier for people to travel around actively. Components of the intervention included traffic calming, widening footpaths, cycle lane installation, and cultural landscaping (see <u>www.futurestreets</u>.org.nz). This presentation will share the research methods used to evaluate intervention effectiveness, and outline preliminary results with a focus on the pathway to increasing mobility and physical activity (PA).

Methods: The study was conducted in Māngere, Auckland, New Zealand, with baseline measures conducted in 2014, and early follow-up in 2016/17. Every household in the intervention and control area was enumerated to obtain a random sample of children/young people aged 7-13 years and those aged 14 years and older. Participants were revisited at follow-up and replenishment sampling was employed to replace participants who were no longer available to participate. The survey collected sociodemographic information, travel patterns, PA, neighbourhood perceptions, social wellbeing, road traffic injuries, and physical abilities. Video footage of road user characteristics and behaviours, and measures of traffic volume and speeds were also collected. In the intervention area only, qualitative interviews, go-along interviews, school focus groups, and participatory mapping were undertaken to understand neighbourhood use, accessibility, perceptions, and barriers for active travel (AT). Generalized linear mixed models are being used to analyse changes in outcomes, accounting for repeated measures and intra-cluster dependencies. Qualitative data have been analysed using thematic analysis.

Results: In total, 1243 adults and 658 children participated in thesurvey at baseline, and 1280 adults and 630 children participated at follow-up. Improved perceptions of walking and cycling and significant reductions in vehicle speeds and volumes have been found in the intervention area. Sociocultural norms, safety concerns and practical limitations were identified as barriers to AT. Changes in PA and AT are currently being examined.

Conclusions: Early findings from Te Ara Mua – Future Streets demonstrate the potential of community-wide infrastructural interventions to improve safety from traffic and improve resident perceptions for mobility and PA.





# Does a park refurbishment promote active transport to the park?

Dr. Alison Carver<sup>1</sup>, Prof. Anna Timperio<sup>2</sup>, Prof. Billie Giles-Corti<sup>3</sup>, Dr. Jenny Veitch<sup>2</sup>

<sup>1</sup>Australian Catholic University, Melbourne, Australia, <sup>2</sup>Deakin University, Geelong, Australia, <sup>3</sup>RMIT University, Melbourne, Australia

#### Policies and environments (SIG)

Purpose: Evidence suggests that living in neighbourhoods that support active transport (AT) to local destinations such as shops, services, and parks is beneficial for residents' health. Improving park design/facilities has been shown to promote visitation rates and park-based physical activity, however it is unknown whether such interventions increase AT to parks. This study examined the impact of a playscape installation in a large metropolitan park in Melbourne, Australia, on AT to/from the park, compared with an unaltered control park.

Methods: Using a natural experiment design, intercept interviews were conducted to record adults' AT to the intervention and control parks pre- (T1, 2013) and post-intervention at 2 (T2, 2014) and 14 months (T3, 2015). Both parks were accessible via shared walking/cycling paths external to and within each park. At each time-point, participants also reported: purpose of visit, accompaniment by child(ren), and frequency of visits. To examine habitual AT, analyses focused on frequent visitors (>once/week).

Results: Total participant numbers (and response rates) were: T1, 794 (75%); T2, 1166 (81%); T3, 1042 (75%). Around one third visited at least once/week (T1, 36%; T2, 34%; T3, 32%). Among frequent visitors, AT rates were consistently higher to the intervention park (T1, 22%; T2, 19%; T3, 18%) compared with the control park (T1, 14%; T2, 18%; T3, 12%). Among AT users, their main reason for visiting was to walk (T1, 39%; T2, 53%, T3, 47%), walk a dog (T1, 17%; T2, 18%; T3, 18%), or cycle within the park (T1, 16%; T2, 18%; T3, 20%). AT among those accompanying a child to the intervention park were low and increased only slightly, post-intervention, then dropped to pre-intervention levels (T1, 11%; T2, 14%; T3, 11%), while these rates dipped at T2 at the control park (T1, 19%; T2, 12%; T3, 19%).

Conclusions: Rates of AT to parks were low, despite the presence of walking/cycling paths. The introduction of a playscape had little impact on AT. Future studies of varying park size/location should investigate which features/facilities would encourage visitors to travel there by AT.





# S.3.38 Reverse translation: Learning from organically scaled-up physical activity interventions for population-level impactDraft Symposium

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# Sustainable community physical activity initiatives: Principles of a Locally Led Approach

<u>Dr. Justin Richards<sup>1, 2</sup></u>, Ms. Liz Smith<sup>3</sup>, Ms. Rachel Lamb-Yorski<sup>3</sup>, Ms. Maria Marama<sup>3</sup>, Mr. Neil Snowling<sup>1</sup>, Mr. A Hamilton<sup>1</sup> <sup>1</sup>Sport New Zealand, Wellington, New Zealand, <sup>2</sup>Victoria University, Wellington, New Zealand, <sup>3</sup>Litmus, Wellington, New Zealand

Implementation and scalability (SIG)

#### Purpose

Behaviour change research typically involves investigator-led development of structured interventions in controlled environments. This contradicts established practice in community development, which acknowledges local autonomy in intervention design to create meaningful and sustainable change. We explored this disconnect through the lens of the "Locally Led Approach (LLA)" to physical activity intervention development that has been implemented by Sport New Zealand and its 14 partner Regional Sports Trusts (RSTs) since 2016.

### Methods

Mixed methods evaluation assessing implementation approach and its impact on practice across the sector. We used appreciative enquiry to collect information from key stakeholders within each RST through semi-structured interviews with senior managers and focus groups with program staff. Further interviews were conducted with community leaders and program participants from six purposively selected case studies. This was triangulated with annual monitoring of quantitative indicators for the five established principles of the LLA using existing survey vehicles and a self-assessment rubric completed by RST personnel.

### Results

Application of the LLA principles was deemed critical to community ownership and subsequent sustainability of the initiatives developed. Three of the principles were already partly embedded in the practice of RSTs prior to 2016: 1) "Understand your community"; 2) "Work in partnership"; 3) "Learn as you go". However, the clear articulation and prioritisation of these principles by Sport New Zealand has improved practice – indicators that these principles were being applied after one year increased from 68% (range: 50-85%) to 80% (range: 73-87%) after two years. There were two novel LLA principles to the RSTs which have taken longer to be consolidated into practice: 4) "Focus on strengths and assets"; 5) "Enable leadership". An emergent theme was that these principles are scalable, but not the specific intervention components that each different community independently developed.

### Conclusions

Although notions of community-led physical activity programming previously existed within RSTs, the principles of the LLA represent a genuine shift in sustainable intervention design. The diversity in initiatives that result from applying the LLA indicates that scaling up interventions should focus on applying the underlying LLA principles rather than replicating specific intervention components.





# 'Mamanet' catchiball league: Empowering women through social sports

### Prof. Dafna Merom<sup>1</sup>, Dr. Riki Tesler<sup>2</sup>, Prof. Orna Baron-Epel<sup>3</sup>

<sup>1</sup>University of Western Sydney, Penrith, Australia, <sup>2</sup>Ariel University, Ariel, Israel, <sup>3</sup>University of Haifa, Haifa, Israel

### Implementation and scalability (SIG)

Purpose: A simple ballgame played by mothers at their children's schools in one Israeli town in 2001 has evolved to a mother-players league currently in 90 Israelis cities involving 10,000 mothers spreading to Austria, Italy, Greece, Cyprus and the USA. This presentation will describe how "Mamanet" was made a sustainable sport and present the first scientific evaluation of its impact.

Methods: First, we review the driving force behind Mamanet as an organisation, social agenda and milestones in uptake and reach. Second, we present the intrinsic values for mother-players "in their own voice" using a short video. Last, we present research outcomes from a follow-up comparative study of participating and non-participating mothers (n=316) in relation to social capital (social support, social involvement and trust) and well-being (somatic symptoms, self-reported health (SRH) and self-reported depressive symptoms).

Results: Mamanet became a way of life for many women who otherwise will stay at home. Volunteers gaining support from mayors run the organisation. It is inclusive movement encompassing all ages (Mamanet Gold, teenagers), cultural background (Arab and Jewish women playing together) and abilities (e.g.,people with intellectual disability). Research showed that women participating in the Mamanet league had higher social capital and SRH scores than the control group to begin with. Over time, participation in the "Mamanet" League seems to have an effect on two of the three social capital measures: social support and social involvement, showing an increase among the "Mamanet" group and no change in the control group. No change was found for 'trust' in both groups. For the well-being measures, participation in the "Mamanet" league had no significant effect for levels of well-being.

Conclusion: While women choosing to participate in the "Mamanet" league had better measures of well-being and social capital at baseline, this may not truly represent the all participants. Unfortunately, there is no system that records participant characteristics, hampering evaluation. However, this primary study suggest that participation in the league increased social support and social involvement, which is a major driving force of its sustainability over 17 years.





# parkrun: An unparalleled phenomenon increasing physical activity globally

#### Dr. Lindsey Reece<sup>1, 2</sup>, Dr. Justin Richards<sup>2</sup>, Prof. Dafna Merom<sup>3</sup>, Dr. Anne Grunseit<sup>2</sup>

<sup>1</sup>Sheffield Hallam University, Sheffield, United Kingdom, <sup>2</sup>University of Sydney, Camperdown, Australia, <sup>3</sup>Sport New Zealand, Wellington, New Zealand, <sup>4</sup>University of Western Sydney, Penrith, Australia

### Implementation and scalability (SIG)

#### Purpose:

parkrun is the largest freely accessible and organised community-based physical activity initiative globally. It comprises weekly 5km running/walking events that occur in local green spaces and are coordinated by local volunteers. There are few previous examples of weekly physical activity interventions that have grown so rapidly and had such global appeal. parkrun started with 13 runners and 5 volunteers at one location in the United Kingdom in 2004 and has since grown to an international community of over 3 million people across 22 countries. The aim of this research is to review the evidence on the rapidly expanding global reach of parkrun and explore the reasons for its unprecedented organic growth.

#### Method:

We conducted a scoping review of published literature for parkrun. We used the sole search term "parkrun" and searched MEDLINE, SPORTDiscus and several grey literature databases. All identified studies addressing the reach and impact of parkrun were included in the review and emergent themes were reported.

#### Results:

We identified three studies that described parkrun reach and five studies that explored the mechanisms by which parkrun was attracting, retaining and impacting participants. parkrun has effectively reached some typically less active population groups (i.e. women, older people, low previous experience of walking/running), people from lower socio-economic status and ethnic minorities remain underrepresented. The popularity of parkrun has primarily been attributed to accessibility, and participation is self-regulated within a diverse group of walking/running ability. The average parkrun time is slowing globally despite marked improvements for those who participate regularly, suggesting parkrun is attracting more people who are less active at the outset. The social and civic engagement associated with parkrun along with the sense of achievement also contribute to retention of participants.

#### Conclusion:

The reach and popularity of parkrun has prompted its organic dissemination and uptake globally. This is largely underpinned by its simplicity and its appeal across the lifespan to several previously inactive populations as well as the social opportunity it provides for participants. The result is a self-scaling public health intervention that continues to grow.





# S.3.39 How can research help deliver more walkable streets?

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# Measuring the effects of walkable streets – Lessons from London and Auckland

#### Mr. George Weeks<sup>1</sup>

<sup>1</sup>Auckland council, Auckland, New Zealand

Policies and environments (SIG)

#### Purpose

As a mode of transport, walking suffers from ubiquity – its importance is hidden in plain sight. Recent research in New Zealand and the UK has attempted to quantify to the significance of walking and its relationship with street design to inform urban planning decisions.

#### Method

In New Zealand, Auckland Council's Business Case for Walking examined the economic value of foot travel in Auckland city centre. Here, on a typical weekday, 500,000 trips are made by foot. This study examined user benefits to determine the net present value (NPV) of delays to people using pedestrian crossings.

A second study in this programme examined the relationship between Auckland's effective job density (EJD), labour productivity and the effects of increasing job density via walkability.

In the UK, the London Borough of Waltham Forest's Mini-Holland Programme sought to increase cycling, walking and public transport use. Interventions included low-traffic neighbourhoods, new junction designs and protected space for cycling along main roads.

#### Results

The NPV of pedestrian crossing delays along Queen Street, the main street in central Auckland, totalled \$186m compared to a best-case scenario. This implies that pedestrian delay could be costed as a function of street design. Changes to the street environment to increase EJD by 1% in Auckland city centre would increase the value of the study area's economy by 0.53%. This demonstrates a statistically significant relationship between urban design and macroeconomics.

In Waltham Forest, residents of areas receiving Mini-Holland interventions were cycling an extra nine minutes per week and walking an extra 32 minutes per week. In addition to the health benefits of everyday physical activity, this also has had a positive impact on air quality and motor traffic reduction.

#### Conclusion

These examples are part of a wider discourse which show that the benefits of pedestrian-friendly urban design can be quantified and, in turn, used to inform policymaking and evaluation. The onus is on decision-making bodies to enshrine these types of findings as part of the process by which the built environment is designed, built and managed.





# The role of inclusive access in walkability

### Dr. Bridget Burdett<sup>1</sup>

<sup>1</sup>MRCagney, Auckland, New Zealand

### Policies and environments (SIG)

Inclusive access - the ability of all people to participate- is central to walkable environments. However, there is a risk that without measurable indicators of inclusive access, it can get trumped by safety or amenity values. This presentation will present desktop and observational survey methods to compare inclusive access as a component of walkability at community and street levels. Inclusive access requires consideration of human variety, including physical and sensory characteristics and capabilities; fluctuating states and variation in wellness; and the impacts of income on people's access choices. Although humans are unique, there are visible proxies (such as gender, walking speed, and mobility aid use) that can be used to compare inclusiveness in different places. Community catchment analyses, using age, gender and ethnicity-specific rates of disability as well as income levels, can be used to identify the relative need for investment in accessible (walkable) environments.

Considering the impact of participation on wellbeing, the presentation will argue for "safety: access: amenity" as ordered, guiding principles for investment in more walkable places.





# Urban liveability: A social determinants of health perspective on walkability

<u>Mr. Carl Higgs</u><sup>1</sup>, Dr. Hannah Badland<sup>1</sup>, Dr. Koen Simons<sup>2</sup>, Prof. Billie Giles-Corti<sup>1</sup> <sup>1</sup>*RMIT University, Melbourne, Australia,* <sup>2</sup>*University of Melbourne, Melbourne, Australia* 

### Policies and environments (SIG)

#### Purpose

The concept of liveability is found in urban policy discourse globally. Liveable neighbourhoods are underpinned by walkable neighbourhoods, and offer proximity to things needed for our daily living. However, levels of liveability and walkability are not equally distributed across a city. Across the past seven years, our liveability research programme has defined liveability through a social determinants of health lens; and have measured its sub-domains: food, transport, social infrastructure, employment, walkability, housing, green infrastructure and the ambient environment. Our definition is referenced in state policies in Australia, and our urban liveability spatial indicators are used by federal and local governments. This presentation will describe methods for calculating and communicating high resolution spatial measures of urban liveability, and its association with walking and cardiometabolic outcomes.

#### Methods

An urban liveability index (ULI) was developed as a composite measure of liveability for residential addresses in Melbourne, Australia. These were linked with VISTA travel survey (2012) participants for analysis against transport mode choice; and with some refinement, the Victorian Population Health Survey (VPHS, 2014) participants for analysis with physical activity and health outcomes.

### Results

The ULI was positively associated with walking for transport (VPHS Adjusted odds ratio per interquartile range change in ULI: 1.63, 95% CI 1.48, 1.78) and negatively associated with body mass index (VPHS kg/m2 per IQR change in ULI: -0.35; 95% CI -0.55, -0.16). A pilot interactive map was developed for visualising the distribution of the ULI and its sub-domains.

### Conclusions

The concept of liveability is an accessible means of communicating research on the social determinants of health to diverse audiences, and we identified spatial inequities in its delivery across Melbourne. Widespread availability of open data, powerful computing and open source software offers new opportunities for measuring neighbourhood attributes that promote active living in diverse cities. Liveability indicators are now being estimated for urban dwellings across Australia's 21 largest cities and other cities, globally. An urban observatory with interactive maps visualising the spatial distribution of the ULI and its domains will be launched in 2020.





# S.3.40 Dissemination and implementation research in nutrition and dietetics: How can we improve the translation of evidence-based nutrition interventions and guidelines?

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# An evaluation of the impact of lifestyle interventions on body weight in postpartum women: A systematic review and meta-analysis

Dr. Siew Lim<sup>1</sup>, Associate Professor Lisa Moran<sup>1</sup>, Dr. Sharleen O'Reilly<sup>2</sup>

<sup>1</sup>Monash Centre for Health Research and Implementation, Monash University, Clayton, Australia, <sup>2</sup>UCD Institute of Food and Health, School of Agriculture and Food Science, University College Dublin, Belfield, Ireland

## Implementation and scalability (SIG)

Purpose: To determine the next step in implementation for postpartum lifestyle, through the assessment of penetration (the proportion of women invited within the target population), implementation (fidelity), participation (the proportion of those invited who enrolled) and effect (weight loss compared to controls) (PIPE) of lifestyle interventions for weight management in postpartum women.

Methods: Systematic review and meta-analysis of 123ptimized123 controlled trials involving lifestyle modification of diet, exercise or behavioural interventions for postpartum women (within 2 years after birth), with PIPE Impact Metric analysis. MEDLINE, EMBASE and other databases were searched up to 3<sup>rd</sup> May 2019. The quality of the studies was appraised using the Cochrane Risk of Bias tool (2.0). Progress in implementation was mapped against the Monash Health Learning Health System (LHS) framework.

Results: Thirty-six trials (49 publications) were included (n=5315 women, age 18-36 years). A single study provided sufficient information to calculate the population penetration rate (2.5%). All studies provided implementation information, but over half had low programme fidelity with no reported intervention manual or structured curriculum, checklist or other measures of quality assurance. The participation rate was calculated for nine studies (0.94% to 86%). Effect was reported with a pooled mean difference (MD) (95% confidence interval, CI) of -2.33 (-3.10 to -1.56) kg change in body weight (25 RCTs), BMI (MD -1.03 kg/m2[ 95% CI -1.43, -0.63], 18 studies) and physical activity (standardized MD 0.57 [95% CI 0.31, 0.82], 24 RCTs) with no change in energy intake (MD -0.52 [95% CI -1.06, 0.03], 12 RCTs). Fidelity or participation rate did not explain heterogeneity in weight loss effect. Postpartum lifestyle is stagnated at Step 3 of the LHS framework.

Conclusions: The limited evidence identified low penetration and participation, likely to translate to very low population impact. The implementation of postpartum lifestyle is halted at the evidence generation phase. This highlights the inadequacy of conventional RCTs in developing complex, yet implementable interventions. It is now vital to focus on pragmatic trials to translate the existing substantive clinical research investment into real-world settings and to develop implementable solutions for postpartum weight management.





# Development and implementation of a scalable intervention to improve the nutritional content of school lunchboxes

<u>Dr. Rachel Sutherland<sup>1, 2, 3, 4</sup></u>, Ms. Alison Brown<sup>1, 2, 3, 4</sup>, Dr. Nicole Nathan<sup>1, 2, 3, 4</sup>, Ms. Lisa Janssen<sup>1</sup>, Ms. Clare Desmet<sup>1</sup>, Ms. Renee Reynolds<sup>1</sup>, Dr. Serene Yoong<sup>1, 2, 3, 4</sup>, Associate Professor Luke Wolfenden<sup>1, 2, 3, 4</sup>

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# Implementation and scalability (SIG)

Purpose: Globally, a significant number of children bring a packed lunch from home for consumption at school. In Australia, more than 6 million serves of discretionary foods are packed in lunchboxes each day. At a population level, supporting small changes to the nutritional content of school lunchboxes may result in significant health gains. We report the development and implementation of a scalable lunchbox intervention called 'SWAP IT' that has been piloted, 124ptimized and evaluated at a population level.

Methods: A six step program of work has been undertaken including:

- I. Identification of the evidence practice gap through the conduct of a lunchbox prevalence study and systematic review of effective school lunchbox interventions;
- II. Formative research to identify school and parental barriers and corresponding behaviour change techniques that underpin an intervention that support parents to pack healthy lunchboxes;
- III. A pilot RCT delivered (n, 12 schools) to evaluate acceptability, feasibility and potential efficacy;
- IV. Intervention optimization prior to a fully powered trial;
- V. Conduct of a hybrid implementation-effectiveness trial (n, 36 schools) and;
- VI. Evaluation of potential dissemination methods suitable for scale-up.

Results: The 'SWAP IT' lunchbox intervention targets five common parental barriers to packing healthy lunchboxes including time, cost, convenience, child preference and knowledge. The intervention consisted of four core strategies including the implementation of school nutrition guidelines and nutrition curriculum, the delivery of electronic messages to parents delivered using an existing school-communication app and parental resources. The pilot RCT found an increase in mean lunchbox energy from 'healthy' foods (79.21 kJ, p=0.04), a decrease in mean lunchbox energy from discretionary foods (-211.6 kJ, p=0.05) and was acceptable to 95% of parents and school principals. Optimized lunchbox messages were incorporated into the hybrid implementation-effectiveness trial currently being conducted in schools. Results from the hybrid RCT and dissemination trials will be presented.

Conclusions: 'SWAP IT' is a scalable lunchbox intervention that has been developed with consideration of large scale implementation. Given its phased development and early results, it has significant potential for population-wide effects to improve the nutritional quality of school lunchboxes.





# Results from a cluster-randomized hybrid Type III implementation trial of obesity prevention practices in head start

<u>Dr. Taren Swindle<sup>1</sup></u>, Ms. Nicole McBride<sup>1</sup>, Associate Professor James Selig<sup>2</sup>, Prof. Susan Johnson<sup>3</sup>, Dr. Leanne Whiteside-Mansell<sup>1</sup>, Ms. Karen Davenport<sup>1</sup>, Ms. Janna Martin<sup>1</sup>, Prof. Geoff Curran<sup>4</sup>

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# Implementation and scalability (SIG)

Purpose: This study reports on a cluster-randomized Hybrid III trial designed to test stakeholder-selected implementation strategies to support Together, We Inspire Smart Eating (WISE). The 8 implementation strategies selected by stakeholders and tested in this study included formal leadership commitments, preparation of champions, an implementation blueprint, reminders, educational materials, incentives, and facilitation.

Methods: A stratified randomization approach allocated 4 preschool centers serving children in families affected by poverty sites (18 classrooms) to receive enhanced implementation support (i.e., treatment) and 5 sites (20 classrooms) to standard support (i.e., control) before school began. The study was conducted in the 2018-2019 school year, and the Re-AIM framework guided the evaluation. T-test comparisons examined differences between conditions at the end of the school year. Additional multilevel regression analyses are planned that account for nesting of the data structure and control for key demographics. Maintenance assessments are ongoing, and those results will be added before the presentation.

Results: Indicators of Adoption and Implementation were significantly different between groups. Specifically, teachers in the enhanced condition reported greater readiness for change (p =.04), fewer barriers to implementation (p =.008), and higher feasibility (p=.05) and appropriateness (p=.03) of WISE. For Implementation fidelity, there were significant differences for 3 of the 4 WISE practices (all p < .03, effect sizes > .80). Educators reported reach of lessons was greater in the enhanced group, but not significantly so (69% basic, 76% enhanced). Child carotenoid levels increased in both groups but did not differ between conditions. Changes in child Body Mass Index were not different between groups. The cost of the enhanced implementation averaged \$274 per classroom per year.

Conclusions: A set of stakeholder-driven implementation strategies improved the adoption, reach, and implementation of the WISE intervention in Head Start. Engagement of key stakeholders in the selection and tailoring of implementation strategies may prove a key approach to improving uptake of evidence in the early care and education setting.





# S.3.41 Talking about complex interventions to reduce sedentary behaviour and increase physical activity in older adults

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# The effectiveness and complexity of interventions targeting sedentary behaviour across the lifespan: A systematic review and meta-analysis

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# Ageing (SIG)

Purpose: Accumulating evidence suggests that sedentary behaviour (SB) is associated with poor health outcomes, even after adjustment for physical activity (PA) levels. SB at any age may have significant consequences for health and well-being. Therefore, the need to develop behaviour-specific, multicomponent, complex interventions that incorporate effective strategies to reduce SB are essential in addressing this novel risk factor.

Methods: A systematic review and meta-analysis was conducted investigating the impact of interventions targeting sedentary behaviour across the lifespan. Six databases were searched and two review authors independently screened studies for eligibility, completed data extraction and assessed the risk of bias and complexity of each of the included studies.

Results: A total of 78 adult interventions and 83 interventions in children were included. A total of five studies conducted in community-dwelling older adults (three randomised controlled trials) were included in the metaanalyses. The overall risk of bias of these five studies was low. Results on sedentary behaviour were inconclusive due to heterogeneity (-19.61mins/day; 95% CI -66.88, 27.67; n=381; p=0.42; I2=89%). The majority of these five studies relied on education and psychological approaches.

The findings of the overall review demonstrated that interventions may induce relevant reductions in daily sedentary time; however, the heterogeneity in reported outcomes, intervention components and control arms (no intervention/alternative intervention) prevented us from drawing more firmer conclusions from the evidence provided. The complexity assessment also suggested that interventions may be complex to address the challenges of a complex system, but a higher complexity score is not necessarily associated with better outcomes in terms of sustained long-term changes.

Conclusions: Future interventions studies should apply more rigorous methods to improve research quality; considering larger sample sizes, randomised controlled designs and valid and reliable measures of SB.





# Efficacy of a computer-tailored web-based physical activity intervention using Fitbits for older adults: A randomised controlled trial

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# Ageing (SIG)

Purpose: Preliminary evidence suggests that web-based interventions with tailored advice and Fitbits may be well suited for older adults.

Methods: This study aimed to test the effectiveness of 'Active for Life,' a 12-week complex web-based physical activity intervention for older adults. The intervention includes 6 modules of computer-tailored physical activity advice, an action planning tool and an exercise library. A total of 243 participants were randomly assigned to one of three trial arms: 1) tailoring+ Fitbit, 2) tailoring only, or 3) wait-list control. The tailored advice was based on either participants' Fitbit data (tailoring+ Fitbit) or self-reported physical activity (tailoring only). The Active Australia Survey was used to assess total physical activity (total PA) and moderate to vigorous physical activity (MVPA) at baseline and week 12. Intention-to-treat linear mixed model analyses were used to test for group differences on changes in total PA and MVPA.

Results: The 12-week assessment was completed by 166 participants (32% attrition). All 6 modules were completed by 69% of tailoring + Fitbit participants and 58% of tailoring only participants. The tailoring + Fitbit participants increased their weekly minutes of total PA from 154.64 (103.80-205.47) to 332.20 (249.59-414.81), the tailoring only participants from 170.62 (127.53-213.72) to 322.47 (246.39-398.55) and the control from 147.95 (100.13-195.76) to 342.25 (263.77-420.73). The tailoring + Fitbit participants' increase in total PA did not significantly differ to the tailoring only (p=.67) or control (p=.78) participants. The tailoring + Fitbit participants increased their weekly minutes of MVPA from 57.83 (30.54-85.11) to 156.02 (106.33-205.72), the tailoring only from 58.02 (34.89-81.15) to 86.68 (40.81-132.54) and the control from 49.74 (24.08-75.40) to 81.32 (33.98-128.67). The tailoring + Fitbit participants increased their MVPA significantly more than the tailoring only (p=.04) and control (p=.05) participants.

Conclusions: A complex computer-tailored web-based physical activity intervention with Fitbits for older adults increased MVPA compared to the intervention without Fitbits and a wait-list control.





# Design and components of the SITLESS intervention and objective daily sedentary and physical activity time in European older adults

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## Ageing (SIG)

Purpose: The SITLESS study aimed to design and assess a complex intervention to reduce sedentary behaviour (SB) and increase physical activity (PA) in community-dwelling older adults. Both behaviours are important determinants of health in older adults. We aimed to describe the design of the SITLESS intervention and the baseline composition of objectively measured SB and PA in older adults, and to assess socio-demographic and functional correlates of engaging in higher levels of SB in participants of a multi-center study including four European countries. We will provide preliminary results of its effect on health and function, due to be analysed in February 2020.

Methods: The SITLESS intervention was designed combining existing PA programmes with self-management strategies (outcome expectations, self-monitoring, goal setting on PA and SB and social support) that address individual, social and environmental factors. 1360 community-dwelling older adults from the SITLESS study (61.8% women; 75.3±6.3 years) completed a self-reported SB questionnaire and wore an ActiGraph accelerometer for seven days. Accelerometer-determined compositional descriptive statistics were calculated. A fixed effects regression analysis was conducted to assess the socio-demographic (country, age, sex, civil status, education and medications) and functional (BMI, and gait speed) correlates.

Results: Older adults spent 80.5% of waking time in SB, 17.8% in light-intensity PA (LPA), and 1.7% in moderate to vigorous PA (MVPA). Watching television and reading accounted for 47.2% of waking time. Older age, being a man, single, taking more medications, being obese and overweight, and having a slower gait speed were statistically significant correlates of more sedentary time.

Conclusions: Our sample showed a high proportion of daily sedentary time. With an ever ageing European population this study justifies the need to develop and evaluate interventions to reduce sitting time with non-sitting activities, especially during television viewing. The distribution of context-specific sedentary activities by country and sex showed minor differences.





# S.3.42 Alternate views of energy balance: examining the effects of gardenbased interventions on behavior and health outcomes

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# The TX Sprouts Project and its effect on obesity, diet, and physical activity

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### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: This study aims to examine the effects of TX Sprouts, a one-year school-based gardening, nutrition, and cooking cluster randomized trial, on dietary intake, physical activity, and obesity and metabolic outcomes.

Methods: Sixteen schools were randomly assigned to TX Sprouts intervention (n=8 schools) or to delayed intervention (n=8 schools) over three years (2016-2019). The intervention arm received: formation/training of Garden Leadership Committees, a 0.25-acre outdoor teaching garden, and 18 gardening, nutrition, and cooking lessons, taught during school year. The delayed intervention was implemented after 1 year of follow-up. Outcomes collected on each child included height, weight, waist circumference, body composition via bioelectrical impedance, blood pressure, and dietary intake via screener. A subsample was measured for glucose, HbA1C, and 24-hour dietary recalls. Physical activity (PA) was measured via accelerometers.Mixed effects linear regression models, accounting for the cluster effect, will be used to analyze change outcomes between intervention and control groups. Linear mixed modeling was used to assess differences in PA on garden and non-garden days.

Results: Of the 4,239 eligible students, 3,137 consented and provided baseline anthropometric measures. Approximately 34% of children successfully completed an optional fasting blood draw and 24% completed two dietary recalls at baseline. Average age of children was 9.2 years and 47% were female. Approximately 66% were Hispanic and 69% received free and reduced breakfast/lunch. Forty-six percent had overweight or obesity. Accelerometer preliminary data showed that when compared to non-garden days, on garden days students demonstrated greater MVPA ( $\beta$ =2.96, p<0.001) and a reduction in SED ( $\beta$ = -9.21, p<0.0001). Post intervention data collection was completed in June of 2019 and data cleaning and analyses is underway and the intent to treat analyses will be completed by the end of the year.

Conclusions: Garden lesson could have a substantial impact on children's PA. This is the first large, clusterrandomized trial to examine effects of a school-based garden, nutrition, and cooking program on obesity and metabolic outcomes in primarily low-income Hispanic children.





# Sustainability via Active Garden Education (SAGE): An early look at physical activity-related outcomes

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### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Early care and education centers (ECEC) educate most young children (3 to 5 y) in the USA and aim to provide children opportunities to meet daily physical activity (PA) policy recommendations. Sustainability via Active Garden Education (SAGE) used a multi-level intervention strategy to promote ECEC PA in children and their families. This study aimed to evaluate the impact of SAGE on children's moderate-to-vigorous PA (MVPA).

Methods: SAGE was a randomized controlled trial implemented in 26 ECEC including 12-lessons repeated in 2 weekly, 60-minute sessions over 12 weeks. SAGE used the plant lifecycle as a metaphor for human development; included physically active songs, games, and garden exploration offered as part of regular ECEC programming. Parents also received weekly newsletters linked to the curriculum to promote PA at home. Actigraph accelerometers measured children's MVPA for 7 days at pre-test and post-test. Parents completed surveys assessing parenting practices and home PA resources.

Results: SAGE was delivered with high fidelity (82-97% program components). Most children (N=173, 49% female, 77% Hispanic, M(SD)=52.5±4.5 months) attended ECECs within in high proportion Hispanic neighborhoods (>30%). MVPA for a subsample (n=35) of children participating in SAGE increased from  $69.1\pm14.7$  minutes/day to  $73.4\pm23.2$  minutes/day and control children MVPA increased from  $58.2\pm19.0$  minutes/day to  $79.2\pm25$  minutes/day over the 12 weeks. Parents (92.4% female; M=32.1\pm8.0 years; 74% completed high school) reported reducing their promotion of screen time (p=.004). Parents across the sample reported fewer home PA resources (M= $3.53\pm2.43$  v.  $2.67\pm2.60$ , p=.09) from pre-test to post-test.

Conclusions: SAGE was easily implemented in ECEC and received well by parents. Simple strategies were effective at reaching parents. Initial results demonstrated the potential for changes in child MVPA, and parenting practices may have improved. Easy-to-implement and fun ECEC strategies should continue to be explored to promote early child MVPA.





# An overview of school garden interventions and their effects on behavior

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### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

**Purpose:** The purpose of this study was to perform a systematic review and meta-analysis of randomized controlled, quasi-experimental, cluster controlled trials and controlled comparison studies, that have examined the impact of school-based teaching interventions on healthy eating outcomes of elementary school children through the use of experiential learning approaches (e.g., school gardens).

**Methods:** The systematic literature search was conducted using a range of electronic databases (A + Education; The Cochrane Central Register of Controlled Trials (CENTRAL); ERIC; Journals@Ovid; MEDLINE; ProQuest Central; PsycINFO; and SAGE Health Sciences Full-Text Collection) from 1990 to 31st October 2018. The review was limited to studies published in English that utilised experiential learning pedagogies in order to influence at least one of the following four healthy eating outcomes: 1) reduced food consumption or energy intake; 2) increased fruit and vegetable consumption or preference; 3) reduced sugar consumption or preference (not from whole fruit); and 4) increased nutritional knowledge.

**Results:** Experiential-learning approaches were used in 14 studies to improve fruit and vegetable consumption or preference in elementary school children. Initial results suggest that these studies proved to be very effective with over 75% of these types of studies yielding statistical significance at p < .05 or better. Of the 11 effect sizes that were calculated, 45% had a large effect and the remaining 55% had a small effect.

**Conclusions:** Given the increased overcrowding of the elementary school curriculum, a meta-analysis of this scope is able to provide key stakeholders with the best evidence of where teaching resources should be focused. It is also clear that whilst teachers are capable of making substantial improvements in elementary school student nutritional outcomes using school gardens, the value of teacher professional development (PD) in this area is not widely understood, due to poor reporting. Future research should consider the role teacher PD is having on these outcomes.





# S.3.43 Reaching the forgotten and understudied cancer population in lifestyle interventions

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# Tailoring exercise and dietary interventions to comorbidities, disease and treatment related adverse effects of cancer: Explanation and application of the i3-S strategy

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Cancer prevention and management (SIG)

#### Purpose:

To optimize outcomes of exercise and dietary interventions, it is important that these interventions are specifically tailored to comorbidities, disease- and treatment-related adverse effects that patients with a specific type of cancer face. Tailoring such interventions is complex and requires adequate clinical reasoning by health professionals. The i3-S strategy may be useful to develop a framework to support these clinical decisions, particularly in understudied cancer populations such as ovarian cancer patients. The aim of this lecture is to describe the methodology of the i3-S strategy and its recent application in patients with ovarian cancer.

### Methods:

The i3-S strategy includes four steps, via which relevant information on the specific disease is collected from literature, guidelines and expert meetings: 1) creation of an inventory of comorbidities and adverse effects of ovarian cancer and its treatment. 2) Extension of the inventory with contraindications and restrictions. 3) Extension with potential adaptations to the exercise and dietary intervention in ovarian cancer specific comorbidities and adverse effects. 4) Integration of information from previous steps into a framework by translating adverse effects to clinical parameters and symptoms to monitor during the intervention.

### Results:

Step 1 and 2 led to the following ovarian cancer specific comorbidities and adverse effects, including disorders of the thyroid gland, ascites, gastro-intestinal symptoms (e.g. anorexia) and an abdominal wound after surgery. Strategies to adapt the exercise intervention (step 3) included monitoring of brady-/tachycardia and related symptoms as a consequence of disorders of the thyroid gland, adjusting exercise to a comfortable intensity or posture in case of discomfort due to ascites, and replacing eccentric exercises by isometric exercises to avoid pressure on the abdominal wound in the post-operative period. These strategies for adapting the intervention to ovarian cancer specific comorbidities and adverse effects were integrated into a framework (step 4).

#### Conclusions:

The i3-S strategy has been applied successfully to tailor exercise interventions to patients with breast or ovarian cancer and to tailor dietary interventions to patients with ovarian cancer. It provided clinical guidance to physiotherapists or exercise physiologists delivering exercise interventions to patients with cancer.





# Developing CanBenefit: CANcer BEhavioural Nutrition and Exercise FeasIbility Trial

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# Cancer prevention and management (SIG)

Purpose: Older adults with intra-thoracic malignancy are often frail and unfit due to their cancer and co-morbidities. This may affect ability to tolerate or receive cancer treatments. Irrespective of whether they are eligible for treatment or are having best supportive care, these people experience poorer quality of life (QoL) than younger counterparts and other cancer groups. Evidence suggests that engaging lifestyle behaviours, such as physical activity (PA) and healthy diet, offer significant improvements in QoL among people with a cancer diagnosis before, during, and post-treatment. These behaviours may also positively impact treatment completion rates, which may improve survival rates. However, older, frailer lung cancer populations tend to be excluded from this type of research under the assumption they are too high a risk to participate. As such, there is very little existing research to inform an intervention among this population. Our aim was to assess the acceptability, usefulness, and practicality of delivering a tailored wellbeing programme for older adults with lung cancer before, during, and after cancer treatment.

Methods: People with lung cancer  $\geq$ 70 years of age, their informal carers, and Multidisciplinary Team (MDT) members were invited to participate in semi-structured interviews with the intention of determining acceptability, usefulness, and practicality of tailored wellbeing programme and specific feedback on individual components to be included. Participants were identified by a clinician in the clinic; informal carers were also invited to participate if they were interested. Topic guides were developed and used for all interviews.

Results: Thirteen interviews have been conducted and transcribed to date. Thematic coding is underway though preliminary assessment indicates patients, carers, and MDT members would welcome a holistic wellbeing programme designed to improve quality of life. Initial feedback on whom should deliver, what content should be, and how to frame the intervention included ensuring it was individually tailored, incremental, and focused on maintaining daily activities was incorporated into subsequent protocols. Remaining interviews will be completed by 30 November 2019.

Conclusions: Preliminary results from this study have highlighted important considerations and components in developing a tailored wellbeing programme for people with lung cancer.





# Process evaluation of a combined exercise and dietary intervention in women with ovarian cancer

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### Cancer prevention and management (SIG)

Purpose:

The single blind randomized controlled 'Physical Activity and Dietary intervention in OVArian cancer' (PADOVA) study evaluates the effectiveness of a combined supervised exercise and dietary intervention in patients with ovarian cancer during chemotherapy treatment compared with a usual care control group that receives exercise and dietary advice after completion of chemotherapy treatment. The second aim of this study is to conduct a process evaluation to examine why and how the intervention is (in)effective.

### Methods:

Participation rates were calculated as the proportion of eligible patients that were willing to participate. Reasons for declining participation were registered. Adherence to the exercise and dietary counselling sessions and the number of times the counsellors (i.e. physical therapist or dietitian) adjusted the intervention as well as reasons for adjustments were registered. Patients were considered adherent when they attended >80% of prescribed sessions.

### Results:

The first 25% of participants have completed the trial. On average, 29% of the patients who were eligible were willing to participate. Main reasons for declining participation were too much burden practically, physically or emotionally (35%) or not willing/able to conduct study measurements (31%).

Mean attendance in the group receiving the intervention during chemotherapy was 76% for the exercise sessions and 92% for the dietary consultations. Of these participants 55% were adherent to the exercise sessions and 80% to the dietary consultations. In 91% of the participants one or multiple exercise sessions were adjusted because they were too ill to follow the prescribed protocol. Being too ill was reported in most participants (55%) as one of the reasons for nonattendance. In total, 66% of the dietary consultations focused on energy and protein intake recommendations, while a healthy diet according to the WCRF guidelines was discussed in 34%.

Of patients in the usual care control group, 25% were interested in exercise, 50% in dietary consultations and 13% in a combined intervention after treatment.

### Conclusions:

The attendance for exercise sessions was reasonable and the attendance for dietary consultations during chemotherapy was good. Patients preferred receiving exercise and dietary support during chemotherapy treatment instead of after chemotherapy completion.





# S.3.44 Why are vegetables so important in early childhood yet such a battlefield?

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# Quantity and variety of fruit and vegetables served in New Zealand childcare centres: An analysis of menus, celebrations and nutrition policies

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Early care and education (SIG)

Purpose: The proportion of New Zealand children meeting the vegetable intake guideline has declined over the past decade. Early childhood education (ECE) centres can assist to improve exposure, taste preference and liking for vegetables in children. This study aimed to assess the presence and variety of fruit and vegetables on ECE menus, at celebrations, and in policies.

Methods: All licensed ECE services in three regions of New Zealand were invited to participate in a 65-item online survey in May 2014. Policies were analysed using the Wellness Child Care Assessment Tool (WellCCAT-NZ). Menus were evaluated for adherence to 50% recommended fruit and vegetable (F+V) quantity (10+ serves/week) and variety (5+ different serves/week) using Ministry of Health guidelines for 2-4 year olds. Chi-square tests for differences in proportions and ANOVA for differences in means between categorical groups were conducted (p<0.05).

Results: 257 services participated (including 91 private, 81 community centres), providing 82 policies and 57 menus. 82.4% of private centres and 55.6% of community centres served food daily to children. All but one centre served adequate F+V quantity across the week. Only five menus (8.8%) contained the same or a greater number of vegetables compared to fruit. 82.4% contained adequate F+V variety: 37.8% of private centres compared to 94.7% of community centres. Centres with written nutrition policies and a cook with nutrition training were more likely to meet F+V variety criteria. 40% of centres usually served F+V at celebrations. Mean scores on the WellCCAT (max=100) were 27.7 and 26.1 for comprehensiveness of policy in private and community centres, respectively, and 10.7 and 13.8 for strength of policy wording.

Conclusions: Vegetables did not appear in sufficient quantity on ECE menus to enable children to improve their intake, liking or food preferences. The variety of F+V served in privately-run ECE centres was particularly concerning. Centres should consider adding specific policies regarding vegetables to ensure quantity and variety at lunch and snacks, and serve vegetables alongside other foods at celebrations.





# Standardising food provision measurement, exchanging discretionary foods with vegetables and regulation: How do they work together in ECEC services?

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## Early care and education (SIG)

Purpose: This presentation highlights the poor state of vegetable provision in Early Childhood Education and Care services (ECEC) at a time when obesity prevention is a public health priority. Young children are an important group as they present a unique early intervention opportunity to embed healthy eating language and practice. Around 1.3 million children access ECEC, with one in four (n=325,000) children likely to have health consequences from increased weight. Standardising measurement of food provision will provide accurate surveillance of the sector. Including strategies that recognise barriers for vegetable intake compliance and displacing discretionary foods with vegetables will likely increase vegetable provision thus intake.

Methods: In Western Australia 30 randomly chosen Long Daycare (LDC) had ingredients weighed, for morning tea (MT), lunch (L) and afternoon tea (AT), over two days. Data were analysed using R (version 3.4.2). A one-sample t-test compared the LDC mean servings of core food groups for a reference child (2.5-year-old male), against 50% of Australian-Dietary-Guidelines (ADG). Costing of ingredients (Foodworks 8.0.3) determined costing distribution. Logistic regression assessed if provision compliance was associated with food cost. Discretionary food serve calculation was based on ADG serve recommendations.

Results: 10% of services complied with all five food group recommendations, 40% of services were compliant for vegetable provision. Vegetables most commonly offered were; other (33.6%), red/orange (24.5%), potatoes (18%), other starchy (12.2%), legumes (9.3%) and green leafy vegetables (2%). A significant difference in vegetable provision based on expenditure between those spending <\$1.50 compared to those spending >\$2.50 per child/day; increased budget increased vegetable provision. >90% of LDC over provided sodium 766±492 mg/d, saturated fat  $9.9\pm7.9$  g/day and discretionary foods  $1.0\pm0.9$  serves/day by [median±interquartile range],all p<0.001.

Conclusion: Under provision of vegetables has significant impact on health outcomes for children. Standard food provision assessment methods would allow surveillance of vegetable provision in LDC nationally and against current guidelines, inform regulatory bodies to mandate for guidelines supporting adequate vegetable provision and strategies for implementation.





# Discrepancy between reported and observed role modelling by educators in the early childhood education and care setting

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### Early care and education (SIG)

Purpose: Role modelling by educators in the Early Childhood Education and Care setting is a promising strategy to promote healthy eating amongst young children (Ward et al 2015). The aim of this analysis was to investigate the prevalence of educator role modelling including modelling of vegetable intake.

Methods: Participants were staff at long day care centres (n=10) across Brisbane and the Sunshine Coast in Australia, participating in a pilot trial of professional development for educators regarding responsive feeding practices. Self-reported feeding practices and demographic data were collected via online survey using the Childcare Food & Activity Practices Questionnaire (Gubbels et al 2015). Direct observation of feeding practices and food provision were collected using the 'Environment and Policy Assessment and Observation' tool (Ward et al 2008).

Results: Self-report data were available for 88 educators (96% female). Mean duration working in ECEC was 13 years (SD=9.4). Median factor score for role modelling was 5.0 (IQR=4.3-5.0), on a possible scale of 1-5. A total of 118 meals were observed across all centres. Nine centres provided food for the children. Of these, one had a kitchen onsite, while the remainder used a catering company. All centres shared a policy which stated 'model healthy eating habits when sharing meals with children'. The proportion of mealtimes at which practices were observed were [median (IQR)]: Educator sat with children, 75% (70.2-83.7); enthusiastic role modelling, 22% (0-33.3); ate the same food, 20% (5.8-33.3). In two centres, no educators were observed eating the same food as children at any meal. Of the 26 occasions in which an educator was observed to eat the same food, 14 of these were consuming a vegetable.

Conclusion: Despite policy support, opportunities for modelling, and high levels of educator self-report, prevalence of observed modelling was low. These findings will be discussed, prompting #ISBNPA2020 delegates to consider organisational barriers to modelling, such as shift rosters and food service, accuracy of measurement of practices, and potential to facilitate role-modelling by analysing economic costs and benefits of meal provision by centres to educators.





# S.3.45 The application of systems thinking in public health: Diverse approaches and lessons learned

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# The DINAMICS project: Application of system dynamics models to understand the role of social norms in obesity prevalence

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### Socio-economic inequalities (SIG)

Background Body weight perception is a product of interactions between an individual and their socio-cultural environment. We consider this a complex system inducing population-level obesity as an emergent property. The system consists of a micro-macro feedback loop between 1) social norms; 2) individuals' body weight perception; and 3) individual lifestyle and BMI. Lifestyle affects norms while also being affected by norms. Given this feedback loop, it remains unclear whether addressing lifestyle only via health awareness can decrease obesity prevalence; norms might be a counteracting driver. Still, norms have been neglected in epidemiological research as quantitative methods cannot consider micro-macro feedback loops. System dynamics modelling (SDM) can be a solution to understand and simulate a system's emergent behaviour.

MethodsWe used an expert-informed causal loop diagram as a template for six SDMs. These correspond to six sociocultural groups (Dutch, Moroccan and South-Asian Surinamese men and women) from an Amsterdam-based cohort, which includes body weight (BMI) and weight perception measures. We validated the SDMs based on their performance on validation statements compared to random SDMs. We simulated the effect of three scenarios on population-level BMI: where individual lifestyle was driven 1) only by health awareness, 2) only by norms, 3) by their interaction (health awareness and norms).

Findings We operationalised norms in the SDMs based on population-level median BMI and data describing sociocultural ideal BMI. The SDMs outperformed random SDMs. They showed that median BMI drops 10.8% (2.78 BMI points) in scenario 1), 5.3% (1.36 points) in 2), and 7.4% (1.91 points) in 3). The male groups demonstrated a 2.06 times larger drop in scenario 1) than in 3) than their female counterparts (1.12 larger drop).

Interpretation Social Norms diminish the potential effect of health awareness on BMI. This was consistent in all groups but the effect was stronger in males than females. Our findings imply that, since norms affect the lifestyle (and ultimately BMI) of female groups to a lesser extent, there must be additional underlying drivers of obesity in women.





# Developing healthy eating, sleeping and physical activity habits among 10-14 year olds in Amsterdam: Design of a systems evaluation framework

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## Assessment and Methodologies in Behavioral Nutrition and Physical Activity

#### Purpose:

Programmes addressing childhood obesity have long focused on targeting single determinants. Causes of childhood obesity are however diverse, complex and multiple.

Systems thinking embraces the complexity of problems such as overweight and obesity and aids in understanding how factors in the system are interrelated and affect each other so that these can be targeted and produce favourable changes in a system.

While there is a growing call for systems approaches in public health research, there is relatively little guidance on how to best develop and evaluate public health interventions in complex systems. This study therefore aimed to develop an evaluation framework using a complex systems approach.

### Methods:

The LIKE (Lifestyle Innovations based on youths' Knowledge and Experience) project was used as a case study. LIKE is part of the Amsterdam Healthy Weight Program and aims to create healthy habits amongst young adolescents in lower socio-economic and ethnically diverse neighbourhoods.

The evaluation framework served both as a tool for informing and supporting the development and implementation of the intervention programme and as way of generating generalizable knowledge on the impact of the programme so that it could be applied elsewhere.

### Results:

A developmental evaluation design was used at the start of the LIKE project as it is particularly well suited for programmes that target complex environments with high uncertainty. It assisted evaluators in developing an understanding of the system and in framing and adapting the intervention in real time as patterns of change emerged and as the intervention unfolded.

Besides supporting the intervention development, the evaluation framework also aimed to produce generalizable knowledge using a summative evaluation. Here the evaluation focuses on comparing pre-existing and follow-up systems and developing indicators on system level changes using the Intervention Level Framework.

### Conclusions:

An evaluation framework was developed for the LIKE project that was informed by key principles of developmental and summative evaluation using a complexity perspective. This evaluation design can inspire future public health programmes in developing and evaluating interventions in complex systems.





# Building a literature-based systems map of determinants of dietary intake in low-income groups as a basis for health equity policies

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## Assessment and Methodologies in Behavioral Nutrition and Physical Activity

**Purpose:** Inequalities in obesity and related non-communicable diseases pertain in part to less healthy dietary intake in disadvantaged groups. Examining determinants of intake in low-income groups as a complex adaptive system – i.e. interconnected determinants exerting non-linear influence on outcomes - honours the complexity of the reality governing individuals' dietary choices, behaviours and intake, and could enhance assessment of policies. However, it is not clear if existing literature on relevant determinants can be synthesised, and understood, as a complex system.

This study aimed to use existing literature to map the complex system underlying dietary intake in low-income groups, in order to identify system structures and goals perpetuating poorer dietary outcomes.

**Methods:** A systematic umbrella review was conducted on literature examining determinants of dietary outcomes in low-income children, adolescents and adults. Inclusion criteria:

- Low-income (or related construct) sample or analysis by income;
- (Non-)systematic, scoping, mapping reviews or meta-analysis of quantitative or qualitative, observational or intervention studies;
- Higher/upper-middle-income countries;
- Exposures: individual, sociocultural, physical, political determinants, effect modifiers;

The following outcomes were excluded: breastfeeding, alcohol and neophobia.

Data on determinants, associations and mechanisms were extracted and, using causal loop diagramming, embedded in a systems map of determinants underpinning dietary intake. The map was analysed in terms of system structure (e.g. subsystems) and goals (e.g. structure and feedback loops).

**Results:** A systems map of hypothesised mechanisms underlying dietary intake in low-income groups was developed from 43 reviews and expert consensus. The system was interpreted as underpinned by cross-sectoral subsystems supporting goals around: commercial competitiveness, cost-efficient purchasing, use of food to indicate group membership and preference-based food selectivity. Goals may undermine opportunities for healthy intake; e.g., energy-dense food choices resulting from cost-efficiency and preferences determined by heightened exposure to energy-dense foods.

**Conclusions:** Using an innovative but challenging systems approach, we developed a literature-based systems map which begins to articulate the systemic basis of dietary outcomes in low-income groups. Deeper understanding of identified system structures and goals will facilitate the development and assessment of effective and equitable policies..





# Intake of sugar-sweetened beverages, hydration status and its association with cognitive function among adolescents in Selangor, Malaysia.

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# Children and families (SIG)

Purpose: While the consumption of sugar-sweetened beverages (SSBs) has been linked to obesity in adolescents, less is known about how SSBs as sources of hydration is associated with cognition. This study aimed to examine the association between the intake of sugar-sweetened beverages, hydration status and cognitive function among adolescents in Selangor, Malaysia.

Methods: A total of 230 adolescents aged 10-14 years participated in this cross-sectional study. Intake of sugarsweetened beverages was assessed using the Beverage Intake Questionnaire (BEVQ-15), hydration status through the urine colour chart and cognitive function through the Wechsler's Intelligence Scale for Children (WISC-IV).

Results/Findings: Water was found as he main source of fluid (877.00±492.08 ml/day) followed by malted drinks (221.88±272.38 ml/day) and sweetened juice beverages (149.73±200.14 ml/day). The least consumed beverages were reduced fat milk (65.39±141.39 ml/day), tea/coffee without sugar and/or creamer (30.92±91.04 ml/day) and diet soft drinks (12.11±42.89 ml/day). More than half of the adolescents were mildly or moderately dehydrated (59.8%) compared with only one-third were well-hydrated (33.2%). Soft drinks (r=-0.180; p=0.006), sweetened tea (r=-0.184; p=0.005) and total sugar-sweetened beverages consumption (r=-0.199; p=0.002) were negatively correlated with cognitive function. Cognitive scores were significantly higher among hydrated adolescents (100.38±12.01) compared to their dehydrated (92.00±13.63) counterparts. In a hierarchical multiple linear regression analysis, after adjusting for socio-demographic factors, soft drinks ( $\beta$ =-0.009; p<0.05) and sweetened tea ( $\beta$ =-0.019; p<0.05) negatively predicted cognitive function ( $\Delta$ R2 = 0.021), contributing 20.1% of the variance in cognitive function.

Conclusion: Results highlight the negative relationship between SSBs intake and dehyration with cognitive function in adolescents. Interventions aimed to decrease consumption of SSBs and increase intake of healthier fluid options such as water can be targeted to increase cognitive function.





# Orals





# O.1.01 - Physical activity epidemiology in children

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# Experimental evidence of within-day compensation following imposed or restricted physical activity

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Children and families (SIG)

Purpose: There has been ongoing debate about whether physical activity compensation occurs. However, few experimental studies have examined the activitystat hypothesis in children. This study investigated whether short-term compensatory responses were observed following imposed or restricted physical activity at school.

Methods: The Reactivity to Activity (REACT) Study was a cross-over randomised controlled experiment that involved three one day experimental conditions: (a) additional light-intensity physical activity (LPA; standing condition); (b) additional moderate- to vigorous-intensity physical activity (MVPA; sports condition); and (c) restricted LPA and MVPA (indoor play condition). In total, 368 children (47.3% boys) in Years 4-6 (age 8-12 years) from 7 primary schools participated. Children wore a hip-mounted ActiGraph accelerometer for 5 days (Monday-Friday) during a 'usual' week and during each 'experimental' week. Total counts for the experimental condition period, for the after-school period and overall on the experimental day, and overall on the following day were extracted from baseline and each experimental week. Paired t-tests examined differences between baseline and experimental time periods. Where differences were observed, differences in the composition of eight energy expenditure bands were examined using a paired Hotelling test for multivariate data using R (v3.5.1).

Results: Total counts decreased by 21.2% and 20.9% during the indoor play experimental condition and whole experimental day, respectively, compared to a usual day. For the sports class condition, total counts increased by 42.8% and 38% during the condition period and whole day, respectively, compared to a usual day. In the afterschool period, a 9.6% decrease in counts was observed following the sports condition. In this period, children reduced their energy expenditure in the highest bands, which equated to MVPA, by 31.7%. Energy expenditure in the lowest bands, which equated to sedentary time and LPA, increased by 35.4%. On the following day, no detectable differences in counts compared to the matched usual day were observed for any condition.

Conclusions: These findings provide some support for a within-day compensation of physical activity following increased MVPA, but not for the other conditions. There was no evidence of between-day compensation, possibly due to the structure of the school day and surrounding environment.




# Latent transition analysis of physical activity and sedentary behaviour from adolescence to young adulthood

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#### Children and families (SIG)

Purpose:

The transition out of secondary school is a time of significant change, associated with declines in physical activity. However, it is possible that not all adolescents experience detrimental changes in activity-related behaviour when they leave school. This study identified activity-related behaviour typologies and explored subsequent changes in typology membership during the transition out of secondary school.

#### Methods:

Year 11 students were recruited via schools and social media and completed annual follow-ups over two years (n=852 completed baseline (BL) and the two-year follow-up (FL); 75% female, mean age= 16.9±0.4 years). All measures were self-reported. Latent class analysis identified typologies of activity-related behaviours (active travel, leisure-time walking, moderate and vigorous physical activity, TV viewing, video gaming and computer use for leisure) at BL and FU, and transition analysis explored change in typology membership over time. Typology transitions were compared by gender, body mass index (BMI), post-school pathways.

#### Results:

At BL and FU, three descriptively similar typologies were identified and labelled: 1) Sedentary gamers (BL: 18%; FU: 15%: characterised by high levels of sedentary behaviours, particularly video gaming); 2) Inactives (BL: 47%; FU: 47%: low physical activities and average levels of sedentary behaviours compared to the other typologies); and 3) Actives (BL: 35%; FU: 38%: high physical activities and low sedentary behaviours). Most participants remained in the same typology across both time points (84%), 10% transitioned to a typology with a more health-enhancing profile and 7% transitioned to a typology with a more detrimental behavioural profile. Although BMI increased among the whole sample between BL and FU, this did not differ by typology transition. Transitions between typologies from BL to FU did not differ by gender or post-school pathways.

#### Conclusions:

Few adolescents moved towards more health-enhancing or detrimental profiles of activity-related behaviours as they transitioned out of secondary school, with no difference by gender, BMI or post-school pathways. The high proportion of 'inactives' and stability over the transition suggests that interventions are required to improve activity-related behaviour typologies before adolescents leave school.





## A meta-analysis of children's activity during physical education lessons taught by generalist and specialist teachers

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#### Children and families (SIG)

Purpose: Despite the large body of evidence exploring the physical activity levels of elementary school children during physical education (PE), much less is known about the extent to which teacher specialization contributes to physical activity accumulation and sedentary time in this environment. As such, this meta-analysis sought to compare accelerometry-measured physical activity and sedentary time among elementary school students during PE lessons taught by generalist and specialist teachers.

Methods: Seven bibliographic databases were searched for peer-reviewed, English-language, original research that measured physical activity and/or sedentary time of elementary school children during PE using accelerometry, and indicated who was instructing the class (i.e., generalist or certified PE teacher). Percentage of PE lesson spent in moderate-to vigorous-intensity physical activity (MVPA) and sedentary time was synthesized across two types of teachers: generalists and specialists. Studies that provided percentage of PE class spent in MVPA/sedentary time, a standard deviation, and sample size were pooled for meta-analysis using the metafor package in R.

Results: Of the 42 included articles, 32 assessed MVPA/sedentary time during PE offered by specialist teachers, nine assessed PE offered by generalist teachers, and one presented results for both types of teachers. On average, children engaged in MVPA for 33% of their PE classes, and were sedentary for 36% of their PE classes. Subgroup analyses found that children spent an average of 34% of their PE class time in MVPA when taught by a specialist, and 30% of their PE class time in MVPA when a generalist was responsible for instruction. Similarly, children spent 34% of PE class time in sedentary pursuits under the instruction of a specialist, and 41% of PE class time when taught by a generalist teacher.

Conclusion: Overall, this review highlights that regardless of teacher specialization, physical activity levels during PE class at the elementary school level are low; and below the Centre of Disease Control and the United Kingdom's Association for Physical Education recommendation of 50% of lesson time spent in MVPA. More focus is needed by both types of teachers on getting children moving during PE.





# The mediating effect of physical fitness on long term influences of overweight in primary school girls' academic performance: The NW-CHILD study

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#### **Children and families (SIG)**

Purpose: Overweight and obesity contribute to multiple health risks in children, while also impacting negatively on educational performance. Physical fitness is found to impact outcomes beyond health related measures, therefor it mightplay a mediating role in the combating of negative effects of being overweight. We hypothesed that obesity will negatively affect academic performance of girls between 6 and 13 years longitudinally, but that physical fitness, can exert a mediational effect on such a negative long-term relationship between academic achievement and obesity.

Methods: Six to thirteen year-old primary school girls (N=172) from the North West Province of South Africa formed part of this random stratified longitudinal research design which included a baseline and two follow-up measurements over the seven year primary school period. Body mass index was used to compile obesity profiles, while the PACER test was used to determine cardiovascular fitness. Academic school achievements for Grades 1, Grade 4 and Grade 7, as well as national and provincial achievements were correlated with overweight status. A repeated measures over time ANOVA and a latent growth curve model from the Structural Equation Modelling framework (SEM) were used to anlyse the data.

Results: No differences (p> 0.05) were found in the academic performance of obese and normal weight girls, although obese girls showed poorer physical fitness values (p





# Predictors of sufficient muscle-strengthening physical activity among Australian adolescents

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#### Children and families (SIG)

Purpose: International guidelines explicitly recommend school-aged youth (5-17 years) participate in musclestrengthening physical activity (MSPA) on three or more days per week. However, the proportion of youth meeting this recommendation is largely unknown, and the factors influencing this health behaviour are poorly understood. Therefore, we aimed to explore associations between guideline-concordant MSPA and a range of demographic, biological, psychological, and behavioural predictors among a sample of Australian adolescents.

Methods: Baseline data were drawn from the 'Resistance Training for Teens' cluster RCT (collected April-June, 2015). Adolescents in Grade 9 (N = 602, 14.1±0.5 years, 50.3% female) from 16 schools in New South Wales, Australia were assessed on a number of demographic (sex, socio-economic status, language spoken at home), biological (health-related fitness), psychological (self-efficacy, perceived strength, motivation), and behavioural (screen-time, total physical activity [MVPA], sleep) measures. MSPA was self-reported and participants were dichotomised as: (i) meeting ( $\geq$ 3 days); or (ii) not meeting (0-2 days) the guideline. Binary logistic regression with odds ratios (OR) was used to determine associations between predictors and guideline-concordant MSPA.

Results: Analyses conducted for each variable group explained small-to-moderate (i.e., 3.1% to 23.3%) proportions of the variance in guideline-concordant MSPA. Sex, muscular fitness, resistance training [RT] self-efficacy, perceived strength, and total MVPA emerged as significant predictors. When all predictors were included simultaneously, the associations for sex, muscular fitness, and perceived strength were no longer significant. However, RT self-efficacy (OR = 2.48 [1.37 to 4.50]) and total MVPA (OR = 1.48 [1.22 to 1.79]) remained independent predictors of guideline-concordant MSPA, with the final model explaining 52.4% of the variance.

Conclusions: This study addresses a substantial gap in knowledge regarding youths' MSPA by examining a range of novel predictors that have not been explored in past research. RT self-efficacy and total MVPA were independent predictors of guideline-concordant MSPA in a sample of Australian adolescents. Future research should evaluate causality, but our findings may nonetheless have implications for the design and delivery of future interventions targeting adolescents' MSPA behaviour.





# Temperamental characteristics, physical activity and sedentary time in preschoolers

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#### Children and families (SIG)

Purpose: Physically active lifestyle begins to develop already in childhood. Identifying individual characteristics that are linked with physical activity (PA) and/or sedentary time (SED) can assist in designing interventions and promoting actions for children. The present study aimed to examine the associations of childhood temperamental characteristics with PA and SED in Finnish children at 3 to 6 years of age.

Methods: We utilized cross-sectional DAGIS data collected in 2015-2016 (N=864). Temperament was reported by the parents using the Children's Behavior Questionnaire (the Very Short Form), and three broad temperament dimensions were constructed: surgency, negative affectivity, and effortful control. PA and SED were assessed over 24-hours during seven days using the hip-worn ActiGraph accelerometer, and the minutes per day spent in light, moderate, and vigorous PA as well as in SED were calculated. In total, 694 children (mean age: 4.7 ±0.9 years, 51.6% boys) had valid data available and were included in the study. Adjusted linear regression analyses were applied.

Results: Children's score for surgency was on average 4.7 (±0.8) on a 7-point Likert scale, for negative affectivity 3.7 (±0.9), and for effortful control 5.2 (±0.7). They had light PA on average305 (±31.6) min/day, moderate PA 61 (±16.2) min/day, vigorous PA 24 (±11.3) min/day, and SED 380 (±45.0) min/day. Of the temperament dimensions, surgency was positively associated with light (B=3.45, p=0.014), moderate (B=4.47, p<0.001), and vigorous PA (B=2.71, p<0.001). In addition, effortful control was negatively associated with moderate (B= -2.18, p=0.007) and vigorous PA (B= -1.60, p=0.007). Furthermore, surgency was negatively (B= -10.51, p<0.001) and effortful control positively (B=5.25, p=0.023) associated with SED. There were no significant associations found between negative affectivity and PA or SED.

Conclusions: Our findings demonstrated that attention should be paid to the children's different temperamental characteristics while supporting the development of the physically active lifestyle in early childhood.





# O.1.02 - Motivation and behaviour change througout the lifespan

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# Active Women over 50 online information and support to promote physical activity behaviour change: a feasibility pilot randomised trial

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Motivation and behavior change (SIG)

Purpose: Participation in physical activity is sub-optimal in women in their middle and older age. This trial aims to establish the acceptability and feasibility of Active Women over 50, a program comprising online information, telephone health coaching and email or SMS support to promote physical activity behaviour change among women aged 50 years and over.

Methods: Participants were community-dwelling women aged 50+, randomised to: 1) receive the Active Women over 50 program; or 2) wait-list control. Active Women over 50 is a 3-month physical activity behaviour change program informed by the COM-B model of behaviour change and consisting of access to a website, one telephone health coaching session and 8 email or 24 SMS messages. Outcomes were feasibility measures (study methods, intervention uptake), intervention efficacy (number of daily steps), and acceptability (proportion of participants who would recommend participation in the study to another person like themselves post 3 months).

Results: Sixty-two eligible participants (mean age 59.3, SD7.1; 47(76%) working; 44(71%) had participated in regular structured physical activity when younger) completed baseline measures and were randomised (intervention n=28, control n=34) between May and September, 2019. Recruitment was predominantly by email (n=27,48%), word of mouth (n=10,18%) and social media (n=10,18%). Mean baseline physical activity was 7459(SD=2424) daily steps. One participant did not access the intervention, 27(96%) participants accessed telephone health coaching, 15(54%) opted to receive email messages and 12(43%) SMS messages.

Google Analytics recorded 128 sessions of Active Women over 50 website usage and 640 pages viewed over 3 months. Users accessed the website via desktop computers, mobile devices and tablets, spending on average 5:48mins/session, and viewing 5 webpages/session. The most frequently viewed pages were the home page (22%), "how to be active" page (14%) and "getting started" page (12%).

Conclusions: Women aged 50+ are motivated to participate in a program offering online information, regular messaging and tailored health coaching to increase their physical activity. The high recruitment rate, uptake of health





coaching, and engagement with the website suggest the program could be tested in a fully powered RCT, with the potential to be directly scalable and implemented at a population level.





# A culturally tailored social network-based intervention promoting water consumption in Caribbean schools: A cluster randomized control trial

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#### Motivation and behavior change (SIG)

Purpose: Sugar-sweetened beverage (SSB) consumption contributes to childhood obesity. Therefore, various intervention studies have been executed worldwide to promote water consumption of younger populations to prevent obesity. However, the Caribbean region, which has the highest average daily rates of SSB consumption, has received little research attention. Therefore, this study's objective was to test a culturally tailored intervention for children of the Caribbean island Aruba, based on a Western-European school-based social network intervention. We hypothesized that children who are exposed to the intervention will consume more water and less SSB, and have a higher intention to consume more water and less SSB compared to the control group. The study contributes to scientific knowledge in an understudied geographic area and contributes to the field of social network-based behavioral health interventions.

Methods: A school-based cluster randomized controlled trial design was deployed among 338 children (age M=11; girls 54%). Participating schools were randomly assigned to a treatment group (n=144) and control group (n=194). The tailored intervention lasted eight weeks and consisted of exposing children to peer influencers who were trained to promote water consumption. At pre-intervention, these influencers were selected through sociometric questions. At pre- and post-intervention, children self-reported their water and SSB consumption.

Results: Preliminary repeated-measures MANCOVA analyses show a significant multivariate interaction effect between time and treatment (V=.047, F(4, 300)=3.714, p=.006, pn2=.047). The univariate outcomes show significant interaction effects between condition and time for water consumption (F(1, 303)=5.334, p=.022, pn2=.017) and for SSB consumption intention (F(1, 303)=8.261, p=.004, pn2=.027) but not for SSB consumption and water consumption intention. However, the observed patterns did not hold in an additional regression analysis conducted to control for differences in consumption at pre-intervention measurement.

Conclusions: Findings indicate that after the culturally tailored social network-based health intervention children consumed more water and have a higher intent to consume less SSB. The patterns of the study are in line with previous research showing that with the power of social peer influence, healthy behaviors can be promoted successfully despite the heavily promoted SSB-brands. Further research is needed to explore the role of initial level of water and SSB consumption.





# "Someone's got my back": Older people's experience of health coaching to promote physical activity and falls prevention in the Coaching for Healthy Ageing (CHAnGE) trial

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#### Motivation and behavior change (SIG)

Purpose: The CHAnGE trial is evaluating the impact on physical activity (PA) and falls of an innovative intervention combining health coaching and activity monitors with a fall risk assessment among people aged 60+. The purpose of the current study was to better understand participants' experiences of the intervention.

Methods: CHAnGE trial participants received a home visit and fortnightly telephone-based health coaching from a physiotherapist, involving flexible goal-setting, and provision of an activity monitor. Participants for this qualitative study were purposively recruited from the CHAnGE trial for maximum variation in pre-trial PA levels and intervention engagement, and took part in semi-structured telephone interviews. Data were managed in NVivo 12 and analysed by two researchers: (a) inductively to identify key themes using the interpretive description approach, and (b) deductively to determine how the intervention components were functioning in relation to the underlying program theory. The coding frame was co-developed iteratively, and early analyses were workshopped with co-researchers to develop shared understandings of the data and increase interpretive rigour.

Results: We included 32 participants: 22 female (69%), age range 60-82. Most participants (29, 91%) found it highly motivating to receive direct feedback from an activity monitor which quantified progress towards tailored PA goals. The majority (28, 88%) felt that coaches increased their commitment to PA by providing accountability within the context of a mutually esteemed relationship. Qualities deemed most important in the coaches were: empathy and respect, gentle encouragement, professional expertise, friendliness, active listening, and reliability. Key structural characteristics included the regularity and duration of phone contact with a dedicated coach, and an early home visit. Together, these supported relationship-building between participants and coaches. Some participants internalised their coach's voice and described how the intervention had helped them "lock in" daily goals/activities.

Conclusion: Participants valued the synergistic interaction of flexible program plans/self-directed goals, selfmonitoring of progress and regular accountability, guidance and encouragement from experienced, socially-skilled coaches. The data strongly support the concept of 'therapeutic alliance' as a crucial mechanism in health coaching.





# Sequential versus simultaneous introduction of nutrition and exercise during pregnancy: Which strategy improves intervention adherence?

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#### Motivation and behavior change (SIG)

Purpose: Nutrition and exercise interventions during pregnancy can improve maternal and fetal health outcomes. To increase the number of women who benefit from a nutrition and exercise intervention, effective strategies to improve program adherence need to be evaluated. Based on the theory of self-control and self-regulation, the purpose of the current study was to test and compare the effect of introducing nutrition and exercise sequentially versus simultaneously on program adherence among pregnant women.

Methods: Women were recruited at 12-18 weeks gestation and participated until 36 weeks gestation. Women were randomized into one of three interventions: nutrition and exercise introduced simultaneously (N+E), nutrition introduced first followed by exercise (N-First), exercise introduced first followed by nutrition (E-First). For the two sequential groups, the second intervention was added at 25 weeks gestation. Adherence was measured by scoring participants on a weekly basis for meeting the intervention goals (3 goals for nutrition, 3 goals for exercise). All adherence scores were converted to a percentage. An average percent-adherence score was calculated at the end of the intervention. Additionally, adherence was measured as dropout rate. An ANOVA analysis compared adherence scores and a Chi-Square analysis compared differences in dropout rate. Significance was accepted as p<0.05.

Results: Eighty-eight women were randomized, and sixty completed the intervention and were included in the adherence analysis (N+E=17; N-First=20; E-First=23). Average adherence in the E-First group ( $80.2\pm14.7\%$ ) was significantly higher (p=0.001, np2=0.21, observed power=0.93) than adherence in both N+E ( $60.9\pm17.9\%$ , p=0.001) and N-First ( $66.8\pm16.7\%$ ; p=0.028). Although trending towards favouring E-First, there was no significant difference in dropout rate (N+E=41\%, N-First=33\%, E-First=21\%; c2 (2, N=88) = 2.91, p=0.23, Cramer's V=0.18).

Conclusion: Sequential introduction of health interventions, including introducing exercise first followed by nutrition, can improve adherence to multiple behaviour change programs during pregnancy.





# Parental perspectives on negotiations over diet and physical activity: how do we involve parents in adolescent health interventions?

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#### Motivation and behavior change (SIG)

Purpose: Adolescence is often characterised by unhealthy behaviours such as a high intake of energy-dense, nutrientpoor food and low physical activity levels. During this time, adolescents' capacity to make their own decisions is increasing, however, parents remain influential in shaping many of their behaviours. This study aimed to explore parents' views of adolescent health behaviours and identify ways in which parental involvement can be successfully incorporated into interventions to support health behaviour changes in their adolescents.

Methods: Twenty-four parents of adolescents participated in semi-structured qualitative interviews to understand their perspectives on adolescent health behaviours. Data were analysed using inductive thematic analysis.

Results: Six themes were identified which described parents perspectives on their adolescents' health behaviours: (1)'My role in maintaining my adolescent's heath' describes the way parents run their households and control their adolescent; (2)'What I think about health' describes parents' past experiences and motivations for improving their own and their family's health; (3)'My adolescent wants...' describes parental perceptions of what their adolescent asks them for as well as factors that will make them more likely to engage in healthier behaviours; (4)'Things outside my control that affect my adolescent's health' describes changing exposure to external factors that are having increasing influence on adolescents' health behaviours as they age; (5)'Negotiating control' describes the changing dynamics between parents and their adolescents. (6)'What parents think could help support adolescent health' describes parents' to be involved.

Conclusions: Qualitative approaches provide a deeper understanding of parental perceptions of family life and their adolescents' values and priorities. Parents are aware that they are role models to their adolescents and feel responsible for guiding them towards healthy behaviours. However, parents recognise that with their adolescents' growing independence other factors are becoming influential in their lives and often push against engaging with healthy behaviours. Finding ways to incorporate parental support into health behaviour change interventions targeting adolescents, in a manner that is acceptable to adolescents, has the potential to improve the engagement levels with and effectiveness of such interventions.





### Physical activity promotion: is something really always better than nothing?

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#### Motivation and behavior change (SIG)

Purpose: Increasing people's motivation to be active is a cornerstone of physical activity behaviour change. In world of limited resources, prevailing dogma is that 'it is always better to do something than nothing' in physical activity promotion. Our objective was to examine this assumption using econometric analyses of existing New Zealand physical activity data and to explore the implications that this has for physical activity and wellbeing promotion.

Methods: Using subjective wellbeing valuation, we derived wellbeing values from nationally representative Active NZ survey data (n=52,183). Subjective wellbeing valuation calculates the change in wellbeing associated with achieving a certain outcome and calculates the equivalent amount of income required to produce the same effect. A measure for weekly activity was used in combination with the level of agreement with the statement "I want to take part in physical activities" to derive the wellbeing value. Using adjusted analyses, we explored the relative wellbeing of people who are motivated to be physically active, but are inactive.

Results: Our results indicate that those who are motivated to be active but are inactive, have lower subjective wellbeing than those who are not motivated and inactive (\$-11,219).

Conclusion: Interventions that solely aim to motivate people to be active, in the absence of opportunities to be active in the way they want to be, could have a negative or negligible impact on subjective wellbeing. Indeed, these results challenge the view that in physical activity promotion it is always better to do something than nothing; call into question the notion that standalone improvements in motivation to be physically active constitute 'intervention success'; and re-enforce the need to take an integrated approach to promoting physical activity, particularly if the objective is to improve population wellbeing.





# A combined health action process approach and mhealth intervention to increase non-sedentary behaviours in office-working adults – A randomized controlled trial

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#### Motivation and behavior change (SIG)

Purpose: Office working adults represent an at-risk population for high levels of sedentary behaviour (SB), which has been associated with an increased risk for numerous chronic diseases. This study sought to determine the effectiveness of a Health Action Process Approach (HAPA) volitional intervention augmented with tailored text messages to reduce workplace sitting time (primary outcome) and increase specific non-SBs (i.e., standing time, walking time, stretching time, break frequency, break duration). A secondary purpose was to examine relationships among HAPA volitional constructs (i.e., action and coping planning, action control) and sedentary and non-SBs.

Methods: In this prospective, two-arm, repeated measure, randomized controlled trial, office workers (Mage=  $45.18 \pm 11.33$  years) were randomly assigned into either a HAPA intervention (n = 29) or control (n = 31) condition. The intervention group received a single behavioural counselling (planning) session, as well as daily sedentary-related text messages over a 6-week period. Workplace sitting time, time spent in specific non-SBs, and HAPA volitional constructs were assessed at baseline, week 2, week 4, week 6 (post-intervention), and week 8 (follow-up).

Results: Significant group by time interaction effects, that favoured the intervention group, were found for workplace sitting time (p=.003, np2=.07), standing time (p=.019, np2=.05), and stretching time (p=.001, np2=.08) as well as for action planning (p<.001, np2=.20), coping planning (p<.001, np2=.18), and action control (p<.001, np2=.15). Significant relations, in the expected direction, were also found between the HAPA volitional constructs and sitting time, standing time, walking time, and break frequency at all time points (p values<.05).

Conclusions: Augmenting a HAPA-based planning intervention with text messages can reduce workplace sitting time and increase time spent standing and stretching in office workers.





### O.1.03 - Neighbourhood features across the lifespan and contexts

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# Exploring the Role of Socio-Cultural Influences in the Perceptions of Park Quality

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Policies and environments (SIG)

#### Purpose

The co-existence of high levels of physical inactivity, obesity, and diabetes is often observed in ethnic/racial minority and/or low-income communities. These heath disparities may be related to the built environment. In particular, the quality of local neighborhood parks (features and amenities) may be related to visits by people for physical activity (PA). Furthermore, ethnic/racial minority and/or low-income individuals may perceive their local neighborhood parks to be lacking park features and amenities that are conducive to health-enhancing PA. The purpose of this qualitative study is to explore the socio-cultural influences in the perceptions of park quality among ethnic/racial and/or low-income individuals in a metropolitan area in Southeast United States.

#### Methods

We employed a cross-sectional study design and purposive sampling to recruit participants for five focus groups with ethnic/racial minority and/or low-income individuals from a city in the Southeast United States. A semistructured focus group guide was used to elicit participants' perceptions of local neighborhood parks, including barriers and facilitators to park use. Focus groups were audio-recorded and transcribed verbatim. Transcripts were analyzed using descriptive and interpretive coding to identify themes. Demographic information was also collected.

#### Results

Participants were primarily female (n=48, with nine male participants), Black (63%), and on average 50 years old. Participants perceived their local neighborhood parks to be in disrepair (e.g., broken playground equipment, damaged athletic courts), and lacking amenities (e.g., water fountains, restrooms, benches, and shaded areas). Although participants perceived poor park quality, participants also believed local neighborhood parks to be sources of community unity because parks were named for historical figures, cultural events held at parks, and the contributions of community groups. Nevertheless, Black participants believed they have been displaced from local neighborhood parks by emerging immigrant groups.

#### Conclusions

Our findings indicate that disparities in health-enhancing PA among racial/ethnic minority and/or low-income individuals from a city in Southeast United States may be related to perceived park quality. Strategies for increasing park use and PA among racial/ethnic minority and/or low-income individuals should address socio-cultural factors such as community pride, neighborhood input, and shared experiences to ignite park activation.





# Perceived importance of neighbourhood features for preschooler's active play, parent's active recreation, and parent-child coactivity.

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#### Policies and environments (SIG)

Purpose: Identify neighbourhood features parents perceived as being important for their child's active play, their own active recreation, and their coactivity (physical activity performed together).

Methods: A cross-sectional study design was used. During May to September 2019, a convenience sample of 145 parents (Mage = 36.21 years) with preschoolers (Mage = 3.90 years) living in Edmonton, Canada were recruited online, through existing lab databases, and in-person from various destinations throughout the city. To achieve a representation of Edmonton, at least 10 families were recruited from each of its 12 electoral wards. Participating parents completed a 20-minute survey (electronic or paper) where they rated the importance of several neighbourhood features (destinations, design, social, safety, aesthetics) for their child's active play,their own active recreation, and their coactivity via 6-item Likert scales (1 = not at all important, 2 = unimportant, 3 = neutral, 4 = important, 5 = most important, 6 = not applicable). Responses "important" and "most important" were collapsed into one group "important". Descriptive statistics were used to summarize categorical and continuous variables.

Results: Over 75% of parents perceived several neighbourhood features (17/32) as important for their child's active play, their own active recreation, and their coactivity. Of these, there were 2/9 destinations (parks, playgrounds), 3/6 design features (quiet streets, trails, sidewalks), 4/6 social features (friends/family, child's friends, knowing neighbours, trusting neighbours), 6/6 safety features (street lighting, crime, traffic, daylight, sidewalk maintenance, crosswalks), and 2/5 aesthetic features (cleanliness, natural features). Neighbourhood features considered important by over 90% of parents for their child's active play, their own active recreation, and coactivity were parks (97.9%, 97.9%, 97.2%), playgrounds (99.3%, 95.9%, 97.2%), sidewalks (90.9%, 97.9%, 90.3 %), low crime (92.3%, 93.1%, 92.4%), and cleanliness (98.6%, 99.3%, 95.9%).

Conclusion: Parents perceived several neighbourhood features as important for all three physical activity behaviours. These findings may be helpful in guiding future research examining neighbourhood correlates of physical activity among preschoolers and their parents. Further, neighbourhood planners may find this information useful for developing neighbourhoods conducive for active living in young families.





# Residential vs school neighborhoods: associations with physical activity among adolescents

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#### Policies and environments (SIG)

Purpose: Adolescents have the potential to be active in multiple places across weekdays and weekends. However, most studies of the built environment and physical activity focus exclusively on residential neighborhoods. This study aims to examine cross-sectional associations of objective built environments around home and school with accelerometer-assessed moderate-to-vigorous physical activity (MVPA) across the week.

Methods: Data were collected from 417 adolescents (12-20 years) in Melbourne, Australia as part of the Neighbourhood Activity in Youth study. MVPA outside school hours on weekdays and weekend were assessed by accelerometer. Built environment features around home and school (500m, 1km and 2km street network buffers), including recreation facilities, park count, park size, trails, and walkability and its components, were assessed using Geographic Information Systems. Sociodemographic information were self-reported by adolescents. Multilevel linear regression models were used to estimate associations.

Results: On weekdays, three features of the built environment (park count, park size and trails) around school (mostly within 500m-1km street network buffers) and one feature of the built environment (recreation facilities) within 2km from home were positively associated with MVPA. On weekend days, seven of eight of the selected built environment features (all except trails) around home across the three buffer sizes were positively associated with MVPA. Only park count within 500m from school was also positively associated with weekend MVPA.

Conclusion: Selected built environment features around home appear to be more important for weekend MVPA and features around school more important for weekday MVPA among adolescents. Understanding the contribution of built environment features around both home and school could serve as a basis for policy recommendations and public health interventions to be developed for each setting.





# The association between neighbourhood walkability and physical activity in 74,000 people across 17 countries: The PURE study

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Policies and environments (SIG)

#### Purpose:

Research linking walkability with higher physical activity (PA) has been done in high-income countries with limited environmental and economic heterogeneity leaving it unclear if these findings apply to low- and middle-income countries. This investigation uses cross-sectional data from the Prospective Urban Rural Epidemiologic study to identify the association between walkability and physical activity (PA) in communities throughout the globe.

#### Methods:

Community-dwelling people between 35 and 70 years were recruited from multiple city-sites in 17 low-, middleand high-income countries. Within each city, participants were recruited in geographical clusters with representation from rural and urban areas. The International Physical Activity Questionnaire (long-form) was used to quantify total, transportation and recreation PA. Walkability was assessed using the Neighborhood Environment Walkability Scale to generate eight domains and a total score. Due to zero-inflated and highly-skewed data distribution of the PA, we used a two-parts model to assess the association between walkability and PA (logistic regression to model the probability of engaging in PA and log-normal regression to model PA values greater than zero). Models were generated for each walkability domain (and total walkability) and each PA domain; adjusted for age, sex, education, disability, location, country income level and community-level socio-economic status. Significance was set at p<0.001 to account for multiple comparisons.

#### Results:

Data were available for 73 528 participants (43% male,  $51.2 \pm 9.8$  years, 59% urban residents) from low- (9%), middle- (76%) and high-income (15%) countries. Total, transportation and recreation PA were greater at higher tertiles of total walkability. Greater access to amenities, safety from crime, land use mix, neighbourhood aesthetics and satisfaction, street connectivity, safety from traffic and total walkability, but not infrastructure for walking, were associated with greater total PA (p<0.001 for all). Transport PA was associated with all walkability domains except for safety from crime and traffic (p<0.001 for all), while recreational PA was associated with all walkability domains except for safety from crime (p<0.001 for all).

#### Conclusions:

Higher neighbourhood walkability was associated with greater PA in a population from a diverse range of environments and socio-economic levels.





# Walking-friendly built environments and objectively measured physical function in older adults

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#### Policies and environments (SIG)

Purpose: Few studies have examined the associations between walkable built environments and older adults' physical function. Especially, it is less known how built environment attributes may influence physical function in Asian cities. Evidence from Asia has a global relevance and will be of interest to policymakers, population/public health practitioners and researchers, especially those interested in supporting physical function among older adults in dense compact cities. The aim of the study was to examine associations between objectively measured environmental attributes of walkability and objectively assessed physical function in a sample of Japanese older adults.

Methods: Cross-sectional data collected in 2013 from 314 older residents (aged 65-84 years) living in Japan were used. This data was obtained from a larger epidemiological study conducted in 2013 at Waseda University that examined social and built environment determinants of Japanese older adults' health behaviours and outcomes. Physical function was estimated from objectively measured upper and lower body function, mobility, and balance by a trained research team member. A comprehensive list of built environment attributes, including population density, availability of destinations, intersection density, and distance to the nearest public transport station, were objectively calculated. Walk Score as a composite measure of neighbourhood walkability was also obtained. The associations among environmental attributes of walkability (continuously) and objectively assessed physical function measures were examined by multiple linear regression with adjustment for covariates (age, educational attrainment, living status, working status, lower body pain, length of residence, depression, and cognitive function) stratified by gender.

Results: Among men, higher population density, availability of destinations, and intersection density were significantly associated with better physical function performance. Higher Walk Score was also marginally associated with better physical function performance. None of the environmental attributes were associated with physical function in elderly women.

Conclusions: Our study provided unique findings in the context of less-studied Asian cities. Our findings indicate that environmental attributes of walkability are associated with the physical function of elderly men in the context of Asia. Walking-friendly neighbourhoods can not only promote older adults' active behaviours but can also support their physical function.





# A qualitative study exploring the impact of a 20mph speed limit in Edinburgh on walking and cycling

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Policies and environments (SIG)

#### Purpose

Natural experiment interventions are gaining increased importance when looking to understand health behaviours. Twenty mile per hour (20mph) (30 kilometre per hour) speed limits are one such intervention purported to increase walking and cycling, through creating more supportive environments for these travel modes. To date there has been little evidence to show if, and how, such 20mph speed limits influence these activities. In 2018, the City of Edinburgh Council implemented a citywide 20mph speed limit – the first Scottish city to do so. This study aimed to understand how, and why this intervention may, or may not have influenced walking and cycling.

#### Methods

Fifteen focus groups were conducted involving 100 participants who lived and/or worked in Edinburgh. Participants represented a range of socio-demographic and travel-related characteristics, including pedestrians, cyclists, parents of young children, and professional drivers. The topic guide was informed by a programme theory, and investigated attitudes towards the speed limit, how the limit influenced participants' personal walking and cycling experiences and behaviours, and their perceptions of others' walking and cycling. Qualitative data were analysed using NVivo 11. Key themes were developed using thematic analysis.

#### Results

Views on how the 20mph speed limit impacted walking and cycling were mixed. Participants identified a reduced speed differential between cyclists and motorists resulting from the speed limit. This was perceived both positively as it reduced intimidation experienced by cyclists, and negatively, as it meant bicycles spent more time in close proximity to passing or following cars. Parents discussed being more comfortable with their children walking and cycling on 20mph streets, as the impact of any potential collision would be lessened. An almost unanimous finding was the importance of segregated cycling infrastructure, and that without this in place a 20mph limit could only ever have a limited impact on cycling behaviour.

Whilst positive perceptions of a speed limit reduction on walking and cycling were highlighted, the implementation of such interventions in isolation is likely to have a modest impact on these behaviours. These limits should be one of several measures to support these behaviours, where segregated infrastructure is prioritised.





# Associations between the neighbourhood characteristics and body mass index, waist circumference, and waist-to-hip ratio: Findings from Alberta's tomorrow project

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#### Policies and environments (SIG)

Purpose: Evidence on associations between neighbourhood characteristics and weight outcomes remain inconsistent. Weight management interventions may not be successful in permanently modifying weight if the built environment is not supportive of this change. The purpose of this study was to estimate the associations between neighbourhood characteristics and self-reported body mass index (BMI), waist circumference, and waist-to-hip ratio (WHR) among Canadian adults.

Methods: A large, geographically and socially diverse sample was used to examine relationships between multiple neighbourhood characteristics and weight status outcomes. This study included cross-sectional survey data from a longitudinal study ('Alberta's Tomorrow Project' (ATP); n=14,550, urban participants only). Using Geographic Information System, neighbourhood characteristics including 3- and 4-way intersections (connectivity), business destinations (land use), population count (density), and neighbourhood greenness (normalized difference vegetation index; NDVI) within a 400m radius of participant's homes were objectively estimated. Connectivity, land use, and density (z-scores) were summed to create a combined walkability score. Adjusted logistic regression models (odds ratios: ORs and 95% confidence intervals: CIs) estimated the associations between each neighbourhood characteristics and weight status outcome.

Results/findings: Among participants, based on BMI, 65% were overweight, of which 26% were obese.Based on waist circumference, 70% of participants were obese. Based on WHR, 61% of the participants were classified as high risk. Four-way intersections (overweight/obese vs. healthyweight: OR 0.94 (CI 0.89, 0.99)) and walkability (overweight/obese vs. healthyweight: OR 0.98 (CI 0.96, 0.99); obese vs. non-obese: OR 0.98 (CI 0.96, 0.99)) were negatively associated with BMI. NDVI was negatively associated with WHR (high risk vs. low risk: OR 0.93 (CI 0.89, 0.96)). Some unexpected (though novel) findings were the positive associations of population count (high risk vs. low risk: OR 1.01 (CI 1.005, 1.012)), and walkability (high risk vs. low risk: OR 1.02 (CI 1.001, 1.04)) with WHR.

Conclusions: Neighbourhood characteristics are associated with weight status outcomes. Public health interventions promoting healthy weight need to incorporate strategies that take into consideration the local built environment. Moreover, modifying the built environment, a population-level intervention, could improve health by promoting healthy weight.





# O.1.04 - Scaling up physical activity

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# Linking implementation barriers to strategies to support prescription of E=M by clinicians

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Early care and education (SIG)

Purpose: Several barriers hinder clinicians to prescribe exercise to their patients, such as lack of time, knowledge or support. As a result, 'exercise is medicine' (E=M) is not systematically implemented in general routine hospital care. Therefore, the aim of this study was to link evidence-based implementation strategies to barriers identified by clinicians in order to develop an implementation blueprint for E=M prescription.

Methods: Guided by the systematic Implementation Mapping protocol (Fernandez et al. 2019), we applied the five steps using strong stakeholders participation to match implementation strategies to barriers identified during interviews with clinicians working at two university hospitals in the Netherlands. We used available theory and evidence-informed strategies from the Taxonomy of Behaviour Change Methods from Kok et al. (2016) and the Effective Practice and Organisation of Care taxonomy from Powell et al. (2015). For each barrier we defined what needed to be changed (e.g. knowledge, beliefs, structures, policy agendas). Next, we identified strategies on how to change these barriers, such as training for clinicians, insight into possible exercise options within the area, and role models for clinicians. Next, we matched the implementation strategies to the practical activities and developed a blueprint for implementation as well as an evaluation plan.

Results: The blueprint for implementation of the E=M consists of bundled implementation strategies to support clinicians, department managers and stakeholders in the broader context through the adoption, co-creation, implementation and sustainability stages. Each stage is supported by implementation tools, practical applications and materials bundled in an implementation blueprint allowing tailoring to the specific clinical context.

Conclusions: Operationalization of strategies into activities, tools, practical applications and materials led to the development of an implementation blueprint tailored to the specific clinical context. The implementation blueprint will be used to support implementation of E=M during a pilot study in four departments of university hospitals in the Netherlands (departments of Rehabilitation and Orthopaedics of UMC Groningen, and Rehabilitation and Oncology of Amsterdam UMC).





# How effective are physical activity interventions when they are scaled-up: A systematic review

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#### Implementation and scalability (SIG)

Purpose: Researchers have found numerous interventions effective in increasing physical activity levels, yet little is known about their broader dissemination. This 'scale-up' of effective physical activity interventions is increasingly recognized as imperative for population wide health improvements and reduced burden of disease. The purpose of this study was to systematically review physical activity interventions scaled-up in community settings by exploring adaptations made as part of the scale-up process and any impact scale-up may have had on effect size.

Methods: We performed a search of six electronic databases, reference lists of reviews, and contacted experts within the field. An intervention was considered 'scaled-up' if it had been delivered to a greater number of participants than a preceding randomised control trial ('pre-scale') in which a significant intervention effect ( $p \le 0.05$ ) was found for any measure of physical activity. Two authors independently screened studies, extracted data and assessed risk of bias using the Cochrane risk-of-bias tool. Adaptations made to scale interventions were categorised using the Adaptome model and differences in effect size from pre-scale to scaled-up trials were quantified ([effect size reported in the scaled-up trial/effect size reported in the pre-scale trial]×100).

Results: Eleven studies were identified as eligible for inclusion. Of these, three targeted solely physical activity and the remaining eight studies focused broadly on obesity prevention or healthy lifestyles. A variety of adaptations were made for scale-up, with the mode of delivery being the most common adaptation (e.g., qualified facilitator vs member of the research team). Seven studies included a measure of physical activity common to the pre-scale trial that enabled calculation of an effect size difference. Majority of scaled-up studies retained a proportion of the pre-scale trial effect size (16-71%), one study experienced a scale-up penalty (<0%), and three studies showed improvements (>100%).

Conclusion: Adaptations may impact the effectiveness of interventions delivered at scale. Interventions adapted specifically for scale-up retained at least half the intervention effect. This review provides valuable insight for researchers and public health practitioners interested in the design and scale-up of physical activity interventions, and contributes to the growing evidence-base for delivering health promotion interventions at-scale.





# Feasibility of implementing E=M in routine clinical care

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#### Early care and education (SIG)

Purpose: Exercise is medicine' (E=M) currently has no position in routine clinical care. To support E=M referral in clinical care, implementation strategies were developed, based on a new blueprint of an E=M decision aid. This study aimed to test the feasibility of implementing E=M in routine clinical care by conducting implementation strategies and an E=M-tool that provides patient tailored E=M-prescriptions.

Methods: A pilot study was performed in four departments of two different Dutch university hospitals (UMC Groningen and Amsterdam UMC, location VUmc), including an extensive learning process evaluation based on the RE-AIM framework. A mixed method approach was used, with questionnaires for clinicians, semi-structured stakeholder interviews involved in the pilot (clinicians, patients, hospital managers and lifestyle coaches) as well as not involved in the pilot, tracking the usage of the newly developed tool and field notes of researchers.

Results: Since local needs were different between the two university hospitals it was necessary to develop two slightly different E=M tools. Clinicians, patients, managers, as well as lifestyle coaches were positive about the applied implementation strategies. An efficient tool that is user-friendly with solid referral options turned out to be necessary for a good implementation of E = M. Clinicians experienced they were more effectively able to discuss E=M with their patients. The time investment was considered small (less than 5 minutes) and referral to a lifestyle coach was efficient. Patients found E=M of added value to the usual treatment.

Conclusions: This study illustrates that implementing E=M in routine clinical care can be feasible. Outcomes gave detailed insight in important factors regarding the implementation of E=M in clinical care. With this research we provide an E=M blueprint of a new E=M decision aid in routine clinical care and serve a continuation of research on the implementation of E=M.





# Real world implementation of a physical activity smartphone app using social marketing techniques

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#### Early care and education (SIG)

Purpose: Physical inactivity is a major public health issue in Australia, contributing to the massive burden of chronic disease. There are many examples of novel, technology-based physical activity programs, however, to date, few attempts have been made to implement RCT-tested programs and deliver them at scale. This study aimed to evaluate the effectiveness of an advertising campaign to disseminate an evidence-based physical activity smartphone app.

Methods: The advertising experiment was a 3x3x3x2 factorial design, testing 54 unique advertisements scheduled over three weekly waves. The budget was AUD\$10,000. Three advertising parameters were explored: platforms (Facebook; Messenger; Instagram), selling-techniques (soft-sell, sending viewers from an ad to a landing-page, then to an app store, and hard-sell, sending viewers directly to an app store: Apple Store and Google Play) and themes (Health and Wellbeing; Body and Self-Confidence; Social Enjoyment). Advertisement efficacy was operationalised in terms of viewer engagement, assessing clickthrough per AUD\$1. A three-way ANOVA was conducted to explore the effects of advertising factors on clickthrough.

Results: Overall, advertisements reached 1,373,273 people, achieved 2,989 clickthroughs and 667 app installs. Facebook advertisements yielded a total of 320 app installs, followed by Messenger at 262 app installs and Instagram at 98 app installs. Hard-sell ads collectively attracted a total of 667 app installs (Apple store app installs=366; Google Play app installs=314) while soft-sell landing page ads attracted 0 app installs.

Clickthrough differed on the basis of platform, whereby Facebook (clicks=1,245) and Messenger (clicks=1248) were superior to Instagram (clicks=496; F=8.98; p=.001). Hard-sell advertisements encouraging viewers to 'download now' (Apple: clicks=1,256; Google: clicks=1,285), produced greater clickthrough than the landing-page (clicks=448; F=10.77; p=.000). Advertisements with a Health and Wellbeing theme (clicks=1,264) attracted greater clickthrough than Social-Enjoyment (clicks=609; F= 5.71; p=.009), yet no significant differences in clickthrough were found amongst other themes. No significant interaction effects were found.

Conclusions: Social media advertisements for an evidence-based physical activity app differed on the basis of social media platform, selling technique, and advertising theme. The most effective social media advertisements were those placed on Facebook and Messenger, using a "hard-sell" approach (i.e. direct to app store), with themes relating to Health and Wellbeing.





# A comprehensive, theory-informed mapping of physical activity interventions implemented in healthcare settings

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#### Early care and education (SIG)

Purpose: Implementation science is proposed as a possible solution to the evidence-practice gap that exists across a range of healthcare settings, including behavioural health interventions such as physical activity. Little is known about the current state of implementation research as it applies to physical activity interventions that are integrated within clinical settings. The purpose of this research is to: 1) reflect the current status of implementation research as it applies to clinical physical activity interventions; and 2) provide recommendations for future research in physical activity that draws explicitly from priorities identified by implementation scientists to enhance translational efforts.

Methods: A theory-informed mapping process was undertaken to identify the current state of implementation research. This work was based on the Consolidated Framework for Implementation Research (CFIR). The CFIR synthesises the factors that influence implementation across 5 domains: Characteristics of the: 1) intervention, 2) individual, 3) inner setting (i.e. organisation), 4) outer setting (i.e. socio-political environment) and 5) process. Experts in implementation science, public health and physical activity informed the final composition of implementation mapping.

Results: A comprehensive picture of the current state of clinical physical activity implementation research, as guided by the CFIR, is produced. We found many examples of studies that describe individual influences on implementation, including healthcare providers lack of knowledge, perceived lack of time and self-efficacy. Far less attention appears to focus on understanding inner or outer setting factors. For example, we identified specific policy levers in Australia and the UK as conducive to implementing clinical physical activity interventions. Despite this, our mapping did not identify studies that have explored the contribution of these factors to the implementation potential of clinical physical activity interventions.

Conclusions: To the best of our knowledge this is one of the first efforts to map implementation of physical activity interventions, used in healthcare settings, against one of the most widely cited implementation frameworks. The findings from this work bridge multiple research disciplines (implementation science, physical activity, public health) to advance the implementation potential of clinical physical activity interventions in healthcare settings.





# Embedding a digital lifestyle intervention in an antenatal service: txt4two facilitators and negotiations

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Early care and education (SIG)

#### Purpose

Optimal antenatal nutrition, physical activity and gestational weight gain (GWG) confer positive health outcomes for both mother and child. While there are an increasing number of research-based antenatal lifestyle interventions, few have been translated into clinical care and hence the barriers and facilitators to implementation are poorly understood. This report documents the facilitators and areas for negotiation in implementing a mHealth lifestyle intervention into routine clinical care.

#### Methods

txt4two is a multi-modality mHealth intervention aiming to promote healthy nutrition, physical activity and GWG in pregnant women. A pilot RCT (n=91) demonstrated a significantly lower GWG (7.8kg + 4.7 versus 9.7 kg + 3.9; p= 0.041) and smaller reductions in physical activity (p=0.001). Following the pilot, a tertiary antenatal hospital is pragmatically implementing and evaluating a tailored version of txt4two, using the RE-AIM model. Modifications include a comparison of three modes of introduction and embedding other txt4two modalities into current digital platforms. Stakeholder group discussion and an open-ended email delivered question elicited facilitators and areas negotiated in implementing txt4two in an antenatal service.

#### Results

Facilitators

- Implementation focus of txt4two and robust implementation plan
- Early inclusion of key stakeholders
- Embedded research dietitian within service
- Health services redesign priority embracing digital disruption Negotiations
- Intellectual property ownership and transactions
- Legal agreements across institutions
- Technology infrastructure
- Additional ethics concerns/requirements for digital delivery
- Refocusing intervention towards unique needs of women
- Health professional behavior change and digital intervention views

#### Conclusion

This paper reports the unique challenges and negotiated areas required to pragmatically implement an mHealth intervention into routine clinical care. As we move beyond pilots and embed research programs within services, this data furthers the dialogue for implementation science in the digital space.





# Adherence rates and associated characteristics over 10 years in an Exercise Referral Scheme: a mixed-methods study

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#### Early care and education (SIG)

Purpose: Little is known about the long-term maintenance of implementation and patient adherence rates of Exercise Referral Scheme (ERS) after their evaluation. Drawing on a national, standardised ERS delivered 10-years after a randomised controlled trial, this mixed-methods study set out to i) examine uptake and adherence levels over a 10-year period ii) uncover the predictive characteristics associated with scheme adherence and iii) explore stakeholder perceptions of the key factors and emerging local practices for supporting uptake and adherence.

Methods: Scheme data were provided on all generic pathway patients (referred for CHD risk factors and/or mental health reasons) between 2007 and 2017. Patients were categorised as adherers (completing all 16-weeks of scheme), non-adherers (withdrawing before 16 weeks), non-starters (referred but not up taking the scheme) and waiting group (on a waiting list). Qualitative data were gathered during a one-to-one interview with scheme coordinators (N=22), scheme delivers (N=8) and leisure managers (N=5). Thematic analysis was conducted. Multi-nominal regression was used to analyse the four-category adherence grouping with 'completed' as the reference category. Associations were examined between adherence grouping and the following scheme entry predictors; age, gender, socioeconomic status and referral reason. Relative risk ratios (RRRs) were reported alongside 95% confidence intervals (95%CI).

Results: In total 73,401 study participants comprised; 25,249 (34.4%) adherers, 15,968 (21.8%) non-adherers, 24,697 (33.6%) non-starters and 7487 (10.2%) waiting group. Compared with adherers, non-starters (RRR:1.10, 95%CI:1.06 to 1.14) and waiting group (RRR:1.06, 95%CI:1.00 to 1.12) were more likely to be male. Across all three groups, patients were more likely to be younger and more deprived compared to adherers, with a consistent increasing risk gradient for both predictors. Clear patterning was found among scheme referral reason, with mental health referrals less likely to be in the adherers group. Stakeholder accounts offered insights into the patient data findings highlighting both supportive (comfortable environment, nudge tactics, personalised approach, role modelling and socialisation) and unsupportive (low patient motivation on referral, pricing of post-scheme exercise and area-level capacity) factors to patient adherence.

Conclusions: Findings enhance our understanding of the variation in uptake and adherence and can inform future practices of ERS referrers and deliverers.



# O.1.05 - The influence of the environment on physical activity in children and adolescents

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# Movement behaviors, executive function and associated factors in preschoolers

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Children and families (SIG)

Purpose: To analyze the association between moderate physical activity, sedentary bahavior, executive function, Beta waves, motor competence, cardiorespiratory fitness, age and sex in preschool children.

Methods: 107 preschool children, of both sex (51,4% female), 4,4 ± 0,78 years-old, from João Pessoa-PB, Brazil, were analyzed. The executive function was assessed by Go/No Go (Early Years Toolbox). To analyze the Beta waves of the prefrontal cortex, a portable eletrocefalogram with four channels (Muse Interaxon®, Toronto, Ontário, Canadá) was used. Brainwave activity was recorded using a smartphone app during one minute (opened eyes) and the Beta wave of channel AF7 was considered. Pysical activity and sedentary time were assessed by accelerometers (Actigraph®, WGTX3), used during seven consecutive days and considered the time in minutes/day for each behavior. Motor competence was measured by the product of tasks that represent three domains (locomotor, stability and manipulative). The sum of the Z-scores of each task was calculated. Cardiorespiratory fitness was measured by the 20m Shuttle run test, adapted for children from three to five years old, and the number of completed laps was considered. Age and sex were parents-reported. To analyze the possible associations between the variables, a Machine Learning Network Analysis was used. Three Centrality indicators were used (Betweenness, Closeness and Strengh). The analyzes were done in Jasp statistic software.

Results: Executive function was positively associated with cardiorespiratory fitness (r = 0.250) and age (r = 0.318), and weak and negatively associated with moderate physical activity (r = -0.117). The Centrality values showed that sex had higher values of Betweenness, Closeness and Strengh, but age and fitness also presented higher values of Closeness and Strengh. Conclusion: Older children with higher cardiorespiratory fitness have greater executive function.





# The school policy, social and physical environment and change in physical activity of adolescents

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#### Children and families (SIG)

Purpose: We examined the association between the school policy, social and physical environment and change in adolescent physical activity (PA) and explored how sex and socioeconomic status modified potential associations. Methods: Data from the GoActive study were used for these analyses. Participants were adolescents (n=1765, mean age±SD 13.2±0.4y) from the East of England, UK. Change in longitudinal accelerometer assessed moderate-to-vigorous physical activity (MVPA) was the outcome. School policy, social and physical environment features (n=267) were exposures. The least absolute shrinkage and selection operator variable selection method (LASSO) was used to determine exposures most relevant to the outcome. Exposures selected by the LASSO were added to a multiple linear regression model with estimates of change in min/day of MVPA per 1-unit change in each exposure reported. Post-hoc analyses, exploring associations between change in variables selected by the LASSO and change in MVPA, were undertaken to further explain findings.

Results: No school policy or physical environment features were selected by the LASSO as predictors of change in MVPA. The LASSO selected two school social environment variables (participants asking a friend to do physical activity; friend asking a participant to do physical activity) as potential predictors of change in MVPA but no significant associations were found in subsequent linear regression models for all participants. In the post-hoc analyses, for every unit increase in change in participants asking a friend to do PA and change in a friend asking participants to do PA, an increase in MVPA of ( $\beta$  (95%CI)) 2.78 (1.55, 4.02) and 1.80 (0.48, 3.11) min/day was predicted respectively.

Conclusions: The school social environment appears an important influence on physical activity during adolescence. Further exploration of how friendships during adolescence may be leveraged to support effective PA promotion in schools is warranted.





# Increasing active transport among adolescents: what is the potential to replace short car trips with active transport?

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#### Children and families (SIG)

Purpose: Physical activity declines rapidly during adolescence. Active travel accounts for a substantial proportion of physical activity. Replacing short car trips with walking or cycling would further increase active travel, resulting in physical activity and sustainability gains. This study examined adolescent travel behaviours on single-mode journeys and the potential to replace short trips made by private vehicle with walking or cycling.

Methods: Data from the Victorian Integrated Survey of Travel and Activity (VISTA) were used. Overall, 2,846 adolescents completed a 24-hr travel diary (82% weekdays; 18% weekends), of which 77% recorded  $\geq$ 1 trip and formed the analytical sample (n=2192, mean age 14.7±1.6y, 48.6% female). All trips were categorised as active travel (walking or cycling), public transport (public bus, train, tram) or private vehicle (taxi, vehicle as driver or passenger). Single- and multi-mode trips were extracted. Trips within walkable (<1.5km) and cycleable (<5km) distances were examined separately to determine the proportion of trips that could feasibly be substituted.

Results: A total of 8981 trips were reported (3204 single- and 5777 multi-mode with public transport). Single-mode trips were made by 2184 individuals; average distance was 6±12.5km; 35.4% were made by active travel, 13.1% by public transport and 51.3% by private vehicle. Of single-mode trips made by private vehicle (1642 trips), 170 trips (10%) were within a walkable and 822 (50%) within a cycleable distance. Most single-mode trips within a walkable (82.9%) and cycleable (51.4%) distance were by active transport.

Conclusions: Private vehicle travel accounted for one in two single-mode trips, 10% of which were within a walkable and 50% within a cycleable distance and therefore able to be feasibly substituted for active travel. This represents 26% of all single-mode journeys made by private vehicle. While active transport is high, there appears to be considerable opportunity to substitute trips made by private vehicle for active modes of transport, assuming the built environment supports walking and cycling. Next steps are to examine the feasibility of replacing private vehicle trips within multi-modal journeys involving public transport and to examine the correlates of these short trips.





# Neighbourhood environment, parents' perceptions and pre-schoolers' lifestyle behaviours

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#### Children and families (SIG)

Purpose: The aims of this cross-sectional, mixed-methods study were i) to quantitatively evaluate the home environmental characteristics associated with screen time (mainly television viewing) in pre-school children and ii) to qualitatively explore parents' perceptions of their children's screen-related sedentary and eating behaviours. The study contributes to our understanding of the mediating influence of home environmental factors on children's screen time.

Methods: Children's screen time (television viewing) and home environmental characteristics (demographic, behavioural and physical) were reported by parents of 332 children aged 3-5 years using validated questionnaires. These quantitative data were analysed using bivariate and multivariate binary logistic regression. An online deliberation platform was used to qualitatively explore 54 of these parents' attitudes and perceptions about their children's screen time behaviours. The qualitative data were thematically analysed.

Results/findings: The quantitative, multivariate analysis showed that the home environmental characteristics positively associated with children's television viewing were: parents own television viewing (OR 1.66, 95%CI 1.09-2.52, p=0.017), parents allowing their children to eat snacks while watching television (OR 2.66, 95%CI 1.17-6.06, p=0.019) and less outdoor play time (OR 2.03, 95%CI 1.05-3.93, p=0.035). The qualitative analysis highlighted parental concerns about the addictive nature of screen behaviours and that screen time should be limited. Positive aspects to screen time were also noted, for example, its use as a safe 'babysitter'. Although some parents perceived that eating while watching television may result in mindless and/or overeating, others believed that if they offer healthy snacks, such as fruit and vegetables, television viewing does not negatively affect their children's diet.

Conclusion: The quantitative and qualitative results of this study enhance our understanding of the home environmental factors associated with television viewing and parents' perceptions of the effects of screen time on the sedentary and eating behaviours of their children. These data can be used to inform interventions aimed at addressing increasing screen time exposure in young children.





## Child Physical Activity and Team Snacks in YMCA Sports Programs

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#### Children and families (SIG)

Purpose: There are limited data on children's consumption of snacks in conjunction with community-based organized sports. This study aimed to document physical activity (PA) and the nutritional quality of team snacks during organized sports practices with existing healthy snack policies.

Methods: Children (3-10 years) participating in YMCA basketball and soccer teams in Indianapolis, Indiana (U.S.) were examined. ActiGraph wGT3X-BT accelerometers were worn during two practices. Time spent in PA intensity levels was determined using age-appropriate cut-points. The brand (e.g., Pepperidge Farm), product (e.g., Goldfish Baked Snack Crackers), flavor (e.g., cheddar), size (e.g., 1.0 oz), and characteristics (e.g., reduced fat) of team snacks were documented at two practices for each team. The Nutrition Data System for Research (NDSR) software was used to determine snack type and caloric content.

Results: 88 children ( $5.0 \pm 1.7$  years) from 32 teams (n=11 basketball and n=21 soccer) participated in this study. Children spent 27% of practice in sedentary behavior (SB) and 46% of practice in moderate-to-vigorous intensity PA (MVPA) (average practice time was  $49.9 \pm 4.8$  minutes). Preschool age children (3-5 years) spent more than twice as much time in SB than 6-10 year-olds (34% vs. 14%). Girls spent more time in SB than boys (33% vs. 24%) and less time in MVPA than boys (40% vs. 49%). Snacks were provided at 63% of preschool age practices. Preschool age children were provided a salty snack or dessert/sweet snack at 45% of practices and a juice or sugar-sweetened beverage at 40% of practices. Snacks were provided at 15% of 6-10 year-old practices. 6-10 year-olds were provided a salty snack or dessert/sweet snack at 12% of practices and a juice or sugar-sweetened beverage at 8% of practices. When snacks were provided, a total of  $3.3 \pm 1.6$  snack items were given to preschool age children (averaging  $287.4 \pm 146.9$  kilocalories) and a total of  $3.3 \pm 1.0$  snack items were given to 6-10 year-olds (averaging  $274.4 \pm 138.2$  kilocalories).

Conclusions: Despite engaging in low levels of PA during organized youth sports programs, children are often provided with high-calorie snacks that fail to meet healthy nutritional policies.





# SMART Indigenous Youth: A Culturally Appropriate Land-Based Active Living Initiative to Improve Indigenous Youth Mental Health

#### Dr. Tarun Reddy Katapally<sup>1,2</sup>

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**Children and families (SIG)** 

Purpose: Indigenous youth in settler nations such as Australia, Canada, United States, and New Zealand, are susceptible to poor mental health due to complex inter-generational systemic inequities. SMART Indigenous Youth's (SIY) purpose is to embed a land-based active living intervention into Indigenous school curricula to improve youth mental health.

Methods: SIY is part of the SMART Platform, a citizen science and mobile health initiative for active living surveillance. SIY is a mixed-methods 5-year longitudinal community trial that embeds a culturally appropriate land-based active living intervention into school curricula. In year-1 (2019), 93 Indigenous youth citizen scientists (YCSs) aged between 13-18 years at baseline engaged with researchers for 8 consecutive days using a custom-built smartphone app, which captured quantitative active living and mental health data. From this cohort 20 YCSs formed the citizen scientist council, which participated in baseline focus groups. School Principals became educator citizen scientists to provide data on school policies and programs. Thereafter, each school initiated separate 4-month (winter term) land-based active living programs that were specific to their culture, community, geography and language. Follow-up focus groups were conducted with the citizen scientist council to evaluate the impact of the intervention. Moreover, during the 4-month intervention period, youth and educator citizen scientists engaged with researchers in real-time using their smartphones to provide their perception of the initiative.

Findings: Baseline focus groups analyses depicted an overarching theme of the importance of Indigenous culture, identity, history, and language. Follow-up focus group analyses showed that land-based activities such as canoeing and setting traps played a role in improved youth mental health by providing them a sense of purpose and identity. Evidence also indicated that land-based active living facilitated more outdoor time, better peer relationships, and even improved educator wellbeing.

Conclusions: Land-based active living can play a critical role in improving Indigenous youth mental health. SIY highlights not only the importance of linking active living with culture, but also indicates the potential of leveraging citizen-owned ubiquitous tools in implementing interventions in rural communities.





# Is active school commuting associated with physical activity and sedentary behaviour among adolescents? A global perspective from 82 countries

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#### Children and families (SIG)

Purpose: Physical activity (PA) levels among adolescents are low globally. Active school commuting (ASC) was associated with higher levels of PA in several country-specific studies. This study examined associations of ASC with time spent in PA and sedentary behaviour (SB) among adolescents from 82 countries.

Methods: The Global School-based Student Health Survey data from 288,082 adolescents (mean age 14.3 [SD 1.43] years, 49% girls), collected between 2007 and 2016, were analysed. Students aged 11-17 years were asked how many days per week they were physically active, walked or bicycled to and from school, and how much time they spent sitting on an average day. Sufficient PA was defined as achieving activities  $\geq 60$  minutes/day, high SB as leisure-time sitting for  $\geq 3$  hours/day, and ASC as active travelling on  $\geq 3$  days/week. Multilevel logistic regression analysis was used to examine the relationships, and the results are presented in odds ratio (OR) and 95% confidence interval (CI).

Results: The prevalence of sufficient PA was 15.6% (boys: 18.9%; girls: 12.1%), while that of high SB was 29.5% (boys: 29.1%; girls: 29.9%). The prevalence of ASC was 44.9% (boys: 46.2%; girls: 43.6%). The analysis showed that adolescents who used ASC  $\geq$ 3 days/week had over double the odds to attaining sufficient PA (OR: 2.18, 95% CI: 2.06-2.31), after adjusting for a set of covariates and mutually for PA and SB. Adolescents who reported ASC  $\geq$ 3 days/week had 13% lower odds of reporting high SB (0.87, 0.83-0.90). There were no apparent gender differences in the association estimates. The estimated OR of PA and ASC was 2.66 (2.40-2.94) in low-income countries, 2.32 (2.22-2.42) in lower-middle-income countries, 2.11 (2.02-2.20) in upper-middle-income countries, and 1.84 (1.75-1.93) in high-income countries. The analysis provided relatively lower estimates of association between SB and ASC, which decreased with the increase of country's income.

Conclusions: ASC is strongly associated with higher levels of PA and moderately associated with lower SB in adolescents of both genders. The estimates of association decreased with the increase of country's income. Promoting ASC should be encouraged to increase PA among adolescents around the globe.





### O.1.06 - Cancer prevention and management across the lifespan

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# Volunteer lifestyle coaching to support reduction of post- menopausal cancer risk factors – Participants responses

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#### Cancer prevention and management (SIG)

Purpose The ActWELL RCT aims to test the effectiveness of a 12-month, volunteer coach delivered, weight management (diet and physical activity) programme in post-menopausal women with a BMI>25 kg/m2 attending routine breast cancer screening appointments.

The novel intervention incorporated increased motivation for weight management (by raising awareness of breast cancer risk within screening) combined with increased capability for lifestyle change (via a volunteer coach delivered personalised programme) and enhanced opportunities for greater physical activity (via local leisure centres). The programme was delivered in two individual, face to face sessions and 9 support calls by volunteer coaches (recruited and managed by the charity Breast Cancer Now).

We report results on participant responses to the acceptability of intervention components with specific reference to volunteer coaches.

Methods Following all data collection procedures intervention participants were invited to complete an anonymous exit questionnaire about the intervention components using 5- scale categorical responses (very helpful to very unhelpful) and to describe the most useful component of the intervention. In addition, qualitative interviews were undertaken by independent researchers and a thematic analysis was undertaken to explore intervention experiences.

Results Volunteer coaches (n=45) delivered 528 coaching sessions and 1940 support calls to 279 women allocated to the intervention group.

Exit questionnaires were returned by 167 (70%) of intervention participants who completed follow up measures. The coach visits were described as very helpful by 55% with a further 34% reporting these as helpful. Of the 10 components described as the most useful, the coach was most frequently cited (46%). Interview data from 24 women indicated that coaches were generally highly regarded. Four main areas were highlighted: the coach's personality or manner, ability to empathise, the support provided throughout the programme, and their ability to understand how to motivate change. In discussion on future changes to the programme many reported a desire for more frequent or extended coach contact.

Conclusions The use of volunteer coaches to deliver a weight management programme is viewed favourably by overweight and obese post-menopausal. women.





# The effects of 16 weeks of Pilates intervention on psychological aspects of breast cancer women undergoing hormone therapy – MoveMama study

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#### Cancer prevention and management (SIG)

Purpose: Analyse the effects of Pilates method intervention on quality of life, sleep quality, fatigue, depressive symptoms and self-esteem in breast cancer women undergoing hormone therapy.

Methods: Randomized clinical trial including 35 breast cancer women undergoing hormone therapy from Oncology Research Center (CEPON) in the South of Brazil. These women were allocated in two groups: the intervention group (n=18) and the control group (n=17). The intervention group received 16 weeks of Pilates method, 2x week for 60 minutes the session, and the control group attended three group meetings with lectures about physical and mental health. The data collection occurred pre and post-intervention using a questionnaire, including the quality of life by European Organization for Research and Treatment of Cancer Quality of Life Questionnaire (EORTC-QLQ C30), the sleep quality by the Pittsburgh Sleep Quality Index, the fatigue by the Functional Assessment of Cancer Therapy-Fatigue (FACT-F), the depressive symptoms by the Beck Depression Inventory (BDI) and the self-esteem by the Rosenberg Self-Esteem Scale. For analysis, it was used the Anova Two way with repeated measures and Sydak test for comparison (p<0.05).

Results: After the 16 weeks of intervention the Pilates group showed better scores for the global status of quality of life (p<0.001), the physical function of QOL (p=0.006), decreased fatigue levels (p=0.014), and increased the self-esteem (p=0.011). The control group also presented better scores for the global status of quality of life (p=0.006). In the sleep quality and depressive symptoms, none of the groups demonstrated any significant improvement (p>0.05).

Conclusion: Pilates method is a viable and effective type of physical activity that can help improve the psychological aspects of breast cancer women undergoing hormone therapy. In addition, the control group demonstrated improvements in self-perception of global health, showing the importance of lectures and educational programs for these women. Programs regarding physical activity are very important in helping these women restore emotional and social well-being and must be implemented in all oncology facilities. (Clinical Trials - NCT03194997)




#### Dietary patterns and adherence to the 2018 World Cancer Research Fund/American Institute for Cancer Research (WCRF/AICR) Cancer Prevention Recommendations in older adults living in Auckland, New Zealand

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#### Cancer prevention and management (SIG)

Purpose: Globally, the population is ageing and the prevalence of cancer is increasing. In 2018, the World Cancer Research Fund (WCRF) and American Institute for Cancer Research (AICR) published their third expert report on Diet, Nutrition, Physical Activity and Cancer. Subsequently, a standardised scoring system was developed to assess adherence to cancer prevention recommendations1. The aim of this study was to investigate data driven dietary patterns, adherence to WCRF/AICR recommendations and associations with socio-demographic factors in adults 65-74 years living in Auckland, New Zealand.

Methods: This cross-sectional study used community-dwelling participants from the Researching Eating, Activity and Cognitive Health (REACH) cohort. Participants completed a demographic questionnaire, validated 109-item food frequency questionnaire and International Physical Activity Questionnaire-Short Form. Weight, height and waist circumference were measured. A score for each participant was constructed using the WCRF/AICR recommendations1. Dietary patterns (DPs) were derived using principal component analysis (PCA). Associations between DPs, the WCRF/AICR score and sex, age, deprivation and living situation were investigated using linear regression analysis.

Results/findings: The mean±SD WCRF/AICR score of participants (n=367; 235 females) was  $4.29\pm1.08$  (possible score 7; higher score reflects adherence to recommendations). Two DPs explained 14% of the variance in dietary intake. The first DP 'healthy' was categorised by high intakes of vegetables, nuts and seeds, legumes, wholegrains, meat alternatives, fruit, fish, seafood and spices. The second DP 'Western' was categorised by processed meats, sauces and dressings, biscuits and cakes, fast food, confectionary, vegetable oils, cheese and beer. Higher adherence to the WCRF/AICR score was positively associated with a 'healthy' DP (r=0.51; p<0.001) and negatively associated with the 'Western' DP (r=-0.38; p<0.001). Females were more likely to follow the WCRF/AICR recommendations (p=0.001) and healthy DP (p<0.001), while the 'Western' DP was associated with being male (p<0.001), living with others (p=0.019) and younger age (p=0.027).

Conclusions: Scores on PCA-derived DPs were associated with adherence to WCRF/AICR recommendations. Participant sex was associated with both DPs and adherence to WCRF/AICR recommendations. Age and living situation were associated with the 'Western' DP. Socio-demographic factors should be considered in lifestyle interventions aimed at reducing cancer risk.

1Shams-White MM et al. Nutrients. 2019; 11(7).





### Eating Behaviors and Dietary Quality in Childhood Acute Lymphoblastic Leukemia Survivors and Peer Controls

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#### Cancer prevention and management (SIG)

Background: Childhood acute lymphoblastic leukemia (ALL) survivors' increased risk for adverse health outcomes (e.g., cardiovascular problems, metabolic disease) could be mitigated through healthy lifestyle behaviors (e.g., balanced diet). Nonetheless, >70% of adult survivors do not meet survivorship dietary recommendations. ALL treatment may amplify risk for restricted dietary preferences and poor food intake self-regulation that ultimately contribute to survivors' suboptimal diets. This relationship has yet to be examined in research. This study aims to (1) characterize differences in picky eating, food intake self-regulation, and dietary quality between survivors and peer controls; and (2) examine the associations between these eating behaviors and dietary quality in survivors relative to peer controls.

Methods: Participants were 32 survivors (Mage =  $8.79 \pm 2.70$ ), 32 age-/sex-matched peer controls (Mage =  $8.59 \pm 2.64$ ), and their caregivers. Children's dietary quality (Healthy Eating Index-2015) was calculated from three 24-hour dietary recalls. Parents completed the Child Eating Behavior Questionnaire-Food Fussiness subscale and the Child Self-Regulation in Eating Questionnaire.

Results: Independent samples T-tests revealed survivors to exhibit significantly greater picky eating than peer controls but have comparable food intake self-regulation and dietary quality. Linear regressions showed survivors' increased picky eating related to worse overall dietary quality ( $\beta = -.39$ , p < .05, R2 = .15)but not food intake self-regulation ( $\beta = .11$ , p > .05, R2 = .01). Peer controls' poorer food intake self-regulation ( $\beta = .51$ , p < .01, R2 = .26), but not picky eating ( $\beta = -.35$ , p > .05, R2 = .09), related to worse dietary quality.

Conclusions: Survivors consumed comparably poor quality diets to peer controls. However, dietary quality is of particular concern for survivors given baseline risk for adverse health outcomes and survivors exhibited greater picky eating. Study results provide preliminary support for different eating behaviors contributing objectively poor dietary quality in children with and without an ALL history. If replicated longitudinally, these findings suggest that interventions to support optimal dietary quality in the context of childhood ALL may benefit from targeting picky eating rather than food intake self-regulation.





### Bladder cancer patient perspectives of vigorous intensity aerobic interval exercise prehabilitation prior to radical cystectomy: A qualitative study

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#### Cancer prevention and management (SIG)

Purpose: Pre-operative cardiopulmonary fitness is increasingly being recognised as an important factor influencing post-operative recovery outcomes in cancer patients. The aim of this study was to explore patient perspectives of pre-operative vigorous intensity aerobic interval exercise in bladder cancer patients awaiting radical cystectomy.

Methods: Patients (N=60) were randomised (1:1) to a supervised exercise or a standard treatment (only) control group shortly after decision to operate. Participants in the exercise group were offered supervised vigorous intensity aerobic interval exercise on a cycle ergometer (Monark 824E; Varberg, Sweden) twice-weekly, in addition to standard treatment. Focus groups involving a purposive convenience sample of 14 patients who had been randomised to the exercise arm (mean age  $\pm$  SD: 72.3  $\pm$  6.0 y) were undertaken after recovery from surgery in a hospital education department. Focus group transcripts were transcribed verbatim before two independent researchers read and analysed the transcripts using framework analysis.

Results/findings: Three themes emerged from the framework analysis which contextualise the perceptions and experiences of participants: (i) Motivational factors; (ii) Perceived benefits of participation; (iii) Perceptions of programme design. Important motivational factors for engaging in the exercise prehabilitation were: social support, previous exercise experience and objective measures of progression (reflecting physiological adaptations). Patients experienced physical, psychological, and psychosocial health benefits and enjoyed participation, however, challenges associated with travelling to the centre, the discomfort of cycle ergometer exercise and need for clear and concise information from healthcare providers to ensure adequate preparation for supervised exercise were highlighted.

Conclusions: This qualitative study provides new insights into the perspectives and experiences of patients with bladder cancer regarding participation in pre-operative vigorous intensity aerobic exercise. The exercise programme provided physical, psychological and social benefits. Supervised exercise, objective improvement, and peer and family support all contributed to motivation to engage with pre-operative high intensity aerobic interval exercise. Individuals may require further support after radical cystectomy to continue with exercise.





### Long-term effects of participation in a physical activity behaviour change intervention on psychological well-being among survivors of cancer

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#### Cancer prevention and management (SIG)

Purpose: Survivors of cancer experience poorer health-related quality of life, greater psychologic distress and more mental health needs compared to individuals without a cancer diagnosis. Identifying strategies to optimise psychological well-being (PWB) for this population is of clinical importance. The aim of this study was to determine the long-term effects of the MedEx IMPACT (IMprove Physical Activity (PA) after Cancer Treatment) trial, a patient-centred, evidenced-based and theoretically-informed PA behaviour change (BC) intervention, on cancer survivors' long-term levels of depression and PWB. The intervention was delivered through a community-based exercise rehabilitation programme for survivors of cancer called 'MedEx Move On' (MMO).

Methods: Adults who had completed adjunctive cancer therapy, were referred to MMO. Participants in the control group (CG) attended two 60-minute supervised exercise classes each week for 12 weeks. In addition to this, participants in the intervention group (IG) also received: i) an independent exercise programme, ii) 4 PA information sessions and iii) a 1:1 exercise consultation. Depression and PWB were measured using the Patient Health Questionnaire (PHQ-8), the Satisfaction with Life Scale (SWLS) and the short Warwick-Edinburgh Mental Well-being Scale (SWEMWBS) respectively, at baseline (T1), programme completion (T2 - week 12) and 3 month follow-up (T3). Linear mixed-model analyses of variance were conducted to investigate time and treatment effects.

Results: One-hundred and ninety-one survivors of cancer were recruited (CG, n= 87; IG, n=104; mean age 56  $\pm$  10 yrs, 73% female). Cancer diagnoses were breast (60%), colorectal (16%), prostate (13%) and other (11%). On average, participants attended 66% of the supervised exercise classes (CG= 67 $\pm$ 22%; IG=65 $\pm$ 27%). 51% of participants completed the trial. There was a substantial main effect for time for all measures, with both groups showing statistically significant improvements from T1 to T2, which were maintained at T3 (p<.05). No statistically significant differences for the outcome measures were identified between CG and IG (p>.05).

Conclusions: Participation in a 12-week community-based exercise rehabilitation programme has a positive longterm effect on cancer survivors' levels of depression and PWB. The inclusion of additional BC strategies to the supervised exercise classes did not augment the benefits achieved.





## What women want: the importance of using co-design for the development of NEWDAY-ABC, a bespoke weight management intervention for breast cancer survivors

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#### Cancer prevention and management (SIG)

Purpose Approximately two-thirds of women are overweight at breast cancer (BC) diagnosis, with further weight gain frequently reported during and after treatment. Excess body weight (body fat) and low physical activity (PA) are modifiable risk factors linked to poorer survival outcomes after early-stage BC-treatment. Co-design techniques were used to explore this behaviourally complex issue with BC-survivors and healthcare professionals (HCPs) to determine what is needed to effectively support women to lose weight after early-stage BC-treatment.

Methods Initial focus groups (FG) were conducted with n=16 BC-survivors and n=21 HCPs. Framework analysis of the data indicated disparities between what HCPs think and what BC-survivors want. Data informed the content of two-stage successive interactive co-design workshops (n=9 BC-survivors who had attended previous FGs). Workshop 1 activities explored BC-survivors' preferences in relation to: i)techniques to motivate change; ii)approaches to overcome challenges to intervention attendance; iii)core components of the intervention. Workshop 2 activities focussed on: i)language and graphics of support and educational materials; ii)delivery mechanisms; iii)refinement of workshop 1 ideas.

Results / findings Workshop 1 revealed the need to feel happier and more positive, less angry and to experience successful weight loss. To achieve this the intervention should address: i)self-confidence and self-esteem; ii) reassurance of safe PA and diet for BC-survivors; iii) improving knowledge about one's body and what was happening to it since treatment.

Workshop 2 revealed: i)certain elements of the intervention such as self-monitoring techniques, should be optional and personalised; ii)content should be as visual as possible and centre around side-effect management; iii)mood is as important to track as PA and diet; iv)terminology should be non-medicalised e.g. Eating Well and Moving Well not diet and PA; v)one-to-one facilitator support is as important as group peer-support.

Conclusions Revealing previously unconsidered themes, the co-design process used BC-survivors' own perspectives to strengthen the development of a practically implementable weight management intervention. Tailored to the bespoke needs and wants of overweight women recovering from early-stage BC-treatment, the effectiveness of this intervention in building the skills and confidence needed for clinically meaningful weight loss and sustainable health behaviour change will be tested in a RCT.





#### O.1.07 - e- and m-health behaviour change and psychosocial factors

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# A composite activity-sleep behaviour index mediates the effect of a physical activity and sleep intervention on symptoms of stress and energy and fatigue of adults: mediation results of a pooled analysis of the REFRESH and SYNERGY mhealth interventions

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e- & mHealth (SIG)

Purpose: Using pooled data from two randomized controlled trials (RCT) that applied the same intervention to improve physical activity and sleep behaviours, the purpose was to examine if a composite activity-sleep behaviour index (ASI) mediates the relationship between the intervention and symptoms of depression, anxiety, or stress, or quality of life in Australian adults.

Methods: REFRESH: Physically inactive adults (40–65 years) who reported poor sleep quality were recruited for a three-arm RCT (Physical Activity and Sleep Health (PAS; n=110), Sleep Health-Only (SO; n=110) or Wait-list Control (CON; n=55) groups). SYNERGY: Physically inactive adults (18–65 years) who reported poor sleep quality were recruited for a two-arm RCT ((PAS; n=80), or CON; n=80) groups). Assessments were conducted at baseline, 3 months (primary time-point), and 6 months. The PAS groups received a pedometer, and accessed a smartphone/tablet "app" using behaviour change strategies (e.g., self-monitoring, goal setting, action planning), with additional email/SMS support. Mental health outcomes were assessed using DASS-21, SF-12 and SF-36. The ASI score comprised self-reported moderate-to-vigorous-intensity physical activity, resistance training, sitting time, sleep duration, sleep efficiency and sleep quality. Data from the PAS and CON groups were pooled for mediation analysis (n=325), which was performed using SEM and the product-of-coefficients test, with bias-corrected confidence intervals (p<0.05).

Results/findings: At 3 months, compared with CON, the PAS group showed significant improvements in ASI scores, and also significant total effects on stress ((b, p-value) -1.27, p=0.041), and energy and fatigue (3.99, p=0.027); but not depression (-1.11, p=0.113), anxiety (-0.70, p=0.107), QOL-physical health (0.72, p=0.405), or QOL-mental health (2.15, p=0.058). At 3 months, improved ASI scores were associated with improvements in depression (-0.16, p=0.002), anxiety (-0.09, p=0.009), stress (-0.21, p<0.001), QOL-mental health (0.36, p<0.001), and energy and fatigue (0.55, p<0.001). Improved ASI scores mediated statistically significant proportions of the intervention effects on stress (57%) and energy and fatigue (48%). Associations at 6 months were attenuated but remained statistically significant and followed a similar pattern.

Conclusions: The intervention significantly improved overall physical activity and sleep behaviours in adults, and these improvements significantly mediated the intervention effect on stress and ratings of energy and fatigue.





Psychological mechanisms underlying the relationship between commercial physical activity app use and physical activity engagement: A cross-sectional study

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#### e- & mHealth (SIG)

Purpose: Previous studies have indicated a relationship between the use of commercial physical activity apps (e.g., Fitbit, Strava) and physical activity engagement. Use of social components of such apps, in particular app-specific communities (connecting with other app users) and existing social media platforms (e.g., Facebook) have the potential to enhance physical activity. This study aimed to explore the psychological mechanisms underlying the relationship between the use of commercial physical activity apps (and their social components) and physical activity engagement.

Method: An online cross-sectional survey assessed physical activity, engagement with commercial physical activity apps (and their associated social components), and psychological constructs (social support, self-efficacy, motivation, trait competitiveness, trait social comparison). The SPSS macro PROCESS was used to conduct mediation (Model 4) and moderation (Model 1) analyses. Alpha was set at 0.05.

Results: Participants were 1206 adults aged 18-83 years (Mage =  $34.0 \pm 13.5$  years, 88.5% female). App use was positively associated with physical activity engagement (p < .001, d = 0.40). The relationship between app use and physical activity was fully mediated by social support (b = 8.7, CI 3.3, 14.7), self-efficacy (b = 21.7, CI 14.2, 30.7), intrinsic motivation (b = 9.4, CI 1.4, 17.5) and identified regulation (b = 34.8, 2, CI 24.7, 48.5). Trait competitiveness (b = 25.3, p < .05) but not trait social comparison (b = 15.6, p = .372) moderated the relationship between app use and physical activity. In addition, the relationships between features of app-specific communities (providing/ receiving encouragement) and existing social media platforms (sharing posts, providing/ receiving encouragement and engagement in comparisons) influenced physical activity via social support, self-efficacy, and identified regulation.

Conclusions: The relationship between the use of commercial physical activity apps (and their social components) and physical activity is underpinned by social support, self-efficacy and motivation (intrinsic and identified). This highlights that commercial physical activity apps may be fundamental in promoting physical activity, given their capacity to influence psychological constructs associated with physical activity. Future research should further explore the use of commercial physical activity apps and their associated social components to increase physical activity engagement.





### TaylorActive – The effectiveness of web-based personally-tailored videos to increase physical activity: a randomised controlled trial

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#### e-&mHealth (SIG)

Purpose:Web-based interventions that use computer-tailoring have shown to be effective, though people tend to 'skim' and 'scan' text on the Internet rather than thoroughly read it. The use of online videos is, however, popular and engaging. Therefore, the aim of this 3-group RCT was to examine whether using personally-tailored videos in a web-based physical activity intervention is more effective compared to traditional personally-tailored text and a control group.

Methods: 501 Australians were randomised into: text-tailored, video-tailored, or control. The control group only received access to web-based physical activity articles. Over a 3-month period, the intervention groups additionally received access to 8 sessions of personalised and theory-based (constructs from TPB, SCT, SDT) physical activity advice based on responses to online surveys. Only the web-based delivery method (either personalised-text or personalised-video) differed between intervention groups. Intervention groups were also able to complete action plans. The primary outcome was a 7-day measure of physical activity using waist-worn Actigraphs. Secondary outcomes include self-reported physical activity, meeting activity recommendations, steps, sitting time and website engagement. Outcomes were assessed at baseline, 3-, and 9-months. Data were analysed using generalized linear mixed models with intention-to-treat using multiple imputation.

Results: Attrition was high with only 186 participants remaining at 9-months; 72% of participants were female, the average age was  $44(\pm 13)$ . Actigraph measured physical activity (min/wk) significantly increased for the control group (at 3-months: 1.23(1.03-1.41),p=0.02; at 9-months: 1.33(1.09-1.62),p<0.001) and for the text-tailored group (9-months: 1.22(1.01-1.47),p=0.04), though no between group differences were found. Likewise, few between group differences were observed for secondary outcomes. Text-tailored participants took more steps compared to video-tailored participants (3-months: 0.88(0.79-0.97),p=0.01), self-reported more physical activity compared to control (3-months: 1.73(1.30-2.30),p<0.01) and were more likely to meet activity recommendations compared to control (3-months: 2.17(1.06-4.45),p=0.03). Video-tailored participants spent more time on the website compared to text-tailored participants (90 vs. 77 minutes, p=0.02).

Discussion: The lack of an intervention effect is in contrast with pilot and other study outcomes. Possible explanations include applying a more rigorous methodology, ceiling effects in psychosocial correlates, or intervention content not being perceived as engaging. Process evaluation and mediation analyses will provide further insights.





### Sit less, get active! Delivery and evaluation of physical activity promotion via MOOCs

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#### e-&mHealth (SIG)

Purpose: Physical activity (PA) interventions are often limited in engagement strategies (e.g., social competition and collaboration, and effective feedback loops) that may be essential for successful behavioural change. These strategies are core elements of massive open online courses (MOOC) that are free and with unlimited participation. However, there have been few attempts to use MOOCs for the purpose of promoting health behaviours of learners. The aim of this study was to evaluate the effect of PA promotion delivered via a MOOC on concern about current levels of PA, readiness, importance and confidence to change learners' PA behaviour.

Methods: The Sit less, get active MOOC consists of three weeks of core PA-related learning material, followed by weekly PA promotional messages and monthly PA promotional videos for six months. Learners who volunteered for the evaluation component completed PA-and health-related surveys: before the course started, upon the completion of the core course, and after 6 months during the time-period October 2016 and March 2018. The effect of the 3-week course on learners' concern about their current levels of PA, and their readiness, importance and confidence to change PA behaviour was explored using repeated measures ANCOVA adjusted for age, sex, and time from baseline to completing the follow up questionnaire.

Results/findings: 530 learners (mean age±SD of 48±14 years, 78% women, 89% with college/university degree) had complete data on variables of interest at baseline and 3-week follow up. After completing the course the learners expressed less concern about their PA levels, and reported being more confident in success to increase their PA and to incorporate extra PA throughout the daily routine. They were also more likely to report doing enough PA to stay healthy and that they intend to do 30 minutes or more of moderate PA at least 5 times per week (p<0.001 for all).

Conclusions: The results indicate that PA promotion delivered via a MOOC improved confidence and readiness of learners to increase their PA level. MOOCs could help scale up PA promotion strategies; and could aid delivery and evaluation of PA promotion among health professionals, patients, work force, and general public.





#### Development and validation of behavioral and psychosocial text messages for the promotion of self-care in patients with type 2 diabetes mellitus

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#### e- & mHealth (SIG)

Purpose: For the first time in the literature we develop and validate behavioral and psychosocial text messages to be used in educational interventions to promote self-care in Brazilian patients with type 2 diabetes mellitus (T2DM).

Methods: The messages were developed based on the scientific literature, as well as on the guidelines of the Brazilian Diabetes Society and the Food Guide for the Brazilian Population. In addition, 35 patients with T2DM from a public health center in Brazil were consulted through discussion groups about their main barriers in managing T2DM. This consultation was approved by the Research Ethics Committee of the Federal University of Minas Gerais (UFMG-Brazil). In the validation process the Delphi technique was adopted. Six diabetes experts from differing areas in Health Sciences (nursing, nutrition, pharmacy, psychology, and odontology) and one linguist were selected to evaluate the messages that were developed. All experts had master's and/or doctorate degree and had been involved in a research project about T2DM in the last 5 years. The evaluation criteria used to classify the messages were relevance, intelligibility, and readability. Experts rated each message with grades assigned from 1 to 3 in an online questionnaire. A comment field was also available. The validation process took place in two rounds until the messages exceeded the minimum Content Validity Index (CVI) recommended by the literature.

Results: Based on the behavioral and psychosocial aspects of T2DM, the themes chosen for the developed messages were medication use, eating habits, physical activity, emotions, and perceived support (friends, family, and medical staff). 34 messages were developed of which 33 were validated. At the end of the second round, consensus was achieved on 91%.

Conclusions: 33 messages were validated and considered relevant, intelligible, and readable for patients with T2DM. Based on this, the authors recommend their use in educational interventions since these are reliable messages with high potential to promote self-care.





### Effectiveness of two popular apps for increasing physical activity: a randomised crossover feasibility trial

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#### e-&mHealth (SIG)

Purpose: The rise of health apps created novel prospects for behaviour change. Despite the popularity of publicly available physical activity (PA) apps, little is known about their effectiveness. This study aimed to investigate the potential of the apps to increase PA. The objectives were: 1) to determine the feasibility and acceptability of the trial, 2) explore the effects of the apps on behavioural and psychological outcomes

Methods: Feasibility randomised crossover trial of two popular apps. Inactive adults residing in London (UK) were eligible. The two interventions were: App A - 7 Minute Workout Challenge by Fitness Guide Inc., App B - One You Couch to 5k by Public Health England. After 1-week run-in period, participants were randomly allocated to one of the two assessment sequence (App A, B or App B, A). The primary outcomes were feasibility and acceptability of the trial measured using recruitment and retentions rates. Secondary outcomes included the effectiveness of the apps on objectively measured PA using accelerometer, self-reported PA, and psychological outcomes: exercise self-efficacy, intentions, PA outcome expectancy. These were assessed at baseline, 1 week post-baseline, 3- and 5-week follow-ups with interviews conducted following the completion of the trial.

Results: The trial methods were feasible and acceptable to participants. Out of 104 participants who were eligible and consented, 63.5% (66/104) were enrolled and randomised. The primary analysis of the accelerometer data showed that there were no significant differences between baseline and the interventions using the continuous variables. Sixteen of 51 participants (31.4%) increased their time in moderate to vigorous PA (MVPA) by 20% from baseline following the introduction of the intervention (95% CI= 19.1% to 45.39). Self-reported PA outcomes showed significant increase and sedentary behaviour decreased. Exercise self-efficacy and intentions increased whilst PA outcome expectancy decreased. There were no significant differences between the two apps.

Conclusions: The recruitment and retention rates found in this crossover trial suggest that this design to study digital interventions was feasible and acceptable to the participants. The impact of this two PA apps showed promising results with an impact observed for 20% increase in MVPA self-reported PA, intentions and exercise self-efficacy.





### WalkIT Arizona: A 2 X 2 Factorial Trial Testing Adaptive Goal Setting and Financial Reinforcement to Increase Walking among US Adults.

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#### e- & mHealth (SIG)

Purpose: Developing novel treatment approaches and treatment combinations for increasing moderate-to-vigorous physical activity (MVPA) is imperative for preventing chronic diseases. Adaptive goal setting and the use of microincentives are relatively novel approaches to increase MVPA. This presentation reports on the main outcomes of the WalkIT Arizona trial testing adaptive goals combined with financial rewards for increasing adults' MVPA. We hypothesized stronger improvements for MVPA among adaptive-goal (versus static) setting and immediate (versus delayed) reinforcement groups over 12 months.

Methods: Insufficiently-active adults (N=518, 64.3% female, mean age=45.3±9.2 yrs.) from Phoenix, Arizona, USA were randomized into one of four treatments to compare goal tye (adaptive vs. static) and financial reward type (immediate vs. delayed non-contingent) for promoting MVPA in a 2x2 factorial trial. Participants wore an ActiGraph GT9X daily to assess MVPA bout-mins, yielding 135,190 total valid wear days. Generalized linear mixed models tested for treatment group x phase (time) interactions, adjusting for accelerometer wear time and design variables. Due to zero-inflated MVPA bout-min values, we examined baseline-to-intervention phase changes in (a) the odds of engaging at least one bout of MVPA on each day and (b) on days with at least one bout, how the daily total of MVPA bout mins differed across goal and reward type conditions (i.e., Group x Phase interactions).

Results: Among static-goal participants, the odds of engaging any bouts during the intervention phase was greater than during the baseline phase (i.e., OR=1.92). Among adaptive-goal participants, the intervention vs. baseline difference was significantly stronger (OR=2.74, p<.001 for Goal x Phase interaction). For the immediate reward group, the intervention vs. baseline difference in odds of MVPA was stronger than in the delayed reward group (OR=2.51 vs. OR=2.10; p=.027 for interaction). On days with at least one MVPA bout, the immediate reward group had 66% more MVPA minutes during the intervention than baseline, while the delayed reward group had 44% more (p<.001 for interaction). No other interactions were significant.

Conclusions: Adaptive goals outperformed static goals, and immediate rewards outperformed delayed-non-contingent financial rewards for MVPA adoption.





#### O.1.08 - Older adult lifestyle interventions

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### Replacing sedentary behavior with light physical activity in the homes of older adults: pilot randomized controlled trial

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Ageing (SIG)

PURPOSE: Older adults spend approximately 65-80% of waking hours in sedentary behavior (SB) with most sedentary pursuits occurring in the home. Replacing SB time with physical activity (PA) is linked to better geriatric-related health outcomes, but reported effectiveness of interventions are limited. The primary purpose of this study was to determine the effectiveness of using a seated elliptical pedaling device (SED) to replace SB with PA in the homes of older adults. A secondary purpose was to determine the intervention effects on physical function.

METHODS: Twenty-six older adults were randomized into an 8-week home-based SB intervention group (EG) or a control group (CG). Baseline and follow-up assessments for PA and SB were performed using self-report and hip-worn accelerometers. A Short Physical Performance Battery (SPPB) was used to assess physical functioning. The intervention group progressively increased pedaling duration goals from 30 minutes per day to 60 minute per day. Both intention-to-treat and per-protocol analyses using mixed models were performed.

RESULTS: Twenty-one older adults (14 females;  $76.9 \pm 6.7$  years) completed baseline and 8-week follow-up. At baseline, participants spent approximately 78% of waking hours in SB and lower-extremity functional limitations ranged from moderate to minimal (SPPB range: 5-12). In the per-protocol analysis, participants that remained in the EG (n=8) were able to meet their goals with 7 of 8 reporting 80% adherence or better. There was a significant group by time interaction effect for daily SB (p=0.002) and LPA (p=0.002) indicating the effectiveness of the intervention to reduce daily SB and increase LPA. Specifically, individuals in the EG experienced a 9.6% reduction in daily SB which translated to a 9.2% increase in daily LPA across the 8-week period. No significant intervention effect was identified for physical function with most measures having small effect sizes.

CONCLUSIONS: A SED appears to be an effective and practical approach to reduce SB in the homes of this small sample of older adults. Future studies should explore more intensive behavioral change strategies to improve adherence and examine other geriatric-related health outcomes in a larger sample size.





### Yoga for healthy ageing and fall prevention: uptake, impact, sustainability and future directions

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Ageing (SIG)

#### Purpose

Yoga is a physical activity that appeals to many older people, however yoga-based research involving older people is scarce. Our previous research demonstrates a positive impact of yoga on balance and mobility (Youkhana et al, 2015), showing yoga has potential as a fall prevention strategy, yet its validity for preventing falls has not been tested. Our research is investigating the role of yoga for promoting healthy ageing and preventing falls in people aged 60+.

#### Methods

We surveyed older people's perceptions of a yoga program scenario compared with their perceptions of two other fall prevention program scenarios: Tai Chi and Otago home-based Exercise Programme. We also conducted a pilot RCT (n=54, mean age 68) to determine the impact of a 12-week yoga program on balance and mobility among community-dwellers aged 60+. We recently obtained NHMRC funding and commenced the first international trial to determine the effectiveness and cost-effectiveness of yoga on falls (primary outcome) in people aged 60+.

#### Results

Our survey (n=235, mean age 69) showed that a yoga-based program was perceived to be as attractive and relevant as Tai Chi and the Otago Programme. In our pilot RCT (n=54, mean age 68) the yoga intervention led to significant improvements in all measures of balance and mobility, which have previously been associated with an increased risk of falling. The yoga program was appealing, with 83% average class attendance, and safe, with no serious adverse events. Importantly, the seniors' yoga classes that were commenced for our pilot trial, are still run today, on a fee for attendance basis, seven years after trial completion, demonstrating sustainability. Recruitment has commenced for our NHMRC-funded trial of yoga with fall rates as the primary outcome (44/560 randomised so far).

#### Conclusion

Yoga is positively perceived by older people. Our research shows that yoga significantly improves balance and mobility, is well received and safe to participate. Research to measure the effect of yoga on falls in older age is warranted and the first trial internationally is currently underway in Sydney.





### Inequalities in travel behaviour by frailty status: A study comparing older adults' travel modes in metropolitan, suburban, and rural areas of Japan

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#### Ageing (SIG)

Purpose: Frail older adults tend to be disadvantaged in travel behaviours. However, it is unclear to what extent inequalities in travel behaviours by frailty status differ by localities. We examined differences in travel behaviours by frailty status in metropolitan, suburban, and rural areas of Japan.

Methods: This study included 9104 older adults (73.5 ± 5.7 years; 51% women) living in metropolitan (n=5032; 22% frail), suburban (n=2853; 14% frail), and rural areas (n=1219; 15% frail) of Japan. Participants reported whether they walked, used a car as a driver, or used a car as a passenger once per week or more. Frailty status (non-frailty and frailty) was assessed by a standardised questionnaire. Logistic regression analysis examined the differences in travel behaviours by frailty status in three localities.

Results: The prevalence of walking, car driving, and being a car passenger was 79%, 47%, and 17% among non-frail participants, and 67%, 29%, and 20% among frail participants, respectively. Relative to non-frail participants, frail participants had a significantly lower odds ratio (OR) of walking (metropolitan: OR=0.47 [95%CI: 0.40, 0.55]; suburban: OR=0.38 [0.30, 0.47]; rural: OR=0.57 [0.40, 0.80]) and driving a car (metropolitan: OR=0.54 [0.46, 0.65]; suburban: OR=0.46 [0.35, 0.61]; rural: OR=0.33 [0.22, 0.49]). Frail participants were more likely to be a car passenger in suburban (OR=1.73 [1.32, 2.25]) and in rural areas (OR=1.61 [1.10, 2.35]) but not in metropolitan areas (OR=1.08 [0.87, 1.33]).

Conclusions: We found that frail older adults were less likely to walk and drive a car, but more likely to be a car passenger than non-frail older adults, and the inequalities differed by locality. Reliance on cars driven by someone else was more pronounced for frail participants in suburban and rural areas than those in metropolitan areas. Our findings suggest that frail older adults in suburban and rural areas are more disadvantaged in travel options than those in metropolitan areas and would benefit from diverse transport services (e.g. ride share, on-demand transport).





### An artificially intelligent virtual health coach for older adults' physical activity and diet

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Ageing (SIG)

Purpose: Most adults are insufficiently active and have poor diet quality, contributing to the global epidemic of chronic disease. Assisting people to successfully modify their lifestyle involves many behaviour change strategies (e.g. education, goal-setting, cues, feedback, overcoming setbacks) ideally over a sustained period. Traditionally, such support is provided by health professionals, who are in high demand and are expensive, limiting their availability. Advances in technology mean such personalised support may now be provided using artificial intelligence, with promise for scalability. This study focused on evaluating a 12-week lifestyle modification program for older adults using an artificially intelligent health coach.

Methods: The program was developed using IBM Watson virtual assistant software, which is capable of natural language processing (i.e. users are able to converse with the coach using their own free text, rather than multiplechoice). The artificially-intelligent virtual health coach, Paola, was accessed via Slack software and used in conjunction with a custom website and Garmin wearable. Paola guided participants through an introductory goalsetting session, prompted participants to complete a weekly check-in with goal revision, and was available 24/7 to answer questions. A total of 31 inactive community-dwelling adults aged 45-75 years participated in a pre-post study to evaluate feasibility and preliminary efficacy for changing physical activity and diet at 0, 6 and 12 weeks. Secondary outcomes were weight, waist-circumference and blood pressure.

Results: Feasibility of recruitment (recruitment was saturated in 3 weeks), and retention (90% at 12 weeks) was confirmed. From 0-12 weeks, physical activity increased by a mean 110 weekly minutes (95% CI 2 to 218) and diet quality scores increased by 5·7 points (on a 14 point scale; 95% CI 4·2 to 7·3). Participants lost an average 1·3kg (95% CI -0·1 to -2·5kg) and 2·1cm in waist circumference (95% CI -3·5 to -0·7cm).

Conclusions: These positive results support the need for ongoing research effort in this area, both for our program, but also more generally. There is vast scope for artificial intelligence technology to deliver personalised health services, particularly in areas that have traditionally been underserviced (e.g. primary and secondary prevention) due to health budget constraints.





# The effect of Active Plus, a computer-tailored physical activity intervention, on physical activity of elderly people with chronic illness(es) – a cluster randomized controlled trial

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Ageing (SIG)

Purpose: Increasing physical activity (PA) is often beneficial for people with chronic illness (ECI), but adherence to PA guidelines is low. PA programs for ECI exist. However, these are often not easily accessible to them. Computer-tailored PA interventions can reach large populations with little resources or demands for the population. Active Plus is a proven effective computer-tailored PA intervention for the general elderly population focusing on PA in daily life. This RCT tests whether Active Plus is also able to improve PA of ECI, both objectively assessed and self-reported.

Methods: ECI ( $\geq$ 65 years) with at least one chronic condition were recruited from 7 municipalities. Comparable neighborhoods within a municipality were randomly allocated to the intervention (N=260) or waiting list control group (N=325). Active Plus participants received three computer-tailored PA advice. Baseline and follow up measurements after 6 and 12 months assess objectively measured LPA and MVPA min/week, and self-report MVPA min/week on common types of PA (household, walking, cycling, gardening, DIY, sports). Multilevel linear regression analyses were conducted.

Results: After 12 months, 432 participants completed follow up (dropout=26%). Preliminary analyses showed the intervention improved self-reported walking (B=66.9, 95%CI=5.1;128.7, p=.034) and cycling (B=70.0, 95%CI=17.2;122.9, p=.009) at six months, and DIY behavior (B=96.9.0, 95%CI=7.28;186.5, p=.034) after 12 months. Additionally, the intervention increased objectively measured MVPA (B=28.8, 95%CI=0.35;57.2, p=.047) and LPA (B=102.1, 95%CI=4.3;199.8, p=.041) after 12 months for ECI with a higher BMI.

Conclusions: The Active Plus intervention improved self-reported walking and cycling at six months. These are two very common types of PA in daily life which were targeted in the intervention. No overall intervention effects on objectively measured PA were found, although persons with a higher BMI benefitted from the intervention. Active Plus is perhaps not sufficient enough for the general ECI population on its own, and blended care is advised.





### Weight loss maintenance: is it possible for mid-older participants with chronic disease?

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#### Ageing (SIG)

Purpose: Australian private health insurance members with obesity-related chronic disease successfully lose weight during an 18-week behavioural lifestyle program addressing healthy eating and physical activity. An evidence-based, extended-contact maintenance-phase using behaviour change strategies, was added to address the challenge of maintaining weight-loss. Research of real-world weight-loss maintenance programs in this setting and of weight change patterns is sparse. We investigated a) the impact of 6-and 12-months of participation in the maintenance phase on anthropometric and lifestyle risk behaviours, and b) weight-change patterns to identify sub-groups who may benefit from service modification.

Methods: Participants (n=490) provided demographic and weight-related information at six time-points to 12months. Pre-post telephone surveys conducted at maintenance-phase baseline, 6- and 12-months with a sub-sample of participants (n=101) collected lifestyle risk behaviour information. We used generalised linear mixed models for repeated measures to determine the program effect on weight-loss and lifestyle risk behaviours. We also examined trends in weight-loss maintenance over the first 12-months.

Results/findings: After initially losing on average 9.1kg (p<0.001), maintenance-phase participants regained 0.9kg (p<0.001) at 6-months and 1.3kg (p<0.001) at 12-months. Weight-loss maintenance was achieved by 76% of participants at 3-months and 62% at 6-months, stabilising at 55% and 56% at 9 (OR=0.22, 95%CI 0.12-0.39, p<0.001) and 12 months (OR=0.08, 95%CI 0.04-0.17, p<0.001) respectively. Greater initial weight-loss was associated with weight-loss maintenance at 12 months (5-9.9%: OR=2.65, 95% CI 0.99-7.07, p=0.018;  $\geq$ 10%: OR=27.70 95% CI 6.60-116.23, p<0.001). Participants <55 years demonstrated consistent weight-loss maintenance over this time but the odds for successful weight-loss maintenance for those  $\geq$ 55 years continued to decrease over time. At maintenance-baseline, 68.3% of participants had sufficient physical activity for health; 61.4% and 19.8% met recommended fruit and vegetable consumption respectively. Lifestyle risk behaviours were maintained; aside from vegetable consumption which increased by 0.4 serves/day (p=0.009) at 12-months.

Conclusions: Weight loss maintenance is undisputedly challenging; so too is sustaining lifestyle behaviours necessary to manage weight. A program extending support strategies for maintaining weight-related behaviour can successfully support these changes in some participants over 12-months. There is a potentially important opportunity for targeted intervention at 6-9 months, particularly in mid-older participants.





### Physical function and engagement responses to a social media enhanced physical activity program in older males and females

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Ageing (SIG)

Most older adults fail to adhere to the multicomponent (aerobic, muscle strengthening, balance training) physical activity (PA) guidelines. Thus, effective and sustainable multicomponent PA programs that promote adherence in older adults remains a public health priority, especially for females given their higher rates of physical inactivity and risk for physical disability compared to males. PURPOSE: To examine if sex/gender influences the effects of a multicomponent 10-week PA intervention grounded in Social Cognitive Theory and augmented with social media (Facebook) on program attendance and engagement, PA behaviors, muscle capacity, and physical function (PFx) in older adults.

METHODS: Physically inactive older adults (71.3 ± 4.3 yo; n=28, 64% female) completed a 10-week multicomponent PA program that included 1) a twice weekly supervised exercise class (muscle strength and balance training) with PA behavior education, 2) Facebook engagement, and 3) an unsupervised walking prescription. PA behaviors were assessed via accelerometers, questionnaires, and pedometer step count logs. Conventional measures of leg strength and power along with a battery of PFx tests were also employed [6-minute walk (6MW), 8-foot up and go (UPGO), chair stands (CHAIR), and transfer task (TRANSFER)]. A two-way [Gender (G) x Time (T)] ANOVA was utilized to determine significance of change.

RESULTS: There was a trend for higher class attendance in females compared to males (96.7±3.8% vs. 92.0±6.7%, p=0.06). Females also had a 2.3-fold greater engagement in Facebook compared to males (p=0.01). Males and females improved PA behaviors similarly (T p<0.05; GxT and G p>0.05). Muscle capacity improved similarly (T p<0.05) with males, as expected, having higher leg strength and power (G p<0.05; GxT p>0.05). Regarding PFx, improvements occurred in 6MW, UPGO and TRANSFER (T p<0.05; GxT p>0.05) with males also having higher functional capacity, as anticipated, in 6MW, UPGO, and CHAIR (G p<0.05).

CONCLUSION: A 10-week PA program improves PA behavior, muscle capacity, and PFx similarly in older males and females. More research is needed to develop effective and sustainable multicomponent PA programs for older adults which may differ by social factors in females compared to males.



#### O.1.09 - Physical activity and sedentary behaviour in early childhood and education

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#### Association of tummy time with infant health outcomes. A systematic review

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#### Implementation and scalability (SIG)

Background: The World Health Organization (WHO) recommend tummy time for infants due to the benefits of improved motor development and reduced likelihood of plagiocephaly. Due to the poor uptake of these recommendations, a comprehensive analysis regarding additional benefits and/or the association of tummy time with other health outcomes is required. Further understanding the effects of tummy time on infant health and development may assist to improve compliance with the WHO tummy time recommendations of 30-minutes per day.

Objective: To review existing evidence regarding the association of tummy time with a broad and specific range of infant health outcomes.

Methods: Electronic databases were searched between June 2018 and April 2019. Peer-reviewed, English language articles were included if they investigated a population of healthy infants (birth to 12 months), used an observational or experimental study design containing an objective or subjective measure of tummy time which examined the association with a health outcome (adiposity, motor development, psychosocial health, cognitive development, fitness, cardiometabolic health or risks/harms). Two reviewers independently extracted data and assessed their quality.

Results: Sixteen articles representing 4237 participants from 8 countries were included. Tummy time was positively associated with gross motor and total development, reduction in BMI-z, prevention of brachycephaly and the ability to move while prone, supine, crawling and rolling. An indeterminate association was found for social and cognitive domains, plagiocephaly, walking, standing and sitting. No association was found for fine motor development and communication. Most studies were observational in design and lack the robustness of a randomized controlled trial. High selection and performance bias were also present. This review also highlighted that further work is required regarding the objective measurement of tummy time rather than relying on parent-proxy questionnaires.

Conclusions: These findings guide the prioritization of interventions aimed to assist infants meet the global and national physical activity guidelines. Results from this review can be used to educate parents, educators and clinicians about the additional benefits of tummy time.





### Longitudinal associations of sedentary time and physical activity duration and patterns with cognitive development in early childhood

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#### Implementation and scalability (SIG)

Purpose: The first five years of life are characterized by significant brain development that is critical for cognitive development. Sedentary behaviour and physical activity are important considerations for optimal cognitive development. Few studies have examined whether patterns of these behaviours (i.e., sedentary and physical activity bouts, and sedentary breaks) change across early childhood and none have examined whether these are longitudinally associated with cognitive outcomes. The current study examined: 1) changes in total duration and patterns of sedentary time and physical activity across three time-points, and 2) longitudinal associations of sedentary time and physical activity durations and patterns with cognitive development.

Methods: This longitudinal study included 100 participants aged 2-5 years from Edmonton, Canada, at baseline (2015-16). Participants wore ActiGraph accelerometers at baseline and 6- and 12-month follow-ups. Sedentary time, light- (LPA), and moderate-to-vigorous-intensity physical activity (MVPA) duration and patterns (time spent in a range of bouts [1-3 to  $\geq$ 10 min] and sedentary breaks) were calculated. Participants also completed response inhibition (Fish-Shark Go/No-Go), working memory (Nebraska Barnyard) and global cognitive ability (Woodcock-Johnson III) measures at 2 or 3 time-points. Multilevel growth modelling was used to examine sedentary and physical activity changes and their longitudinal associations with cognitive outcomes.

Results: Sedentary time decreased ( $\beta$  [95% CI]=-9.24 [-15.76, -2.72]; intercept=75.72 min), whereas MVPA duration increased (5.65 [1.89, 9.41]; 362.14) with age. There was also a significant decrease in time spent in  $\geq$ 10-min sedentary bouts (-9.76 [-13.56, -5.96]; 71.56) and significant increases in sedentary breaks (13.41 [7.18, 19.63]; 251.34), and time spent in 1-3-min (2.56 [0.96, 4.15]; 16.82) and 3-5-min (0.86 [0.33, 1.38]; 3.57) MVPA bouts. There was minimal evidence of longitudinal associations with cognitive outcomes.

Conclusions: The observed changes in sedentary time and MVPA are promising for child health. Nevertheless, these were unrelated to cognitive outcomes. Future studies with larger sample sizes should investigate whether specific types of activities are associated with cognitive development over time and establish whether or not these can be changed through interventions.





### The relationship between educators' and children's physical activity and sedentary behaviour in early childhood education and care

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#### Implementation and scalability (SIG)

Purpose: The early childhood education and care (ECEC) environment has a significant role to play in the promotion of physical activity and reduction of sedentary behaviour in young children. Educators' physical activity and sedentary behaviours maybe an important social factor influencing children's physical activity and sedentary behaviour, however limited evidence exists on this relationship. The primary aim was to examine the relationships between educators' physical activity and sedentary behaviours and children's physical activity and sedentary behaviour within ECEC settings.

Methods: A cross sectional study, involving 11 ECEC centres from NSW, Australia. Data for each centre were collected over five consecutive days. Objectively measured physical activity and sedentary behaviour were collected from children using Actigraph accelerometers. Data were analysed using STATA 13c. Linear regression was used to examine relationships between children and educators, adjusted for centre clustering.

Results: Data were collected from 110 educators and 490 children. A significant association was reported between educators' sedentary behaviour and children's sedentary behaviour (p=0.047). Educators spent 61% of their work day in sedentary behaviour sedentary behaviour and 4% in moderate- to vigorous-intensity physical activity. Children spent 48% of their day in sedentary behaviour and 16% in moderate- to vigorous-intensity physical activity.

Conclusions: The relationship between educators' physical activity and children's physical activity has received limited attention in previous studies. Furthermore, no studies have investigated the relationship between educators' sedentary behaviour and children's sedentary behaviour. The positive relationship identified between educators' sedentary behaviours and children's sedentary behaviour in this study highlights a novel area to target in future interventions. Improving physical activity and sedentary behaviours of educators will likely improve children physical activity levels and reduce time spent being sedentary and thus health and wellbeing outcomes.





#### Environmental Influences on Children's Physical Activity and Sedentary Behaviour in Early Childhood Education and Care

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#### Implementation and scalability (SIG)

Purpose: Physical activity is integral to children's health and wellbeing. Many children attend Early Childhood Education and Care (ECEC), and these environments afford the contexts to support children to be physically active, however, children are not meeting the recommended guidelines for PA while in ECEC. Children's physical activity and sedentary behaviour in ECEC settings is influenced by a number of factors. The purpose of this study was to examine three less-studied environmental factors on children's physical activity and sedentary behaviour in ECEC–routine, size of the outdoor environment and time spent in the outdoor environment.

Method: A cross-sectional study (n=490, aged 2-5y, 11 ECECs) was completed. ECEC routine, size of the outdoor environment and time spent in the outdoor environment were calculated for each centre. Children's physical activity and sedentary behaviour was measured using accelerometers. A multivariate linear regression analysis examined associations of the attributes of ECEC centres (routine, time outdoors, and size of outdoor environment) with the outcome variables, adjusting for the effects of centre clustering and gender.

Results: Children in centres that offered free routines spent significantly less time in sedentary behaviour (SB) (28.27mins/hr vs 33.15mins/hr; p=0.001) and more time in total physical activity (TPA) (7.99mins/hr vs 6.57mins/hr; p=0.008) and moderate- to vigorous- activity (MVPA) (9.49mins/hr vs 7.31 mins/hr; p=0.008) than centres with structured routines. Children in centres with an outdoor environment greater than 400m2 spent significantly less time in sedentary behaviour (28.94 min/hr vs 32.42 mins/hr; p=0.012). Although not significant, children in centres that offered >4h outdoor time spent less time in SB (29.12mins/hr vs 32.65mins/hr) and more time in TPA (16.79mins/hr vs 14.39mins/hr) than those that offered less outdoor time.

Conclusion: Modifiable practices such as offering a free routine, increasing the time spent in outdoor environments and managing the available space effectively could potentially offer an easy and sustainable way for ECEC to promote physical activity and reduce sedentary behaviour.





#### Validity and Reliability of the Movement Environment Rating Scale (MOVERS)

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#### Implementation and scalability (SIG)

Purpose: Quality of early childhood education and care (ECEC) is important for children's outcomes. To date, quality has largely been measured in the cognitive and socio-emotional domains of child development. The Movement Environment Rating Scale (MOVERS) was recently developed to assess quality in the physical domain. The aim of this study was to determine validity and reliability of MOVERS.

Methods: Data were collected from 13 ECEC setting. Quality was assessed in the 3-5-year-old room using MOVERS, the Sustained Shared Thinking and Emotional Well-being (SSTEW) scale and the Environment Policy Assessment and Observation (EPAO). Children's gross motor skills were assessed using the Test of Gross Motor Development 2nd edition (TGMD-2). Children's fine motor skills were assessed using the Ages & Stages Questionnaire 3rd edition (ASQ-3). MOVERS test-retest reliability was calculated using ICCs, percentage agreement and weighted Kappa. Internal consistency was examined using Cronbach's alpha. To examine concurrent validity between MOVERS, SSTEW and EPAO, correlation coefficients were calculated. Multi-level regression analyses were conducted to examine the criterion validity related to child outcomes associations (TGMD-2, ASQ-3) with MOVERS.

Results: Test-retest reliability revealed excellent reliability of MOVERS (ICC=0.959; p<0.0001; Weighted Kappa 0.904; p<0.0001; percentage agreement: 69% - 100%). Cronbach's alpha analyses indicated excellent internal consistency of the scale (a=0.90 first observations, a=0.89 second observations). There were a large number of statistically significant correlations between the MOVERS and the SSTEW (Spearman's rho 0.57 – 0.87, p < 0.05). Generalized linear mixed models showed a strong relationship between Item 4 of MOVERS (Body movement to support fine motor skills) and ASQ-3. However, the relationship between Item 3 (Gross motor skills) of the MOVERS and TGMD-2 was not statistically significant.

Conclusion: This is the first study to report on the validity and reliability of the MOVERS scale. Despite the small sample size, the results revealed excellent test-retest reliability and excellent internal consistency of the MOVERS scale. Finding relevant tests to evaluate concurrent validity of the MOVERS was challenging due to MOVERS innovative focus on assessing both structural and process quality rather than just process quality.





### Where are preschool children active or inactive in childcare centres? A hotspot analysis based on accelerometer, GIS and GPS data

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#### Implementation and scalability (SIG)

#### Purpose:

Preschool children spend a significant amount of their time in the childcare centre environment, however studies of the childcare physical environmental influences on preschool children's physical activity behaviours are sparse and limited by the lack of use of device measured physical activity and objectively measured physical environment data. The use of device measured physical activity and spatial data can provide objective information on how spaces are used and the types of physical activity preschool children do in the child care outdoor environment. This study aims to investigate where preschool children are most and least active in the childcare outdoor environments using device measured physical activity and objectively measured physical environment data.

#### Methods:

Participants included 403 preschool children aged 2-5 years from 31 childcare centres taking part in the part in the Play Spaces & Environments for Children's Physical Activity (PLAYCE) Study in Perth, Western Australia. Participant wore an accelerometer (Actigraph GT3X) and a Global Positioning System (GPS) device (Qstarz Q-1000XT) on for7 days. Optimized hot-spot analysis was performed using ArcGISpro to identify the statistically significant spatial clusters of GPS points with high or low physical activity levels in every childcare centre.

#### Results:

Clusters of hotspots were found to be gathered in childcare open areas (20 out of 30 childcare centres) and around sand boxes next to an open space or large play equipment. Dramatic play areas were associated with a mix of hotspot and coldspot. Gardens were associated with coldspots for activity. Preliminary finding shows that childcare outdoor areas are used differently by boys and girls.

#### Conclusions:

children attending childcare centres were most active in open areas and around sandboxes that were next to an open area or large play equipment. Only light intensity physical activity behaviours were seen around gardens. Both vigorous and light intensity physical activity behaviours were seen in dramatic play areas in childcare centres. These finding provide preliminary evidence to help identify where preschool children are physically active or inactive in the childcare environment, and will help to inform the planning, design, building of childcare centres that are sensitive to children's needs.





#### Are atmospheric contamination and safety concerns threatening outdoor time among early years children in the era of climate emergency?: A prospective cohort study

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#### Implementation and scalability (SIG)

Purpose: Young children are recommended to spend more time outdoors for health benefits, particularly in developed countries. However, increasing levels of climate change induced air pollution and safety concerns may influence children's outdoor time. The objectives of this study were to examine 1) longitudinal associations between air pollution, neighbourhood/traffic safety, and outdoor time and 2) how outdoor time tracks over 4 years during early childhood.

Methods: A birth cohort that participated in the Panel Study of Korean Children (PSKC) (N=2,150) in Years 2010-2014 (ages 2-6 years) were included. Trained staff visited each participating household and the PSKC questionnaire was completed by the primary caregiver each year. in addition to outdoor time and neighbourhood and traffic safety variables, five air pollutants (Particulate Matter [PM] 10, Ozone (O3), Carbon monoxide [CO], Nitrogen Dioxide [NO2], and Sulfur dioxide [SO2]) from the Air Korea were used. Child's age and gender, household income, and parental education were included as covariates. Generalized linear mixed models were conducted with gamma distribution because outdoor time was skewed positively. Tracking coefficients for outdoor time across three time points were also calculated.

Results: Of 1,802 children who participated in the PSKC at age 2 (retention rate: 84%), 1,451 children who had complete data on key variables in all three time points were included in the analysis. On average, children spent 34, 55, and 49 min/day outdoors at age 2, 4, and 6, respectively (no significant gender differences observed). Over time, Low CO (b = 0.119, p < 0.001) and O3 (b = 0.066, p = 0.017) levels and safe neighbourhood (b = 0.081, p = 0.026) predicted higher outdoor time. Outdoor time at age 2 significantly tracked at low levels at age 4 (b = 0.09; p = 0.001) but not at age 6 (b = 0.05; p = 0.101).----

Conclusions: This study identified air quality and neighbourhood safety as potential key correlates of time spent outdoors across early childhood. Strategies to promote outdoor time among young children could consider climate change-related air pollution levels and neighbourhood safety in South Korea.





#### O.1.10 - Screen use and inactivity in children and adolescents

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#### Media Use and Metabolic Syndrome and its Components in European Children and Adolescents-Results from the I.Family Study

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Children and families (SIG)

Purpose: To evaluate the relationship between media use and metabolic syndrome (MetS) and its components: waist circumference, blood pressure, dyslipidemia and homeostasis model assessment of insulin resistance (HOMA-IR) in children and adolescents and whether there is an interrelation between sedentary behaviour (SB), moderate to vigorous physical activity (MVPA) and media use.

Methods: 7263 children (2-16 years old) from 8 European countries of the I.Family study were included in the crosssectional analysis. Self-reported media use (hours/day) included TV, computer, game console and internet use. Children were categorized as having MetS and high level of its components when the latter exceeded the 90th percentile, based on reference curves. Using logistic regression models we examined the association between media use and MetS, adjusting for various covariates, including dietary behaviours and puberty status. In a subsample including accelerometer data (3640 children), SB, MVPA and media use were considered to check for interrelation in the association with MetS and its components. Based on WHO guidelines we examined whether meeting screen time recommendations( $\leq$ 1h/day for children 2-5 years and  $\leq$ 2h/day for children  $\geq$ 5 years old) was associated with MetS.

Results: Children used media for 2.3 hours/day on average (SD=1.4). Only 49% of children met the guidelines for media use. There was a significant association of media use with high waist circumference (OR=1.16, 95%CI=1.09-1.23), dyslipidaemia (OR=1.06, 95%CI=1.008-1.13) and MetS (OR=1.22, 95%CI=1.07-1.40). The association remained after examining for interrelation between SB, MVPA and media use. Positive association was seen between media use and blood pressure (1.05, 95%CI=0.93-1.19) and HOMA-IR (OR=1.14, 95%CI=0.95-1.37). Children who met the media use guidelines, had lower odds for any of the metabolic outcomes, but significant only for having high





waist circumference (0.75, 95%CI=0.67-0.84) and dyslipidaemia (OR=0.86, 95%=0.77-0.96), independently of covariates.

Conclusions: Media use was associated with metabolic syndrome, waist circumference and dyslipidaemia. Our novel approach suggests that this association is independent of dietary habits and physical activity patterns. However, meeting the media use guidelines seemed to have a protective role on the risk for MetS and its components. Longitudinal associations between media use and MetS will be investigated.





### The moderation effect of physical activity on the association between sitting time and cardiometabolic health markers

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#### Children and families (SIG)

Purpose: There is limited evidence of the association between device-measured sitting time and health markers and how physical activity impacts this relationship among children. The aim of this cross-sectional study was to examine whether device-measured light-intensity physical activity (LIPA) and moderate-to-vigorous physical activity (MVPA) moderate the associations between sitting time and cardiometabolic health markers: waist circumference z-score (zWC), body mass index z-score (zBMI), blood pressure (BP), high-density lipoprotein (HDL), low-density lipoprotein (LDL), cholesterol, triglycerides, glucose, insulin, vitamin D and C-reactive protein (CRP) among children.

Methods: This study included data from 114 children (mean age 8.2±0.5), collected in 2010 in Melbourne, Australia. ActiGraph GT3X accelerometers were used to determine time spent in LIPA, low-LIPA and high-LIPA (i.e. split at mid-LIPA cutpoint), and MVPA. Average time spent sitting was obtained from activPAL inclinometers. Anthropometric measures and resting BP were assessed by trained staff using standard protocols. Fasting-blood samples were obtained at a commercial pathology laboratory using standard protocols.

Interactions between sitting and LIPA, low-LIPA, high-LIPA, and MVPA on the health markers were examined using linear regression, adjusting for age and sex, and moderation by LIPA, low-LIPA, high-LIPA and MVPA was examined by adding interaction terms. Significant interaction effects were probed by comparing associations at the mean and at one standard deviation below and above the mean.

Results: There was a positive association between sitting time and glucose (p=0.015) that remained significant after adjusting for specific physical activity variables. A significant negative association was found between sitting time and vitamin D, however, this was non-significant after adjusting for physical activity variables. No moderation effects were found for any of the physical activity variables in the relationship between sitting time and cardiometabolic health markers.

Conclusions: The association between sitting time and glucose appeared to be independent of time spent in physical activity, which is consistent with research amongst adults. However, other cardiometabolic health markers were not independently related to children's sitting. Experimental evidence and more sophisticated analyses (e.g. compositional) are needed to further explore the moderation effects of the different physical activity intensities and relationships between sitting time and cardiometabolic health markers.





### Development of FLASH, an automatic, objective assessment of children's screen use: Face verification and gaze tracking accuracy

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#### Children and families (SIG)

Purpose: Current measures of children's screen use limit the ability to acurately assess children's exposure to screen media for surveillance and research. Most studies rely on self- or parent-reports. Advances in image technology, such as facial verification and gaze tracking offer solutions to objectively measure children's screen use. We report two steps in the development of an objective screen use monitoring system: FLASH (Family Level Assessment of Screen use in the Home).

Methods: FLASH-TV uses machine learning algorithms to process videos based on convolutional neural networks (CNN) to 1) detect faces, 2) verify presence of target child's face, and 3) estimate time child's gaze is on screen. Here steps 2 and 3 are reported. A video dataset was collected from 12 families in an observational lab. The target child, parent, and sibling spent time watching and not watching a TV in different positions and lighting conditions. Trained staff coded video data for target child's presence and gaze on TV (10% double coded) to serve as gold standard. Videos from 10 families were available to assess face verification. Face verification was stratified by gaze/no-gaze and reported as accuracy (true positives) and false positive rate (FPR). In a separate protocol, 5 other parent-sibling triads took part in observational protocols on two visits to assess face verification across days. A CNN-based gaze detection algorithm was trained on 5 families and, to date, tested on 4 families' data.

Results: Kappa of staff double-coding gaze was 0.91 (SD 0.15). Face verification accuracy of target child was 94.7% (SD 4.8%) for gaze and 78.5% (SD 14.4%) for no gaze, with FPR of 1.96% and 15.3% respectively. Face verification accuracy for visit 1 was 96.6% and 96.4% for visit 2. FLASH gaze detection achieved accuracy of 84.0%.

Conclusions: Current face verification algorithms are robust during gaze. Face verification during no-gaze will not be necessary to calculate screen use estimates. Our short-term goal is to optimize FLASH gaze detection to accuracy of 95%. In parallel, we are developing FLASH-Mobile, which will be a background application on mobile devices.





### Correlates of screen time and mediators of socioeconomic differences among adolescents

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Children and families (SIG)

Purpose: Existing literature shows that there is an inverse association between socioeconomic position and screen time among youth. What is less known is the mechanism behind these differences. The study aimed to explore correlates of total screen time among adolescents and to assess their mediating role in the association between parental education and total screen time.

Methods: A cross-sectional study including 706 adolescents (mean age of 13.6 (SD=0.3)) was conducted in 2016. Data were collected at school through an online questionnaire. Multiple regression analyses were used to explore factors associated with total screen time. Mediation analyses were conducted to assess whether these factors mediated the association between parental education and total screen time.

Results: Multiple linear regression analyses showed that parental modelling of TV and movie streaming (B= 4.44 (CI: 2.90, 5.98)), self-efficacy towards limiting TV and movie streaming (B= -0.62 (CI: -1.03, -0.21)), self-efficacy towards limiting computer/electronic game use (B= -1.18 (CI: -1.54, -0.82)), TV/movie streaming during dinner (B= 1.10 (0.07, 2.13)) access to screens (B= 1.81 (CI: 0.42, 3.20)) and the perceived opportunities for physical activity in the neighborhood (B= -1.39 (CI: -2.47, -0.31)) were related to total screen time. All of these factors except self-efficacy towards limiting TV and movie streaming mediated the association between parental education and screen time.

Conclusions: The study identified several modifiable factors at the individual, interpersonal and perceived neighborhood environmental levels that can be targeted in interventions aimed at decreasing screen time among youth in general and among those with a low socioeconomic position in particular.





### Longitudinal associations of weight perceptions and physical activity in adolescent girls

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#### Children and families (SIG)

Purpose: There is a well-documented trend of physical activity disengagement that is disproportionately observed among girls in adolescence, compared to age-matched boys. Negative perceptions of weight have been linked with lower rates of participation during distinct phases in adolescence, however this data is limited to cross-sectional designs. Due to the declining rates of physical activity participation and potential changes in weight perceptions throughout adolescence, it is important to understand changes over time during this critical developmental period. As such, the present investigation aimed to assess the association between weight perceptions and the odds of participating in physical activity in girls throughout adolescence.

Methods: The sample consisted of a 4-year linked (Years 2015-2018) sample ofn = 1066 adolescent girls in the COMPASS study who had completed yearly self-reported survey assessments (i.e., self-reported body mass index [BMI], weight perceptions, participation in school-based physical activity, school-based competitive sport, and organized sport outside of school). Generalized estimating equation models were conducted to test the effect of weight perception on physical activity over time, controlling for BMI, age, race/ethnicity, and geographic location.

Results: Beyond the effects of BMI, girls who perceived their weight to be "about right" (OR = 0.88, 95% CI: 0.80-0.99) or "slightly overweight" (OR = 0.89, 95% CI: 0.81-0.99) were less likely to be disengaged from school-based physical activity, compared to girls who perceived being "very overweight". However, only BMI, and not weight perceptions, were significant in predicting participation in school-based sport or competitive sport outside of school.

Conclusions: Girls who perceive their weight to be higher than "socially acceptable" are more likely to disengage from or avoid behaviors that are weight-salient, and thus may be underrepresented from recreational physical activity contexts (e.g., intramurals, non-competitive clubs). Meanwhile, higher actual weight rather than perceived weight, may be associated with less competitive and performance-based sport engagement due to sport-related weight restrictions. Overall, the pervasive stigmatization and discrimination of higher-weight bodies in Western societies warrants further investigation as it may be associated with the decline in recreational physical activity observed in adolescent girls.





### Home-based screen behaviours amongst youth and their parents: familial typologies and their modifiable correlates

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Children and families (SIG)

Purpose: The home environment has a key influence on family screen behaviours (i.e. TV viewing, smartphone use etc.). Due to the shared environment, screen behaviours of parents and children may cluster, forming unique typologies of familial behaviours. Determining correlates of these typologies can inform intervention design and implementation. This study identified familial typologies of multiple screen behaviours within the home, and their modifiable correlates.

Methods: Parents (n=542, 40.7yrs, 94% female) in the Sitting in the Home (SIT) study self-reported their own, and proxy reported their child's (11.2yrs, 46% female) participation in six screen behaviours (TV/videos/DVDs, computer/laptop [homework/work and leisure use separately], tablet/smart phone [homework/work and leisure use separately], tablet/smart phone [homework/work and leisure use separately], and video game use), 6 intrapersonal (e.g. behaviour preference), 10 social (e.g. role-modelling), and 6 physical environment (e.g. screen availability) characteristics which were assessed as modifiable correlates. Latent class analysis identified familial typologies of screen behaviours. Characteristics of typologies were compared using one-way ANOVAs and chi-square tests. Logistic regression identified correlates of typology membership.

Results: Three typologies were identified: 1)'computer users' (36%), characterised by high parent and child computer use for homework/work and leisure; 2)'leisure screenies' (25%), high parent and child TV/video/DVD and tablet/smart phone use for leisure; and 3)'low-users' (39%), low parent and child use of all screen types. Compared to other typologies, 'low-users' reported the most sleep, physical activity and restrictive rules, and the lowest screen time preference, use of screens as a babysitter, peer screen time co-participation, and screen options in the bedroom and home. The requirement to use a tablet/laptop for homework was highest in the 'computer users' and lowest in the 'leisure screenies'.

Four correlates significantly predicted typology membership (reference: low-users): sedentary behaviour preference was associated with increased likelihood of being a 'computer user' and 'leisure screenie'. The frequency that child's homework requires tablet/computer and parental sedentary behaviour encouragement and support was associated with increased likelihood of being a 'computer user'. Parental physical activity was associated with a reduced likelihood of being a 'leisure screenie'.

Conclusion The three typologies show similar patterns of screen behaviours of children and parents. Strategies need to target the whole family.





#### O.1.11 - Trials and interventions in motivation and behaviour change

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### Using self-determination theory to predict fitness center visits in previously inactive exercise initiates

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Motivation and behavior change (SIG)

Purpose: Many adults join fitness centers to increase physical activity; yet, fitness center attendance decreases over time. Self-Determination Theory suggests that individuals who have their basic psychological needs satisfied become more autonomously motivated to attend a fitness center to engage in activity; this hypothesis has yet to be tested. This study examined whether basic psychological needs satisfaction and autonomous regulation are related to fitness center visits in previously inactive exercise initiates.

Methods: Using a 12-week longitudinal cohort study design, inactive adults (N=160) who were joining a fitness center completed measures of demographics, basic psychological needs satisfaction in exercise, and behavioral regulation in exercise at baseline and 4 weeks after starting their exercise programs. Fitness center visits were captured via membership card swipe; the total number of visits per week was calculated for each participant. Multilevel Poisson regression models were used to predict weekly fitness center visits.

Results: Overall, there was a significant decrease in the number of fitness center visits per week (b=-0.05, SE=0.01, p<.001; M=1.9 visits in week 1 and 0.9 visits in week 12). Those who had greater psychological needs satisfaction at baseline (p<.001) and who experienced greater increases in needs satisfaction in the first 4 weeks (p<.001) had more fitness center visits. Further, there was a significant interaction between change in needs satisfaction and time (p=.018). Those who saw greater increases in needs satisfaction had greater reductions in fitness center visits over time (Week 12 M=1.2 visits, 1.4 fewer visits than week 1), yet they remained higher than those who decreased in needs satisfaction over time (Week 12 M=0.5 visits, 0.3 fewer visits than week 1). The same pattern emerged for autonomous regulation.

Conclusions: Those who experience greater increases in needs satisfaction and autonomous regulation attend the fitness center more frequently, but may also experience a more rapid decline in fitness center visits over time. Future research is needed to clarify how changes in needs satisfaction and autonomous regulation are related to physical activity adoption.





#### A Meta-analysis of self-determination theory-informed intervention studies in the health domain: Effects on motivation, health behavior, physical, and psychological health

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#### Motivation and behavior change (SIG)

Purpose: Ng et al. (2012) meta-analysis of applications of self-determination theory (SDT; Ryan & Deci, 2017) in the health domain included many non-experimental studies. A more recent meta-analysis by Gillison et al. (2019) of intervention studies in this area did not calculate changes in indices of physical or mental health. Advancing the SDT literature in the health domain, we present a meta-analysis of experimental studies that tested changes in at least one SDT variable and at least one health-behavior, physical-health outcome, or psychological-health outcome.

Methods: 73 studies (N=30,088) met our inclusion criteria and provided sufficient data for the purposes of the review. The behaviour change techniques (BCTs) and SDT-based need supportive techniques used in the studies were also coded. Risk of bias was assessed using an adapted version of the Cochrane Risk of Bias Tool. To test whether changes in SDT-related constructs engender changes in other SDT-related constructs, health behavior, physical health and psychological health, a set of meta-regressions were conducted. Sensitivity analyses were applied to examine the robustness of the synthesized results by removing outliers and by examining whether any of the BCTs were associated with the effect sizes from individual studies.

Results/findings: A random-effects meta-analytic model (using Stata, v. 15) showed that the interventions produced small-to-medium changes in most SDT constructs at the end of the intervention period, and in health behaviors at the end of the intervention period and at the follow-up. Small positive changes in physical and psychological health outcomes were also observed at the end of the interventions. Increases in need support and autonomous motivation (but not controlled motivation or amotivation) were associated with positive changes in health behavior.

Conclusions: Interventions in the health domain based on SDT produce modest (in the region of g=.30 to .60) but sustained increases in health behaviors and improvements in physical health, and short-term changes in psychological health. These effects are partly due to increases in self-endorsed motivation for change and support from social agents.





#### A gamification-based intervention to encourage active travel

#### Mr. Marc Harris<sup>1, 2</sup>

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#### Motivation and behavior change (SIG)

Purpose: The United Kingdom and the European Union have declared a climate emergency. There are enormous economic, human, and environmental costs of inactivity, climate change, air pollution and congestion and active travel can help reduce and prevent these. In England, however, only 26% of all trips are made by walking and only 2% are made by cycling and collectively, walking and cycling contribute just 4% of total distance travelled. 'Beat the Street' is a community-wide intervention which aims to increase active travel by turning an area into a 6-week game. Residents earn points and prizes by walking and cycling and tapping a smartcard on RFID readers called 'Beat Boxes' placed on lampposts at half-mile intervals. To-date, over 1 million people have taken part in the intervention, however, the impact of the program on adult active travel is yet to be explored.

Methods: In Autumn 2019, Beat the Street was delivered throughout the London Borough of Hounslow. Prior, and immediately following the intervention, residents were invited to complete a self-report questionnaire (Sport England Active Lives Survey-SF) to assess changes in physical activity. Time-stamp data generated through Beat Box activity provided an objective measure of intervention engagement and a traffic survey camera was used to measure the number of cars travelling along 1 target road between 1-week pre- and 1-week post-intervention.

Results: 28,219 people took part in the six-week game. Between pre- and post-intervention there was 7% decrease in adults reporting less than 30mins of activity per week and a 13% rise in adults reporting 150+ mins (n=346, p<0.01). Beat box data ascertained that 25% of total taps at all Beat Boxes were made between 08:00-08:59am and a further 28% were made between 3:00-3:59pm, typical travel to school/work periods. Further, traffic camera data showed that between the week before and week following Beat the Street, 1199 and 705 fewer cars and 130 and 36 fewer vans were observed travelling along Cambridge Road between 07:00-09:30am and 2:00-4:30pm, respectively.

Conclusions: These data sources, in combination, suggest gamification may be an encouraging approach to increasing levels of active travel at a community-wide level.




# Can a workplace-based programme engage people to increase cycling: the Cycle Nation Project feasibility study

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#### Motivation and behavior change (SIG)

Purpose: The UK currently has low levels of cycling: 28% of adults cycle less than once a month, although many of these (57%) would like to cycle more. Designed in partnership with a major UK bank and third sector cycling organisation, the Cycle Nation Project (CNP) is a workplace-based initiative to encourage bank staff who infrequently cycle to cycle more. CNP includes a 12-week bike loan and a practical 9-week foundation (or 6-week intermediate) group cycling course delivered by colleagues (self-identified cycle-enthusiasts trained to be Cycle Champions). This feasibility study aimed to explore recruitment, attendance, retention and indicative outcomes.

Methods: CNP was delivered to employees at four bank offices across the UK between August 2019 - March 2020. The recruitment target was 30 staff at each site. Measurements included self-reported cycling frequency and wellbeing (Warwick-Edinburgh Mental Wellbeing Scale) at baseline, 9 weeks and 13 weeks. Cycle Champions recorded weekly session attendance.

Results: CNP was delivered at Site 1 between 6th August - 6th October 2019 to 14 participants (mean age 37.7 $\pm$ 11.0 years; 12 men, 2 women; 9 foundation, 5 intermediate). 12/14 (86%) completed the programme, attending on average 72.4% of weekly sessions. Multifaceted recruitment strategies used at Site 2 achieved recruitment of 32 participants (mean age 37.8 $\pm$ 9.4 years; 18 men, 14 women; 17 foundation, 15 intermediate). 26/32 (81%) completed the programme between 1st October - 27th November 2019, but only attended 49.2% of sessions. At Site 1, all participants attended baseline, 85.7% 9-week and 71.4% 13-week measurements. At 9 weeks, mean self-reported total cycle rides increased from 1.6 $\pm$ 3.2 to 6.5 $\pm$ 5.4 per week; cycle commutes increased from 0.7 $\pm$ 1.8 to 3.0 $\pm$ 3.7 and leisure rides from 0.4 $\pm$ 0.7 to 2.2 $\pm$ 1.7 per week. Wellbeing increased from 52.9 $\pm$ 4.1 to 56.1 $\pm$ 4.1.

Conclusions: Multifaceted strategies succeeded in achieving recruitment targets, but session attendance decreased as day-length shortened. Initial results suggest CNP has potential to increase cycling and wellbeing. Findings from four sites will be available in June.





# A combined health action process approach and mhealth intervention to reduce office-workers' sitting time: impact on health-related quality of life outcomes

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#### Motivation and behavior change (SIG)

Purpose: Office working adults represent an at-risk population for high levels of sedentary behaviour (SB), which has been associated with an increased risk for numerous chronic diseases. Recent evidence has also suggested a relationship between greater SB and adverse mental health outcomes, including increased risk of anxiety and depression, and lower health-related quality of life. This study examined the effects of a Health Action Process Approach (HAPA) volitional intervention augmented with tailored text messages targeting reductions in workplace sitting time on work performance and health-related quality of life outcomes. A secondary purpose was to examine relationships between sedentary and non-SBs, and work and health-related outcomes.

Methods: In this two-arm, repeated measure, randomized controlled trial, office workers (Mage=  $45.18 \pm 11.33$  years) were randomized into either a HAPA intervention (n = 29) or control (n = 31) condition. The intervention group received a single behavioural counselling (planning) session, as well as daily sedentary-related text messages over a 6-week period. Work performance and health-related outcomes including role limitations due to physical and emotional health problems, emotional well-being, and energy/fatigue were assessed at baseline and week 6 (post-intervention).

Results: Significant group by time interaction effects, that favoured the intervention group, were found for perceived role limitations due to emotional health problems (p = .031,  $\eta p 2 = .08$ ) and emotional well-being (p = .014,  $\eta p 2 = .10$ ). There was a trend interaction effect for energy/fatigue (p = .072,  $\eta p 2 = .06$ ). Significant time effects were found for role limitations due to physical health problems (p < .001,  $\eta p 2 = .21$ ), energy/fatigue (p = .012,  $\eta p 2 = .10$ ), and work performance (p < .001,  $\eta p 2 = .44$ ). Significant relations were also found between sitting time, standing time, walking time, break frequency and specific health-related outcomes at week 6 (p values< .05).

Conclusions: A behavioural intervention targeting reductions in workplace sitting time may lead to improved emotional well-being and energy/fatigue, and contribute to fewer perceived role limitations due to emotional health problems among office workers.





# Evaluating the feasibility and impact of a high intensity interval training intervention in sedentary adult office workers in the workplace: The Work-HIIT pilot RCT.

**Dr. Narelle Eather<sup>1,1</sup>**, Dr. Mark Babic<sup>1,2</sup>, Dr. Nick Riley<sup>1,2</sup>, Miss Mikeelie Jeffs<sup>1</sup>, Prof. David Lubans<sup>1,2</sup> <sup>1</sup>University of Newcastle, Callaghan, Australia, <sup>2</sup>Priority Research Centre for Physical Activity and Nutrition, Callaghan, Australia

Motivation and behavior change (SIG)

#### Purpose:

Approximately 50% of Australian adults are insufficiently active and over 50% of Australian workers report that they sit often or all of the time at work. High-intensity interval training (HIIT) is a potent and time-efficient mode of exercise that has been shown to elicit physical and mental health benefits in adult populations. However, no previous study has evaluated the efficacy of HIIT delivered for highly sedentary adults in a 'real world' workplace setting. The primary aim of our study was to evaluate the feasibility and impact of the WORK-HIIT intervention on sedentary adults' physical and mental health.

#### Methods:

We conducted the Work-HIIT pilot RCT at the University of Newcastle, Australia, March-July 2019. Participants were sedentary adults 18+yrs (n=  $45.4 \pm 10.7yrs$ ; 41 female) randomized to the Work-HIIT (n=24) intervention on the wait-list control group (n=23). Work-HIIT included a variety of aerobic and muscular fitness exercise combinations lasting 8 minutes (30:30 sec work:rest intervals) and participants attend up to 3 sessions / week for 8-weeks. The primary outcome was cardiorespiratory fitness. Secondary outcomes included muscular fitness, body composition, motivation to exercise, and HIIT self-efficacy. Data were analysed using linear mixed models and Cohen's d effect sizes were calculated. Process evaluation measures were used to assess program feasibility.

#### Results:

There was a small but non-significant treatment effect for cardiorespiratory fitness [+2.9 laps (-4.19-10.14), p=0.403, d=0.34]. Significant and large group-by-time differences were found for muscular fitness [push-ups 3.5 repetitions (95% CI (0.69-6.33), p=0.016, d=0.95; standing jump 10.1cm (95% CI (3.24-17.08), p=0.005, d=1.12]; autonomous motivation [0.23 units (95% CI (0.03-0.44), p=0.024, d=0.76]; and HIIT self-efficacy [16.53 units (8.77-24.30), p<0.001, d=1.57]. No significant intervention effects were found for body composition (p>0.05). Participant ratings showed high levels of perceived benefit and enjoyment. Participants' average heart rate and peak heart rate during sessions were 85.9% HR max. and 92% HRmax, respectively.

#### Conclusions:

Our study provides evidence for the feasibility and preliminary efficacy of Work-HIIT to improve muscular fitness, motivation, and HIIT self-efficacy in sedentary adults. Future research testing of the scalability and sustainability of Work-HIIT via a larger, multi-site program trial is required.





# O.1.12 - Food wars: Behaviours, practices and contexts

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# Urban-regional patterns of food purchasing behaviour: A cross-sectional analysis of the 2015-16 Australian Household Expenditure Survey

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Policies and environments (SIG)

Purpose: In many high-income countries people living in regional areas have higher rates of chronic disease compared to people living in urban areas, with diet a known contributor to these inequities. Food purchasing provides a potential pathway linking residential location with dietary intake and health outcomes. Little is known about geographic differences in food purchasing behaviours. This study examined the relationship between geographic location and food expenditure on a range of foods. This is the first known Australian study to examine the relationship between geographic location and food expenditure.

Methods: Data from the 2015-16 Australian Household Expenditure Survey (n=9827) was used to examine weekly household food expenditure and proportion of total food expenditure on fourteen categories of food items. Foods were classified using the Australian Guide to Healthy Eating. Two-part models and zero-one inflated beta regression models were used to assess the association between geographic area and food expenditure.

Results: Average fruit expenditure was more for households located in major cities (\$13.35, 95% CI = 12.28;14.41) compared to households located in inner regional (\$11.81, 95% CI = 10.67;12.96) and outer regional areas (\$11.31, 95% CI = 10.13;12.48). Furthermore, compared with households located in major cities, households located in inner and outer regional areas spent less on fresh fruit, fish and meals out. Households located in outer regional areas spent less on all core foods except meat. Households located in inner regional areas spent more on sweet cakes, biscuits, puddings, desserts, chocolate and ice-cream compared to households located in major cities and outer regional areas.

Conclusions: The geographic patterns in food purchasing suggest those in regional areas may be at risk of diets less aligned with healthy guidelines. By examining food purchasing patterns across urban and regional areas, this study has enhanced understanding of potential factors contributing to health disparities for people living in regional areas. Given the known geographic differences in diet and health and findings of this study suggesting geographic differences in food purchasing, further research is warranted to determine the drivers of food purchasing behaviours in regional areas.





# Impact of a state-wide policy on New South Wales (NSW) hospital staff and visitors' food purchasing behaviours

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#### Policies and environments (SIG)

Purpose: To examine changes in NSW hospital staff and visitors' food purchasing behaviour following the introduction of an innovative state-wide policy, which aimed to increase the availability and promotion of healthy food for sale in NSW hospitals.

Methods: Two repeated cross-sectional surveys were conducted in 10 randomly selected NSW hospitals in March-May 2018 and again in April-June 2019, following the target date for initial implementation (1 January 2019). The time period represented the initial phase of an ongoing intervention. Interviewer-administered intercept surveys were conducted with hospital staff and visitors at hospital entrances and main cafés, including questions on awareness, support, and usual purchasing behaviour, and observations of foods purchased (café only). Food items were coded as 'Everyday' (healthy) or 'Occasional' (unhealthy). Mixed effects logistic regression analyses explored the difference in 'Everyday' food items purchased over the initial intervention period, controlling for sex, staff/visitor status, age group and education.

Results: Most staff (91.1%) and visitors (89.8%) supported the policy. There were significant increases over the study period in awareness of the policy, for both staff (29.3% vs 59.2%; p<0.0001) and visitors (15.8% vs 34.9%; p<0.0001), and for staff, noticing more healthy food items for sale (38.0% vs 57.5%; p=0.0007). Of 3,551 food purchases observed, the proportion of 'Everyday' items increased slightly in this period (56.3% vs 59.2%; p=0.3). 'Everyday' purchases increased slightly for snack items (36.0% vs 40.0%; p=0.5), hot meal items (55.9% vs 57.4%; p=0.4), and cold meal items (85.3% vs 91.6%; p=0.1). Visitors, younger adults (18-35 years), and non-tertiary educated participants were significantly less likely to purchase 'Everyday' food items than staff (OR 0.8 95%CI 0.7-0.9), older adults (aged 55+) (OR 0.7 95%CI 0.6-0.9), and tertiary educated participants (OR 0.7 95%CI 0.6-0.9), and tertiary educated

Conclusions: This study shows promising short-term impacts of a policy implemented at scale, with significantly increased staff and visitor awareness of more healthy food availability, and a slight increase in 'Everyday' food item purchases. Longer-term follow-up is recommended, with continued efforts targeting 'Everyday' healthy food availability and promotion.





# Assessing the consumer nutrition environment for the implementation and adoption of recommended policy, system and environmental practices within food pantries in Illinois

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Policies and environments (SIG)

#### PURPOSE

Within the United States, food pantries are one support service for food insecure individuals to obtain food at no cost. Many individuals experiencing food insecurity have compromised diet quality which can lead to poor health. There is support that the broader consumer nutrition environment (CNE) of the pantry can influence patrons' food selections and could play a role in addressing dietary quality. This research describes the implementation and adoption of recommended policy, system, and environmental (PSE) supports that influence the pantry CNE, specifically using a validated assessment tool, Nutrition Environment Food Pantry Assessment Tool (NEFPAT). While others have described adoption of specific recommendations qualitatively, this research quantitatively describes the implementation and adoption across multiple recommendations for a statewide network of pantries.

#### METHODS

The study included a sample of pantries in Illinois that were interested in receiving programming support in FY2019. The repeated measures design included a baseline NEFPAT assessment, support to implement PSE interventions, and NEFPAT post-assessment. The NEFPAT measured the implementation of recommended practices, scored as one point for each practice (total = 47). Pantries self-selected into the intervention, consisting of technical assistance, where adopted recommended practices were logged into a database.

#### RESULTS

61 pantries completed a baseline assessment, scores ranged from 9-40 (Mean 22.62). 233 recommended changes were adopted across 54% of pantries. The greatest frequency of adopted recommendations was at the supply-level or using promotion tactics. Policy adoption was most infrequent (n=16). 31 pantries completed a post-intervention assessment, scores ranged from 16-41 (Mean 28.45), for an average score improvement of 5.83.

#### CONCLUSION

Overall there was modest implementation of recommended practices within the CNE for study pantries. During the intervention, pantries were most likely to adopt supply-level and promotion practices in the CNE. The higher adoption of these practices may indicate they are more feasible for pantries to implement. As changes across PSE levels are important to improve the CNE, this information of pantry uptake will empower implementation support staff to understand which recommendations to first implement before engaging on more complex levels. More pantries adopting various PSE practices could greatly impact the diet quality of pantry clients.





# Walkability and energy intake: Moderating effects of area-level socioeconomic status

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#### Policies and environments (SIG)

Purpose: While walkable neighbourhoods are beneficial for active living, some adverse associations between walkability and cardio-metabolic health indicators have been reported. Potential explanations include detrimental health impacts of other behaviours that may take place in walkable neighbourhoods, such as dietary behaviours. Since walkable neighbourhoods have more commercial destinations, residents of such neighbourhoods may have easy access to unhealthy food outlets. We examined the association of walkability with energy intake; and, potential moderating effects of area-level socioeconomic status (SES) on this association, given that accessibility of unhealthy food outlets have been found different by area-level SES.

Methods: We used the 2011–12 wave of the Australian Diabetes, Obesity and Lifestyle Study (AusDiab3) data from 2,354 participants (54% women, mean age = 63.0 years) who had not changed their residential locations since the 1999-2000 baseline survey. The outcome variable was daily energy intake (kJ/day) assessed using a food frequency questionnaire, and higher values reflected the consumption of energy-dense foods. A walkability index was calculated, using dwelling density, intersection density, and destination density, all within 1 km street-network buffer around participants' residence. Area-level SES was determined from Census data. Multilevel linear models estimated main and interaction effects.

Results: The average energy intake was 7087.8 kJ/day. After adjusting for potential confounders, walkability was not associated with energy intake (b= -81.8 kJ/day, p = 0.154). We found statistically significant interactions of walkability and area-level SES with energy intake (p = 0.003). Higher walkability was associated with lower energy intake in high SES areas (b= -276.4 kJ/day, p = 0.055), whereas higher walkability was associated with greater energy intake in low SES areas (b= 433.4 kJ/day, p = 0.018).

Conclusions: These findings suggest that dietary behaviours may also contribute partially to the relationship of walkability with cardio-metabolic health. However, the role of dietary behaviours may differ by area-level SES. The development of walkability-focused strategies to reduce the burden of cardio-metabolic diseases should take into account multiple health behaviours, which may differentially influence the disease risk.





# Is urban growing of fruit and vegetables associated with better diet quality and what mediates this relationship?

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#### Policies and environments (SIG)

Objective: Urban agriculture (UA), the growing of fruits and vegetables in urban and peri-urban areas, has potential as a means of improving food security, public health and dietary quality on both a broad and personal scale. However, there is little research on the relationship between UA and diet, and potential mediating factors are also unclear. The purpose of this study was to assess if proximity to and engagement with UA is associated with healthy and sustainable dietary choices and what accounts for this relationship.

Methods: UK-based adults (N=583, 69% Female) completed measures of proximity to and engagement with UA, perceived access to fruits and vegetables, health and ethical food motivations, connection with nature, psychological distress and dietary quality in an online survey. Participants were recruited from UA-related groups and the general public. The study protocol and analysis plan were preregistered via Open Science Framework: https://osf.io/4zrhy/

Results: Proposed relationships were analysed using a structural equation model (CFI=.948, IFI=.949, NFI=.932, RMSEA=.070, SRMR=0.719). Greater proximity to and engagement with UA was associated with greater perceived access to fruits and vegetables (B=.017, SE=.004, p<.001), more health-related food choice motivations (B=.003, SE=.001, p<.001), more ethical-related food choice motivations (B=.008, SE=.001, p<.001), feeling more connected with nature (B=.009, SE=.001, p<.001) and, unexpectedly, with greater psychological distress (B=.032, SE=.014, p=.027). More health-related food choice motivations were, in turn, associated with better diet quality (B=2.541, SE=.515, p<.001), as was more ethical food choice motivations (B=.887, SE=.431, p=.039). The direct pathway between proximity to and engagement with UA and diet quality (i.e. not including the mediators) was not significant (p=.665).

Conclusions: Results indicate that proximity to and engagement with UA is associated with better dietary quality, and this was partly explained by healthier and ethical food choice motivations. Upscaling UA may have benefits for dietary quality via these factors, and more research is needed to test these causal relationships and to understand these complex interactions.





# Tongan Children's Beverage Availability and Consumption: A Wearable Camera Study

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#### Policies and environments (SIG)

Purpose: Sugar-sweetened beverage (SSB) availability is a key driver of SSB consumption, and in turn, noncommunicable diseases (NCDs), including obesity, type 2 diabetes and dental caries. Most Pacific Island Countries and Territories (PICTs), including Tonga, are in the midst of a NCD crisis. Little is known about Tongan children's SSB availability and consumption. Using wearable cameras, this study aimed to objectively assess the nature of the drinks available to, and consumed by, Tongan children from the capital Nuku'alofa and the island of Ha'apai, which is less impacted by westernisation.

Methods: In 2016-17, 38 randomly-selected children (aged 11y) from Nuku'alofa (n=19) and Ha'apai (n=19) wore wearable cameras that captured images every 7s over three days (Friday – Sunday). Image data were coded and analysed using content analysis to determine drink type, and the children's daily beverage availability and consumption. Tongan researchers led the research in partnership with the Tonga government.

Results: On average, drink availability was higher for children from Nuku'alofa (12.0 (95% CI 9.8, 14.8) than from Ha'apai (6.9 (95% CI 5.7, 8.5). Significantly more non-core drinks (predominantly SSBs) were available to Nuku'alofa children (4.9 (95% CI 3.4, 7.1)/day) than Ha'apai children (1.2 (95% CI 0.8, 1.8)/day). Reflecting this difference, children from Nuku'alofa consumed 0.7 (95% CI 0.4, 1.2) non-core drinks/day and Ha'apai children consumed 0.5 (0.3, 0.8) non-core drinks/day. Non-core drinks were most commonly available at the fale koloa (convenience store), home and supermarket; they were also available in schools.

Conclusion: SSB availability and consumption is higher among Tongan children from Nuku'alofa, than from Ha'apai, an island. SSBs were available in all locations in which the children spent time. The findings suggest the impact of westernisation in Tonga. They support efforts by the Tonga government to implement healthy drink policies, and to maintain/increase taxes on, and/or ban the importation of, sugary drinks, and provide evidence for Tonga's new NCD Strategy 2020-25. The findings also support the implementation of the Pacific Legislative Framework for NCDs and are likely relevant to other PICTs.





# O.1.13 - Disease prevention and management in adults

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# Impact of a gender-tailored, eHealth weight loss program for men with depression: The SHED-IT: Recharge randomised controlled trial

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#### Disease prevention and management

Purpose: Obesity and depression are major, inter-related health concerns for men, yet most men with these conditions are reluctant to seek help. Gender-tailored lifestyle programs have shown potential to improve men's physical and mental health, but none have included specific mental health strategies or targeted men experiencing mental illness. This study investigated whether an eHealth weight loss program with integrated mental health support could improve the weight and mood of men with overweight/obesity and depression.

Methods: Overall, 125 men (mean weight=103.8 kg (SD 15.8), age=48.3 years (SD 11.7)) were recruited for a 6-month RCT. All men were overweight/obese (BMI >25kg/m2) and experiencing mild (55%) or moderate-to-severe (45%) depression according to the validated Patient Health Questionnaire (PHQ-9). Men were randomised into i) the SHED-IT: Recharge group (n=62), or ii) a wait-list control (n=63). The 3-month eHealth program was adapted from the evidence-based SHED-IT program, but the content was tailored for men with depression and supplemented with interactive online modules featuring cognitive behavioural techniques targeting mental health (e.g., cognitive reframing). The primary outcomes were weight and depressive symptoms (PHQ-9). Secondary outcomes including MVPA, sleep quality, and risky alcohol consumption were measured with validated scales. Men were assessed at baseline (September 2019) and 3 months (December 2019, primary endpoint), and will be followed up at 6 months (March 2020).

Results: Intention-to-treat linear mixed models identified medium-sized treatment effects at post-test for weight (adjusted mean difference -2.6 kg, 95%CI -4.3,-0.8, d=0.5) and depressive symptoms (adjusted mean difference -2.5 units, 95%CI -4.4,-0.7, d=0.5). Significant (p<0.05) intervention effects were also observed for MVPA (d=0.4), sleep quality (d=0.4), and risky alcohol consumption (d=0.5). On a scale of 1-Poor to 5-Excellent, the mean (SD) program rating was 4.4 (0.7).

Conclusions: Among men with depression, a gender-tailored, eHealth program that combined behavioural weight loss advice with specific mental health support generated significant, short-term improvements in weight loss and mood. These effects are particularly meaningful given men are traditionally hard to engage in weight loss and mental health research. The program was also completely self-directed, which greatly increases its potential for dissemination, particularly to men in regional and remote areas.





# The contribution of physical inactivity and socioeconomic factors to the rise of type 2 diabetes in Nepal: a structural equation modelling analysis

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Disease prevention and management

#### Background

Type 2 diabetes mellitus (T2DM) is emerging as a major public health challenge in Nepal. Increasing physical inactivity, rising overweight and obesity levels, changing dietary patterns along with economic transition, industrialisation, rural-to-urban migration and urbanisation are creating environments conducive for developing T2DM. Understanding the pathways between physical activity and social position to T2DM is crucial for designing effective prevention programs.

#### Methods

This study analysed cross-sectional data from 1977 Nepalese adults aged 40-69 years from the 2013 WHO STEPwise approach to surveillance survey. Participants' fasting blood glucose level was used to ascertain their diabetes status. Structural equation modelling, with adjustment for the complex sampling design, was conducted to identify the regression pathways between physical activity, social position, anthropometric and metabolic variables and T2DM.

#### Results

The overall prevalence of T2DM was 7% with almost double the burden among urban residents (13%). The prevalence was greater among males (9.8%) compared to females (5.5%). After adjusting for the effects of age, sex and place of residence, standardised path coefficients indicated that social position (0.380), waist circumference (0.204), triglycerides (0.087) and hypertension (0.152) had a statisticallysignificant direct effect on T2DM. We also found a positive direct effect of social position on body mass index (0.638), waist circumference (0.134), triglycerides (0.208) and total cholesterol (0.189) and a negative effect on physical activity (-0.303). Physical activity had a negative direct effect on waist circumference (-0.068), total cholesterol (-0.070) and hypertension (-0.064) and an indirect effect on T2DM mediated by waist circumference (-0.014).

#### Conclusion

Among Nepalese adults, the higher social position has a significant direct effect on T2DM, while both physical activity and higher social position have significant indirect effects. In addition to having its own direct effect on T2DM, waist circumference was an important mediating variable of the indirect effects of social position and physical activity on T2DM. Policies and programs to address T2DM in Nepal should address the factors contributing to unhealthy weight status, particularly among those of higher social position.





# Does having a seated or height-adjustable desk make a long-term difference to health and productivity at workplace?

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#### Disease prevention and management

Purpose: Workplaces are often stressful and competitive environments with and in some cases where sitting options are the only options during working hours. Epidemiological studies have shown that prolonged sitting is associated with morbidity and mortality due to cardiovascular diseases as well as all-cause mortality. Energy expenditure at work can be achieved by periodically interrupting sitting through changing in posture, standing, or brief bouts of walking. This study aims to determine the long-term effects of using height-adjustable standing desks on health, wellbeing and productivity.

Methods: Mixed-methods, quasi-experimental study was conducted with 32 University employees aged  $48 \pm 9$  years (n = 20 experimental, n = 12 control) in Auckland, New Zealand. Time spent sitting, standing and stepping was monitored with the ActivPAL3TM inclinometer for seven days. The Health at Work Questionnaire assessed perceptions of productivity, health and wellbeing. Semi-structured interviews were conducted and coded, and themes extracted using thematic network analysis.

Results: There were no statistically significant differences between the two groups in sitting, standing and stepping time and step count. Significant differences were found in the number of transitions but an unexpected direction. The SITTING group transitioned from sitting to standing on average  $59 \pm 16$  times (p = 0.036, overall) and  $34 \pm 15$  times (p = 0.023, office hours) compared to the STANDING group, who transitioned  $46 \pm 14$  (overall) and  $22 \pm 9$  (office hours). The STANDING group had a significantly (p = 0.002) lower heart rate ( $64 \pm 6$  beats/min) compared to the SITTING group ( $73 \pm 8$  beats per minute). The SITTING group evaluated themselves as performing better at work compared to others (p=0.05). Analysis of qualitative data showed the following dominant themes: i) The height-adjustable desks allowed for different needs to be met and provided options for use and ii) There were barriers and facilitators of the use of height-adjustable desks relating to physical health, work, internal administrative processes, and information for use.

Conclusion: Height-adjustable desks may have some effect on total steps and health long term. A larger sample is needed to substantiate these results.





# Modifiable risk factors and major chronic diseases among immigrants and Australian born adults: a longitudinal investigation

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#### Disease prevention and management

Purpose: Overall 7.3 million immigrants living in Australia. There is very diminutive information available for the prevalence of chronic diseases and risk factors about immigrants in the Australian setup. The first aim of this study was to measure and compare the prevalence of risk factors and chronic diseases in the immigrant and Australian born population. The second aim was to examine the trajectories of these diseases and risk factors over a period of nine years.

Methods: This study used data from five waves (2007, 2009, 2011, 2013 and 2016) of a longitudinal survey of 11,035 (40-to 65-y-old; 55% female at baseline) residents in Brisbane, Australia. Disease burden was assessed using major chronic conditions of cancer, diabetes, coronary heart diseases, emphysema, and asthma. The major modifiable risk factors were excessive weight (BMI  $\ge$  25), insufficient physical activity (PA<600 MET-min per week), and cigarette smoking. The participants were divided into three groups: Australian born, immigrants from high-income countries (HIC), and immigrants from low-middle-income countries (LMIC).

Results/findings: There was an increase in the prevalence of cancer, diabetes and heart diseases during nine years, whereas emphysema and asthma showed a slight decline in some waves. The rates of cancer were consistently higher among participants born in Australia (8.1% in 2007 to 27.7% in 2016) and HIC immigrants (6.1 to 22.7%) than those from LMICs (2.9% to 8.0%). The prevalence of diabetes at each time point was higher in LMIC immigrants (9.6% in 2016) than Australian born (7.4%) and HIC immigrants (7.6%). The proportion of current smokers was lower in LMIC immigrants (12.2% to 6.4%) than the Australian born (16.5% to 7.4%) and HIC immigrants (14.9% to 7.2%). Insufficient physical activity was consistently higher among LMIC immigrants (44.9% in 2016) than their Australian born counterparts (41.3%) and HIC immigrants (38.3%).

Conclusions: This study provides information about levels of chronic diseases and risk factors in immigrants and Australian born adults. Further research is needed to understand the disparities of chronic diseases and risk factors in the Australian population's groups.

Keywords: immigrants, chronic disease, risk factors, Australia.





# Green space, physical activity, and mental well-being in young people: A systematic review and structural equation model

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#### Disease prevention and management

Purpose: Green space is theoretically a valuable resource for physical activity and has the potential to contribute to improving mental well-being. The aims of this study were: (1) to determine the evidence for the associations between green space and adolescents' mental well-being (and quality of this evidence), and (2) to develop a structural equation model for investigating links between green space and adolescent mental well-being taking into account the potential mediating role of physical activity in this relationship.

Methods: A systematic literature search was conducted in June 2019. Articles were eligible if they were experimental or observational studies (e.g., randomized controlled trial, intervention, cross-sectional, or longitudinal design) exploring the association between green space and adolescents' mental well-being. Exploratory structural equation modeling (SEM) analyses were undertaken using Mplus to explore the direct effects of green space on adolescent mental well-being and its indirect effects through mediating variables.

Results: Fifteen studies met the inclusion criteria and were assessed for quality and strength of the evidence. The majority of papers found weak to moderate associations between green space and mental well-being indicators in adolescents. Three papers indicated that physical activity may have a mediating pathway between changes in green space and benefit outcomes. Based on the results of the systematic review, a structural equation model was developed and tested to analyze the causal mechanisms among green space, physical activity, and adolescents mental well-being.

Conclusions: Green space is positively related to mental well-being in adolescents. The mediating pathway of physical activity on the relationship between green space and mental well-being is an area requiring further investigation. Further research is needed to provide more consistent evidence on the mechanisms of how green space might promote mental well-being among young people.



# O.1.14 - Innovative programmes and interventions to increase physical activity in children

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# Findings from healthy summer learners: A pilot quasi-randomized control trial to stop the summer slide in academics and health

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Children and families (SIG)

Purpose: Weight gain and academic loss during summer are concerns for low-income U.S. children. This may be explained by limited access to health and academic summer programming. This study examined the impact of health and academic focused summer programming on children's health behaviors, BMI z-scores, and reading proficiency.

Methods: Healthy Summer Learners (HSL) a 6-week summer program operated from 8:00am-3:30pm in two lowincome elementary schools. HSL provided reading instruction, physical activity, nutrition education, and breakfast, lunch, and a snack. The schools also operated a 6-week summer program exclusively focused on academics that provided breakfast and lunch. Participants (N=193, 6-9 years) attended HSL (n=60), academic-only (n=67) or no program (control, n=66). Height and weight and reading percentile on a standardized national test were collected before and following summer. Fitbit Charge 2© measured participants' physical activity and sleep while parents reported their child's diet and screen time twice weekly throughout summer. Daily logs tracked attendance for HSL and academic-only programs; parents of control children reported summer program attendance via daily diaries. Multilevel linear regression estimated differences in behaviors on program days and changes in reading percentiles and BMI z-score over the summer.

Results: On days children attended a summer program, children engaged in statistically significantly(p<0.05) more MVPA, less sedentary, and less screen time, while going to bed and waking earlier than control children. Intent-to-treat analysis showed no statistically significant group-by-time differences in BMI z-score or reading percentiles. As treated analysis (accounting for HSL and academics-only children who never attended and control children attending structured summer programming) showed children who attended a program during the summer gained - 0.08 (95CI=-0.15, -0.02) less BMI z-score than those not attending a program, but no difference in reading percentile changes.

Conclusions: Attending structured programing, regardless of program focus, can impact children's health behaviors and zBMI during the summer. Strategies to increase attendance at these programs are needed if they are to impact all children.





# Effects of a curriculum-integrated dance programme on children's physical activity: A mixed methods study

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Children and families (SIG)

Purpose: Curriculum-integrated dance programmes are an under-researched strategy to increase children's physical activity, particularly in the New Zealand (NZ) primary school context. The purpose of this study was to evaluate an integrated dance intervention on NZ schoolchildren's physical activity (PA), and to explore children's perceptions of dance as a form of learning and fitness.

Methods: A total of 134 schoolchildren aged 8 - 9 years were recruited from four primary schools in Auckland, NZ. Each school was randomly assigned to either the dance group (DG; n = 78) or the control group (CG; n = 56). The DG participated in a six-week, curriculum-integrated dance programme with their teacher during school time. In addition to focussing on curricular learning (such as science, mathematics, English, and Māori culture), the dance programme also embedded activities related to fitness and coordination. The intensity of PA varied according to the focus of each dance session. PA was measured at baseline and post-intervention using waist-mounted ActiGraph GT3X+ accelerometers for eight consecutive days.

DG participants also shared their perceptions of the dance programme through journal reflections and focus group interviews. Intervention effects on sedentary, light, moderate, and vigorous physical activity and daily step counts were examined using generalised linear models. Qualitative data from children's journal writing and focus group interviews were coded and thematically analysed.

Results: There were no significant effects of the dance programme on step counts or PA levels; however, DG children did perceive the dance programme to be a form of intense physical activity as themes pertaining to fitness, energy, movement, and exercise emerged. This overlapped with other themes related to cognition and curricular learning.

Conclusions: While the dance programme in this study did not influence daily physical activity, qualitative findings suggested that children felt energised and active after the dance sessions. This adds to the literature surrounding children's perceptions towards movement-based learning and embedding dance into primary school teaching.





# From "Stop running" to "Let's go play": Impact of a brief staff training intervention on children's physical activity during an after school program

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#### Children and families (SIG)

Purpose: After school programs are a promising setting to promote children's physical activity (PA). However, program staff may lack the motivation or capacity to structure the environment or implement evidence-based strategies to promote PA. The purpose of this study was to evaluate the impact of a brief staff training based on contemporary theoretical approaches on PA among children attending an after school program.

Methods: Two Boys and Girls Club (BGC) after school sites participated in this quasi-experimental study. Four days of data were collected from each site in February 2019 (baseline) and May 2019 (follow-up). Data collection included accelerometer-measured PA of participating children (n=27 per site) and direct observation of BGC staff behaviors (frequency of PA encouragement and discouragement). Following baseline data collection, BGC staff at site 1 attended a 30-minute training, which incorporated principles from the Theory of Expanded, Extended, and Enhanced Opportunities (TEO) and the Supportive, Active, Autonomous, Fair, Enjoyable (SAAFE) framework. Staff identified strategies to allocate more time to PA and free play and facilitate a variety of games to promote PA among all children. Site 2 served as a comparison group. Changes in sedentary time, light activity, and moderate-to-vigorous physical activity (MVPA) were compared between sites using independent samples t-tests (alpha = 0.05). Children with at least two days with >30 minutes of wear time at both time points were included in a complete case analysis.

Results: Significant differences between sites were observed for all variables. Relative to the comparison group, children at the intervention site decreased sedentary time by 14.4 min/day (p=.04, 95%CI=1.3-27.7 min/day), and increased light activity and MVPA by 8.8 (p=.007, 95%CI=2.7-14.7 min/day) and 6.8 minutes (p=.002, 95%CI=2.9-10.7 min/day), respectively. The ratio of staff encouragement to discouragement improved from 40% to 94% at site 1, compared to 51% and 59% at site 2.

Conclusions: The application of TEO and SAAFE principles with leaders of an after school program shows promise for increasing children's PA in this setting. Future studies should examine the effectiveness of these approaches across a wider range of after school programs and explore sustainable strategies for conducting staff training.





# Feasibility of increasing physical activity in the entire family using activity trackers and apps: The Step it Up Family Program

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Children and families (SIG)

Background: Interventions using advanced activity trackers and smartphone apps have demonstrated their ability to increase physical activity in children and adults. However, they have not been tested in families. Further, very few family-based interventions have actively involved both parents.

Purpose: This pilot study investigated the feasibility of increasing physical activity in the entire family using agespecific activity trackers and apps. Intervention feasibility was assessed in mothers, fathers and children aged 6-10 years.

Methods: Between May 2017 and January 2019, 40 families participated in the 6-week Step it Up Family Program in Queensland, Australia. Using commercial activity trackers combined with apps (Garmin Vivofit Jr for children, Vivofit 3 for adults), this pre/post intervention included individual and family-level goal setting, self-monitoring and performance feedback, family step challenges, family social support and modelling, weekly motivational text messages, and a face-to-face introductory session. Parent surveys, family telephone interviews and activity tracker/app recordings were used to assess intervention feasibility (recruitment, retention, engagement as per activity tracker and app usage, perceived usefulness). Descriptive statistics and qualitative content analysis were applied for analyses.

Results: Of 76 recruited families, 40 families including mothers (39/98%), fathers (33/83%) and children (58/84%) participated in the intervention. Twenty-nine of the 40 families completed the post intervention survey (73% retention; mothers: 70%, fathers: 58%). Families recorded steps using the activity trackers and apps for an average of 36 out of 42 intervention days (mothers: 37 days, fathers: 36 days, children: 34 days). Most parents (mothers: 96%, fathers: 87%) and children (94%) found the activity trackers useful for increasing their physical activity. Similarly, most parents (mothers: 93%, fathers: 83%) and children (96%) considered the app useful for increasing physical activity. Parents reported that the Step it Up Family Program increased their awareness of physical (in)activity levels in the family, and improved family quality time and connections.

Conclusions: This pilot study demonstrates feasibility of increasing physical activity in the entire family using agespecific activity trackers and apps. Using this technology, both mothers and fathers can be easily and actively involved in a family-based intervention. The findings support the implementation of a RCT to examine intervention efficacy.





# Step it Up Family: Efficacy of an activity tracker-and app intervention to increase physical activity in the entire family

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Children and families (SIG)

Background: Interventions using activity trackers and smartphone apps have demonstrated their ability to increase physical activity in children and adults. However, they have not been tested in entire families. Further, few family-centred interventions have actively involved both parents, and assessed intervention efficacy separately for children, mothers and fathers.

Purpose: This study examined the short-term efficacy of an activity tracker and app intervention to increase physical activity in the entire family (children, mothers and fathers).

Methods: This was a single arm pilot intervention study with pre-post measures. Between 2017-2018, 40 families (58 children aged 6-10 years, 39 mothers, 33 fathers) participated in the 6-week Step it Up Family program in Queensland, Australia. Using commercial activity trackers combined with apps (Garmin Vivofit Jr for children, Vivofit 3 for adults), the intervention included individual and family-level goal setting, self-monitoring, performance feedback, family step challenges, family social support and modelling, weekly motivational text messages, and an introductory session delivered face-to-face or via telephone. Parent surveys were used to assess intervention efficacy measured as pre-post intervention changes in moderate-to-vigorous physical activity (MVPA) in children, mothers and fathers.

Results: Thirty-eight families completed the post intervention survey (95% retention). At post intervention, MVPA had increased in children by 58 min/day (boys: 54 min/day, girls: 62 min/day; all p<.001). In mothers, MVPA increased by 27 min/day (p<.001), and in fathers, it increased by 31 min/day (p<.001). Furthermore, the percentage of children meeting Australia's physical activity guidelines for children ( $\geq$ 60 MVPA min/day) increased from 34% to 89% (p<.001). The percentage of mothers and fathers meeting Australia's physical activity guidelines for children ( $\geq$ 60 MVPA min/day) increased from 34% to 2150 MVPA min/week) increased from 8% to 57% (p<.001) in mothers, and from 21% to 68% (p<.001) in fathers.

Conclusions: Findings suggest that an activity tracker and app intervention is an efficacious approach to increasing physical activity in entire families to meet national physical activity guidelines. The Step it Up Family program warrants further testing in a larger, randomised controlled trial to determine its long-term impact.





# Family influences on physical activity: Positive associations between parent and child activity levels

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**Children and families (SIG)** 

#### Purpose

Participation in physical activity is influenced by social norms and the behaviour of friends and family. Young people have a lot of exposure to their immediate family and it is thought that the health behaviours of their parents may be particularly influential. However, this may vary across the lifespan of a young person and there is limited empirical evidence that substantiates this at a population level. We aim to use existing data to explore the association between parent and child physical activity levels.

#### Methods

We examined data for health-enhancing recreational physical activity duration from the nationally representative 2016-2019 Active NZ survey. We matched the data of young people with that of an adult parent living in the same household (n=8,837 pairs). We used logistic regressions to examine whether a parent meeting national physical activity recommendations (150minutes/week) was associated with their child's physical activity levels adjusted for age, sex, education and ethnicity. We repeated this analysis for incremental increases in the adult's weekly physical activity duration and also stratified according to school-level (primary, intermediate, secondary).

#### Results

There was a positive association between child physical activity duration and whether their parent met the national recommendations (OR=1.44, 95%CI:1.31-1.58). A parent doing any physical activity was also positively associated with child physical activity levels (OR=1.30, 95%CI:1.17-1.44). This association strengthened as the weekly duration of parent physical activity increased to 60-minutes (OR=1.35, 95%CI:1.22-1.50), 120-minutes (OR=1.36, 95%CI:1.23-1.50), 180-minutes (OR=1.46, 95%CI:1.33-1.60), and 240-minutes (OR=1.57, 95%CI:1.43-1.72), before weakening slightly for 300-minutes (OR=1.53, 95%CI:1.40-1.67) and 360-minutes (OR=1.51, 95%CI:1.38-1.66). The associations with parent physical activity levels were stronger for younger children.

#### Conclusion

Parents who do any physical activity are more likely to have children who are active. The likelihood a child will be physically active appears to increase as their parent's physical activity duration increases in hourly increments up to four hours at which point it plateaus. The influence of parental physical activity behaviour appears to reduce as their children get older. Further research is indicated to establish causation, but our results suggest that family focussed interventions to promote physical activity are likely to be effective in New Zealand.





# O.1.15 - Nutrition and socio-economic inequalities

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# Food security related to depression and anxiety predisposition and anemia among undergraduate Mexican students.

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#### Socio-economic inequalities (SIG)

Several studies have described the impact that Food Insecurity (FIS) has on different factors at a physical, mental and social level, which is also observed in young adults and adolescents. The aim of the study was to describe the association of food insecurity in undergraduate Mexican students with the presence of anemia, and depression and anxiety predisposition.

An online survey was applied to 1329 young students. FIS was assessed by the Latin American and Caribbean Food Security Scale (ELCSA). To asses depression predisposition, the Patient Health Questionnaire (PHQ-9) was used. And for Anxiety the Generalized Anxiety Disorder Scale (GAD-7) was applied. In a subsample of 286 female students, hemoglobin (Hb) was measured by capillary blood with an HemoCue Hb201+.

A food insecurity (FIS) rate of 58.2% was observed, of which 29.4% was low, 19.9% moderate, and 8.9% severe FIS. The prevalence of low Hb was 14.3%. Regarding depression and anxiety predisposition, it was observed in 58.5% and 67.2% of the subjects respectively. 52.1% of the students presented simultaneously depression and anxiety predisposition. That variable was contrasted with FIS, obtaining an OR of 2.642 (95% CI, 2.110 - 3.306).

This study indicates that the predisposition of depression and anxiety among undergraduate Mexican students is highly related to living with food insecurity. It also indicates a relatively high prevalence of low hemoglobin values (anemia). Food insecurity is a matter of great concern for national and international health agencies since it not only has implications on nutritional, but also mental health.





# The independent and combined effects of nudging and pricing on food purchasing behavior in a virtual supermarket setting

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#### Socio-economic inequalities (SIG)

Purpose: There is a need for evidence on what strategies - or combination of strategies - work best in increasing healthy food purchases and consumption, while not enhancing socio-economic inequalities in dietary intake. This study is the first to examine the efficacy of combined nudging and pricing strategies on increasing healthy food purchases and possible differences by socioeconomic position (SEP).

Methods: A randomized study design was used within a virtual supermarket (SN VirtuMart). Participants were exposed to five within-subject conditions (control, nudging, pricing, price salience and price salience with nudging) and randomized to one of three between-subject arms (25% price increase on unhealthy products, 25% price discount on healthy products, or 25% price increases and discounts). 455 participants of low and high SEP (using either education or income as proxy) conducted their weekly shopping in the supermarket for five consecutive weeks. Data were analyzed using linear mixed models.

Results: In total, 346 (76%) adults completed all five shops within the SN VirtuMart. Median age was 32.5, 49.2% had high education and 32.8% had high income. Nudging and pricing strategies alone did not significantly increase healthy food purchase (e.g., in the price increase and discount arm Bnudging = 1.8, 95%CI = -0.1; 3.7 and Bpricing= 0.7, 95%CI = -1.2; 2.6), whereas combined salient price increases with discounts led to an absolute increase in the percentage of healthy food purchases (Bprice salience = 4.5, 95%CI = 2.6; 6.4). Combining salient pricing and nudging strategies led to significant increases in the percentage of healthy products in all three pricing arms, with the largest effect found in the combined price increase and discount arm (Bprice salience and nudging = 4.0, 95%CI = 2.0; 6.0). These effects were not modified by SEP.

Conclusions: Combining price increases of unhealthy foods with price discounts on healthy foods and advertising these price changes (salience), and combining the salient price strategies with nudges increases healthy food purchases. These effects were similar across socioeconomic subgroups. Further research is needed to estimate the effect of combined nudging and salient pricing strategies in real world settings.





# Socioeconomic inequities in cancer morbidity and mortality are partially mediated by modifiable risk factors

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#### Socio-economic inequalities (SIG)

Background: Inequities in cancer morbidity and mortality have been well reported; however, the extent to which these inequities are mediated by modifiable risk factors is unclear. This study aimed to quantify the mediating effects of modifiable risk factors including smoking, excess alcohol consumption, low fruit and vegetable intake, physical inactivity and obesity in associations between socioeconomic position (SEP) and cancer morbidity and mortality.

Methods: We used eight cycles of the nationally representative cross-sectional Canadian Community Health Survey (2000-2011) to identify a cohort of adults ( $\geq$ 35 years) without cancer at the time of study administration (n = 400,250) and followed until March 31, 2012. SEP was measured by creating a latent variable consisting of self-reported education and household income. Self-reported modifiable risk factors including smoking, excess alcohol consumption, low fruit and vegetable intake, physical inactivity and obesity were considered as potential mediators. The outcome was cancer morbidity and mortality and for its ascertainment, the cohort was linked to administrative health data in the Discharge Abstract Database and the Canadian Mortality Database. We used generalized structural equation modeling to estimate mediating effects of modifiable risk factors in associations between low SEP and cancer morbidity and mortality in the total population and stratified by sex.

Results: There was a clear socioeconomic gradient in cancer morbidity and mortality. Modifiable risk factors mediated 45.6% of associations between low SEP and cancer morbidity and mortality. Smoking was the most important mediator in the total population and in males, which respectively explained 15.5% and 42.2% of associations between low SEP and cancer morbidity and mortality. For females, obesity was the most important mediator.

Conclusions: Modifiable risk factors are important mediators of inequities in cancer morbidity and mortality. Nevertheless, over half of these associations remained unexplained. While midstream interventions that target modifiable risk factors may help to alleviate inequities in cancer risk in the short-term, ultimately upstream interventions are needed to reduce and prevent inequities in cancer morbidity and mortality.





# Evaluating the Intersection of Race/Ethnicity & Socioeconomic Status: An Assessment of Food-Away-From-Home (FAFH) Purchasing among U.S. Households

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#### Socio-economic inequalities (SIG)

Purpose: Food-away-from-home (FAFH, a meal or food item prepared for consumption by a commercial or noncommercial institution) continues to make up a large proportion of the American diet. Over 50% of U.S. adults consume at least three FAFH meals per week. This statistic is concerning because FAFH meals are often higher in calories, saturated fat, sodium, and added sugars compared to home-prepared meals. Several studies have reported racial/ethnic and socioeconomic differences in FAFH purchasing, respectively. There is limited understanding of the how the intersection of these two factors influences FAFH purchasing. Thus, the objective of this research is to evaluate the intersection of race/ethnicity and socioeconomic status (SES) in regards to FAFH purchasing among U.S. households.

Methods: We obtained and analyzed cross-sectional data from the United States Department of Agriculture's (USDA) National Household Food Acquisition and Purchase Survey (FoodAPS). This program collected detailed information on food purchases over a 7-day period for 4,826 households between April 2012 and January 2013. The FAFH data contained information on 116,074 food and beverage items purchased by members of these households. We assessed the relationship between race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, and other) and SES (<100%, 100-185%, >185% of the federal poverty line) in regards to several FAFH measures including total money spent (\$), total pounds of food acquired, and sources of FAFH (i.e., grocery store, fast food, etc.).

Results: Preliminary analyses revealed racial/ethnic and SES differences in total money spent and total pounds of FAFH acquired over the 7-day period. Non-Hispanic black and Hispanic households spent less money on FAFH compared to non-Hispanic white households. On average, the amount of money spent on FAFH increased across levels of SES with >185% households spending the most on FAFH. We observed this trend among all households except non-Hispanic black households. Low-income non-Hispanic black households (i.e., <100%) spent more money on FAFH compared to low-income households of other races.

Conclusions: Regression models with interaction terms will assess the intersection of race/ethnicity and SES in regards to FAFH purchasing after adjusting for important covariates such as education level and geographic location.





# Three Years after Environmental Contamination: Racial Differences in City Water Avoidance and Subsequent Sugar Sweetened Beverage Consumption among Low-Income Residents in Toledo, OH, USA

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Socio-economic inequalities (SIG)

#### Purpose:

In 2014, as the Flint, MI lead water crisis began in the USA, the nearby city of Toledo, OH faced a water crisis of its own. A cyanobacteria bloom in Lake Erie (city water supply) caused a neurotoxin called microcystin to contaminate the drinking water. Considering this backdrop and historical racial disproportionality in experiencing environmental contamination, we sought to investigate racial differences in city water avoidance, water intake, and healthfulness of beverage alternatives.

#### Methods:

We collected survey data in 2017 from residents (n=264) in the UpTown neighborhood of Toledo as part of a larger longitudinal impact assessment study. The survey included a brief food-frequency questionnaire/screener, items about city water avoidance, sociodemographics, and other nutritional/health/economic variables. Data were analyzed cross-sectionally using two sample t-tests and chi-squared tests.

#### Results:

Mean age was  $44.9\pm13.8$  years, 66.8% were women, and median annual household income was very low-income (\$7,500). Participants were non-Hispanic black (50.4%), non-Hispanic white (36.7%), mixed race/ethnicity (6.1%), Hispanic/Latino(a) (3.4%), or other races/ethnicities (3.4%). Nearly half (47.0%; n=124) reported avoiding city water; with one-quarter (25.8%; n=68) avoiding due to health/safety concerns, rather than taste/preference (21.2%; n=56). Compared to those not avoiding city water, those avoiding due to health/safety concerns consumed total water significantly less frequently (2.22 $\pm$ 1.06 times/day vs. 1.89 $\pm$ 1.15; p<0.05; Cohen's d=0.303). Compared to non-Hispanic white participants, non-Hispanic black participants were significantly more likely to avoid city water due to health/safety concerns (X2(1, N=184)=10.95, p<0.01). Further, of the sub-sample that avoided city water due to health/safety concerns, non-Hispanic black participants consumed sugar-sweetened beverages significantly more frequently than non-Hispanic white participants (1.57 $\pm$ 1.72 times/day vs. 0.85 $\pm$ 0.90; p<0.05; Cohen's d=0.466).

#### Conclusions:

This study indicates that within in a low-income area in OH, racial differences may contribute to the level of trust about the health/safety of city water. Non-Hispanic black residents avoiding city water due to health/safety concerns were more likely to consume sugar-sweetened beverages; although, it is unclear how generalizable these findings are. As environmental contamination events become more frequent, likely in relation to global climate change, more research is needed to investigate how these events impact dietary behaviors in the short and long term.





# Income Disparities in the Uptake and Awareness of a Non-Refundable Tax Credit to Increase Children's Participation in Physical Activity in Alberta, Canada

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#### Socio-economic inequalities (SIG)

Purpose: Tax credits are suggested as one type of economic instrument to alleviate financial barriers to physical activity (PA). We examined potential income disparities in the (1) awareness and uptake of the Child Fitness Tax Credit (CFTC) in Alberta, Canada in 2012 and 2014, and (2) differences in PA and sport participation of children from families who did and did not claim the credit.

Methods: Secondary analyses of three cross-sectional datasets of grade five students (10-11 years) were used, including APPLE Schools in 2012 (N=1037), and Real Kids in 2012 (N=2676) and 2014 (N=3125). For all datasets, parents reported whether they claimed the CFTC in the previous year, their education and household income, and their child's gender and organized PA from the previous year. Children self-reported their PA from the last 7-days. In APPLE Schools the children also wore time-stamped Omron pedometers for 8 consecutive days. Analyses included chi-square difference tests, and linear and logistic regressions controlling for clustering within schools, child gender, parent education, and household income.

Results: Between 57-70% of parents reported claiming the CFTC in the previous year, and 87-91% were aware of the credit. However, higher income families were more likely to be aware of and to have claimed the credit compared to low income families. A logistic regression analysis showed that children whose parents claimed the credit were more likely to engage in organized PA at least once per week (main effect; OR=3.27-4.25, ps<.01). However, this varied by household income (interaction effect), with the difference in organized PA participation between those who did and did not claim the credit being lower for families who made <\$50,000/year (OR=3.27-4.25, ps<.01) compared to families who made >\$50,000/year (OR=8.73-9.45, ps<.001). No other effects were observed.

Conclusions: Though the CFTC had some impact on organized PA, it had no impact on overall PA or steps. Furthermore, a clear income disparity exists in the awareness and uptake of the CFTC. Due to the income disparities evident with the CFTC, and the lack of impact on overall PA, this policy is not recommended as an economic instrument to facilitate PA.





# O.2.16 - Time use in children

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# Reallocating sedentary time with total physical activity and physical activity accumulated in bouts: Associations with children's cardiometabolic biomarkers using isotemporal substitution

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Children and families (SIG)

Purpose: There is emerging evidence that the way in which total physical activity is accumulated may be important for health. However, little is known about whether replacing sedentary time with time in physical activity bouts of varying intensities is beneficial for the cardiometabolic health of children with healthy weight or overweight. This study investigated the theoretical effects of reallocating a specific amount of sedentary time with an equal amount of time in total physical activity and physical activity bouts of varying intensities on children's cardiometabolic risk biomarkers, and examined whether this varies by weight status.

Methods: Children aged 8-9 years (n=599) from 20 primary schools in Melbourne, Australia, participated in the Transform-Us! study (2010). Children were included if they had complete accelerometer and blood biomarker data (high-density lipoprotein cholesterol [HDL-C]; low-density lipoprotein cholesterol [LDL-C]; triglycerides [TG]; homeostatic model assessment of insulin resistance [HOMA-IR]). Isotemporal substitution models assessed the theoretical impact of replacing 10 minutes of sedentary time with 10 minutes of physical activity or physical activity in bouts of varying intensities on cardiometabolic health risk factors. Analyses were conducted for the whole sample and stratified by weight status.

Results: Overall, 169 children (age 8.7 [0.4] years; 55.6% girls; 66% healthy weight) were included in the analyses. Replacing sedentary time with 10 minutes of vigorous-intensity physical activity (VPA), regardless of manner of accumulation, was associated with lower TG levels in the whole sample (0.96; 95% CI: 0.93, 1.00). Replacing sedentary time with VPA accumulated in bouts was associated with better HDL-C (1.04; 95% CI: 1.00-1.09) and TG (0.95; 95% CI: 0.91-1.00), and worse HOMA-IR (1.17; 95% CI: 1.05-1.29) in in children with a healthy weight only.

Conclusion:Replacing sedentary time with MPA and VPA, regardless of accumulation pattern, may have some benefits on cardiometabolic health. This was mostly observed among children with healthy weight; few associations were observed for children with overweight/obesity. No associations were found for replacing sedentary time with LPA. The findings suggest interventions should focus on replacing sedentary time with higher intensity activities to benefit children's cardiometabolic health.





# Relationships between 24-hour movement behaviours and mental health in English primary school children

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**Children and families (SIG)** 

#### Purpose:

Twenty-four hour movement behaviours represented by sleep, sedentary behaviour (SB), light physical activity (LPA), and moderate-to-vigorous physical activity (MVPA) may influence child mental health, which is underresearched relative to indicators of physical health. The study aims were (1) to examine the relationships between 24-hour movement behaviours and indicators of mental health in English primary school children, and (2) to investigate the predicted differences in mental health outcomes when time was reallocated between the movement behaviours.

#### Methods:

Wrist-mounted accelerometers were worn continuously for 7-days by 132 children (66 boys) aged 9-10 years. Following processing, estimates of time spent sleeping, and in SB, LPA, and MVPA were calculated. Questionnaires were used to assess social and emotional wellbeing (SEW), prosocial behaviour (PSB), depression symptoms (DEP), and self-esteem (SE). To account for the mutually exclusive and co-linear nature of the movement behaviours compositional data analysis was used to express the movement behaviours in relative terms as isometric log-ratio coordinates. For aim 1, regression models adjusted for sex, age, parental education level, and BMI examined the influence of each movement behaviour on the outcomes, relative to the other behaviours. For aim 2 differences in mental health outcomes between the baseline composition and new compositions when 15 minutes was added to each movement behaviour in turn was calculated.

#### Results:

Movement behaviours did not significantly predict SEW, DEP, and SE. PSB was significantly predicted by sleep ( $\beta$ = 3.26 (1.36), p=.018) and SB ( $\beta$ =-3.05 (1.12), p=0.007). The greatest predicted changes in mental health outcomes were observed when MVPA increased by 15-minutes with a proportional 15-minute decrease in the remaining behaviours. Specifically, there were favourable predicted changes in SEW (-0.25), DEP (-0.68), and SE (+0.51). Moreover, adding 15-minutes to SB reflected a predicted 0.12 decrease in PSB, while allocating this time to sleep resulted in a 0.12 predicted increase.

#### Conclusions:

The relationships between 24-hour movement behaviours and mental health of the children in this study were equivocal. The exception was prosocial behaviour which was significantly related to sleep and SB. Time reallocations suggested that increasing MVPA may have a favourable influence on some mental health outcomes.





# Associations between 24-hour time use and academic achievement in Australian primary school-aged children

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#### Children and families (SIG)

Purpose: Previous research has examined associations between individual activity behaviours (e.g. sleep, screen time and physical activity) and academic achievement. Yet, activity behaviours should be analysed together because they are co-dependent parts of the 24-h day. This study used compositional data analysis to examine associations between all daily activity behaviours and academic achievement.

Methods: Child Health CheckPoint was a cross-sectional study nested between waves 6 and 7 of the Longitudinal Study of Australian Children. Included participants were 963 children aged 11 to 12 years (mean age 12.0 years (SD=0.4); 50% male). Objective daily activity behaviour data (sleep, sedentary time, light and moderate-to-vigorous intensity physical activity) were collected using 8-day, 24-hour wrist worn accelerometry (GENEActiv). Daily time use was also assessed across 7 super domains (sleep, screen time, physical activity, school related, domestic/social, passive transport, quiet time) using the Multimedia Activity Recall for Children and Adolescents (MARCA). Recalls were completed on at least one school day and at least one non-school day. Academic achievement was assessed using a nationally administered standardised test in literacy (spelling, grammar and punctuation, writing and reading) and numeracy. Compositional models (adjusted for age, sex, socioeconomic position and pubertal development) regressed isometric log ratios of activity behaviours against academic scores. We used the models to estimate academic achievement for every possible daily activity mix (in 10-minute increments) within the empirical range. Estimated outcomes were plotted against incrementally increasing min/d for each individual activity component and loess curves were fitted.

Results: Both accelerometry and MARCA activity behaviour compositions were associated with all academic outcomes (all models  $p \le 0.02$ ). Accelerometry showed less light intensity physical activity, longer sleep and more sedentary time to be beneficially associated across all academic outcomes. The MARCA showed more time spent in school-related behaviour, and less screen time and physical activity was consistently positively associated with all domains of academic achievement.

Conclusion: Results suggest that spending more time in sleep and school-related behaviours, whilst reducing screen time and light intensity physical activity may contribute positively to academic achievement. This finding warrants further investigation given the known physical and mental health benefits associated with physical activity.





# 'Social Screens' and 'the Mainstream': longitudinal competitors of nonorganized physical activity in the transition from childhood to adolescence

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#### Children and families (SIG)

Purpose: Physical activity (PA) tends to decline during late childhood and adolescence. In Australia, this decline has been shown to occur particularly in non-organized PA (e.g. active play and informal sport). Using a social marketing approach, market segments (segments of youth) may be identified and targeted based on their profile of alternative activities that compete with non-organised PA during the transition to adolescence. This study aimed to identify and describe segments of youth whose participation in non-organized PA declined between 11 and 13 years, based on changes in other potential competing activities during this period.

Methods: Data were sourced from Waves 4 and 5 of the Longitudinal Study of Australian Children. Participation in non-organized PA and thirteen alternative activities (e.g. video games, homework, sleep) were measured using 24-hour time-use diaries. Analyses were limited to participants whose non-organized PA had declined between 11 and 13 years (n=1043). Two-stage cluster analysis was conducted and segments were described using chi-square and t-tests.

Results: Among the analytic sample, non-organized PA declined by 87 minutes/day between 11y and 13y (p<0.001). Two segments were identified ( $\kappa$  = 0.66). The 'Social Screens' segment (n=143) had large increases in texting, emailing and social media use (+56 min/day, p<0.001) and other internet use (+32 min/day, p<0.001). Conversely, 'the Mainstream' segment (n=900) had smaller increases in a wider range of activities, including other PA (organised PA, active transport, active chores/work) (+16.0 min/day, p<0.001), homework/study (+9.5 min/day, p<0.001) and electronic gaming (+6.7 min/day, p<0.05). The 'Social Screens' segment were more likely to attend public school, live in urban areas and have more advanced pubertal development (girls only). 'The Mainstream' were more likely to participate in PA and out-of-school activities.

Conclusions: The 'Social Screens' segment had a much larger increase in texting, emailing, social media and other internet use, and lower participation in overall PA and out-of-school activities. Future research may trial PA promotion strategies to replace benefits that this segment may seek in competing activities (e.g. social PA apps).





# Children's moderate-to-vigorous physical activity on weekdays versus weekend days: A multi-country analysis of the 'Structured Days Hypothesis'

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### Children and families (SIG)

Purpose: The Structured Days Hypothesis (SDH; Int J Behav Nutr Phys Act 14:100, 2017) posits that children's obesogenic behaviors – such as physical activity - are more favorable on days that contain more 'structure' (i.e., rules, routines, regulation) such as school weekdays (WD), compared to days with less structure, such as weekend days (WE). The purpose of this study is to test the SDH by using a large, multi-country, device-measured physical activity dataset to compare youth (age 6 to 18 years) moderate-to-vigorous physical activity (MVPA) on WD versus WE.

Methods: Data were obtained from the International Children's Accelerometer Database (ICAD) during summer 2019. In addition to the ICAD inclusion criteria for a valid day of wear, only non-intervention data (e.g., baseline intervention data), children with at least 3 WD and 1 WE, and ICAD studies with data collected during school months, were included for analysis. Mixed effects models accounting for the nested nature of the data (i.e., days within kids) assessed MVPA differences between WD and WE. Separate models explored differences by country/region. All models controlled for sex, age, and total wear time.

Results: 9,460 children (56% female, 10.8 ±2.1 yrs) across 9 different countries from 15 studies provided 51,934 days of valid accelerometer data. Boys and girls attained +11.7 (95%CI: 10.5, 12.9) and +6.9 (95%CI: 6.2, 7.6) more MVPA minutes, respectively, on WD versus WE days. Children from the United Kingdom (+4.7, 95%CI: 3.7, 5.8), Continental Europe (+14.6, 95%CI: 13.2, 16.0), USA (+6.4, 95%CI: 5.3, 7.6), and Australia (+13.0, 95%CI: 11.6, 14.4) achieved more MVPA minutes on WD versus WE. No WD versus WE differences were observed for Brazilian children.

Conclusions: Children and adolescents from multiple countries display higher levels of MVPA on WD versus WE during school months, consistent with the SDH. Future intervention studies targeting children's obesogenic behaviors should consider periods of time when children are not exposed to a structured environment such as extended holidays or summer breaks.





# Associations between 24-hour movement behaviours and motor competence in English primary school children

#### Dr. Richard Tyler<sup>1</sup>, Dr. Andrew J. Atkin<sup>2</sup>, Prof. Stuart J. Fairclough<sup>1</sup>

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#### Children and families (SIG)

Background/Purpose: Research suggests that a positive feedback loop exists, in which children with greater levels of physical activity develop better motor competence, consequently further increasing engagement. However, very little to no evidence has been provided on the reallocation of time between physical activity and other movement, and the effect on motor competence. Therefore, the aim of this study was to investigate the motor competence predictions of time reallocations between 24-hour movement behaviours, using a compositional data analysis approach.

Methods: Cross-sectional data were captured on 210 children (51% boys; aged 10.4±0.7 years) as part of the Waterloo CoDA Project conducted in the West Lancashire region of northwest England. Accelerometer-derived 24h free-living activity (sedentary time (ST), light physical activity (LPA), moderate-to-vigorous physical activity (MVPA), and sleep) was assessed. Motor competence was measured using the Dragon Challenge (DC) which involves nine tasks, requiring the application of different combinations of fundamental, combined and complex motor skills. The DC is completed in a continuous timed circuit and yields DC technique, outcome, time, and total scores, with higher scores displaying better motor competence. Log-ratio multiple linear regression models were used to predict DC technique (process), outcome (product), time, and total scores for the mean movement behaviour composition. Predictions were also made for new compositions where fixed durations of time had been reallocated to one behaviour, while all other behaviours were proportionally decreased to maintain a total daily maximum of 24 hours.

Results: Mean  $\pm$  SD for DC technique, outcome, time, and total score were,  $9.0 \pm 3.1$ ,  $10.0 \pm 3.5$ ,  $12.2 \pm 2.2$ ,  $31.2 \pm 7.4$ , respectively. The distribution of time spent in MVPA, relative to other behaviours, was significantly associated with DC total (p=0.003), time (p=0.004) and process (p=0.038) scores, but not product scores (p>0.05). A 15 minute increase in MVPA and a proportional total decrease in other movement behaviours predicted higher DC technique (0.41), outcome (0.20), time (0.44), and total (0.16) scores.

Conclusion: The findings from the present study reinforce the key role of MVPA for children's motor competence. Reallocating time from sleep, ST and LPA to MVPA in children is supported.





# O.2.17 - Intervention strategies, behaviour change and health

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# "I'm not going to fall off the wagon now": participant experiences of a weight loss maintenance program

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Motivation and behavior change (SIG)

Purpose: Reports of participant experiences with weight-loss maintenance programs are sparse and their perceptions of the challenges of losing and maintaining weight are not well understood. This study explores how participants with chronic disease account for their engagement with an extended contact weight-loss maintenance program and what role the behaviour-change program plays in their ongoing weight management.

Methods: Qualitative telephone interviews were conducted with participants 6-months after starting a lifestylebased weight loss maintenance program, which followed an 18-week weight loss program. Interviews were audiorecorded and transcribed verbatim. Two researchers used a thematic inductive approach to identify common themes generated from interview content. Themes were checked against the data and interpretations refined in consultation with an independent researcher.

Results: Of 17 participants interviewed 9 were male, 16 had lost  $\geq$ 5% of body weight prior to starting the maintenance program, and 12 had maintained their weight loss after 6 months of program participation. Participants' accounts of the role of the program centred on how the program kept them 'on track' and helped them 'back on track'. The analysis generated four themes describing the means by which participants' ongoing weight management was shaped, namely: Personal Responsibility, Real-Life, Sense of Agency, and Self-regulation. Accounts of weight-loss management reflected a complex interplay between real life threats and a sense of personal responsibility, and the services offered by the program. The program's value was the capacity to enable reconciliation between personal responsibility for weight management and challenges posed by their real-life situations by supporting a sense of agency and self-regulation. In supporting agency and allowing self-regulation, the program was compatible with feeling personal responsibility for their ongoing weight management. Participants were able to enact the 'personal responsibility for health' discourse by picking and choosing from the services available as their weight management circumstances dictated.

Conclusions: Service providers of weight loss maintenance program can use these insights to better support individuals to overcome real-life threats and make positive health choices for ongoing weight management, as well as to inform and facilitate program monitoring and improvement.





# The START Trial: A motivationally-embellished peer-led group-based walking intervention in the workplace

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#### Motivation and behavior change (SIG)

Purpose: There is a dearth of studies on how to train physically active employees to act as peer leaders and use motivationally supportive communication to promote physical activity in their physically inactive colleagues. We delivered and evaluated a self-determination theory-based, peer-led, workplace group walking intervention.

Methods: A 16-week pilot cluster randomized controlled trial with an enhanced (5 worksites; n=50 participants) and minimal treatment (3 worksites; n=47 participants) arms. All participants were given a Fitbit Zip and information on health benefits of walking. Enhanced treatment participants also had access to a mobile app incorporating behavior change techniques, were trained on principles of autonomous motivation, and had a peer leader trained in a motivationally supportive communication style. Feasibility measures (recruitment, drop-out rates, training and intervention acceptability) were estimated. Steps, minutes standing and sitting were measured using ActivPALs. Cardiometabolic risk factors (waist circumference and waist-to-height ratio) were assessed. Motivation to walk and well-being (affect at work, general psychological well-being) were measured using analyses, accounting for time and worksite clustering, were conducted.

Results: We evidenced strong feasibility of recruitment, retention, and assessment procedures, and high levels of acceptability. The evidence for preliminary efficacy was mixed. Markers of cardio-metabolic risk improved in the enhanced treatment only (Cohen's d=.10-.16). Autonomous motivation increased in both conditions. Significant improvements in time spent standing) and sitting were observed in the enhanced treatment condition, but none of the time × condition interaction effects for steps, standing, or sitting were significant. For well-being, none of the main or interaction effects were significant.

Conclusions: High baseline scores in steps across both conditions suggest the presence of reactivity as a result of receiving the activity tracker and could explain lack of treatment effects regarding step count. However, given that this was a pilot, the strong evidence for feasibility and the fact that improvements were in the expected direction, suggest that the trial has the potential to be tested at a larger scale.





# Recruiting and retaining young adults: What can we learn from behavioural interventions targeting nutrition, physical activity and/or obesity?

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#### Motivation and behavior change (SIG)

Purpose: Recruiting and retaining young adults (aged 17-35 years) in health research is a major challenge. The aim is to describe the strategies used to recruit and retain young adults in nutrition, physical activity and/or obesity intervention research, and the effectiveness of these strategies.

Methods: Six electronic databases were searched for RCTs published up to October 2018 that evaluated nutrition, physical activity and/or obesity interventions in young adults (17-35 years). Recruitment was considered effective if pre-determined goal sample size was met. Retention was considered effective if attrition was  $\leq 20\%$  for  $\leq 6$ -month follow-up or  $\leq 30\%$  for >6-month follow-up. Effectiveness of individual recruitment and retention methods were calculated as the number of times the method was used in a study with effective recruitment or retention divided by the total number of times the method was used in a study.

Results: From 18,779 manuscripts identified, 94 RCTs were included. Median recruitment duration was 90 days (range: 7 to 1095), with a median efficiency of 2.1 participants recruited per day (range: 0.04 to 33.6). Forty-seven studies (50%) reported recruitment details, and of these 37 (79%) achieved successful recruitment (i.e. met goal sample size). Twelve recruitment strategies were effective in >50% of studies, with the most effective being face-to-face (i.e. health service appointments) (11 of 11 effective or 100%), followed by email, predominantly bulk email to university students (14 of 15 effective or 93%) and newspaper advertisements (7 of 8 effective or 88%). Adequate retention was achieved in 59 studies (63%). Six retention strategies were effective in >50% of studies, with course credit the most effective (13 of 15 effective or 87%), followed by prize/prize draw (7 of 10 effective or 70%) and financial compensation (26 of 38 effective or 68%).

Conclusion: This is the largest review to date that has synthesised retention and recruitment rates of interventions targeting nutrition, physical activity or overweight/obesity in young adults. Among studies that reported recruitment and retention details, findings demonstrate most were successful in recruiting young adults (79% effective) but retaining this group was more challenging (63% effective). Greater efforts to retain young adults are required.





# Understanding, comparing and learning from early childhood obesity prevention interventions: A multimethod study

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#### Motivation and behavior change (SIG)

Purpose: Early obesity prevention interventions are complex and vary in effectiveness. We aimed to unpack interventions using novel frameworks, taxonomies, and experience from four landmark trials forming the EPOCH collaboration. The objectives were to:

- 1) Deconstruct interventions into their components.
- 2) Identify lessons and recommendations for intervention planning, delivery, evaluation and implementation.

Methods: This multimethod study included four world-first RCTs aimed at preventing childhood obesity within the first two years of life. Firstly, interventions were deconstructed into their components, including target behaviours, delivery features and Behaviour Change Techniques (BCTs), using the TIDieR checklist and the BCT Taxonomy v1. Published and unpublished intervention resources for each trial were coded twice by independent coders, and results were tabulated and analysed. Secondly, semi-structured interviews were conducted with principal investigators and intervention facilitators. The interview guide was informed by the UK Medical Research Council development-evaluation-implementation process framework, and inductive thematic analysis was used to draw out themes.

Results: All trials commenced in the first six months of life, included a component related to lifestyle, and had the primary goal of preventing overweight and obesity. Each trial targeted 10 to 14 obesity-related behaviours, such as bottle-feeding, introducing solids, parent response to hunger cues, and limiting screen time. Key variations in delivery features related to intensity, delivery mode and tailoring. Across the four trials, 35(38%) of the possible 93 unique BCTs were coded. BCTs used across interventions included ones related to goals and planning, social support and consequences. More than 19(54%) of the BCTS were identified in only one or two of the trials. Qualitative interview content was coded into themes related to the planning, delivery, evaluation and implementation. Key recommendations from the interviews include the importance of collaboration with a range of stakeholders and consideration of implementation throughout the whole study process.

Conclusions: The innovative combination of frameworks, taxonomies and interviews used in this multimethod study is a major step forward in understanding complex early obesity prevention interventions. A global trials




registry is being established through the TOPCHILD collaboration to quantitatively explore the key components of these complex interventions that are associated with effectiveness.





## Long-term follow-up on perceptions and practices from a multi-component health promotion intervention in Denmark

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Motivation and behavior change (SIG)

#### Purpose:

The study examines the perceptions and practices of professional stakeholders three years after completion of a community-based health promotion project addressing healthy eating and active living among families with young children. The project was carried out in three rural communities in Denmark and implemented a 19 months multi-component intervention within the framework of Project Health and Local Community, also referred to as Project SoL.

#### Methods:

The study was qualitative in nature and involved nine professional stakeholders with diverse roles in Project SoL. Three study participants were working for the local government and its public administration: an elected politician chairing the health policy committee, the head of the health department in the public administration, and a civil servant working with health promotion. Other study participants included a headmaster of a public primary school, an in-charge of a public kindergarten, a chair person of a local community development council, a member of a local business council, an editor-in-chief of a local TV-station, and a business partner of a local fitness center. All study participants were in-depth interviewed about their project-related perceptions and practices since project completion three years back. The interviews were digitally recorded and transcribed verbatim prior to being analyzed inductively through interpretive coding, categorization and thematic formation addressing the research question.

#### Findings:

The study showed that Project SoL had made a substantial and long-term impression on all study participants. Although their actions were no longer implemented with specific reference to the project, the values and principles of the project were still guiding their professional practices. These values and principles were not health specific but related to wider egalitarian and democratic epitomes such as involvement, empowerment, social mobilization, respectfulness and collaboration across settings and sectors. Coordinating structures that vanished upon project completion hampered continuation of joint action among stakeholders but did not affect their contribution to community-based actions within their respective professional networks.

#### Conclusion:

Basic organisational structures are required to sustain complex community-based interventions for healthy living but values, principles and actions may endure provided that they are rooted in community needs and embraced by community stakeholders.





## Salt-Swap: A feasibility randomised controlled trial and qualitative evaluation of a behavioural intervention to reduce salt intake among people with high blood pressure

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Motivation and behavior change (SIG)

#### Purpose

High salt intake is a risk factor for hypertension. We examined the feasibility of a novel intervention to encourage individuals with raised blood pressure to reduce their salt intake by purchasing lower-salt products when grocery shopping.

#### Methods

Forty-seven adults with a record of high blood pressure were recruited from GP practices and randomised to receive the intervention (n=31); or a generic salt-reduction advice leaflet (control, n=16). The intervention comprised a 30-minute behavioural support session with a healthcare practitioner in primary care and use of a theoretically-informed smartphone app (Salt-Swap) to help participants choose lower-salt foods when grocery shopping. Primary outcomes were progression criteria for a larger trial: follow-up attendance, use of the Salt-Swap app and fidelity of intervention delivery. Secondary outcomes included the change in salt intake (24-hr urinary sodium) and blood pressure after six weeks. A qualitative assessment was conducted in a subgroup, using the think-aloud method and semi-structured interviews to explore the impact of advice to reduce salt intake on shopping behaviours and purchasing decisions, analysed thematically.

#### Results

Progression criteria were met, with 96% (45/47) follow-up, 87% (27/31) of intervention participants using the app more than once in month one, and 81% fidelity of intervention delivery. Salt intake decreased in both groups, (intervention -0.2g/d, 95% CI -1.4 to 0.9; control -1.0 g/d, 95% CI -2.4 to 0.4) as did systolic blood pressure (intervention -1.0 mmHg, 95% CI -5.5 to 3.6; control -1.1 mmHg, 95% CI-6.7 to 4.4). There was no significant difference between groups. Qualitative research with 17 participants showed Salt-Swap increased participants' knowledge of the sources of dietary salt, increased use of product nutrition labels for salt, and changed purchasing behaviours that could help to reduce salt intake. Participants' successfully identified lower-salt products with the app but reported insufficient product coverage as the main barrier to use.

#### Conclusions and implications

It would be feasible to conduct a larger definitive trial to assess the intervention's effect on blood pressure. The Salt-Swap app was popular among participants, but the number of products recognised by the app must be increased for it to be useful to more participants.





## Where to next in comprehensive intervention strategies to supporting parents to reduce children's unhealthy food intake

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#### Motivation and behavior change (SIG)

#### Purpose

Parents are an important target for interventions to reduce children's excessive intake of unhealthy snacks. Reducing unhealthy snacks consumption is a complex issue and interventions to date have not been effective. New interventions are needed, designed using best-practice, systematic approaches to increase their potential to achieve greater intervention effectiveness. We aimed to develop theoretically-grounded, evidenced-informed intervention content to support parents to limit purchasing of unhealthy snacks for their 3-7-year-old children.

#### Methods

This study used the Behaviour Change Wheel process to guide the design of a comprehensive package of intervention strategies, including those suitable for implementation in different environments within the socio-ecological model. This study synthesised evidence from two of our previous studies with parents of young children and published literature, in a behavioural analysis based on the Capability, Opportunity, Motivation and Behaviour model. Design focussed on gaps in the use of behaviour change approaches in past interventions.

#### Results

Thirteen intervention strategies were proposed to address parents' psychological capability, physical and social opportunity, and reflective and automatic motivation, needed to limit unhealthy snack purchasing. Strategies were designed for implementation in the following setting: policy/society (5), food supply (3), community (3) and home (2). Most commonly proposed intervention functions included environmental restructuring, persuasion, enablement, coercion and education, and communication/marketing, guidelines, legislation, and environmental/social planning policy categories. Together strategies could include up to 38 unique behaviour change techniques, most commonly from the hierarchical clusters of antecedents and natural consequences.

#### Conclusions

Our study provides a road-map for future intervention research to comprehensively address parents' provision of unhealthy snacks to their children. Proposed intervention content can be refined in proceeding stakeholder consultation and feasibility testing. This study is the first application of the Behaviour Change Wheel process to design an intervention targeting a reduction in unhealthy food purchasing in any age group. It adds to the evidence base and provides examples of a thorough application of the framework, which can be used as an exemplar for future nutrition intervention design and evaluation.





## O.2.18 - Wicked investigations for national health and wellbeing

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## The trips4health study protocol: A single-blinded randomised controlled trial incentivising public transport use to increase physical activity

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Policies and environments (SIG)

Purpose: Public transport users accumulate more physical activity (PA) than motor vehicle users, but evidence of effective, cost-effective and scalable strategies for increasing public transport-related PA is sparse. Further, incentive-based strategies show promise for increasing leisure-time PA, but no studies have examined impacts on other PA domains, such as transport PA. This paper describes the trips4health randomised controlled trial (RCT), which aims to determine effectiveness of an incentive-based strategy to increase public transport use on PA.

Methods: trips4health is a single-blinded RCT with a four-month intervention phase and six-month follow-up phase. Three hundred and fifty adults ( $\geq$  18 years) from southern Tasmania will be randomised to: an incentives-based intervention (bus trip credits for reaching bus trip targets, theoretically-driven weekly text messages to support greater bus use, written PA guidelines); or an active control (written PA guidelines). Incentives are allocated by the public transport provider. The primary outcome is change in mean accelerometer-measured daily step count at baseline, four- and ten-months. Secondary outcomes are changes in: measured and self-reported travel behaviours (e.g. public transport use), PA and sedentary behaviour; self-reported and measured health (blood pressure, waist circumference, height, weight); travel behaviour enablers/barriers; quality of life; and participant and provider transport-related costs. Linear mixed model regression will determine group differences. Extensive process, implementation and scalability evaluation is embedded throughout (e.g. participant surveys, intervention group interviews, public transport provider interviews, reach, fidelity).

Results: Since October 2019, 77 participants have provided been randomised. The intervention appears to be showing a high level of participant acceptability, with only one withdrawal to date (due to a non-trial-related injury). Data from process evaluation interviews with public transport provider staff (n=4) indicate high acceptability, with mutual benefits identified, workloads not significantly impacted and recognition of scalability potential.

Conclusions: trips4health will determine the effectiveness of an incentive-based strategy to increase PA by targeting public transport use. The findings from this novel partnership-based intervention will enable evidence-informed decisions about the worthiness of such strategies.





## Assessing the Reach of Investments to Reduce Early Childhood Obesity in Los Angeles (LA) County, California

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#### Policies and environments (SIG)

Purpose: This study assesses the reach of a diverse set of investments that employed innovative strategies (nutrition education, media campaigns, financial incentives, changes to physical activity environments, policy changes) aimed at reducing early childhood obesity (RECO) in low-income communities in LA County. We assess reach in terms of communities served and networks created through executing the RECO work. We also explore facilitators and barriers to reach.

Methods: This study used several innovative methods. Geospatial analyses of reach were conducted using ArcGIS with location data collected via grantee reports and interviews, and census-tract-level data on community need characteristics from Public Health Foundation Enterprises, WIC administrative data, and the American Community Survey. Network analysis conducted using UCINET examined connections between RECO-funded organizations based on grantee-reported partnerships and geographic overlap, using location data. Inductive thematic qualitative analysis of data from grantee reports, focus groups with community members, and interviews with RECO grantees assessed facilitators and barriers to reaching populations targeted by RECO, using NVivo 11.

Results: Geospatial analyses revealed that RECO activities reached a majority of LA County; 59% of census tracts received RECO activities. Even higher percentages of high-need communities were reached (e.g., 75% of census tracts in which more than 20% of WIC-participating 2 to 5-year-olds were obese were reached). Network analysis revealed connections between grantees and indicated greater network density based on geographic overlap compared to grantee-reported connections (25% vs. 15%), suggesting there was greater potential for grantee collaboration (based on serving the same geographic areas) than was actually realized (based on grantee-reported partnerships). Qualitative findings highlighted that building relationships with community members, policy-makers, and other stakeholders was key to reaching targeted populations. Lack of awareness of RECO activities due to minimal outreach and marketing was a key barrier to reach.

Conclusions: RECO reached many high-need communities in LA County; relationship-building and partnerships were key facilitators to this reach. Many partnerships between RECO grantees were established, but realizing additional potential for collaboration among grantees serving the same geographic areas might have expanded the reach of RECO to even more communities in need of these nutrition and physical activity promotion services.





## Mayors and health: Perceptions of public health priorities and accountability

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#### Policies and environments (SIG)

Purpose: Mayors play a pivotal role in advancing city health, yet little is known about mayors' priorities and attitudes regarding public health challenges. This study aimed to assess mayors' perceptions of top health challenges facing their cities, examine mayors' perceptions of accountability for public health challenges, and explore predictors of perceived accountability.

Methods: Data are from a nationally representative survey of U.S. mayors (N=110) and publicly available data repositores on city-level health metrics. Participants were asked to identify the greatest health challenge facing their city. Perceived accountability for nine public health issues (asthma, gun violence, hunger/malnourishment, mental health, lead/toxicants, obesity, opioids, other substance abuse, and traffic accidents) was assessed by asking participants to rate the extent to which they believe constituents hold them accountable for each issue. We conducted descriptive analyses and multivariable regression models to examine associations between mayoral and city-level characteristics (predictors) and level of perceived accountability (outcome) for each of the nine health issues.

Results: Mayors most frequently cited obesity/chronic diseases (25%), opioids/addiction (24%), health care access (15%), and mental health (14%) as the top health challenges facing their cities, yet identified traffic accidents, gun violence, and environmental toxins as health issues for which they believe constituents hold them most accountable (obesity ranked lowest). Democratic mayors rated higher accountability from constituents for gun violence ( $\beta$ =0.78; SD=0.26; p<0.001), hunger/malnourishment ( $\beta$ =0.75; SD=0.25; p<0.001), asthma ( $\beta$ =0.40; SD=0.18; p=0.02), and obesity ( $\beta$ =0.46; SD=0.18; p=0.03) than Republican mayors. Male mayors rated lower accountability for mental health ( $\beta$ =-0.033; SD=0.23; p=0.03) than female mayors. Prevalence of opioid deaths was the only health outcome that was positively associated with perceived accountability ( $\beta$ =0.019; SD=0.010; p=0.05).

Conclusions: Findings indicate a discrepancy between mayors' perceptions of public health challenges vs. perceived accountability to address such challenges. Findings can inform strategies to engage local policymakers in cross-sector collaborations to improve urban health.





## Urban policies that support physical activity and health: A comparison of four cities

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#### Policies and environments (SIG)

Purpose: Built environments are known to influence physical activity and other health determinants. Land-use, transport planning and urban design policies and interventions shape the form and function of built environments, and thus the environmental exposures and lifestyles of urban dwellers. This research assessed urban policies for four cities worldwide, to compare the extent to which they were health-promoting, and to inform policy recommendations for each city.

Methods: Drawing on indicators proposed in a recent Lancet paper (Giles-Corti et al 2016), we reviewed policies to measure support for creating healthy, active cities. Indicators were developed focused on availability of policies and standards for integrated transport and urban planning, destination accessibility, housing density, car use demand management, urban design to support active transport, access to public transport and active transport infrastructure, and air pollution. Policy data were collected via an online survey for four cities: Auckland, New Zealand; Melbourne, Australia; Chennai, India; and Odense, Denmark. Two researchers undertook content analysis to assess presence/absence of key policies, and their potential to deliver healthy, active neighbourhoods. Inter-rater reliability was tested.

Results: There was significant variation in governance arrangements, policy standards and measurable targets between the four cities, with each having different strengths and limitations. For example, Odense had advanced policies related to destination accessibility and urban design to encourage walking and cycling. In Chennai, there was support for active transport, but policy gaps related to integrated transport and land-use. Melbourne aimed to support active living through creating 20-minute neighbourhoods. Auckland had clear public and active transport targets, but some limitations on land-use policy indicators. Further analysis will quantify the availability of policy into a score, enabling city policy performance to be compared. Inter-rater reliability results showed substantial agreement (90%; Cohen's kappa=0.83).

Conclusions: All four cities had some level of explicit policy support for healthy cities, but no city performed well on all policy indicators. This study demonstrates opportunities to make policies more evidence-based, specific and measurable, to better support accountability and delivery of policy aspirations. Requirements for health impact assessment of major urban developments and policies could assist in creating healthy, active cities.





## Physical activity and wellbeing: Redefining our contribution to national prosperity

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#### Policies and environments (SIG)

#### Purpose

National prosperity has historically been based on fiscal outcomes, such as Gross Domestic Product (GDP), which has shaped government investment. The New Zealand Government has recently led the world in adopting a wellbeing agenda that broadens our measures of national prosperity to include four indicators of future wellbeing capital and 12 domains of current wellbeing. Our aim was to map how sport, active recreation and play contribute to these indicators of future and current wellbeing to generate an Outcomes Framework that guides future physical activity investment and research in New Zealand.

#### Methods

We reviewed existing international evidence and consulted global physical activity experts to explore how each of the future and current wellbeing outcomes are associated with sport, active recreation and play. To explore any nuanced differences to international findings, we also collected cross-sectional data on the perceived value of sport from a representative sample of 1516 New Zealanders. This was accompanied by focus groups conducted over an 18-month period with more than 100 stakeholders representing over 60 organisations from across the physical activity sector in New Zealand. We applied an intervention-logic approach to explore the direct and indirect "spill-over" contributions of physical activity to each of the wellbeing outcomes.

#### **Results/Findings**

We found direct contributions of sport, active recreation and play into the following current wellbeing domains: Knowledge & Skills; Time Use; Cultural Identity. There were "spill-over" benefits into the following domains of current wellbeing: Health; Social Connections; Subjective Wellbeing; Civic Engagement & Governance; Environmental Quality. Our contribution to future wellbeing was primarily realised through Social and Human Capital with "spill-over" benefits to Natural and Produced Capital. Achieving these wellbeing outcomes was underpinned by delivering quality experiences through a variety of culturally distinctive pathways that leverage the intrapersonal, interpersonal, social, environmental and policy mediators within the physical activity system.

#### Conclusions

The Outcomes Framework clearly articulates the broad contribution of sport, active recreation and play to the wellbeing of New Zealanders beyond fiscal and produced capital. This demonstrates the cross-sectoral relevance and value of physical activity and provides a platform for dialogue across multiple national and local government agencies.





# Associations between area socioeconomic status, individual mental health, physical activity, diet and change in HbA1c amongst a cohort of Australian adults: a longitudinal path analysis.

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#### Policies and environments (SIG)

Purpose: Presumed pathways from environments to physical health largely implicate health behaviour although mental health may play a role. Few studies have simultaneously assessed mental health together with health behaviour as mediators between environmental factors and physical health. This longitudinal study assessed mental health, diet, and physical activity as mediators of the relationship between area socioeconomic status (SES) and 10-year change in cardiometabolic risk (CMR).

Methods: Three waves of population-based biomedical cohort data collected over 10 years were spatially linked to census data, based on participant residential address. Area SES was expressed at baseline using an established index for education and occupation (SEIFA-IEO). Individual behavioural and mental health information collected at Wave 2 included diet (fruit and vegetable servings per day) and physical activity (meets/does not meet recommendations), and the SF36 (mental health component). CMR, expressed as HbA1c, was measured at each wave of data collection. Relationships were estimated using latent variable growth models with a structural equation modelling approach to assess mediating pathways (path analyses). Multiple path models were estimated. Models were adjusted for age, sex, employment status, marital status, education, and smoking.

Results: HbA1c worsened over time ( $\beta$  0.048% points per year [95% CI: 0.036, 0.061], p<0.001). Greater area SES was associated with greater fruit intake (0.060 [0.000, 0.120], p<0.05), meeting physical activity recommendations ( $\beta$ -log odds 0.244 [0.153, 0.335], p<0.001), and had a protective effect against worsening CMR directly (-0.014 [-0.018, -0.009], p<0.001) and indirectly through physical activity behaviour ( $\beta$ IE x100 -0.043, [-0.082, -0.003], p<0.05). Positive mental health was associated with greater fruit (0.067 [0.019, 0.115], p<0.01) and vegetable intakes (0.086 [0.033, 0.139], p<0.01), and was indirectly protective against increasing HbA1c through physical activity ( $\beta$ IE x100 -0.058 [-0.113, -0.002], p<0.05).

Conclusions: Greater SES was protective against worsening CMR. This relationship was partially mediated by physical activity but not diet, and a protective effect of mental health was also exerted through physical activity. Public health interventions should ensure individuals residing in low SES areas, and those with poorer mental health are supported in meeting physical activity recommendations to prevent the development of CMR.





# Capitalism, physical activity, and human health in the era of climate change: Joint effects of economic freedom, greenhouse gas emissions, and physical inactivity on human health

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Policies and environments (SIG)

Purpose: Climate change is a direct result of capitalistic economic systems prioritizing profit and accumulation over people and the planet. Both capitalism and climate change-related measures (e.g., ambient air pollution, natural disasters) may be associated with physical inactivity, and, in turn, human health. However, this relationship has not been investigated scientifically. This study examined associations between capitalism, climate change, physical inactivity, and mortality due to non-communicable diseases (NCD) in 124 countries globally.

Methods: This study used multiple secondary data sources. The Fraser Institute's 2012 economic freedom summary index, World Bank's 2014 carbon dioxide (CO2) emissions (metric tons per capita), and World Health Organization's 2016 physical inactivity and NCD-related deaths data were used. Linear regression and moderation analyses were conducted.

Results: With physical inactivity as the outcome variable, CO2 emissions positively predicted physical inactivity (b: .6550, 95% confidence interval [CI]: .3798, .9303) but economic freedom did not. Also, there was a significant interaction between the economic freedom index and CO2 emissions on physical inactivity (b: -.5025, 95% CI: -.9498, -.0552). When NCD-related mortality was added as the outcome, economic freedom (b: 9.3156, 95% CI: 5.4992, 13.1320), CO2 emissions (b: 1.5192, 95% CI: 0.9456, 2.0928) and physical inactivity (b: .3116, 95% CI: .0280, .6051), individually, positively predicted NCD-related deaths. Also, there were significant interactions between economic freedom and CO2 emissions (b: -1.5438, 95% CI: -2.4416, -.6460) and CO2 emissions and physical inactivity (b: -.0906, 95% CI: -.1277, -.0536) on NCD-related deaths.

Conclusions: This ecological, longitudinal investigation found that the capitalistic economic model combined with CO2 emissions and physical inactivity are jointly associated with NCD risks globally. This study suggests that the more a country's economic model is capitalistic, the more deleterious CO2 emissions and physical inactivity on NCD risks among counties with low to average CO2 emissions. NCD-related mortality was high in countries that are hyper-capitalistic and highly physically inactive, regardless of CO2 emission levels. This study is the first to elucidate the potential mechanisms between capitalism, climate change, physical inactivity, and health at a global scale.





## O.2.19 - In-school physical activity programmes

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## High-intensity activity breaks on adolescents' on-task behaviour and subjective vitality

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Implementation and scalability (SIG)

#### Purpose:

Physical activity levels drop dramatically during adolescence and less than 10% of older adolescents are sufficiently active. Considering that previous school-based physical activity interventions targeting adolescents have been largely ineffective, we need to explore novel intervention strategies to provide older adolescents with a dose of health-enhancing physical activity. The purpose of this study was to evaluate the impact of the "Burn 2 Learn" (B2L) intervention program that involved high intensity activity breaks on older adolescents' on-task behaviour and subjective vitality.

#### Methods:

This was a sub-study of the Burn 2 Learn (B2L) cluster randomised controlled trial, which included two cohorts. Participants for this sub-study (N = 221) were from 10 secondary schools (23 classes) in NSW (cohort 2). Teachers allocated to the B2L intervention group were provided with training, resources and support to implement 2-3 high intensity activity breaks per week for the study period. The control condition followed their normal curriculum. Ontask behaviour was assessed at baseline and post-test, using a momentary time sampling procedure and expressed as a percentage of lesson time. Students were observed on a rotational basis in 15 sec intervals for 30 min in the allotted curricular time. At post-test, subjective vitality was assessed at the start and end of the lesson using a validated questionnaire. Linear mixed models were used to assess the impact of the intervention.

#### Results:

Linear mixed models revealed significant group-by-time effects for on-task behaviour in the B2L group [adjusted mean difference = 18.9% (95% CI, 3.2 to 34.6), p = .020, d = 0.4]. Also, significant group-by-time effects on subjective vitality favouring the B2L group were observed [adjusted mean difference = 0.71 (95% CI, 0.28 to 1.14), p = .003, d = .02].

#### Conclusions:

The B2L intervention was successful in improving senior school students' on-task behaviour and their subjective vitality. These findings highlight the potential academic benefits of re-allocating curriculum time to physical activity during the senior school years.

Australian and New Zealand Clinical Trials Registry (ACTRN12617000544370)





## Time-efficient physical activity intervention for older adolescents: Preliminary findings from the Burn 2 Learn cluster randomized controlled trial

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#### Implementation and scalability (SIG)

Purpose: Time-efficient interventions are needed for older adolescents ( $\geq 16$  years) in secondary schools where there is a heavy focus on academic performance and physical activity (i.e., physical education and school sport) is not mandatory. The aim of our study was to evaluate the impact of a school-based intervention designed to improve older adolescents' cardiorespiratory fitness by integrating vigorous intensity activity breaks into curriculum time.

Methods: The Burn 2 Learn (B2L) intervention was evaluated using a cluster randomized controlled trial with adolescents (N=670) from 20 secondary schools in New South Wales, Australia. We utilized a range of implementation strategies to support teachers to facilitate at least two high intensity interval training (HIIT) breaks/week during lessons: (i) training (professional development), (ii) resource provision (activity cards, heart rate monitors, bespoke smartphone/tablet application) and (iii) on-going support (observations, monitoring, feedback). The innovative HIIT sessions involved a combination of aerobic and muscle-strengthening exercises, designed to be fun and engaging as well as vigorous in nature. Teachers and students in the control group continued with their usual practice. Outcomes were assessed at baseline and 6-months. The primary outcome was cardiorespiratory fitness (multi-stage fitness test). Secondary outcomes were muscular fitness (push-up and standing long jump tests), body composition (body mass index), and mental health (questionnaires) assessed at baseline and 6-months. Data were analyzed using linear mixed models, accounting for clustering of effects at the class level. A detailed process evaluation was also conducted.

Results: Significant group-by-time effects were found for the primary outcome cardiorespiratory fitness (4.0 laps [95% CI, 1.7 to 6.4], p = 0.001) and for upper body muscular endurance (1.2 repetitions [95% CI, 0.3 to 2.2], p = 0.008]. Effects for lower body muscular power, body composition, and mental health outcomes were not statistically significant.

Conclusions: Implementing high intensity breaks during curricular time improved older adolescents' cardiorespiratory and muscular endurance, but not their mental health. Our findings highlight the health benefits of re-allocating curriculum time to physical activity during the final years of secondary school. Trial registration: ACTRN12618000293268





## Second-level Active School Flag: end of the first year

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#### Implementation and scalability (SIG)

#### Purpose:

Whole-school physical activity programmes is recognised as part of Ireland's National Physical Activity Plan. Attempts to transfer the successful primary Active School Flag programme to second-level schools (SLASF) have led to the need for conducting a feasibly trial before a definitive randomised control trial. The SLASF is a theory driven two-year and two-tiered (Year 1 – certificate, Year 2 – flag) intervention using co-design between students, policy and researchers. The purpose of this study is to report the limited efficacy during the first year of the programme.

#### Methods:

In the first year, three feasibility and process evaluation case-study schools (mixed, all-girls and mixed lower socioeconomic status) were recruited. Multiple methods throughout the school year included monthly observations, full school needs assessment questionnaires, stakeholder interviews and a subsample completed an outcomes survey and physical health measures including accelerometers at baseline (T0) and the end of year 1 (T1). Matched, by school type, control schools (without SLASF) were recruited to provide limited efficacy data on the SLASF outcomes survey and were analysed through t-tests between conditions and reported through Cohen's d.

#### Results:

The response rate in the outcomes survey dropped by 86% (n=299) and 74% (n=216) between T0 and T1 in intervention and control schools respectively. Accelerometer data dropped by 79% (T0; n=163, T1; n=128), and physical health measures dropped by 89% (T0; n=206, T1; n=184) between the two time points from the intervention schools. Control schools were involved with these measures. At baseline, screening of physical activity levels and screen time did not differ among females, between the intervention and the control schools. However, females in intervention schools had lower levels of physical activity self-efficacy (p=.001, d=0.33), and higher student autonomy (p<.001, d=0.35), whereas for males there were higher levels of peer support (p=.04, d=0.32) than control schools.

#### Conclusions:

The SLASF is a complex behaviour intervention. More effort on student engagement and staff involvement is needed to increase adherence of the intervention across the two-year two-tier intervention. Subtle statistical differences in T0 outcome data between the conditions must be taken into consideration when analysing the limited efficacy data from the feasibility study.





## An Evaluation of the Sustainability of Physical Activity Scheduling in Schools

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#### Implementation and scalability (SIG)

Purpose: Governments internationally have released guidelines or policies mandating the minimum time each week primary schools are to schedule structured physical activity (PA) for children. Despite this, the majority of schools in many jurisdictions fail to implement these policies. The aim of this study was to assess the impact of a multi-strategy implementation intervention in increasing and sustaining primary school teachers scheduling of weekly PA.

Methods: A cluster randomised controlled pilot trial was undertaken in 12 primary schools with over 100 teachers in New South Wales, Australia. Schools were randomly allocated to receive a multi-strategy implementation intervention to increase their scheduling of weekly PA including time in sport, physical education, energisers and integrated lessons. Designed using the Theoretical Domains Framework (TDF) the implementation strategy consisted of; provision of centralised technical assistance, identification and training of school champions, obtaining executive support and provision of ongoing support, tools and resources. Data were collected at 12 months i.e. directly following implementation support and 30 months i.e. 18 months with no implementation support. The mean minutes of PA scheduled by primary school teachers was measured via teacher logbook at both time points.

Results: At 12 months, teachers in intervention schools were scheduling a mean of 135.95 minutes of PA each week (SD=59.46) compared to teachers in control schools 99.04 (SD=51.83) [adjusted mean difference of 36.6 minutes [95% CI 2.7 - 70.5, p=0.04]]. However, at 30 month follow-up teachers in intervention schools had significantly decreased the minutes they scheduled for PA with a mean of 94.39 minutes (SD: 38.85)

Conclusion: A multi-strategy intervention was effective in achieving initial implementation, however not for sustaining teachers' scheduling of PA. Without sustained program implementation the potential public health benefits of evidence-based interventions cannot be achieved.





## Impact of the Burn 2 Learn intervention on older adolescents' objectively measured physical activity

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#### Implementation and scalability (SIG)

Purpose: Physical activity declines with age, and fewer than 6% of Australian older adolescents ( $\geq$ 16 years) are sufficiently active. Competing time pressures contribute to the low physical activity levels among this group, and time-efficient interventions are needed. The aim of this study is to evaluate the impact of embedding high-intensity interval training (HIIT) into the school day on older adolescents' physical activity. A secondary aim was to identify potential moderators of intervention effects.

Methods: We conducted a cluster randomized controlled trial in 20 secondary schools in New South Wales, Australia (N=670, 16.0  $\pm$  0.4 years, 45% female). Participants randomized to the Burn 2 Learn (B2L) intervention participated in 2-3 teacher-facilitated HIIT sessions/week during curriculum time for 16 weeks. The control group continued their usual practice. Physical activity was assessed using ActiGraph GT9X accelerometers worn on the non-dominant wrist for seven consecutive days at baseline (February-April, 2018/19) and post-test (August-September, 2018/19). Steps per day and counts per minute (CPM) on weekdays and during school hours were analyzed separately using linear mixed models, adjusted for clustering. Five potential moderators (socio-economic status [SES], sex, weight status, psychological distress, and cardiorespiratory fitness [CRF]) were examined and sub-group analyses were conducted if interaction tests were significant at p < 0.10.

Results: A significant group-by-time effect was observed for steps during school hours in favor of the intervention group (853 steps/day [95% CI, 513 to 1194], p < 0.001). Intervention effects for CPM during school hours, steps and CPM during weekdays were not statistically significant. Sex (p = 0.004), psychological distress (p = 0.033), and SES (p < 0.001) moderated intervention effects for steps during school hours, with stronger effects observed for girls, students with higher levels of psychological distress, and students from low SES backgrounds.

Conclusions: The B2L intervention significantly increased older adolescents' steps during school hours. However, the volume of activity provided by the school-based HIIT sessions did not contribute to a significant effect on older adolescents' physical activity across the whole day.





## Impact and implementation of the Moving Well-Being Well Physical Literacy Intervention.

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#### Implementation and scalability (SIG)

Purpose: Behan et. al (2019) highlights that primary school children display low levels of Fundamental Movement Skills (FMS) proficiency. FMS are reported to have a significant impact on physical activity participation (Barnett et. al, 2009). The Moving Well-Being Well (MWBW) intervention was designed to develop FMS in 7 – 9-year-old primary school children. Design and implementation of the intervention is innovative as the system sees coaches from the Gaelic Athletic Association deliver intervention components, while upskilling classroom teachers onsite. The aim of this study was to process-evaluate and examine the impact of this intervention.

Methods: Intervention design was informed by findings from Behan et. al (2019). Participants (n=926, 47% Female, mean age 7.55) were recruited from 18 primary schools. Participants partook in an 8-week intervention incorporating three elements: 2 x 30-minute PE classes/week, classroom components and home activity. Data were collected on eight FMS and two balance skills pre and post intervention using the TGMD-3 and the BOT-2. Data were gathered from students via focus groups in 4 schools (n=32, 62% Male) which incorporated a Write, Draw, Show & Tell component. This aimed to evaluate children's enjoyment and motivation towards the intervention and game components. Data informing the process-evaluation were gathered from teachers (n=31) and Principals (n=5) via online questionnaire and coaches via focus groups (n=16, 62% male) and weekly reflections. A mixed methods analysis approach was employed.

Results/findings: Results show significant increases in all FMS and balance skills from pre to post intervention. Qualitative data sources generated 7 themes: PE in schools, Intervention programme, Implementation, Games, Challenges, Improvements and Outcomes. These themes were broken down into sub-themes which highlighted the necessity for culture change, suggested MWBW is an enjoyable, effective and inclusive alternative, however fidelity of implementation was mixed.

Conclusions: This study suggests that the MWBW intervention is effective in improving FMS among 7 – 9 year old primary school children. The process-evaluation confirmed that, from the children and teachers perspective, the MWBW intervention is suitable, efficient and enjoyable for all. Results from child focus groups could also aid the design of future intervention components/games, enabling maximum enjoyment and benefit.

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## A scalable school-based intervention to improve children's cardiorespiratory fitness: The internet-based Professional Learning to help teachers promote Activity in Youth (iPLAY) cluster randomised controlled trial

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#### Implementation and scalability (SIG)

Purpose:Children's health is at risk because of declines in cardiorespiratory fitness. Meta-analyses of efficacy studies show that school-based physical activity interventions can improve children's cardiorespiratory fitness. These interventions, however, are rarely disseminated at scale, meaning they typically have little public health impact. iPLAY is a primary school intervention designed to build schools' capacity to promote physical activity without relying on external providers delivering programs to students. To enhance scalability and sustainability, iPLAY is delivered to teachers via an online learning platform, with mentoring support from experienced physical education teachers. Our aim was to determine whether iPLAY, when deployed across a large number of schools, could improve children's cardiorespiratory fitness.

Method: We did a cluster randomized controlled trial (RCT) with allocation at the school level (1:1 allocation). We completed assessments at baseline, post-intervention (12 months after baseline), and maintenance (24 months after baseline). The primary outcome was students' cardiorespiratory fitness, as measured by a 20m shuttle run test. We tested for between-arm differences in changes in student outcomes using linear mixed models.

Results: We recruited 132 primary schools in New South Wales, Australia. We assigned a representative sample of 22 schools to the cluster RCT. The remaining 110 schools entered an implementation study in which teachers received iPLAY but students did not complete primary outcome assessments. In the 22 schools involved in the cluster RCT, we recruited 1,217 students from Grades 3 and 4 who completed baseline assessments of their cardiorespiratory fitness. At 12-months (post-intervention), there was a significant between-arm difference in students' change in fitness favoring the iPLAY intervention condition (1.0 laps [95%CI=0.1,2.0]). Preliminary analysis of 24-month outcome data (maintenance) from 16 of the 22 cluster RCT schools showed this benefit continued to increase after the intervention ended (1.8 laps [95%CI=0.5, 3.2]).

Conclusion: I PLAY is a scalable model to deliver a school-based physical activity intervention that improves children's cardiorespiratory fitness. iPLAY may also build capacity in schools such that benefits are sustained or continue to grow after the intervention ends. Trial registration: ACTRN126160007314





## O.2.20 - Nutrition related behaviours and outcomes

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## Big Snack: Using wearable cameras to explore children's daily snacking behaviours

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**Children and families (SIG)** 

#### Purpose

Snacking is a major contributor to children's daily energy intake. However, research on snacking patterns is mostly limited to self-report and has offered little information on the social context of snacking. Recently, 168 children aged 11-13 in the Wellington region recorded their world for four days, using wearable cameras that automatically took pictures every 7s and GPS devices, providing 1.3M images linked to 2.9M GPS points. Using this data, we aimed to assess the frequency, nature and social context of children's snacking patterns.

#### Methods

Two days' of image data (Thursday and Saturday) were analysed for snacking episodes and their context (e.g setting, source and screen use). Snacking was defined as any individual food item or meal consumed in between the three main meals. Data were entered in Excel and foods categorised as core or non-core, according to a nutrient profiling model. Data were analysed to determine differences in snacking patterns by setting, ethnicity, gender and deprivation.

#### Results/ findings

Children consumed more than twice as many non-core snack foods as core snack foods. Confectionary, cookies/cakes and sugary drinks and juices were the most commonly consumed non-core snacks. Fresh fruit was the most commonly consumed core snack. School cafeterias and convenience stores near schools were a significant source of non-core snack foods and drinks. Snacking was commonly associated with screen time.

#### Conclusions

This study provides objective evidence on children's snacking patterns and social context in children's everyday lives. The extent of non-core snacks sourced from school cafeterias and convenience stores near schools is concerning, raising support for healthy school food programmes and broader interventions targeting the obesogenic environment in which children live. Given the attenuated obesity epidemic, it is paramount that healthy snack options are made available to children.





## Do parental characteristics affect the physical activity of adolescents living in Mumbai slums?

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#### Children and families (SIG)

Purpose: WHO defines adolescence as age 10-19 years. Physical inactivity during childhood and adolescence increases the risk of obesity, and both are associated with non-communicable diseases. Parents' socioeconomic attributes may influence their children's physical activity (PA). We assessed PA among adolescents and examined associations with parental education and socioeconomic status (SES).

Methods: Children born to women, who participated in the Mumbai Maternal Nutrition Project, living in the slums of Mumbai, were recruited. Antropometry and percentage body fat (fat%) were measured and parental SES was documented. In a subgroup, PA was measured over 7 days, using accelerometers (MTI Actigraph). Actigraph data gave objective measures of PA counts and time spent in sedentary, moderate or vigorous intensity activities (calculated using Evenson cut points). Associations of parental exposures with PA were analysed using correlation and multiple linear regression.

Results: 144 children were recruited (mean (SD) age: 11.3(0.4) years; 77 boys) and 79 children (40 boys) used accelerometers. Median (IQR) BMI of the children was 15.5 (14.3, 17.7) kg/m2; 83% were underweight and 3% overweight. Majority of parents (>70%) had completed secondary education. During school vacations, boys spent more time than girls in vigorous activities (165.4 v 81.1 minutes/day; p<0.001). Girls had higher fat% compared to boys (16.0% v 10.2%, p=0.03). Weight (r=0.27, p=0.001), BMI (r=0.26, p=0.004) and fat% (r=0.24, p=0.003) were positively correlated with SES. Fathers' education was positively associated with accelerometer counts/minute (B=65.9, p=0.049), and negatively with time spent in sedentary activities (B= -33.6, p=0.005). Total family income was positively associated with time spent in vigorous activities (B=0.002, p=0.03, including age, sex, income, SES, mother and fathers' education as covariates). There was no association of maternal education with PA.

Conclusion: Girls are less active and have a higher fat% than boys. The fathers' education, income and socioeconomic status were associated with adolescent's time spent on sedentary and vigorous activities. As girls are less active than boys, interventions aimed at girls, involving parents, are needed. The sample size of this study is small and results would need replication in larger sample size.





## Trends and sociodemographic determinants of underweight and overweight among Malaysian children and adolescents: Nationwide population surveys from 2006 to 2015

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#### Children and families (SIG)

Introduction: Malaysia is experiencing a nutrition transition because of positive economic growth and rapid urbanisation. Therefore, public health attention needs to be drawn towards both undernutrition and overnutrition. Purpose: We examined secular trends and sociodemographic determinants of underweight (UW) and overweight including obesity (OW) in 6-17-year-old Malaysians from 2006 to 2015.

Methods: We analysed data from the National Health and Morbidity survey conducted in 2006, 2011 and 2015. These cross-sectional surveys involved objective measures of height and weight. We used the International Obesity Task Force BMI criteria to define UW and OW. We performed trend analysis using log-binomial regression separately by sex and age groups, and stratified by ethnicity, residence area, household (HH) size and HH income, taking account the complex survey design. Individuals were stratified into three age groups: pre- (6-9 years), early (10-13 years) and late (14-17 years) adolescence (total n=28,094).

Results: Overall, the UW prevalence decreased among Malaysian youths between 2006 and 2015, while the OW prevalence increased. The prevalence of UW decreased from 22% (95%CI 21.0, 23.1) to 18% (95%CI 16.2, 20.3) in boys, and 23% (95%CI 22.2, 24.2) to 19% (95%CI 17.4, 21.0) in girls. Significant decreasing trends in UW prevalence were observed in all sex-age groups, except preadolescent boys. During the same time period, prevalence of OW increased from 20% (95%CI 19.2, 21.3) to 26% (95%CI 23.8, 28.5) in boys, and 19% (95%CI 17.9, 19.9) to 24% (95%CI 22.4, 26.5) in girls. The increase in OW prevalence over time was significant in all sex-age groups, except late adolescent boys. Prevalence of UW and OW varied across sociodemographic subgroups with differences observed in few subgroups over time.

Conclusions: Malaysia is facing a double burden of malnutrition with increasing trends of OW and persisting UW among 6-17 years old. Further research is needed to explore if double burden also exists at other levels than the country; such as state, household and individual levels.





## Adherence to national infant feeding guidelines is associated with child overweight/obesity and central obesity at age 54- months: results from the Growing up in New Zealand cohort study

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#### Children and families (SIG)

Purpose: Despite evidence that childhood obesity is influenced by early life events and environmental exposures, the contribution of diet in infancy to the development of overweight/obesity remains relatively unexplored. Most studies investigating the effect of infant feeding on overweight/obesity focus on discrete practices (e.g. breastfeeding) and do not consider dietary quality more broadly. We examined associations between adherence to the New Zealand (NZ) national infant feeding guidelines and development of child overweight/obesity and central obesity at age 54-months.

Methods: Data were collected on 6,435 infants born in 2009-10, enrolled during pregnancy into the Growing Up in NZ cohort study. Adherence to the guidelines was measured by an Infant Feeding Index (IFI) which was created based on the Ministry of Health's Food and Nutrition Guidelines (2008). The IFI score ranged from 0 (no adherence) to 12 (complete adherence). Anthropometric measurements and screen time were collected at the 54-month interview. Body-mass-index/age (BMI/A) was calculated and classified according to WHO 2006 growth standards (overweight/obesity: >+2z scores). Waist-to-height ratio (WtHR) >90th percentile identified children with the highest values for central obesity. Maternal sociodemographic and health behaviour characteristics were described from the antenatal face-to-face interview. Adjusted Poisson regressions with robust variance (risk ratios-RR and 95% confidence intervals-95%CIs) were applied to examine the effect of the IFI scoring (in tertiles) on BMI/A and WtHR. Models were adjusted for maternal antenatal characteristics, screen time and exact age at the 54-month interview (p<0.05).

Results: In the fully adjusted model and compared to children in the highest tertile of the IFI, girls who scored in the lowest and middle tertiles were more likely to have BMI/A>+2z at 54-months (RR=1.46, 95%CI 1.03-2.06 and RR=1.55, 95%CI 1.08-2.21 respectively), and boys who scored in the lowest tertile of the IFI were more likely to have WtHR >p90th at 54-months (RR=1.59, 95%CI 1.06-2.39).

Conclusions: In this NZ nationally-generalizable birth cohort, lower adherence to national infant feeding guidelines was associated with the development of overweight/obesity and central obesity in early childhood, with gender differences evident. Improvement in infant feeding practices is a potential strategy for prevention of childhood obesity.





## Maternal perspectives on infant feeding practices in Soweto, South Africa

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Children and families (SIG)

Purpose: This study used focus group discussions (FGDs) and in-depth interviews (IDIs) with mothers of infants aged 0-24 months to: (i) describe the infant feeding practices of South African women living in Soweto; and (ii) understand from the mothers' perspective what influences these feeding practices.

Methods: Semi-structured FGDs were conducted with 19 mothers. The FGDs were stratified according to the age of the mother's baby as follows: one each for mothers of 0-6-month olds, 7-14-month olds and 15-24-month olds respectively. Four mothers from each FGD then attended an IDI.

Results/findings: While mothers understood that breastfeeding was beneficial, babies were exclusively breastfed for a very short time. The dietary diversity of weaning foods was low (mostly grain-based porridge) and the introduction of high-quality novel foods was limited as babies grew older. In addition, 'junk' food was commonly given as a snack. Infants were fed using a bottle or spoon and feeding mostly occurred separately to family meal times. Mothers feeding practices were influenced by the belief that how and what babies eat is important for their health; with an unwillingness to eat being a sign of ill health. It was therefore common for mothers to force feed their babies – potentially ignoring satiety cues. In addition, mothers believed that solid food was necessary for babies before six months of age. Family matriarchs (the participants own mothers and grandmothers) were highly influential to the feeding practices adopted by mothers; with their advice often contradicting that of health professionals. As such, mothers chose to lie about how they were feeding their babies when at health facilities due to fears of being judged and shouted at.

Conclusions: Our study shows that, in urban African settings such as Soweto, shifting the norms around mixed feeding and the early introduction of solid foods, as well as promoting more responsive feeding approaches, must play a central role in the establishment of healthy appetites and eating behaviours in the early years. In addition, engaging family members – particularly grandmothers and great-grandmothers, as well as fathers where possible – is important in promoting more supportive household and community structures around infant feeding.





# Associations of family meals and parent meal-related behaviors with fruit and vegetable servings and dietary intake of children: Data from a randomized controlled trial in a rural community in the United States

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#### Children and families (SIG)

Purpose: To examine parent meal-related behaviors and perceptions and their associations with home-served evening meals where half the plate is fruits and vegetables (1/2 plate FV) or FV intake among school-age children in a rural United States community. Past research has found protective associations between family meal frequency, parent meal-related behaviors and perceptions, and child FV intake; however, this research focused primarily on suburban or urban areas, leaving a gap in understanding for rural communities.

Methods: Baseline data (collected 2017/2018) were drawn from the New Ulm at Home (NU-HOME) randomized controlled trial, conducted in a rural community by academic researchers in collaboration with community leaders and affiliated health systems. The trial recruited 114 children ages 7-10 [59% girls; M=8.9, SD=1.0 years] and parents [97% women; M=37.9, SD=5.4 years]. Parents and children completed surveys; children were assisted by research staff. Research staff completed 2 dietary recalls with parents to measure children's dietary intake. Logistic regression and general linear models (GLM) analyzed associations of family meal frequency and parent mealtime behaviors (meal planning) and perceptions (cooking self-efficacy, parent/child cooking skills) with ½ plate FV, and parent role modeling with child FV intake, respectively.

Results/findings: On average, parents reported eating evening meals with all/most family members 5 times per week and children were served ½ plate FV at the evening meal 3 times per week. Child FV intake averaged 2.36 servings/day; only 10.5% met the recommendation of at least 4 FV servings/day. Unadjusted multivariable logistic regression results indicated children had significantly higher odds of having ½ plate FV with higher family meal frequency (OR=1.39, CI=1.07-1.79) and parent meal planning (OR=1.25, CI=1.02-1.53). In unadjusted GLM, higher child FV intake was significantly associated with frequent (vs. infrequent) parent role modeling of vegetable consumption at evening meals (2.67 vs. 2.12 servings; b=0.55, SE=0.25, p=.027).

Conclusions: In this rural community, parents play significant roles in shaping FV intake of school-age children, whether by planning and serving regular family meals incorporating FV or by role-modeling healthful dietary intake habits at home. However, more work needs to be done to bring FV intake to recommended levels.





## Variation in outcomes of the INFANT program according to maternal education and age at two years post-intervention.

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#### Children and families (SIG)

Purpose: Very few interventions targeting obesity-related behaviours investigate effectiveness in different population groups and whether differences persist over time. After the intervention in the INFANT trial, intervention effects were observed for vegetable (positive) and sweet snack (negative) consumption in more educated mothers and the intervention was more effective in increasing vegetable and water intake in younger mothers. Thus, the aim of this study is to assess the effectiveness of the INFANT program according to maternal education and age, two-years post-intervention completion.

Methods: INFANT was a cluster-randomized controlled trial focusing on the prevention of obesity-related behaviours in first-time Australian parents with infants aged four months between 2008-2010 (n=542). All families completing the program (n=492, child age 20 months) were invited to participate in the follow-up when their child was 3.5 years old. Outcomes included are: BMI z-scores, physical activity (ActiGraph), television viewing (parent report), and dietary intake (3 unscheduled 24hr dietary recalls). The moderator variables maternal education and age were dichotomized (university degree vs. no university degree and <32 years vs.  $\geq$ 32 years, respectively).

Results: Interaction effects were observed for both maternal education and age in the treatment group. Intervention effects were greater for vegetable consumption in infants whose mother had a university degree (mean difference = 29.8g/day [CI95:11.3, 48.3]), and sweet snack consumption was lower (mean difference = -9.3g/day [CI95:-15.0, - 3.6]). Conversely, a higher consumption of water was observed among infants whose mothers did not have a university degree (mean difference = 179.4g/day [CI95:41.0, 317.7]). In relation to maternal age, a lower sweet snack consumption was observed in mothers aged 32 years or older in the treatment group (mean difference = -9.9g/day [CI95:-15.3, -4.5]). However, water consumption was greater in mothers younger than 32 years in the treatment group (mean difference = 177.4g/day [CI95:79.8, 274.9]).

Conclusions: Interventions aiming to prevent obesity-related behaviours in young children may have varying effectiveness in different groups of mothers depending on age and education level, even when there has not been an effect for the overall sample. Identifying such differences within populations will allow us to create more effective and tailored interventions in the future.





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## Is it Physical Activity or Green Space that Impacts Adolescent's Mood? – An Ambulatory Assessment Study.

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Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Contextual factors have a critical impact on human behavior and mental health, with ambulatory assessment as the state-of-the-art approach to collect data on all three components: Through combining accelerometer-measured physical activity (PA), e-diaries on smartphones to assess mood in real-time, and geolocation-tracking, ambulatory assessment allows to investigate within-person processes in human's everyday life. The within-person relationship between PA and mood has been investigated in several ambulatory assessment studies, but results are inconsistent. This might be due to a neglect of contextual factors. Thus, we tested if PA and green space (GS), a well-researched contextual factor, show distinct effects or confound each other in predicting mood.

Methods: Within the URGENCY study (https://www.zi-mannheim.de/en/research/research/associations/pez.html), adolescents (N = 141, 42.5% female, mean age = 15.07; BMI = 20.4) wore accelerometers for seven consecutive days. Additionally, they responded on average six times per day to mood-questionnaires on GPS-triggered smartphone-diaries during everyday life. We calculated the percentage of GS within 100m2 around the participants geolocation (using ArcGIS), parameterized GS and PA across different time frames prior to the e-diary prompts, and applied multilevel model analyses (using SPSS) to test for within-subject effects of PA and GS on mood.

Results: If using separate models for PA or GS predicting mood dimensions, both PA and GS were positively associated with affective valence (both p <. 01) and energetic arousal (both p <. 05), but calmness was only negatively impacted by PA (p <. 05). However, entering both PA and GS simultaneously into the models changed the results for affective valence, which was only associated with GS (p <. 05). No interaction effects were found between PA and GS.

Conclusion: PA and GS show distinct effects on adolescents' mood in everyday life: Only GS enhances affective valence, both GS and PA increase energetic arousal, but only PA decreases calmness. If replicated, these results can guide interventions using PA and GS to regulate adolescents' mood. Moreover, they may explain inconsistent findings from within-person studies, suggesting that future studies should not only measure PA, but also include contextual factors.





## Assessing the school neighbourhood built environment: Modification of an environmental audit tool and protocol (MAPS Global-SN)

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

#### Purpose

Active transport to school contributes towards adolescents' daily physical activity and can be influenced by school neighbourhood built environment (SN-BE) characteristics. SN-BE assessment typically involves micro-scale (i.e., environmental audits) or macro-scale (Geographic Information Systems (GIS)) tools. However, existing environmental audits are time/resource-intensive and not specific to school neighbourhoods, while GIS databases are not generally purposed to include micro-scale data. This study evaluated the inter-rater reliability and feasibility of using a modified audit tool and protocol (Microscale Audit of Pedestrian Streetscapes Global–School Neighbourhood (MAPS Global-SN)) to assess the SN-BE of secondary schools. Correlations between MAPS Global-SN and GIS measures of the SN-BE were also examined.

#### Methods

MAPS Global-SN audit (adapted from the original MAPS Global audit) and GIS spatial analysis (intersection density, residential density, land use mix, walkability) was conducted within a 0.5 km street-network buffer-zone around all twelve secondary schools in Dunedin, New Zealand. Based on investigator and expert consultation, MAPS Global-SN included eight modifications to both auditing processes and items. Inter-rater reliability data was collected from two independent auditors across two schools. Intraclass correlation coefficient (ICC) was calculated for nine MAPS Global-SN overall sub-scales and scores. The feasibility of a condensed audit protocol (auditing one side of each street segment in the neighbourhood, compared to both sides) was also assessed. Data were analysed using Pearson's Product Moment Correlations and Spearman's Rank Correlation Coefficient.

#### Results

Overall, all assessed sub-scales and scores showed "good" to "excellent" inter-rater reliability (ICCs=0.60-0.99). When considering the condensed audit protocol, significant positive correlations were identified between odd and even sides of each street segment for five of eight assessed sub-scales and scores (r=0.68 to r=0.98; all p<0.05). Only one of the overall MAPS Global-SN sub-scales was positively correlated with school-level GIS measures of intersection density, residential density and walkability (r=0.64 to r=0.75; all p<0.05).

#### Conclusions

MAPS Global-SN and condensed protocol may be a feasible alternative to micro-scale SN-BE assessment, by simplifying data collection and time/resource commitments. Macro-scale GIS analysis should complement MAPS Global-SN. Future studies should establish the reliability of MAPS Global-SN internationally and assess the SN-BE in relation to active transport to school.





## Investigating associations between child body size and exposure to the nutrition environment: considering the home and school neighbourhoods and routes to school

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: For over a decade, there has been considerable research linking the nutrition environment (NE) and children's body size. However the evidence is mixed and objective methods to measure associations widely differ. The aim of this study was to better quantify children's exposure to the NE around the home, school and along the route to school, using novel geospatial techniques, and test for associations with children's body size.

Methods: Data from the Neighbourhoods for Active Kids (NfAK) study was used to quantify children's exposure to the NE. NfAK is a cross-sectional study of 1102 children aged 8-13 years across 19 schools in Auckland, New Zealand. Children's waist-to-height ratio was the primary outcome of interest. The NE was categorised according to 'unhealthy' (e.g. fast food outlets) and all food types. For every child, three exposures to the NE were created around the 1) home, 2) school and 3) along the route to school (child-drawn). A number of Geographical Information System (GIS) techniques, including kernel density estimation and network analysis, were used to develop child-specific exposure measures around the home and school. Multilevel regression analysis was used to examine associations between NE and children's body size for each of the neighbourhood exposure types. Models were adjusted for age, sex, ethnicity, neighbourhood deprivation, travel mode and whether children were accompanied or not by a parent on their way to school.

Results: Preliminary results indicate that in all three environments, high exposure to 'unhealthy' food environments were associated with increased body size in children. Mode of travel to school and whether children were accompanied or not by a parent to school also affected their exposure to 'unhealthy' food in the NE. Further analyses are currently being undertaken and will be presented and discussed in this paper.

Conclusions: This study used a novel child-centred approach to quantifying the exposure of the home, school and route to school environments and testing associations with children's body size. More specific and refined geospatial measurement approaches are necessary to improve the evidence base necessary for influencing public health policies and improving child health outcomes.





## Developing automated methods to collect, store and characterise by cuisine type sold, large volumes of fast-food outlet data: a feasibility study.

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Research investigating associations between physical exposure to fast-food outlets and dietary behaviour is commonly cross-sectional, limiting causal inference. Moreover, despite variation in nutrient profiles of food sold, associations have not been tested by fast-food outlet cuisine type (e.g. burgers, fried chicken, pizza). These knowledge gaps could be addressed using well-characterised, longitudinal data. The Food Standards Agency (FSA) now publishes real-time data on all UK fast-food outlets (n=>60,000) via an Application Programming Interface (API). These data have significant research potential, but are not available retrospectively, and outlets are not characterised by cuisine type sold. Repeated manual data collection and storage, and characterisation of outlets by cuisine at this scale, is unrealistic. We test the feasibility of using innovative data science methods to automate data collection, storage and prediction of outlet cuisine type from business name alone.

Methods: We wrote a python script to collect outlet data weekly from the API, for storage in a custom database. To characterise outlets by cuisine type we developed a model using machine (deep) learning. The model used a 'training' dataset from another provider, of 15,000 fast-food outlets, where each had been labelled as one of nine major cuisine types, to learn the 'language' of how outlets of different cuisines are named. We tested the accuracy of our predictions on a separate dataset of 5,000 outlets.

Results: Data were collected automatically 22 times between September and November 2019. Overall, our model had 65% cuisine type prediction accuracy. Prediction rates varied by cuisine type (in descending order): Fish & Chips (81%), Chinese (77%), Desserts (77%), Indian (76%), Chicken (74%), Pizza (62%), Bakery (61%), Kebab (56%), Burgers (40%).

Conclusions: It was feasible to automate weekly collection and storage of FSA data. This longitudinal dataset is unprecedented and will be made publicly available to underpin public health research. Early machine learning results are promising, but indicate imperfect cuisine type prediction. We will refine our model to improve accuracy, and liaise with end-users to maximise accuracy for priority cuisine types. Our final model will be applied to stored FSA data, and could be adapted for application to international data.





## Development of a Cycling Scale for Preschool Children

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Learning to cycle independently is a milestone for most children, one which requires time and practice to master. A measure of cycling ability would allow accurate assessment of the development of cycling and would provide teachers, practitioners and parents a valuable tool to further encourage uptake of cycling in early childhood. Cycling is an important skill to promote in early childhood and throughout life as it has many health benefits along with being a commonly reported physical activity globally. To date, there are no measurement tools examining the developmental process to independent cycling in early childhood. The current study aimed to develop a cycling scale and to further assess the development paths children took across a 5-week cycling intervention. Development of the scale occurred in four phases: (1) development of criteria and stages, (2) review of instructions and criteria and pilot inter-rater and test-retest reliability, (3) 5-week cycling intervention and (4) final inter-rater and test-retest reliability. Three hundred and forty-nine children between 2 and 6 years took part in one of the four phases. The developed scale included eight stages in total. The scale was found to have excellent inter-rater reliability (ICC = 0.97, 95% CI = 0.96-0.98) and good to excellent test-retest reliability [(ICC = 0.91, 95% CI = 0.87-0.94) & (ICC = 0.90, 95% CI = 0.85-0.93)]. Typical routes to independent cycling along the scale were observed and reported as being stepwise except one instance where a two-stage jump was as common as the step-wise route. Alternate routes were also observed and reported on. The current study developed a reliable measurement tool for assessing children between 2 and 6 years of age on the developmental process to independent cycling. The developed cycling scale will allow teachers, practitioners and parents to assess competence in cycling and moreover, track changes in skill development. Furthermore, the scale could also be used to better understand and better asses a child's progression when learning to cycle.





## Shall we go to the park and work out? A comparison of outdoor exercise equipment use in a Western Australia neighbourhood in 2012 with 2019

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Parks are an important physical activity resource as they are accessible and provide a place to be active. Easy-to-use, park-based outdoor gyms were a novel opportunity embraced by local governments a decade ago. In 2012, two Western Australia (WA) parks installed weight-based park exercise equipment; in 2018 the equipment was replaced by resistance-based equipment. The aim of this study was to evaluate the use, and perception of outdoor gym equipment in two metropolitan WA parks and compare the changes over a seven year time period (2012 with 2019).

Method: A mixed methods design was used. Data were collected in 2012 and 2019 in the City of Belmont via observations of equipment users using a modified (SOPARC) tool, and intercept interviews with equipment users. Data were collected in summer and winter.

Results: In 2012 n= 833 and 2019 n=909 people were observed at the two parks. In 2012 6.6% of park visitors used the gym equipment compared with 8.6% in 2019. More males used the equipment at both parks in 2012 (66.7%); 2019 (71.8%). In 2012 (n=43) park users completed the intercept interviews and reported using the equipment 2-3 times per week, for 10 minutes or less. In 2019 n=63 interviews were completed. Of the interviewees 66.7% reported their physical activity level had increased since using equipment. In 2019 there was a significant increase in use of the outdoor gym equipment when comparing summers, and a significant decrease when comparing winters.

Conclusions: Park based gym equipment is a feasible method to promote low cost, physical activity opportunities however remains underutilised. The research confirmed few visiting the park used the gym equipment, and highlighted the need to explore strategies to increase equipment use including social support and clear guides on how to use the equipment. The findings provide local government planners and policy makers with data to support the use of local parks for low cost physical activity opportunities.





# Training computers to see the built environment for physical activity: automated detection of sidewalks using computer vision and Google Street View images

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Sidewalks are vital built environment features to encourage safe walking and other physical acitvities, but data on the location or presence of sidewalks on US streets is often non-existent. Virtual audits of environmental features using Google Street View (GSV) are reliable alternatives to traditional in-person audits. However, because audits must be conducted by humans, virtual audits remain time-intensive and are susceptible to auditor fatigue. The scalability of virtual audits remains dependent on the amount of available trained human labor.

Objective: To train, test, and validate an artifical intellegence approach to detecting sidewalks in Phoenix, Arizona, USA.

Methods: Researchers labeled 557 GSV images (512x512 pixels) in Phoenix using semantic segmentation (i.e., each pixel classified as sidewalk vs. not sidewalk) to identify the presence and location of sidewalks for training of deep neural networks. An additional 601 images with existing segmented sidewalks labels from the Cambridge-driving Labeled Video Database (CAMVID) augmented this training dataset. Training data were used to develop deep-learning models for sidewalks, based on a Fast.ai deep-learning architecture (i.e., dynamic U-Net based ResNet-38). Researchers also developed an independent dataset of images to validate trained models (i.e., 200 GSV images from Phoenix and 101 from CAMVID). Model-detected sidewalk features were compared to human 'ground-truth' features during testing and validation using pixel-level comparisons with standard machine learning metrics: positive predictive values (PPV), negative predictive values (NPV), and sensitivity.

Results: Sidewalks were sufficiently present in both the training (96%) and validation (94%) datasets. During validation, if the computer model detected sidewalks, the probability that the pixel-level detection agreed with human raters (PPV) was 90%, with sensitivity values of 90%. For non-sidewalk pixels, the model agreed with humans 99% (NPV) of the time. Validation against Phoenix-only images suggested lower, but still acceptable validity (PPV=0.83, NPV=0.99, sensitivty=0.81).

Conclusions: Machine-learning approaches validly detected sidewalks in GSV images. Results confirmed visual inspections showing a close match between computer-inferred and human raters' sidewalk locations. Next steps include further generalizability and construct validity testing across thousands of neighborhoods with participant physical activity levels.



## O.2.22 - Novel methods for assessing outcomes and developing interventions using e-and m-health

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## Ecological Momentary Assessment Respondent Burden in a Child Nutrition and Physical Activity Study

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e- & mHealth (SIG)

Purpose: Ecological momentary assessment (EMA) has become an increasingly popular survey methodology due to its strengths in capturing exposures and health-related behaviors (e.g., physical activity and dietary intake) that vary throughout the day. A concern is that multiple surveys administered many times a day could result in burden or panel conditioning that may deflate measure validity. The current study examines EMA survey burden and patterns of variation across days.

Methods: The Family Matters EMA study was administered to a diverse population of American, primarily lowincome families in a Midwest urban city (N=150). Primary caregivers (91% female) responded to a minimum of four daily surveys administered over the course of a week to understand characteristics of the home food environment. Caregiver daily survey burden and overall mental health (depressive symptoms, coping, and overall stress) was measured to assess difficulty in completing surveys that day. Time series analyses with conditional fixed effects regression modeled within-participant variation in survey burden.

Results: Average burden was  $1.2 \pm 1.1$  indicating overall low survey burden. Parents reporting higher burden were more likely to be born outside the United States (P=0.02) and to prefer speaking a language other than English inside the home (P=0.04). Across 1,392 survey days, participants reported no burden 25% of the time. Severe burden was rare (12% of days), affecting less than half of respondents (n=66). Burden did not increase as the study progressed, caregiver stress level and depressed mood were positively correlated with EMA burden (P=0.003 and P=0.009 respectively), and compliant days were less burdensome (P<0.001) and were predictive of lower next day burden (P=0.001). Parent survey burden was not different on weekends and weekdays (P=0.511).

Conclusions: EMA methodologies appear to be a reasonable design to assess how parent-level exposures relate to child dietary intake and physical activity throughout the day. Burden appeared transient in the current study which may indicate external factors, rather than the survey instruments, affected burden. Researchers should develop strategies to support foreign-born and non-English speaking participants to capture complete observation days. Multiple data collection methods (dietary recalls and accelerometry) may minimize potential missing data on non-compliant days.





## goFOOD[TM]: From Dietary Monitoring to Dietary Assessment

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#### e- & mHealth (SIG)

Purpose Diet monitoring and assessment is becoming increasingly crucial for individuals living with a dietrelated disease or wanting to follow a healthy lifestyle, as well as healthcare professionals aiming to monitor or assess their patients' diet or the eating habits of populations. goFOODTM uses artificial intelligence algorithms, smartphones and embedded sensors for time- and cost-efficient dietary monitoring and assessment, with accuracy being the cornerstone of the entire research effort.

Methods The goFOODTMLite app is designed and developed for visual data recording of eating habits. The app allows the recording of food/beverage images or videos and provides a diet log to the individual or healthcare professional. The acquired data are concurrently used to enhance an algorithmic pipeline implementing the automatic detection, recognition, segmentation and 3D reconstruction of food. The information about the type, segment and volume of food is used along with food composition databases, in order to estimate its calories and macronutrient content (carbohydrate, protein, fat). The goFOODTM app provides different versions that address the needs of both dietitians and the general population for real-time, cost-efficient, automatic dietary assessment. With the use of a video or two images goFOODTM outputs the meal's calories and macronutrient content in kcal and grams, while with the use of one image it outputs the nutrient content as a traffic-light system.

Android users need to capture two separate images or a video and to place a designated reference card beside their meal for proper size estimation. iPhone X users are able to simultaneously capture both images with one shutter click, since the app exploits the iPhone's two integrated cameras. No reference card is required in this case, as well as in the case of the single image input.

Results goFOODTM supports 24 broad and 324 fine food categories. It is evaluated on the MADiMa2017 database, which contains 80 central-European dishes with known food categories, weight, volume and nutrient content. The average error percentage in volume estimation is in the order of 20%.

Conclusions The goFOODTM versions address a variety of needs and exploit different technologies adjusting their functionalities for accuracy, simplicity or speed.





## Ecological momentary assessment in physical activity and health behaviors among college students

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#### e-&mHealth (SIG)

Purpose: The University of Vermont Wellness Environment (WE) program is a neuroscience-inspired behavioral change program to promote a healthy environment through classroom and residential halls. A customized application 'WE App' was developed to incentivize healthy behaviors such as exercise and meditation among college students. A 14-item survey was administered daily through the App to monitor wellness behaviors. The purpose of the study is to evaluate the association between self-reported exercise and other wellness behaviors from a large cohort of college students.

Method: A total of 668 WE and 596 non-WE participants who were college freshman and sophomores provided daily survey data. The average number of daily surveys completed per participant was 136 out of a possible 209 days from October 2017 to early May 2018. Generalized linear mixed models were used to estimate the association of exercise and other wellness and risk behaviors for both WE and non-WE students after controlling for gender, race, and academic year.

Results: Results revealed a significant association between higher engagement in exercise and better mood ( $\beta$ =0.1, p < .0001), shorter sleep duration ( $\beta$ =-0.05, p < .0001), higher consumption of fruit or vegetable ( $\beta$ =0.1, p < .0001), higher consumption of water ( $\beta$ =0.19, p < .0001), and less non-academic related screen time ( $\beta$ =-0.04, p < .0001). At baseline, compared to non-WE participants, WE participants had statistically significantly higher daily consumption of fruit and vegetables (p = .0006), more mindfulness practice (p < .0001); and lower prevalence of overall alcohol use (p < .0001), having a shot of liquor (p < .0001), using marijuana (p < .0001), smoking cigarettes (p < .0001), using illicit drugs (p = .005), and taking unprescribed pills (p = .0034).

Conclusion: These findings demonstrate favorable outcomes for using technology to track health and risk behaviors among college students. Exercise was positively associated with mood and a range of health behaviors and negatively associated with multiple types of substance use, suggesting that exercise may be an important target for health-promoting interventions among undergraduate students.





# A digital citizen science methodology for adapting mobile ecological momentary assessments to capture prospective physical activity within social and physical contexts: A SMART platform study

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#### e- & mHealth (SIG)

Purpose: Evidence indicates that ecological momentary assessments (EMAs) are a valid, reliable, and feasible method of data collection. Mobile physical activity (PA) EMAs have demonstrated better correlation with accelerometer estimates than traditional self-report methods. However, existing evidence also shows discrepancies in mobile EMA methodology (e.g., triggering processes, time to follow-up), as well as limitations in terms of usage of identical mobile devices and inability to capture context. The purpose of this study was to develop a novel, replicable methodology of mobile EMAs to capture prospective PA within free-living social and physical contexts by leveraging citizen-owned smartphones running on both Android and iOS systems.

Methods: Data were obtained from the adult cohort of the SMART Platform, an innovative citizen science and mobile health initiative for active living surveillance. 538 citizen scientists (≥18 years) residing in Regina and Saskatoon, Canada, provided PA data during 8 consecutive days using a custom-built smartphone app. After rigorous pilot testing and feedback from citizen scientists, a time-triggered EMA was developed to capture daily prospective PA. The EMA enabled reporting of light, moderate, and vigorous PA, as well as physical and social contexts of PA via complex looped linking of intensity and context questions. Retrospective PA was reported using International Physical Activity Questionnaire (IPAQ). For both measures, PA intensities were categorized into mean light and moderate-to-vigorous PA/day. Wilcoxon signed ranks tests and Spearman correlation procedures were conducted to compare PA intensities reported via EMA and IPAQ.

Findings: Daily time-triggered EMAs were able to capture not only prospective light and moderate-to-vigorous PA, but also enabled PA reporting across varied physical and social contexts. Moreover, EMA and IPAQ intensity measures showed moderate correlation.

Conclusions: These findings suggest that time-triggered mobile EMAs are an effective method to record comprehensive prospective PA accumulated across multiple physical and social contexts. With approximately 6 billion smartphones estimated to be in circulation by the year 2020, these ubiquitous tools can be leveraged via citizen science to understand active living patterns of large populations in free-living conditions through EMAs.




# Beyond the concept of 10,000 steps a day: association of physical activity with 6-month weight change in a real-life study among 26,935 connected device users

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#### e- & mHealth (SIG)

Purpose: We aimed to study the association between the evolution of objectively-assessed Physical Activity (PA) patterns and weight change during a six-month period within a real-life setting. Physical activity was assessed objectively via wearable activity trackers and not through self-reported questionnaires which are known to be prone to social desirability and recall bias. The originality of our study comes from the fact that our results are based on one of the few large, real-life, prospective studies of a large population of 26,935 connected users of commercially available digital health tools.

Methods: We analyzed data from 26,935 connected device users (wearable activity trackers and connected digital scales), with 11,911,291 available measures of daily steps and 12,357,814 available weight measures. Users were categorized according to their six-month weight change as stable weight, weight gain (>5% of initial weight), and weight loss (<-5%). PA patterns were derived from information on both PA level and regularity of the level of PA practice, which were estimated using daily steps values. Multinomial logistic regression models were used to analyze initial PA patterns and their evolution over six months in association with the six-month weight change.

Results: Our results suggest in our population that evolutions of PA patterns characterized either by maintaining globally a high PA level (i.e. average PA level  $\geq$  5,800 steps/day) within a six-month period or an increase in the PA level resulting in an average daily steps  $\geq$ 5,800 steps/day at the end of this six-month period were associated with weight loss [odds ratio (OR)=2.22 (95% CI: 1.97-2.49), OR=2.47 (95% CI: 2.06-2.95), respectively].

Conclusions: Our findings indicate that increasing PA levels, irrespectively from the baseline level, may be beneficial in the short term. Our results also suggest that health benefits can already be observed below the 10,000 steps per day and emphasize the idea that "some PA is better than none". Our work may have important public health implications when encouraging adults to engage in PA that is monitored as steps/day, especially at-risk low-active adults for which adherence to the 10,000 steps/day may be too ambitious or unrealistic to achieve.





## #Fitspiration on Instagram: development of a screening tool to identify credible Instagram fitspiration accounts

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#### e- & mHealth (SIG)

Purpose: Fitspiration is a social media phenomenon purported to inspire viewers to lead healthier lifestyles, however psychological impacts aren't well understood. Some fitspiration images have negative effects on body image, and research is yet to confirm whether credible fitspiration accounts can positively influence physical activity without producing negative psychological effects. This study aimed to (1) develop a screening tool to identify credible Instagram fitspiration accounts and (2) test the reliability of the tool.

Methods: Aim 1: Social media literature was examined to guide development of the screening tool. A video recording is taken of the Instagrammers' bio and most recent 15 posts and screened in three stages. Stage 1 examines the images. Accounts are excluded if any images contain nudity or inappropriate clothing, sexualisation or objectification, portrayal of extreme bodies (extreme thinness or muscularity), or fewer than 4 fitness-related posts. Stage 2 examines captions and hashtags. Accounts are excluded if any content contains thinspiration or other negative messages (e.g. encouraging unhealthy attitudes towards the body, diet or exercise). Stage 3 collects information about the account holder (e.g. demographics) and content (types of posts) from posts and account bios. Aim 2: The tool was trialled on 100 Instagram fitspiration accounts identified through Google searching (search phrase "top Instagram fitspiration accounts"). The first 50 Google results were examined. Accounts were included if they were mentioned in >1 Google result (n=60), or based on highest number of followers (n=40). Inter-rater reliability of two independent raters was determined using kappa.

Results: From the 100 accounts audited, 65 were excluded at stage 1. Two were excluded at stage 2. Agreement between raters was excellent (96%,  $\kappa$ =0.91, p<.001). Stage 3 (n=33 included accounts) indicated that account holders were predominantly female (63%), from the US (67%) and held a relevant qualification (58%). Posts included varied content, such as details of workouts, exercise videos, inspirational quotes, and other lifestyle posts.

Conclusions: This project developed a feasible and reliable tool to identify credible Instagram fitspiration accounts that may have a variety of research applications in future.





## Systematic Review of Smartphone-based Interventions to Reduce Sedentary Behaviour and Promote Physical Activity Using Dynamic Models

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#### e- & mHealth (SIG)

Purpose: Smartphone-based behaviour change interventions have been developed predominantly using psychological theories, which have limitations when considering more dynamic digital behaviour change intervention such as just-in-time adaptive interventions (JITAIs). It is unclear how many dynamic model-based interventions have been undertaken in the domain of physical activity (PA) and sedentary behaviour (SB). Therefore, this review aims to quantify the number of studies that have used dynamic models to develop smartphone-based interventions to promote PA and reduce SB, describe their features, and where possible evaluate their effectiveness.

Methods: Databases including PubMed, PsychINFO, IEEE Xplore, Cochrane and SCOPUS were searched from inception to 15 May, 2019 using terms related to mobile health, dynamic models, and activity. Two researchers conducted the screening and data extraction, independently. Outcomes included general characteristics, dynamic model, theory/construct integrated, and outcomes measured (SB and PA behaviours). Data were synthesized narratively. There were limited scope for a meta-analysis because of the variability in the study results.

Results: A total of 1086 reports were screened. Eventually, 12 reports describing 8 studies were eligible and included. Only three studies targeted SB, two of which attempted to interrupt SB by light-intensity walking, and one focussed on both standing and movement. Social Cognitive Theory (SCT) was the major psychological theory on which the studies were based. JITAIs were described in three studies. Dynamic Decision Network, Control Systems engineering, Behavioural Analytic Algorithm and Exploit-Explore Strategy each were employed by one study. Android was the main smartphone operating system in all but one study that used iOS. Four studies used built-in smartphone sensors (i.e. accelerometers) to measure activity, two of which used phone's GPS as well. Three studies used wearable activity trackers. Six studies reported on effectiveness of the intervention.

Discussion: To our knowledge, this is the first systematic review that reports on smartphone-based studies to interrupt SB and promote PA with a focus on integrated dynamic models. Current findings highlight the scarcity of dynamic model-based smartphone studies to interrupt SB or to promote PA. Future research is required to assess the effectiveness of dynamic models to promote PA and reduce SB.





### O.2.23 - Behavioural patterns in older adults

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# Physical activity and sedentary behaviour recommendations for older adults while hospitalised with an acute medical illness: Findings from an International Delphi survey

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#### Ageing (SIG)

Purpose: Immobility is major contributor to poor outcomes for older people during hospitalisation with an acute medical illness. As there is no specific mobility guidance for this population, this study aimed to generate draft physical activity and sedentary behaviour recommendations for older adults' during hospitalisation for an acute medical illness.

Methods: A 4-Round online Delphi consensus process was conducted. International researchers, multidisciplinary clinicians, academics from national activity guideline development teams, and patients were invited to participate. Responses to Round 1 open-ended questions were collated before participants rated the importance of items using a Likert scale (1-9) over Rounds 2-3. Consensus was defined a priori as:  $\geq$ 70% of respondents rating an item as "critical" (score  $\geq$ 7) and  $\leq$ 15% of respondents rating an item as "not important" (score  $\leq$ 3). Round 4 provided the opportunity for comments on draft recommendations.

Results: 49 participants from nine countries were invited to each Round; response rates were 94%, 88%, 81% and 71% from Rounds 1-4 respectively. 43 items from Rounds 2 and 3 were incorporated into 29 draft statements under the themes of PA (e.g. "some PA is better than no activity"), SB (e.g. "older adults should aim to minimise long periods of SB while hospitalised"), people (e.g. "when encouraging PA and minimising SB, people should be culturally responsive and mindful of older adults' physical and mental capabilities") and organisational factors (e.g. "opportunities for PA and minimising SB should be incorporated into the daily care of older adults with a focus on function, independence and activities of daily living"). There was consensus that three of the six WHO guidelines for older adults remain applicable when hospitalised with an acute medial illness, two are "not applicable" and consensus was not reached on activity bout duration.

Conclusions: These world-first consensus-based statements from expert and stakeholder consultation provide the starting point for recommendations to address PA and SB for older adults hospitalised with an acute medical illness. Further consultation and evidence review will enable final recommendations to be developed with examples to improve their specificity and translation to clinical practice.





## Diurnal pattern of sedentary behavior and physical function in older women: Evidence from the Objective Physical Activity and Cardiovascular Health (OPACH) substudy of the Women's Health Initiative

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#### Ageing (SIG)

Purpose: Summary measures of sedentary behavior (SB), e.g., daily sedentary minutes, are linked to negative health in older adults. By leveraging minute-level accelerometry, can we derive clusters of diurnal timing of SB that further elucidate SB-health associations?

Methods: 6204 OPACH participants (79±7 years) wore accelerometers for 4-7 days, yielding 41,356 days with >600 minutes/day of data. Participants were followed for upto 6 years with annual physical functioning (PF) assessments. We conducted novel 2-phase clustering: phase I longitudinal k-means clustering classified 41,356 person-days into 4 diurnal SB patterns; phase II hierarchical clustering classified participants using phase I patterns. We used mixed models to evaluate SB cluster and longitudinal PF, adjusting for demographics, BMI, moderate-vigorous-physical activity (MVPA), comorbidities, and sedentary minutes. Effect modification by MVPA was evaluated via likelihood ratio tests.

Results: At baseline, sample means (SD) were 28.1 (5.7) kg/m2 for BMI, 597 (103) minutes/day for SB, 50 (34) minutes/day for MVPA, and 69 (26) score for PF. Mean PF decline was 2.2 units/year (SE=0.07). Four diurnal SB clusters were identified: high-SB-throughout-the-day (c1, n=2239); moderate-SB-with-lower-morning-SB (c2, n= 1536); moderate SB-with-higher-morning-SB (c3, n= 1137); low-SB-throughout-the-day (c4, n=1292). C1 was less healthy (high BMI, low MVPA, more comorbidities) than c2-c4. SB and PF associations differed by baseline MVPA (p < 0.001); across all clusters, lower vs higher MVPA had worse baseline PF (c1-c4 means 70 -75 low MVPA vs 78.5 - 81.6 high MVPA) and higher decline (PF slopes 2.2 – 3 low MVPA vs 1.6 to 2.1 high MVPA). Paradoxically, the c2-low-MVPA group, had higher baseline PF, yet the steepest PF decline (p < 0.04, vs c1,c4). These effects were mitigated by higher baseline MVPA.

Conclusions: In older women, diurnal SB pattern was associated with differential rates of PF decline. Diurnal timing of SB, independent of total sedentary time, may offer new insights into SB-associated healthy aging.





# Change in diet quality and 15-year healthcare costs in the mid-age cohort of the Australian longitudinal study on women's health

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#### Ageing (SIG)

Purpose: No studies have examined associations between change in diet quality over time and healthcare costs. Our aims were to investigate the relationships between baseline diet quality, and change in diet quality over time, with 15-year cumulative healthcare service use and costs.

Methods: The Australian Recommended Food Score (ARFS) was measured in 2001 (n=9377) and 2013 (n=7415 both time-points) for the 1946-51 cohort of the nationally-representative Australian Longitudinal Study on Women's Health. Fifteen-year (2001-2015) data on healthcare services/costs were obtained from Medicare (Australia's universal healthcare cover).

Part i: To investigate relationships between baseline diet quality and 15-year cumulative services/costs were reported by baseline ARFS quintiles within BMI category.

Part ii: To investigate the relationship between change in diet quality and healthcare costs, by categories of diet quality 'worsened' (ARFS decrease  $\leq$ -4 points), 'remained stable' (-3 $\leq$ change in ARFS $\leq$ 3 points) or 'improved' (ARFS increase  $\geq$ 4 points). Analyses were conducted using linear regression modelling, adjusting for geographical area and socioeconomic status.

Results/findings: Part i: Healthy weight women with the highest diet quality at baseline had fewer healthcare services over 15 years compared to women with the lowest diet quality, although overweight/obese women incurred higher gap (out-of-pocket) costs (p<0.05). Among all mid-aged women, having a greater variety of vegetables was inversely associated with total services and costs over 15 years. For every 1-point increase in ARFS vegetable subscale (equivalent to one extra type of vegetable per week), healthy weight women had 3.4 (95%CI 1.2-5.6) fewer services and incurred \$267 (\$103-430) fewer charges, while overweight/obese women had 3.3 (1.0-5.5) fewer services and incurred \$241 (\$80-403) less charges (p<0.05). Higher ARFS dairy and fruit subscales were associated with higher services and costs (p<0.05).

Part ii: Women whose diet quality remained stable or improved over 12 years had fewer services compared to those whose diet quality worsened (p<0.05).

Conclusions: Higher diet quality is associated with fewer Medicare healthcare services among healthy weight midaged women. Higher vegetable variety is associated with fewer healthcare services and costs, although results are reversed for fruits and dairy. Women who maintained or improved their diet quality over time had fewer healthcare services.





# Total energy expenditure measured using doubly labelled water compared with estimated energy requirements in older adults

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#### Ageing (SIG)

Purpose: Fundamental to supporting healthy ageing are policies to support global population changes; at their core are food and nutrition requirements at population and individual levels. Accurate estimates of energy requirements are crucial to guide nutritional recommendations for healthy ageing. We aimed to determine the optimal method of estimating total energy expenditure (TEE) in adults aged  $\geq$  65 years through 1) determining which resting metabolic rate (RMR) equations best reflect measured RMR and 2) using these equations to calculate TEE and determining the agreement with TEE measured by doubly labelled water (DLW).

Methods: An international database of 31 studies of healthy, ambulatory adults aged  $\geq$  65 years, (988 participant level RMR data and 1488 participant level TEE data) was developed to enable comparison with 17 commonly used predictive equations. Bland-Altman plots assessed the agreement between measured RMR and TEE with predicted RMR and TEE in adults aged  $\geq$  65 years, 65-79 years and  $\geq$  80 years. Proportional bias was assessed using linear regression.

Results/findings: The Ikeda, Livingston and Mifflin equations agreed most closely with measured RMR for the population aged  $\geq$  65 years, as well as the sub-group analyses of 65-79 years and  $\geq$  80 years. In adults aged  $\geq$  65 years, the Ikeda and Livingston equations overestimated TEE by a mean ± SD of 175 ± 1362 kJ/d and 86 ± 1344 kJ/d respectively. The Mifflin equation underestimated TEE by 24 ± 1401 kJ/d. Commonly cited equations (Schofield and Harris–Benedict) showed proportional bias and overestimated RMR. Proportional bias was seen with increasing energy expenditure.

Conclusions: The Ikeda, Livingston and Mifflin equations are recommended for the estimates of energy requirements for older adults aged  $\geq$  65 years, including both 65-79 years and  $\geq$ 80 years. Predictive energy equations currently used in practice rely on chronological rather than biological age, itself a potential limitation on accuracy. Future research should focus on the development of equations to meet the requirements of older adults with considerations given to body composition and functional state.





# An incremental goal-setting intervention to reduce sitting time in older adults with non-insulin dependent type 2 diabetes: feasibility and effectiveness

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#### Ageing (SIG)

Purpose: Reducing sitting time may confer important health benefits for inactive people with chronic disease. The global prevalence of diabetes in adults has almost doubled from 1980 to 2014. There is scant evidence investigating ways to decrease sitting time in people with type 2 diabetes (T2DM). This study aimed to evaluate the feasibility and preliminary effectiveness of an incremental goal-setting intervention on sitting time and blood glucose levels (BGLs) in people with T2DM.

Methods: This study used a pre-post design. Non-working adults ( $\geq 60$  years) with non-insulin dependent T2DM were recruited. Participants attended a one-hour face-to-face session and were: guided through a review of their sitting time; provided with normative feedback on sitting time; and assisted with setting goals to reduce sitting time and bouts of prolonged sitting. Participants chose six goals and integrated one per week incrementally for six weeks. Sitting time and bouts (activPAL3c) and BGLs (Continuous Glucose Monitoring System) were measured for 7-days pre- and post-intervention. During these periods, a 24-hour time recall instrument was administered by computer-assisted telephone interview. Paired t-tests (2-tailed) were completed ( $\alpha$ =0.05).

Results: Of the 28 participants enrolled (69.8±5.4 years, 57% female, BMI 31.3±5.2), 22 have completed, two withdrawn, and four are pending. Data collection will cease March 2020. Post-intervention (n=22), there was no significant change in total daily sitting time (4min/d), and small non-significant increases in standing (18min/d) and stepping (6min/d) time. The time participants spent in short sitting bouts (<30min) increased significantly post-intervention by 36min/d (p=0.03), and the time spent in prolonged sitting bouts ( $\geq$ 30min) decreased by 30min/d, however this was not significant. There was no significant change in average daily BGLs from pre- (7.65mmol/L) to post-intervention (7.88mmol/L). Participant retention was high (93%), all participants reported achieving their goals, were highly satisfied (mean 9.1, 10 was 'extremely satisfied') and would recommend the program to others (9.3, 10 'definitely recommend').

Conclusions: The program is feasible to be implemented with older adults with T2DM. Only small changes in sitting time behaviour were found, with participants spending more time in shorter bouts of sitting but no change to overall daily sitting time.





# Trajectories of accelerometer-measured physical activity and mortality in older adults of the ActiFE-Ulm study

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#### Ageing (SIG)

Purpose: Physical activity is an essential component of health. Objective measurement of physical activity trajectories is sparse in older adults. We aimed to analyze the association of objectively measured trajectories of physical activity during older age on mortality in community-dwelling older adults.

Methods: Walking duration as a measure for physical activity was recorded from 1,406 participants ( $\geq$ 65 years, 56.2% men) of the ActiFE-Ulm study in 2009/10 and followed-up two times (2012/13 and 2017/18), each measurement period was over one week (16,761 measurement days in total) using a thigh-worn uniaxial accelerometer (activPAL; PAL Technologies, Glasgow, Scotland). Mortality was assessed last in February 2019. A latent class joint survival model was used to identify trajectory classes over age and estimate its association with mortality. The longitudinal sub-model included attained age as fixed, random and mixture effects, weekday and daily maximum temperature were included as additional fixed effects (as weather conditions and Sundays have previously been found to affect activity levels). The survival sub-model was adjusted for sex. Both sub-models were joined by attained age as the shared component.

Results/findings: The analysis identified three walking duration trajectory classes over age. A slowly declining class one (n=1,224, 87.1%), a moderately declining class two (n=158, 11.2%), and a rapidly declining class three (n=24, 1.7%). There were 390 deaths during follow-up. Median life expectancy for individuals following trajectory class one was estimated as 92.4 years. Individuals following trajectory class two showed a hazard ratio (HR) of 4.96 (95%-confidence interval (CI): 3.37; 7.32), and those following class three a HR of 68.7 (95%-CI: 29.0; 162.6) compared to class one; equivalent to 7.2 and 18.6 years shorter remaining median life expectancy.

Conclusions: In summary, trajectories of walking duration were clearly associated with overall mortality in community-dwelling older adults. A rapidly declining walking duration trajectory was associated with the highest risk of subsequent mortality.





# Understanding how urban densification impacts on leisure-time walking in older Hong Kong residents

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#### Ageing (SIG)

Purpose: Urbanisation and urban densification are global trends. A recent review found insufficient evidence of associations between dwelling density and either total or within-neighbourhood leisure-time walking. There also little evidence regarding associations between density and walking outside the neighbourhood in comparison to within-neighbourhood leisure-time walking. High density may encourage displacement of within-neighbourhood walking with outside-neighbourhood leisure-time walking. To better understand the influence of neighbourhood dwelling density on leisure-time walking, this study examined the pathways through which dwelling density and related environmental attributes may impact on within- and outside-neighbourhood leisure-time walking in Hong Kong Chinese older adults.

Methods: Data are from the Active Lifestyle and the Environment study in Chinese Senior epidemiological study on environmental correlates of 65+ year old Hong Kong community dwellers' walking and mental health. Participants (n=909) were recruited from administrative units stratified by area-level income and walkability. Within and outside-neighbourhood leisure-time walking, socio-demographics and health status were measured using validated, interviewer-administered questionnaires. Environmental attributes were assessed using Geographic Information Systems. Generalised Additive Mixed Models were used to estimate associations.

Results: Total effects indicated that neighbourhood dwelling density was positively associated with frequency and weekly minutes of outside-neighbourhood leisure-time walking. The former association was mediated by neighbourhood intersection density and suppressed by recreation facilities density via its effect on frequency of within-neighbourhood leisure-time walking. The association of dwelling density with weekly minutes of outside-neighbourhood leisure-time walking. The association of dwelling density with weekly minutes of outside-neighbourhood leisure-time walking was mediated and suppressed by the pathways affecting outside-neighbourhood frequency of leisure-time walking. It was also mediated by transportation density and car ownership and suppressed by ill-health. The effects of dwelling density on within-neighbourhood leisure-time walking were mediated by recreational density and suppressed by street intersection density.

Conclusions: Multiple antagonistic pathways are responsible for the potential effects of urban densification on leisure-time walking in Hong Kong older adults. Disentangling these mediating and suppressing factors is important for the planning of environmental interventions aimed at creating healthy and age-friendly communities.





# O.2.24 - Nutrition and physical activity programmes for children

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# Comparing the effectiveness of the Healthy Start-Départ Santé online training intervention to the in-person training on childcare educators' healthy eating and physical activity practices, and knowledge of fundamental movement skills

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#### Early care and education (SIG)

Purpose: Educators working in early childcare centres (ECCs) are important role models to promote healthy eating (HE) and physical activity (PA) in young children. In-person training interventions with educators have shown positive impacts on children's dietary intake and physical activity. However, the sustainability these interventions is limited by financial and human resource constraints. An online training intervention may be a more cost-effective, sustainable and effective way to reach educators, while also improving their practices. This study aimed to compare the effectiveness of an online version of the Healthy Start-Départ Santé (HSDS) intervention to the traditional inperson intervention and to usual practice on ECC educators' HE and PA practices and knowledge of fundamental movement skills (FMS).

Methods: Seventy-eight ECCs were randomly chosen across the provinces of New Brunswick and Saskatchewan, Canada and were allocated to either the online training, the in-person training or the usual practice group. Educators in each group completed the Nutrition and Physical Activity a self-administered questionnaire before and ten months after the intervention. The questionnaire included questions regarding educators' HE and PA practices in the ECC, as well as their knowledge of children's FMS. Group differences were assessed with mixed-effect models.

Results: Two hundred and four educators completed the pre and post questionnaire. Educators in the online training group reported a greater improvement in the score for HE practices then the change observed among educators in the in-person training and usual practice groups (2.4 vs. vs. 0.6 vs. 1.1, p=0.03). Educators in the online training group reported a greater improvement in the score for PA practices than the change observed among educators in the in-person training group (1.3 vs. 0.1, p=0.03). The rate of improvement in FMS knowledge did not differ across all three groups (p=0.9).

Conclusions: The HSDS online training is a cost-effective method of enhancing educators' knowledge of HE and PA practices in ECCs. Its ability to reach a greater number of educators makes the HSDS online training a promising method to create healthier environments in ECCs.





# Optimising nutrition education for primary school children: an evaluation of components of two existing Dutch programs

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Early care and education (SIG)

Background: A healthy diet is important for children's growth and development. Children need encouragement and support to adopt healthy eating behaviours. Dutch nutrition education programs such as EU-Schoolfruit (EUS) and Taste Lessons (TL) contribute to this by providing children with fruit, vegetables (FV) (EUS) and nutrition education (TL). However, little is known about which components are most effective.

Aim: To examine effective components of existing Dutch nutrition education programs for primary school children (n=1436, n=38 schools) aged 8-12 years.

Hypothesis: It is hypothesized that nutrition education programs are more effective as more components are added. Measures: Child nutrition knowledge, food literacy and FV intakes are measured by a 30-minute questionnaire for the children.

Design: A quasi-experimental study with three arms: (1) schools that implement EUS, (2) schools that implement EUS + TL and (3) schools that implement no nutrition education. Outcomes are being assessed pre-intervention (baseline), immediately following the intervention (post-intervention), and 6 months post-intervention. Analysis: Descriptive analysis using the statistical program R. First, the two intervention groups and the control group are being compared on their socio-demographic characteristics using one-way ANOVA. Subsequently,

multilevel regression analysis will be conducted to evaluate the effect of EU-Schoolfruit and Taste Lessons on nutrition knowledge, food literacy and fruit and vegetable intake, including three levels: (1) pupil, (2) class and (3) school. Simple linear regression will be used, and potential confounders and effect modifiers will be identified. Effect sizes will be expressed as Cohen's d.

Results: Preliminary results from T0 and T1 indicated a significant increase in nutrition knowledge only for children in schools that participated in both programs (EUS and TL), compared to the control group (p<0.01), but no significant increase in FV intake (fruits p=0.19 and vegetables p=0.20). The change in food literacy scores did not significantly differ between the three groups (p=0.99). Full results of the three measurements (T0, T1 and T2) will be presented.

Conclusion: The two existing nutrition education programs (EUS and TL) have some impact on children's nutrition knowledge and FV intake, but specific effects of individual components needs to be evaluated in the future.





# Similarity of Nutrition and Physical Activity Health Behavior and Effects of Role Modeling Between Childcare and Home Environments in Low-Income Children

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Early care and education (SIG)

Purpose: There is a growing prevalence of childhood obesity, especially within low-income populations. Children under age 5 spend a significant amount of time in early care education centers (ECEs), presenting an opportunity to impact their nutrition and physical activity (PA) behaviors. Aims of this study were to: understand the similarity of child health behaviors between ECE and home environments; and investigate the importance of teacher and guardian role modeling in ECE and home environments on impacting child health behaviors.

Methods: Surveys were conducted at 32 ECEs participating in the HealthMPowers program. Teachers and guardians reported their health behaviors and child's behaviors at ECE and at home, respectively. Measures were based on benchmarks created from federal health guidelines and included frequency of fruit and vegetable consumption and PA. Data was collected at baseline and post intervention. Analysis was done on both baseline data and changes from baseline to post intervention. Similarity of child behavior between environments was assessed by kappa agreement statistics. Spearman correlation analyses were conducted to understand the associations of adult and child health behaviors.

Results/Findings: Analysis indicates agreement between childcare and home environments of 5-10% for frequency of daily fruit and vegetable consumption, and 20% for PA behavior. Spearman correlation analysis indicates that there is a positive association between guardian and child health behaviors at baseline and for changes in behavior, with correlation in behavior ranging from 0.49-0.70. (p





# "I was crouching but now I am flying": Impact evaluation of improving the quality of physical education delivery in New Zealand

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#### Early care and education (SIG)

#### Purpose

The global decline in the quality of physical education (PE) has prompted multiple actions to improve student experiences. As the primary delivery agents of PE, school teachers are a key target audience for intervention. The deterioration in PE delivery prompted Sport NZ to develop Play.Sport in 2016, which is a 4-year community-based initiative that provides hands-on practical support and training for teachers, schools, and community organisations to improve the quality of physical activity, play and sport experiences for young people. Our aim was to understand the impact of Play.Sport on teacher confidence and practice in delivering PE and how this affected the subsequent experience and participation of their students.

#### Methods

A mixed-methods evaluation was completed through a total of 45 primary/intermediate schools in two regions of New Zealand between 2016-2019. We assessed change in teacher confidence and practice using a pre-post survey of 197 teachers and subsequent face-to-face interviews of 32 teachers. We assessed changes in student experiences and participation using a pre-post survey of 3185 students and subsequent focus groups with 38 students.

#### Results

Teacher confidence to deliver all components of the PE curriculum improved significantly from 45% to 57%. Similarly, their confidence to effectively deliver at least one component of the curriculum significantly improved from 70% to 82%. Over 85% of teachers reported changes in how they delivered PE as a result of the initiative. This finding was substantiated by qualitative findings that highlighted the importance of the support provided by Play.Sport to develop new practice. Student data indicated significant improvement in PE classes as learning environments for: skill development (62% to 70%); working together (77% to 82%); leadership (60% to 67%); decision making (45% to 58%); community engagement (60% to 67%). The student qualitative results also indicated changes in participation across all strands of the PE curriculum.

#### Conclusions

We found that the Play.Sport initiative improved teacher confidence and practice, which subsequently positively influenced student experience and participation across the PE curriculum. Ongoing evaluation of Play.Sport will elucidate whether this translates into sustained physical activity behaviour change outside of the school setting over the longer term.





### Strategies to improve the implementation of healthy eating, physical activity and obesity prevention policies, practices or programmes within childcare services

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#### Early care and education (SIG)

Background: Although best practice recommendations exist to guide childcare service implementation of healthy eating and physical activity policies and practices, research indicates that implementation is poor. Due to the increasing amount of implementation research being conducted in the childcare setting, an update of this 2016 review was required to reflect the current state of the evidence.

Aim: The primary aim of the review was to examine the effectiveness of strategies aimed at improving the implementation of policies, practices or programmes by childcare services that promote child healthy eating and physical activity. Secondary aims were to examine the effect of implementation strategies on cost or cost-effectiveness, adverse effects on childcare service staff, and child diet, physical activity or weight status.

Methods: A search of electronic databases and a hand search of international implementation journals and trial registries was conducted in February 2019. Authors independently screened abstracts for eligibility, extracted trial data and assessed risk of bias. Studies with a parallel control group that compared any strategy to improve the implementation of a healthy eating, physical activity or obesity prevention policy, practice or programme by childcare services to no intervention, 'usual' practice or an alternative strategy were included.

Results: In addition to the 10 trials included in the 2016 review, a further 11 trials were identified as eligible. Collectively, the 21 trials sought to improve the implementation of policies and practices targeting healthy eating (six trials), physical activity (three trials) or both healthy eating and physical activity (12 trials). A range of implementation strategies were tested in the 21 trials. Nine studies using score-based measures of implementation were included in pooled analysis, indicating a significant improvement in implementation outcomes (SMD 0.49; 95%CI 0.19-0.79; I2 = 54%; p





# Menu planning practices in early childhood education and care – practices associated with menu compliance with sector dietary guidelines

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#### Early care and education (SIG)

Background:Despite recommendations, early childhood education and care (ECEC) services do not plan menus in accordance with sector dietary guidelines. An understanding of current practices undertaken in ECEC by service cooks to plan a menu, and whether these practices impact on guideline implementation, is needed to inform the development of future interventions to improve guideline implementation. This study aimed to examine the following among ECEC services: i) menu planning practices; ii) prevalence of menu compliance with sector dietary guidelines; and iii) menu planning practices associated with higher menu compliance with sector dietary guidelines.

Methods: A cross sectional study was undertaken with long day care services within Hunter New England region of NSW Australia. Cooks within participating services completed a pen and paper survey assessing a range of menu planning practices (e.g. frequency of menu review, time allocated to plan a menu). Service's two-week menus were assessed for their compliance with sector dietary guidelines, based on the number of servings of core food groups and discretionary foods provided per child, per day. Simple and multiple variable poisson regression models were used to determine associations between menu planning practices and "higher" compliance with dietary guidelines.

Results: Cooks from 72 services completed the survey, and 69 provided a copy of their menu for review. Results indicated that the service cook was fully responsible for planning the menu in 43% of services. Service menus were compliant with an average of 0.68 food groups, out of a possible 6. In the multiple poisson regression models, a shorter menu cycle length (p<0.05) and the receipt of training opportunities to support menu planning (p<0.01) were significantly associated with higher menu compliance.

Conclusions: Menu compliance with sector dietary guidelines was low among participating services. This study resulted in novel findings not previously reported, namely that services with a shorter menu cycle, and those who have received training opportunities to support planning a menu, are significantly more likely to have higher menu compliance. The implementation of such practices may assist in the planning of menus that are more compliant with dietary guidelines to improve child nutrition in this setting.





# A Novel Obesity Prevention Intervention Improves Diet Quality and Sedentary Behavior of 2-5 Year Old Children Cared for in Family Childcare Homes: Results from the Healthy Start/Comienzos Sanos Trial

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#### Early care and education (SIG)

Purpose: Family childcare homes (FCCHs) are the second-most utilized non-relative childcare in the United States and may be more obesogenic than childcare centers. Yet, little research has been done in this setting.

Methods: Healthy Start/Comienzos Sanos is a cluster-randomized trial to help family childcare providers (FCCPs) change FCCH environments and improve the diet and physical activity (PA) of children aged 2-5 years in their care. FCCPs completed two surveys and underwent two days of FCCH observation/measurement at baseline and 8 months. The intervention arm received a novel obesity prevention intervention and the control arm a literacy intervention. Child dietary intake was collected using the Dietary Observation in Child Care. Diet quality was calculated using the Healthy Eating Index-2015 (HEI) total and 13 component scores per child (n=366). Child's PA was measured using hip-worn triaxial accelerometers. Children's height and weight were measured to calculate BMI. HEI scores, PA and BMI were averaged by FCCH and ANOVA models examined change in from baseline to follow-up by experimental condition.

Results: 119 FCCP enrolled (100% female, 72% Hispanic, 16% Black, mean age 48.4 years, 11% no high school education) with 87 completing 8 month follow-up. Baseline: Children's HEI scores averaged 61.87 (SD 10.4) (80=healthful diet). Most of children's time in FCCH was spent sedentary ( $61.5\% \pm 11.0\%$ ), with only 9.9% $\pm 4.7\%$  in moderate-to-vigorous PA (MVPA); 33% of children were overweight/obese.; Pre-Post Change: Children in the intervention group FCCH had greater changes than control group in total HEI scores (+3.82 vs. -3.34, p = 0.0004), and total vegetable (+0.49 vs. -0.37, p = 0.03); added sugar (+0.97 vs. +0.01, p = 0.03) and refined grain (+1.26 vs. - 0.17, p = 0.06) HEI component scores. Furthermore, intervention children decreased percent sedentary time (-1.67% vs. +3.60%, p = 0.042) and increased percent time in MVPA (+1.46% vs. -0.40%, p < 0.08) more than control group children. As expected, there were no between treatment differences in BMI Z-score or BMI-percentile.

Conclusions: The Healthy Start intervention improved the dietary quality and decreased the sedentary time of 2-5 year old children cared for in FCCHs, which has important implications for professional development and policy.





### O.2.25 - Home environment and children's energy balance-related behaviours

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### Are maternal feeding practices associated with toddlers' food neophobia?

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#### Children and families (SIG)

Purpose: Toddlerhood is a crucial period for developing eating habits. Evidence about the association between maternal feeding practices and children's food neophobia is lacking. This study was conducted to explore the relationship between maternal feeding practices and toddlers' food neophobia among a sample in Ireland.

Methods: This was a follow up to the DIT-Coombe Hospital cohort study in Ireland. Mothers in the original cohort were contacted by telephone call. Postal questionnaires were distributed to those who agreed to participate in the current follow up. Multivariate logistic regression analyses were performed to determine the association between maternal feeding practices and toddlers' food neophobia.

Results: There were 205 participants included in the study of which 98 (47.8%) toddlers had high degree of food neophobia (score>12). Children's food neophobia was positively associated with maternal practices of coaxing the children to eat at refusal (OR=2.279, 95% CI:1.048-4.955), maternal unpleasant feelings at mealtime (e.g. stressful or hectic for themselves, or tearful for children) (OR ranged between 1.618 and 1.952), and mothers' own degree of food neophobia (OR=1.036, 95% CI: 1.001-1.072). Mothers who were not anxious when confronted with food refusal of the child, was a protective factor for child's food neophobia (OR=0.251, 95% CI: 0.114-0.556).

Conclusions: The determinants of high level of child's food neophobia revealed in this study suggests that responsive feeding for the toddlers; and mothers remaining calm and patient with the child at mealtime be recommended.





# The moderating role of parental characteristics in the association between child television viewing and measured childhood obesity: a cross-sectional study

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#### Children and families (SIG)

Purpose: The association between sedentary behaviour and obesity in childhood is complex and may be moderated by parental characteristics. This study investigates the association between sedentary behaviour and obesity in a pooled sample of New Zealand children and whether parental characteristics moderate any associations.

Methods: Cross-sectional child and adult data from the New Zealand Health Survey were pooled for the years 2013/14–2016/17 (n=9,022 children aged 2-14 and adults aged 15-70). Each adult survey participant was recorded as being the parent of the participating child. Sedentary behaviour for children was estimated using parental self-reported television (TV) time. Parents were asked for the average time the participating child spent watching TV each weekday and weekend. Childhood body mass index (BMI) and obesity was defined using measured height (cm) and weight (kg) and the International Obesity Task Force (IOTF) cut-off values. Parental participant characteristics, including ethnicity and education-level, were also collected as part of the survey. Effect modification was assessed by stratifying binary logistic regression analyses by parent education (low, moderate, high) and ethnicity (Asian, European/other, Māori, Pacific). Data are shown as Adjusted Odds Ratio (AOR) (95% Confidence Intervals (CI)).

Results: Watching  $\geq 2$  hours TV on average per day in the past week, relative to <2 hours TV viewing, was associated with a higher risk of childhood obesity (AOR=1.26 [1.06, 1.51]). Stratification showed that the association between  $\geq 2$  hours TV and obesity was most pronounced for parents of low education (AOR=1.36 [1.01, 1.85]) and high education (AOR=1.50 [1.03, 2.20]), and European/other parent ethnicity (AOR=1.85 [1.36, 2.52]).

Conclusion: Higher levels of sedentary behaviour in childhood was associated with higher risk of obesity. However, we found some support for a moderating role of parent education and ethnicity. This suggests a more complex relationship exists between child sedentary behaviour and obesity than is sometimes suggested.





# Patterns of food parenting practices regarding junk food and sugary drinks among parent-child dyads

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#### Children and families (SIG)

Purpose: Food parenting practices affect children's dietary intake and are often used in combination, although they generally are studied independently. Hence, the purpose of this study was to determine patterns of food parenting practices regarding junk food and sugary drinks (JS) and explore their associations with demographic characteristics and dietary intake in parents and their children (12-17 years). Unique aspects of this study include the use of a person-centered analytic approach and data from a large sample of children and parents that purposely included fathers.

Methods: Dyadic survey data from Family, Life, Activity, Sun, Health and Eating, a cross-sectional, Internetbased study conducted in 2014, were analyzed using latent class analysis to identify patterns of parent- and childreported JS parenting practices (n=6). Model covariates included parent and child sex, body mass index, intake of sugar from sugar-sweetened beverages (SSB), and beliefs about whether it is okay for a parent to make rules about a child's behavior like JS intake (JS legitimacy of parental authority [LPA]).

Results: Based on 1,657 parent-child dyads, five latent classes were identified – Complete Influencers (28%), Indifferent Influencers (21%), Negative Influencers (20%), Minimal Influencers (18%), and Disagreeing Influencers (13%). Compared to older child dyads, younger child dyads had 77% and 65% lower odds of belonging to Indifferent and Minimal Influencers versus Complete Influencers. Odds of belonging to Negative Influencers were 3% higher for every teaspoon increase in parent intake of sugar from SSB while odds for Minimal Influencers were 8% lower for every teaspoon increase in child intake of sugar from SSB versus Complete Influencers. Dyads with low compared to high parental and child agreement with JS LPA had between 2 and 27 times the odds of belonging to one of the other classes versus Complete Influencers.

Conclusions: This study's findings indicate that distinct patterns of JS parenting practices exist and are associated with dyadic demographic characteristics, dietary intake, and JS LPA. Because parents are not all the same in their use of and the number of parenting practices used to influence their child's dietary intake, a more personalized approach may be needed when designing family-based nutrition interventions.





# Parental happiness is associated with the co-occurrence of healthy energy balance-related behaviors in preschoolers

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Children and families (SIG)

Purpose: Different energy balance-related behaviors (EBRBs) exert combined effects on children's health. Therefore, factors associated with the co-occurrence of EBRBs need to be identified. We examined whether parental happiness and perceived wellbeing are associated with the co-occurrence of preschoolers' healthy EBRBs.

Methods: This cross-sectional study included 647 pairs of parents (88% mothers) and children (mean age 4.7±0.9 years) from the DAGIS study. The parents completed the validated Subjective Happiness Scale and answered other wellbeing-related questions. Children wore an ActiGraph wGT3X-BT accelerometer, and the parents filled in a sedentary behavior diary and a food frequency questionnaire on behalf of the children. We defined four healthy EBRBs: meeting the WHO physical activity or screen time guidelines; high consumption frequency of vegetables, fruits and berries; and low consumption frequency of sugary foods, treats and drinks. We conducted multinomial logistic regression analyses.

Results: Among the children, 27%, 37% and 36% had 0–1, 2 and 3–4 healthy EBRBs, respectively. After adjusting for parental gender, education and BMI, research season, and children's gender and age, parents with higher happiness scores had higher odds of having children with 2 (OR 1.29, 95% CI 1.06–1.57) or 3–4 (OR 1.26, 95% CI 1.04–1.54) healthy EBRBs than children with 0–1 healthy EBRBs. Similarly, parents who perceived physical activity as quality time for the family had higher odds of having children with 2 (OR 1.25, 95% 1.02–1.55) or 3–4 (OR 1.49, 95% CI 1.19–1.87) healthy EBRBs, and parents who perceived eating together as quality time for the family (OR 1.46, 95% CI 1.10–1.92) or had better perceived economic wellbeing (OR 1.27, 95% CI 1.02–1.59) had higher odds of having children with 3–4 healthy EBRBs. In contrast, parents who perceived having bigger problems than child's EBRBs had lower odds of having children with 2 (OR 0.95, 95% CI 0.90–1.00) or 3–4 (OR 0.93, 95% CI 0.88–0.98) healthy EBRBs than children with 0–1 healthy EBRBs.

Conclusions: Parental happiness and better perceived wellbeing are associated with preschool children engaging in multiple healthy EBRBs. Targeting wellbeing of the whole family should be considered when promoting children's health.





# Home food availability and parental dietary patterns

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#### Children and families (SIG)

Purpose: Numerous studies have investigated the relationship between healthy and unhealthy home food availability and food behavior among children. However, as the home food availability mainly reflects the choices of the parents rather than the children's, we aimed to 1) examine data-driven dietary patterns among parents of preschoolers and to 2) study the association between home food availability and dietary patterns among fathers and mothers separately.

Methods: The participants were 510 fathers and 622 mothers of 3–6-year-old Finnish preschoolers who participated in the cross-sectional DAGIS study in 2015–2016. Parents filled in food frequency questionnaires (FFQs) enquiring the consumption frequencies of 49 food items during the past week. Dietary pattern scores were derived using principal component analysis. Parents also reported how often they had certain food items in the home, and a composite score describing the availabilities of fruits and vegetables (5 items) and sugar-enriched foods (6 items) was calculated. Linear mixed models were used to examine the association between quarters of home food availability and dietary pattern scores.

Results: We identified two major dietary patterns, which were named 'health-conscious' (high loadings of e.g. berries, natural yogurt, plain nuts, fresh fruit, and fresh vegetables) and 'sweet-tooth' (high loadings of e.g. sweet pastries, biscuits, wholemeal bread, chocolate, and potatoes). In multivariate models, the availability of fruits and vegetables was positively and that of sugar-enriched foods inversely associated with the health-conscious pattern both among fathers and mothers. The availability of sugar-enriched foods was positively associated with the sweet-tooth pattern among fathers and mothers. The associations seemed to be stronger among mothers than fathers.

Conclusions: This study suggests that the associations between home food availability and dietary patterns are fairly similar among fathers and mothers. Based on the results, the role of the unhealthy home food environment is substantial, and by restricting the availability of unhealthy foods in the home the parents could possible improve both their own and their children's diets, as the children are dependent on the foods provided by the parents.





# Associations between obesogenic home food environment and frequency of snack intake among 7-10 year old children living in rural communities

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#### Children and families (SIG)

Purpose: Snacking among children is a major source of discretionary calories. Given the childhood obesity epidemic, this study examined associations between obesogenic home food environmental factors and number of snacks consumed by 7-10 year old children living in rural communities.

Methods: The present study analyzed 2017/2018 baseline data from 106 parent/child dyads participating in the NU-HOME randomized controlled trial. Snacking data were collected via ecological momentary assessment surveys that were sent via text to parents' cell phones on seven evenings over a two-week period (random schedule) asking parents about the types of snacks their child ate that day. Parents responded (yes/no) if their child ate a snack that day and then (yes/no) to a list of 11 common snacks, including sugar-sweetened beverages (SSB). Mean number of snacks were calculated over the total number of days measured (4-7 days). Home food environmental factors were measured by the validated Home Food Inventory and included the number of unhealthy foods available in the home and number of unhealthy foods accessible in refrigerator. Children's dietary quality (HEI 2015 scores) were collected via dietary recalls. Demographics (child age, food security, parent education) were collected from parent surveys. General linear modeling examined associations between average number of snacks children consumed per day with unhealthy food items in refrigerator (1=0-1; 2=2; 3=≥3 items) and demographics. Correlations examined associations between number food environment, demographics, and children's diet quality.

Results: On average, children consumed 2.4 snacks per day (SD=1, range=0.17-4.71). Number of unhealthy foods available at home was significantly correlated with average number of snacks consumed per day (r=0.35; p=0.0002). There were no significant associations between average number of snacks consumed by demographics or diet quality (HEI 2015).

Conclusions: Real-time snack consumption findings suggest that children consume a greater number of snacks when more unhealthy foods are available at home. However, a higher total number of snacks consumed does not mean overall diet quality is poorer.





### O.2.26 - Adolescent and young adult health and well-being

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# Links between anxiety and weight-related concerns, behaviors, disordered eating risk of young adults

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Disease prevention and management

Purpose: Anxiety, characterized by excessive uncontrolled worry or concern, is associated with increased risk of disordered eating; however little is known about how anxiety is related to specific weight-related concerns (eating concern, shape concern, weight concern) and behaviors (restraint eating, inappropriate weight-management behaviors). Thus, this study examined links between anxiety, weight-related concerns and behaviors, and overall disordered eating risk.

Methods: Young adults (n=1792, 65% female, age=20.36±1.32SD years) completing an online survey comprised of all Eating Disorder Exam Questionnaire (EDE-Q) assessments (eating, shape, and weight concerns; restraint and binge eating; inappropriate weight-management behaviors) were divided into 3 groups based on Generalized Anxiety Disorder-7 (GAD-7, alpha=0.93) scale score (7-item, 4-point Likert; possible score 0-21): low (score <7; n=991), moderate (score  $\geq$ 7 to <14; n=625), or high (score  $\geq$ 14; n=286) anxiety.

Results: ANOVA with Tukey post hoc tests revealed the low anxiety group had significantly (p<0.01) less concerns about eating, shape, and weight and were less likely to engage in restraint eating, binge eating, or use inappropriate weight-management behaviors (i.e., vomiting, laxative use, excessive exercise) than both the moderate and high anxiety groups. Similarly, the moderate anxiety group had significantly less eating, shape, and weight concerns and restraint and binge eating behaviors than the high anxiety group. Use of inappropriate weight-management behaviors did not differ between moderate and high anxiety groups. Overall disordered eating risk scores increase with anxiety, with all groups differing significantly from each other.

Conclusion: Anxiety is associated with every concern and behavior assessed by the EDE-Q, as well as overall EDE-Q score. The prevalence of moderate to high anxiety in young adults (48% of this sample), the links elucidated between weight-related concerns and behaviors, and the risks these concerns and behaviors pose to immediate and long-term health all suggest that nutrition interventions targeting young adults should consider incorporating anxiety reduction tools and evaluating the potential for these accessory tools to improve overall health.





# Maternal Health Behaviours and Child's Birth Weight: Findings from the Communication Healthy Beginnings Advice by Telephone (CHAT) Study in Australia.

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#### Disease prevention and management

Purpose: Birth weight has been linked to infant morbidity and mortality, childhood development and health status in adulthood. Past studies indicate the link between pre-pregnancy body mass index (BMI) and infant birth weight. Maternal nutrition is also recognised as one of the key determinants of fetal growth. This study examined whether mother's weight status before pregnancy and their dietary habits during third trimester predict infant's birth weight.

Methods: This study used baseline data from a randomised controlled trial of Communicating Healthy Beginnings Advice by Telephone, conducted in four local health districts in New South Wales, Australia. Women in their third trimester of pregnancy were included. Telephone survey was used to collect baseline data such as the women's demographic background, pre-pregnancy BMI, dietary habits including fruits, vegetables, processed meat, chips, fast foods, soft drinks, and juice consumption, gestational diabetes and smoking status. Infant birth weight data were collected using a second telephone survey while the baby was 6 months of age. Multivariate regression modelling was used to determine the factors predicting low (<2,500g) and high ( $\geq$ 4,000g) birth weight.

Results/findings: Data were available for 1,154 participants. The majority of the infants (86%) were within normal birthweight, 4% were classified as low birth weight while 10% were classified as high birth weight. Findings indicate high consumption of soft drinks (ARR= 2.30, p<0.05), chips (ARR= 0.30 p<0.05), and fast food (ARR= 1.54, p<0.05) during pregnancy were associated with infant's low birth weight. Mothers who were obese before their pregnancy (pre-pregnancy BMI  $\geq$ 30) (ARR= 2.01, p<0.05) were associated with infant's high birth weight.

Conclusions: The study findings revealed that mother's weight status and certain dietary behaviours during pregnancy could play significant role in infant birth weight. These findings support the need of intervention to promote healthy weight status among women who plan for pregnancy as well as to promote less junk food consumption during pregnancy in order to reduce the risk of unhealthy infant birth weight.





### The effect of a high and low fat meal on ghrelin levels in young Malaysian men

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#### Disease prevention and management

Purpose: Weight loss in obesity is often achieved by calorie restriction and increased energy expenditure. A gradual return to previous eating habits makes success a challenge. Ghrelin, an orexigenic hormone secreted by the stomach may be elevated among obese individuals. It may play a role in activation of the reward systems of the brain, and influence feelings of hunger to motivate consumption of food. The response of hormones regulating appetite and hunger to different types of nutrients may help to understand this. Thus, the objective of this study is to observe the change in plasma ghrelin to two isocaloric meals with a %fat composition of 30 and 50.

Methods: Twelve male participants with normal BMI, between the ages of 18 and 22 recruited by advertisement, enrolled in this cross-over experiment. Informed consent was obtained before commencement of the experiments. Basic anthropometric measurements were made including height (Seca, Hamburg, Germany), weight and body composition (Tanita, Tokyo, Japan). In the first experiment, one of 2 isocaloric meals containing either 30 or 50% fats was administered in random order determined by a coin toss after an overnight fast. A second experiment was conducted at least 4 days later with the other meal given similarly. A fasting serum ghrelin and ghrelin 1 hour after consumption of each meal was analysed by immunoassay using a commercially available kit (Elabscience, Texas, USA) and measured in ng/ml.

Results/findings: Participants had a BMI of  $22\pm2$  kg/m2and % body fat of  $18.5\pm5$ . Ghrelin levels decreased by an average of 34% and 20% after the high fat meal which was statistically significant (p<0.025), and low fat meal respectively, when compared to baseline levels.

Conclusions: Thus within this study group, ghrelin levels measured one hour after consuming a meal decreased significantly with a high fat meal. This finding may help to understand and manipulate fat content of a meal to achieve lower post-meal ghrelin levels. Further investigation into whether this translates to greater satiety levels is needed.





# Child waist circumference cut-points for identifying Acanthosis Nigricans, the Children's Healthy Living Program

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#### Disease prevention and management

Purpose: Waist circumference is an ideal anthropometric measure for abdominal obesity and a predictor of insulin resistance, independent of body mass index (BMI) in youth. The objective of this study is to develop optimal age- and sex-specific waist circumference cut-points for identifying risk of Acanthosis nigricans among 2 – 8-year-old US Affiliated Pacific (USAP) children.

Methods: A cross-sectional secondary analysis examined 4023 children from data collected in 2012 – 2013 from the Children's Healthy Living Program. Height, weight, and waist circumference measurements and the observation of Acanthosis nigricans were assessed by trained staff. Receiver-operating characteristic (ROC) analysis was used to estimate the age- and sex-specific waist circumference sensitivity and specificity to detect Acanthosis nigricans. Youden's Index (J) determined the optimal waist circumference cut- off points by sensitivity + specificity - 1 with a range from 0 and 1. These cut-points are compared to the 90thpercentile, which is the International Diabetes Federation criteria for children 6 years and older.

Results: Overall, waist circumference increased with age among boys and girls. The 90th percentile for boys ages 2 – 5 years (58.15 cm) and 6 – 8 years (71.63 cm) were slightly higher than girls for both age groups (girls: 2 – 5 years: 57.97 cm and 6 – 8 years: 70.37 cm). In a model including both sexes, the highest sensitivity and specificity for identifying Acanthosis nigricans had a value of 60.0 cm, equivalent to the 85th percentile. The optimal cut-points for identifying Acanthosis nigricans for boys, 2 – 5 years (53.25 cm) was at the 75th percentile and 6 – 8 years (63.63 cm) at the 80th percentile. For girls he cut-point for ages 2 – 5 years (58.24 cm) was at the 90th percentile and 6 – 8 years (63.60 cm) was at the 80th percentile.

Conclusions: In USAP children, waist circumference was shown to be a predictor for identifying Acanthosis nigricans. Further longitudinal analysis is warranted to confirm Acanthosis nigricans at lower waist circumference percentiles than expected. These cut-points provide an estimate for epidemiological and possibly clinical applications for early detection and prevention of Type 2 Diabetes.





# Feasibility and efficacy of unsupervised combined aerobic and resistance highintensity interval training in people with Type 2 Diabetes

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Disease prevention and management

Purpose: High-intensity interval training (HIIT) elicits equal or superior health benefits to moderate intensity continuous training (MICT) in a supervised setting. Self-directed participation in HIIT following supervised training has not been widely examined. Therefore, we aimed to determine the feasibility and efficacy of home-based combined aerobic and resistance HIIT (C-HIIT) compared with combined MICT (C-MICT) after a supervised period in people with type 2 diabetes (T2D).

Methods: Fifty-seven adults with T2D (63% male, age 61±9y, HbA1c 7.7±1.2%) completed 8weeks of supervised C-HIIT (1x4min HIIT @ 85-95% HRpeak plus 8x1min resistance training, 3times/week) or C-MICT (52.5min @ 55-69% HRpeak, 2times/week; 22.5min @ 55-69% HRpeak plus 30min resistance training, 2times/week), before completing 10months of self-directed, home-based training. Feasibility was assessed via adherence to the exercise prescription and face-to-face interviews. Efficacy was assessed via changes in cardiorespiratory fitness (CRF; ml/kg/min) and leg press 1 repetition maximum (1RM; kg). The quantitative data were analysed using one-way ANCOVA. The qualitative data was analysed using a thematic analysis.

Results: C-HIIT and C-MICT participants completed 48% and 67% of the prescribed sessions respectively during the home-based training period, with 63% and 80% adherence to the prescribed intensities. The key barriers to C-HIIT were identified as lack of access to specialised equipment and lack of supervision. After 8weeks, there were similar improvements in CRF (C-HIIT: mean difference (MD) 0.9ml/kg/min, 95% CI [-0.2, 1.9], p=0.12; C-MICT: MD 1.9ml/kg/min [0.2, 1.8], p=0.02) and 1RM (MD 17.0kg, [-3.9, 37.9], p=0.15) between groups. At 12months, CRF improved further in C-MICT (MD 1.3ml/kg/min [0, 2.6], p=0.04), but the improvement in C-HIIT (MD 1.2ml/kg/min [-0.3, 2.7]) was not significant (p=0.10). There was no between-group difference in 1RM after 12months (MD -15.4kg [-37.1, 6.3], p=0.15).

Conclusions: This is the first study to compare the feasibility and efficacy of high- and moderate intensity combined aerobic and resistance training in people with T2D. It highlights the need for strategies to enhance long-term HIIT participation in people with T2D, with focus around equipment access and supervision.





# Comparison of bone mineral density according to the different types of sedentary behavior in children and adolescents

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Disease prevention and management

Purpose: Sedentary behavior (SB) may be detrimental to the health of different populations, but in children and adolescents it is unclear whether young people with high SB would have lower bone mineral density (BMD) and whether such results would be independent of confounding factors such as somatic maturation and physical activity (PA).

Objectives: To compare the BMD of different sites according to the level of different types of SB in children and adolescents.

Methods: The sample consisted of 88 students (54 males) aged  $9.5 \pm 1.5$  years of Presidente Prudente-SP, Brazil. SB was evaluated by the number of hours of TV, computer, video game and smartphone use. The total SB was evaluated by the sum of the number of hours in the different screen devices. Children were divided into tertiles according to each SB. The BMD on each site and the entire body has been evaluated by DEXA. Somatic maturation was calculated using the Maturity Offset estimation formula, in which values of weight, height, trunk and leg length were used. PA was assessed using the questionnaire developed by Baecke et al. The comparison of the different types of BMD sites according to the SB levels by each screen device and the total SB were analyzed by ANCOVA adjusted for sex, age, somatic maturation, lean mass and PA.

Results: Children and adolescents classified with low video game use had higher BMD-legs compared with high video game use peers (P= 0.013; F= 4.567). Young people as well as to those with moderate use of this device (P= 0.035; F= 3,496). Children and adolescents with low total SB had higher BMD-legs than young people with high total SB, but this relationship is mitigated after adjustment for PA (P= 0.068; F= 2.775). Whole body BMD was higher in young people with low total SB than in those with moderate and high SB (P=0.011; F=8.333).

Conclusions: Adolescents with high SB tend to have lower whole body BMD compared to those with low sedentary behavior.





### O.2.27 - Physical activity research in adults

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# Development of the Irish Physical Activity Research Collaboration (I-PARC) and a practical standardised evaluation framework for monitoring physical activity interventions.

Dr. Joseph Murphy<sup>1,2</sup>, Dr. Fiona Mansergh<sup>3</sup>, Ms. Jemima Cooper<sup>1,2</sup>, Dr. Niamh Murphy<sup>4</sup>, Prof. Marie Murphy<sup>5</sup>, Ms. Shirley O'Shea<sup>6</sup>, Ms. Sarah O'Brien<sup>6</sup>, Ms. Colette Brolly<sup>7</sup>, Mr. Peter Smyth<sup>8</sup>, Mr. Benny Cullen<sup>8</sup>, Mr. James Lavelle<sup>9</sup>, Mr. Ronan Kielt<sup>10</sup>, **Prof. Catherine Woods<sup>1,2</sup>** 

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#### Other

Purpose: Despite multiple interventions for promoting physical activity (PA) being delivered across Ireland, the majority of the population fail to meet the recommended levels of PA. Ireland's national physical activity plan calls for collaboration between the relevant stakeholders to gain a better understanding into what interventions work, for whom, and in what context. The purpose of I-PARC is to bring together those stakeholders to find answers to these questions.

Methods: I-PARC uses a mixed methods approach to develop and transfer knowledge between researchers, policy makers and practitioners across three work packages (WPs). WP1 seeks to develop the collaboration, the project aims, objectives and methods of effective communication between the various stakeholders. A combination of surveys, workshops, interviews and iterative feedback from the I-PARC team has led to a practical standardised evaluation framework (SEF) for monitoring PA interventions (WP2). The same method is being used to develop good practice statements for successful evaluation (WP3)

Results: To date, I-PARC has brought together a research team (n=20), practitioner advisory group (n=25) and research advisory panel (n=6) involved with PA promotion. The collaboration has been enhanced through participation events (n=4), social media and an I-PARC website that has 1,725 views since March 2019. The SEF has been developed through observation of previous evaluation frameworks (n=12) and feedback from the collaboration (3 rounds). Using this feedback, the SEF has been revised through two versions, now asking questions to both the intervention coordinator (25 questions) and participants (8 questions). The SEF collects information around intervention reach, resources needed, cost and impact on PA levels.

Conclusion: I-PARC highlights the need for effective partnerships in order to promote PA. This collaboration has allowed stakeholders to begin communicating their needs and aligning their goals for the promotion of PA as a whole system. I-PARC has seen the creation of a SEF that is more usable in practice than previous approaches and provides key information to both those involved in practice and policy. Furthermore, gathering information from those





involved in the delivery of PA interventions will provide valuable insight into the facilitators and barriers of implementation.





### Emergency nurses: A shift a day can impact work, rest and play

**Miss Stephanie Chappel**<sup>1</sup>, Associate Professor Brad Aisbett<sup>1</sup>, Prof. Julie Considine<sup>2, 3</sup>, Associate Professor Nicola Ridgers<sup>1</sup> <sup>1</sup>Deakin University, Institute for Physical Activity and Nutrition (IPAN), School of Exercise and Nutrition, Geelong, Australia, <sup>2</sup>Deakin University, School of Nursing and Midwifery and Centre for Quality and Patient Safety Research, Geelong, Australia, <sup>3</sup>Centre for Quality and Patient Safety Research – Eastern Health Partnership, Carrum, Australia

Other

#### Purpose

Emergency nursing is a physically demanding occupation yet research suggests emergency nurses do not meet current physical activity guidelines. Interventions to increase nurses' physical activity have had limited effectiveness as they may unintentionally impact on the amount of physical activity nurses' accumulate in another domains (e.g., leisure, household). Currently, little is known about how physical activity during leisure time may affect work activity and vice versa. This study aimed to determine the associations between emergency nurses' activity levels at work and during their leisure time on work days.

#### Methods

Data from 49 emergency nurses (44 female, five male) participated in the Physical Activity in Emergency Departments (PACED) Study were analysed. Nurses wore an ActiGraph accelerometer and completed work and sleep diaries for up to four weeks. An activPAL inclinometer was simultaneously worn by 41 nurses. Time spent sedentary (SED), sitting, standing, stepping, and in light-, and moderate- to vigorous-intensity physical activity (MVPA) during work and leisure time (before and after a shift) were determined. Multi-level analyses examined associations between emergency nurses' activity levels and their work and their leisure time.

#### Results

On work days' emergency nurses engaged in 39 minutes of MVPA. Increasing MVPA prior to a morning shift was associated with more SED time and less physical activity (light and MVPA) at work. Conversely, increased stepping time at work was associated with more sitting, standing and stepping time after each shift, but the opposite was observed for night shifts. Lastly, increases in sitting and standing time at work were associated with less sitting and stepping time after the shift, with less standing time observed specifically after a morning shift.

#### Conclusions

This is the first study to examine associations between emergency nurses' physical activity at work and their leisure time activity (and vice versa). The results demonstrate that increased physical activity before a morning shift may impact emergency nurses' occupational activity. These findings provide critical insights into how and when researchers should intervene if seeking to increase physical activity levels to facilitate adequate recovery for nurses' post-shift and balance competing demands on their leisure time.





# How pre-/pregnancy activity behaviour influences women's device-measured activity in established parenthood: Findings from the Southampton Women's survey

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Other

Purpose: Little is known about how activity behaviours before and during pregnancy (pre-/pregnancy) relate to those in later parenthood. We assessed how women's pre-/pregnancy sitting and moderate/strenuous exercise were associated with sedentary time and physical activity in established parenthood (6-7 years postpartum).

Methods: In the Southampton Women's Survey, women reported hours/week spent sitting and in moderatestrenuous exercise pre-pregnancy, and at 11 and 34 weeks' gestation. Trajectories of pre-/pregnancy activity behaviour were derived using median splits of hours/week sitting and in moderate/strenuous exercise [e.g. 0-0-0: consistently low sitting or exercise pre-/pregnancy]. In established parenthood, women wore an accelerometer for  $\leq$ 7 days; we derived two outcomes: daily minutes sedentary (SED) and in moderate-to-vigorous physical activity (MVPA). Multi-level linear regression was used to explore the associations between pre-/pregnancy trajectories and device-measured SED/MVPA in established parenthood [i.e. sitting $\Rightarrow$ SED and exercise $\Rightarrow$ MVPA]. Analyses were adjusted for maternal age, pre-pregnancy BMI, parity, educational attainment and ethnicity. Due to non-normality,

MVPA data were log-transformed, with back-transformed coefficients presented as geometric mean ratios (GMR).

Results: 569 women provided valid data pre-/pregnancy and in established parenthood [device-measured activity: mean(SD) 5.4 (1.8) days]. Compared with consistent low sitters pre-/pregnancy, consistent high sitters were more sedentary in established parenthood ( $\beta$ =41.8 minutes/day (19.3, 64.1)). Compared to consistent low exercisers pre-/pregnancy, consistent high exercisers [i.e. 1-1-1] had a larger percentage increase in MVPA in established parenthood (GMR (95%CI): 1.26 (1.02, 1.56)); this equates to approximately 26% more MVPA in the consistent high exercisers vs. consistent low exercisers. Similar results were seen for women with variable pre-/pregnancy exercise ([0-1-0 or 1-0-1]; 1.27 (1.02, 1.59) and women increasing their exercise during pregnancy ([0-1-1 or 0-0-1]; 1.23 (1.00, 1.52)) (vs. consistent low exercisers).

Conclusions: Pre-/pregnancy trajectories of sitting and exercise are associated with sedentary time and MVPA respectively in established parenthood, suggesting that activity behaviours pre/pregnancy predict those in later adulthood, and despite becoming a parent. That those who engage in or start exercising during pregnancy (vs. consistent low exercisers) have higher MVPA later in life also hints that exercise during pregnancy confers positive benefits into later parenthood, possibly through management of pregnancy weight-gain.





# Gender-specific correlates of objectively measured physical activity and sedentary behaviour in adults with intellectual disabilities

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Other

Purpose: Adults with intellectual disabilities (ID) have high sedentary behaviour (SB) rates, and low physical activity (PA) levels. Women in this population are reported to engage in significantly less moderate to vigorous PA (MVPA) than men, however no research has explicitly explored the role of gender in PA and SB of adults with ID. Therefore, this study aimed to identify gender-specific correlates of objectively measured MVPA and SB in adults with ID.

Methods: A secondary data analysis of the pooled baseline data (n = 143; 51.7% female) of two Glasgow-based intervention studies recruiting adults ( $\geq$ 18 years old) with mild to profound ID. Objectively measured percentage time in MVPA (%MVPA) and percentage time in SB (%SB) were collected using GT3X+ Actigraph Accelerometers. Data was categorised by gender with four multiple regression models developed for %MVPA and %SB of each gender, with variable selection procedures employed. Correlates reflected the socio-ecological model. Data on self-efficacy for PA (SE) was only available for n = 94 participants, so bivariate correlations between SE and %MVPA / %SB of men and women were conducted.

Results: For men, age and presence of physical health problems were negatively associated with %MVPA (F (2, 57) = 10.172, p > .001, R2 = .263), and presence of physical health problems were positively associated with %SB (F (1, 58) = 4.254, p = .044, R2= .068). For women, no correlates were retained in the final model for %MVPA, however, presence of a mental health problem and obesity were positively associated with %SB (F (2, 63) = 6.486, p = .003, R2 = .171). SE was positively associated with %MVPA (F (1, 42) = 4.536, p = .039, R2 = .097), and negatively associated with %SB (F (1, 42) = 8.708, p = .005, R2 = .152) in women only.

Conclusions: Differences were observed in the correlates for each gender, making the lack of ID literature in this area concerning. Exploration of gender-specific factors, including psychosocial influences, such as SE, would inform the development of interventions to target PA and SB in adults with ID.





# Comparison of shift and non-shift workers physical activity and sleep behaviours: A cross-sectional analysis of adults from the Household Income and Labour Dynamics of Australia (HILDA) cohort.

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Other

Purpose: Shift-workers are predisposed to increased risk of circadian disruption, which is associated with higher risk of CVD and all-cause mortality. Increased physical activity (PA) and good sleep health (SH) may be protective against some of the poorer health outcomes observed in shift workers. However, few studies have compared the combined differences in PA and SH between shift-workers and day workers. This study aims to compare PA and SH in day and shift-workers.

Methods: Study population included full-time employed adults ( $\geq$ 18 years) who participated in the 2017 Household Income and Labour Dynamics of Australia (HILDA) study (n=7,378). Employment status was classified as day worker or shift-worker (night-time/rotating shifts). PA was assessed using the IPAQ-SF and SH from four self-reported items. A PA and SH score was calculated (0 – 6, where higher=lower risk) based on number of lower risk behaviours;  $\geq$ 600 MET min.week of (1) walking, (2) moderate and (3) vigorous activity, meeting age-appropriate sleep duration recommendations on (4) work-days and (5) non-work days, and (6) no insomnia symptoms (having trouble initiating or maintaining sleep  $\geq$ 3 days per week plus poor self-rated sleep). Linear regression was used to examine differences in the activity-sleep score between day and shift-workers, adjusted for covariates, which included age, sex, education, occupation, income, marital status, BMI, smoking, alcohol, diet, self-rated health, chronic disease status and mental health.

Results: Participants with complete data on all variables were included in analyses (n=5,253). Participants were predominantly men (61%), reported working in professional occupations (47%) and had an average age of 41 (SD 12.8) years. Shift work (n=522) was significantly associated with a decreased activity-sleep score compared to day workers (n=4,731) [ $\beta$ =-0.14; 95% CI: -0.26, -0.02]. The average score for shift-workers (mean=3.25, CI: 3.14 – 3.36] was significantly lower than day workers [mean= 3.39 points; CI: 3.36 – 3.43].

Conclusions: Full-time employed shift-workers have an overall higher risk pattern of PA and SH in comparison to day workers. Future studies including broader range of indicators (resistance training, sleep timing, domains and type of activity) may provide greater insight on the differences in overall activity and sleep patterns between day and shift-workers.





# Physical activity patterns prior to and during pregnancy and associations with sociodemographic factors: evidence from a British birth cohort

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Othe

Purpose: Physical activity (PA) during pregnancy improves maternal and foetal health. However, few pregnant women in Western populations meet the target of 150 minutes moderate intensity activity each week and little is known of determinants of PA in pregnant women. This study aimed to assess changes in patterns of PA from preconception throughout pregnancy, and determine characteristics of pregnant women according to PA levels.

Methods: A prospective cohort of low risk pregnant women aged 18-45 years in Leeds, UK, completed self-reported questionnaires to assess PA 4 weeks before pregnancy (n=595), and in trimesters 1 (n=597) and 2 (n=633). Women were asked to report the length of time (minutes) per day spent performing light, moderate, or strenuous exercise. Answers were converted into metabolic equivalents (MET)-minutes per week values and categorised into low (<600 MET·mins·week-1), moderate (601-2999 MET·mins·week-1) or high (<sup>3</sup>3000 MET·mins·week-1) activity levels using the International Physical Activity Questionnaire protocol. Participant characteristics were self-reported at recruitment and explored across PA levels.

Results: Total median MET·mins·week-1 decreased from 4 weeks before pregnancy [3202 (IQR: 1744, 4836)] to trimester 1 [2662 (IQR: 1386, 4158), p<0.001)] and trimester 2 [2376: (IQR 1386, 3690), p=0.003)]. The percentage of women who were highly active decreased, from 51% preconception to 40% in trimester 2 (p<0.05). The proportion of women being moderately active increased from 40% preconception to 54% in trimester 2, and those in low activity decreased from 9% preconception to 7% in trimester 2. Compared to women in the low activity category, highly active women were more likely to be older, have a university degree, be Caucasian and less likely to be nulliparous (p<0.05).

Conclusions: PA decreased during pregnancy from preconception with signs of social patterning associated with PA levels. These factors would need to be accounted for in future studies of PA in pregnancy and pregnancy outcomes, and can be used to better target health intervention aiming to increase PA during pregnancy.




## O.2.28 - Scaling up healthy lifestyle interventions

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## Evaluation of the FAMILY HEALTHY LIVING PROGRAM Pilot (FHLP): exploring implementation from the family and program delivery level

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Implementation and scalability (SIG)

Purpose: To evaluate the implementation of a free, evidence-based, childhood healthy weights program designed in British Columbia for children (8-12 years old) with a BMI ≥85th percentile and their families. The 10-week program, based on the multi-process action control theory, consisted of 90-minute weekly group sessions, weekly e-sessions, plus four community-based activities. Topics included healthy eating, physical activity, physical and food literacy, sleep, screen-time, positive mental health and behavior change techniques. Eleven programs ran in seven BC communities (September 2018 - March 2019).

Methods: A mixed-methods concurrent triangulation design assessed implementation at both family and program levels. Family measures were reach, adherence, satisfaction (acceptability), facilitators and barriers. Program delivery measures were adoption, fidelity, compatibility, context, feasibility, acceptability and facilitators and barriers. Qualitative data was collected through parent and Program Facilitator interviews and quantitative data through parent and Program Facilitator surveys, attendance tracking forms and e-session analytics. Interviews were recorded, transcribed using Transcriptive software and categories identified using NVIVO. Quantitative descriptives were generated using SPSS.

Results: 132 families were eligible (n=211 enquiries), and 79 families (88 children) registered (42%). 55 families (63 children) started the program and 80% completed. Of those, 82.5% of families attended 70% of sessions. 26% of families accessed 30%+ of core e-session content. Average contact time was 17.7 hours (range 12.78-25.02 hours). Family participation facilitators were: free of cost, location, sibling inclusion, and complimentary recreation passes. Participation barriers were: other commitments, illness, transportation and scheduling. Program acceptability/satisfaction across parents and children was high, with satisfaction ratings over 4/5 for all measures. Seven of the nine (78%) communities originally identified as pilot sites implemented the program. Fidelity was 73.5% across program components (range 42-95%). At the delivery-level, implementation facilitators were high compatibility, context (support from recreation center, having qualified staff), and resources (room availability, manual, equipment and grant funding). Barriers to implementation were recruitment, small group size, attendance, and limited time to deliver material. Interviews showed Program Facilitator acceptability/satisfaction acceptabi

Conclusions: The FHLP was acceptable and feasible for both families and program delivery partners, but recruitment, attendance, and on-line engagement were challenges.





## Evaluation of School Wellness Integration Targeting Child Health (SWITCH®) Program Dissemination and Implementation through a Mixed Methods Approach

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### Implementation and scalability (SIG)

Purpose: Factors within and outside the school environment can affect the degree to which wellness programs are implemented. The Cooperative Extension system in the U.S. provides a way to disseminate evidence-based programs within and across states, but little is known about its impact on school programming. The study addresses this gap by evaluating the influence of Extension on school wellness programming guided by the SWITCH (School Wellness Integration Targeting Child Health) process.

Methods: The study adopts a mixed-methods approach, informed by the Consolidated Framework for Implementation Research (CFIR), to study the facilitators and barriers of school wellness programming. Following the SWITCH capacity-building framework, elementary school (N= 30) wellness teams (SWT) were provided with training, resources, and a web-based platform designed to enhance health behavior change for obesity prevention in youth. The 2019 iteration of SWITCH intentionally promoted support from state Extension staff during implementation, but the SWTs had autonomy over how programming was implemented. Data on school programming efforts were collected from SWTs through 3 standardized surveys (pre-mid-post) and a post-implementation interview. Indicators of school wellness capacity and school wellness environment were assessed using the validated School Wellness Environment Profile (SWEP) and changes (pre-post) analyzed using 2-Way (Time\*Extension Support) ANOVA models. Interview data were analyzed using a constant comparison approach, followed by deductive analysis grounded in CFIR concepts, with particular emphasis on the outer setting, inner setting, and process domains.

Results: Quantitative data revealed no significant main or interaction effects for Extension support. Significant main effects of time (p=0.02) for school wellness environment were observed, but not for capacity (p=0.29). Qualitative data demonstrated that factors within the outer setting (e.g., engaging Extension and community partners) facilitated programming. Inner setting factors (high/low support from administration and school staff) significantly affected implementation. Process construct themes (SWT planning, communication, and engaging students) were found to have a positive influence on implementation.

Conclusions: Results highlight the facilitators and barriers of school wellness programming and the supportive influence from Extension and community partners. The mixed-methods framework identified other factors in inner setting and process domains that also explain variability in outcomes of school wellness programming.





# Systematic review of the factors which support or impede the maintenance and sustainability fidelity of nutrition, physical activity, obesity, alcohol and/or tobacco prevention policies, practices or programmes in schools and childcares

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### Implementation and scalability (SIG)

Purpose: Understanding the barriers and facilitators which may be related to the sustained implementation of health promotion polices, practices or programmes in educational settings (i.e. schools and childcare services) is needed to maximise public health benefits. Despite being the fundamental building blocks for the development of any implementation support strategies, there are no reviews identifying barriers and facilitators of sustained implementation of chronic disease prevention initiatives in education settings. The primary aim of this review was to identify the factors that support or impede ongoing delivery of physical activity, nutrition, obesity, alcohol and/or tobacco prevention policies, practices or programmes in education settings.

Methods: A systematic search was undertaken in eight data bases for quantitative or qualitative studies that examined childcare, primary or secondary school teachers or administrators barriers or facilitators for maintaining or sustaining a physical activity, nutrition, obesity, alcohol and/or tobacco prevention policy, practice, or programme at least 6 months following implementation support. Following duplicate title and abstract, data from identified articles were extracted and coded against a sustainability framework.

Results: A total of 11,487 studies were identified through database search and one additional study though reference list searching. 7,856 records were screened after removal of duplicates and 126 full tests were screened. 21 studies were included in the final analysis. Preliminary analysis suggests that most commonly reported barriers to sustaining chronic disease prevention policies, practices or programs in educational settings were; a lack of resources i.e. money, equipment, and space (25 items), as well as a lack of time (13 items). The most commonly reported facilitators included integration of the intervention into the school policy or curriculum (7 items), flexibility/adaptability of the intervention (5 items) and including fun activities in the intervention (5 items).

Conclusions: This is the first review internationally of barriers and facilitators of sustained implementation of prevention initiatives in schools and childcare, providing comprehensive evidence needed to design sustainability interventions in these settings. Strategies that target these factors may represent promising means to improve sustainability of chronic disease prevention policies in these settings.





## Economic evaluation of an incentive-based program to increase physical activity and reduce sedentary behaviour in middle-aged adults

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#### Implementation and scalability (SIG)

Purpose: Incentive-based programs are popular among health insurers to encourage health behaviours. However, little is known about the economic credentials of such programs. This study aimed to determine the cost-effectiveness of the ACHIEVE (Active CHoices IncEntiVE) incentive-based program designed to encourage increased physical activity and reduced sedentary behaviour in middle-aged adults.

Methods: A within-trial cost-efficacy analysis was undertaken and results expressed as the cost per minute reduction in sitting time, cost per Body Mass Index (BMI) unit reduction, and the cost per MET minute increase resulting from the intervention. An additional analysis of the long-term cost-effectiveness of the intervention scaled up to the Australian population was modelled from the health sector perspective. Pathway analysis was used to determine the resource use associated with the intervention. In the scale up scenario, the 16-week intervention was modelled for roll-out across Australia over a 1-year time horizon for people with private health insurance who are insufficiently active. Health-adjusted life years (HALY) gained (based on calculated effects on BMI and MET minutes) and costoffsets (resulting from reductions in obesity-related diseases) were tracked until the cohort reached age 100 years or death. A 3% discount rate was used and all outcomes are expressed in 2010 values. Simulation modelling techniques were used to present a 95% uncertainty interval around the incremental cost-effectiveness ratio (ICER).

Results: The ACHIEVE intervention cost AUD\$110,419 (95% CI: 103,833;114,503), which equates to AUD\$1,051 per BMI unit loss, AUD\$594 per mean sitting minute reduced per week and AUD\$70 per MET minute gained per week. If scaled-up to all eligible Australians, a total of 265,096 participants would be recruited. The mean net cost of the scale-up was AUD\$89.9 million (95% CI: AUD\$37.6 million; \$AUD165 million). Health care cost savings were AUD\$17 million (95% CI: AUD\$30.5 million; AUD\$4.1 million). Total HALYs gained were 4,976 (95% CI: 3,283 to 6,933). The mean ICER was estimated at AUD\$18,949 (95% CI: 6,727; 39,271) per HALY gained which is considered cost-effective in the Australian setting.

Conclusion: The study findings suggest that financial incentives are cost-effective in promoting healthy behaviours related to physical activity and sedentary behaviour.





## Optimising and scaling up a nutrition intervention to improve dietary guideline implementation in early childhood and education care centres

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#### Implementation and scalability (SIG)

Purpose: To describe the process of optimising and scaling-up an evidence-based intervention targeting the implementation of dietary guidelines in early childhood and education care (ECEC) centres. To our knowledge, this is the first attempt to describe a systematic process of optimising and scaling-up a nutrition program in ECEC.

Methods: This presentation will provide an overview of the steps we have undertaken to optimise and scale up an implementation intervention in ECEC. As part of this, we undertook a three arm randomised controlled trial in one region in Australia (Hunter New England). The interventions included a high-intensity intervention primarily delivered face-to-face and a low intensity telephone intervention, targeting childcare centre implementation of dietary guidelines on their menus. We undertook a prioritisation process, based on both quantitative and qualitative data to assess suitability of each of the interventions for scale up and which implementation strategies to retain. Finally, we embedded these strategies into an online program and sought to assess the impact of the program on childcare centre menus and child consumption in one state (New South Wales) and centre adoption of the program nationally.

Results/findings: The high intensity intervention resulted in a large effect on improving childcare menus, while the lower intensity was not effective in changing provision of food. We describe the process of translating these interventions into an online program aimed at supporting ECEC centres to plan healthier menus. The online program was highly acceptable among ECEC staff, and effective in increasing child consumption of fruit and reducing consumption of discretionary foods in care. The program was also significantly cost-beneficial relative to usual care in NSW. The intervention has been scaled up and adopted by over 3000 ECEC centres in Australia.

Conclusions: This study describes an innovative process of optimising intensive face-to-face implementation interventions in ECEC for scale up to improve child health, and produce population wide adoption. Such systematic processes are crucial to develop as the health benefits of effective nutrition interventions can only be achieved if they are widely adopted by end-users.





## Scaling up obesity interventions: Adaptations, effectiveness and quantifying the scale-up penalty

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#### Implementation and scalability (SIG)

Purpose: Since 1975 global rates of overweight have almost tripled, increasing the risk of a variety of preventable diseases, such as cardiovascular disease, cancer, and diabetes. Proven effective interventions exist to reduce modifiable risk factors for obesity and mitigate adverse effects. Maximising the benefits of investments in overweight and obesity research requires effective interventions to be adopted and disseminated broadly across populations (scaled-up). However, interventions often need considerable adaptation to enable implementation at scale, a process that can reduce the effects of interventions.

Methods: A systematic review was undertaken for trials that sought to deliver an obesity intervention to populations on a larger scale than a preceding randomised controlled trials that established its efficacy.

Results: Ten scaled-up obesity interventions (six prevention, four treatment) were included. All trials made adaptations to interventions as part of the scale-up process, with mode of delivery adaptations being most common. Meta-analysis of BMI/zBMI from three prevention RCTs found no significant benefit of scaled-up interventions relative to control (SMD=0.03; 95% CI: -0.09, 0.15, p=0.639 – I2 = 0.0%). All four treatment interventions reported significant improvement on all measures of weight status. Pooled BMI/zBMI data from prevention trials found significantly lower effects among scaled-up intervention trials than those reported in pre-scale efficacy trials (SMD=-0.11; 95% CI: -0.20, -0.02, p=0.018 – I2 = 0.0%).

Across measures of weight status, physical activity/sedentary behaviour and nutrition, the effects reported in scaleup interventions were typically 75% or less of the effects reported in pre-scale-up efficacy trials.

Conclusions: The findings underscore the challenge of scaling-up obesity interventions. Results enable a more realistic appraisal of the likely effects, and reduction in effects, of interventions delivered following scale-up—providing clearer eyes for decision making.





## O.2.29 - Mental health and energy balance-related behaviours

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## What are the features of the mind-body connection most important for intuitive eating?

<u>Dr. Amanda Taylor</u><sup>1</sup>, Ms. Erina Barker<sup>1</sup>, Ms. Isabella Ferraro<sup>1</sup>, Ms. Jessica Szulc<sup>1</sup> <sup>1</sup>University of Adelaide, Adelaide, Australia

Other

Purpose: Intuitive eating, or a person's ability to eat in accordance with their body's cues for hunger and satiety, has become a recent focus of research due to its associations with healthy eating behaviour and wellbeing. Intuitive eating is considered related to the mind-body connection, but limited investigation has focussed on mind-body factors that predict intuitive eating. The present study aimed to develop better understanding of mind-body skills (e.g., interoceptive awareness, alexithymia, self-compassion) associated with intuitive eating, which may therefore allow for identification of treatment targets. It was expected that interoceptive awareness, self-compassion, and body appreciation would positively predict intuitive eating when relevant covariates were accounted for, and that alexithymia would be negatively associated.

Methods: A cross-sectional, survey based design was used. Participants were 226 adults (79% female, mean age 23.78 years), recruited via local university and social media platforms. All participants completed the survey online; measures of interoceptive awareness, self-compassion, body appreciation, alexithymia and intuitive eating. They also provided their estimated height and weight, from which body mass index (BMI) was calculated. Multiple linear regression analyses were conducted to evaluate the relative importance of mind-body connection predictors, controlling for relevant covariates (age, gender, BMI).

Results: Bivariate correlations showed intuitive eating to be positively associated with interoceptive awareness, selfcompassion and body appreciation, and negatively correlated with BMI. In the regression analysis, while selfcompassion ( $\beta$ =.21) and body appreciation ( $\beta$ =.32) significantly predicted intuitive eating, interoceptive awareness no longer showed a significant association. Of the covariates, only BMI showed a significant association ( $\beta$ =-.20). Of the components of self-compassion, self-kindness and mindfulness were the most important factors for intuitive eating. The full model explained close to 40% of the variance in intuitive eating.

Conclusions: Self-compassion and body appreciation may be important targets to facilitate intuitive eating. Of note, the extent to which one is subjectively aware of and understands one's own body signals (interoceptive awareness and alexithymia) may be less important for intuitive eating when other relevant factors are accounted for. This has implications for future research and intervention focussed on promotion of intuitive eating.





## Frequency of breakfast intake is associated with depression and poor sleep in young adults

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#### Other

Purpose: A primary contributor to obesity is an increase in unhealthy eating habits, such as skipping breakfast, which has been strongly associated with overeating, weight gain, and obesity. Nearly 30% of young adults skip breakfast every day and 60% report eating breakfast infrequently. The objective of this study was to determine if frequency of breakfast consumption is associated with markers of wellbeing such as anxiety, depression, and sleep.

Methods: Students at the University of Arkansas were asked to participate in the Exercise is Medicine questionnaire which assessed eating behavior; depression, anxiety, and stress using DASS21; and sleep using the Pittsburgh Quality Sleep Index (PSQI). 703 undergraduate students (36% female) completed eating behavior questions and DASS21 and 590 completed the eating behavior survey and PSQI. Data was analyzed using ANOVA to assess the relationship between eating breakfast and wellbeing outcomes, adjusted for sex.

Results: Participants were frequent breakfast skippers with 26.7 % reporting never eating breakfast, 34.6% ate breakfast 1-3 times per week, 21.9% ate breakfast 4-6 days per week, and 16.8% ate breakfast 7 days per week. The median score for depression was 6 (25th-75th, 2-14) with 10.1% of participants reporting mild, 12.7% reporting moderate, 5.3% reporting severe and 10% reporting extremely severe depression. Skipping breakfast every day was associated with higher depression scores compared to eating breakfast 1-3 times per week (-1.1, 95%CI:-2.1, - 0.1, p=0.033), 4-6 times per week (-1.5, 95%CI: -2.6, -0.4, p=0.010), and 7 days (-2.6, 95%CI: -3.8, -1.4, p<0.001). However, skipping breakfast was not associated with anxiety (p=0.624) or stress (p=0.861). The mean score for sleep was 5(SD 2.6) with 53.2% of participants classified as poor sleepers. Skipping breakfast was significantly associated with poor sleep score (p=0.10). Participants who skipped breakfast had worse sleep compared to individuals who ate breakfast 7 days per week (-0.9, 95%CI:-1.5, -0.2, p=0.15).

Conclusions: Breakfast skipping is associated with depression and poor sleep in young adults. Future interventions for young adults targeting breakfast may be a good strategy for improving depression and sleep. Additional research is needed to understand the association of breakfast skipping and breakfast composition on markers of wellbeing.





Is there a dose-response relation between physical activity, screen-time and mental wellbeing among adolescents? Evidence from European and North American countries

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Othe

Purpose: Evidence is emerging that physical inactivity and screen-time (ST) are associated with mental health of adolescents; however, little is known about their possible dose-response relationships. This study aimed to examine dose-response relationships of physical activity (PA) and ST with mental wellbeing among adolescents.

Methods: We analysed data from the 2013/2014 Health Behaviour in School-aged Children (HBSC) in 199,409 adolescents (13.59±1.63 years; 51% females), living in 39 European/North American countries. Mental wellbeing was assessed with the 4-item HBSC symptom checklist psychological subscale, and total symptom score (range 0-16) was dichotomised as "good" and "poor" based on median split. Adolescents reported on frequency of days they did PA for  $\geq$ 60 mins and daily hours of ST. We used multilevel logistic regression analysis, adjusted for a set of covariates. The results are presented in odds ratio (OR) with their 95% confidence interval (CI).

Findings: Multilevel modelling showed a negative dose-response relation of PA and a positive dose-response relation of ST with poor-wellbeing. Compared with those who did not engage in PA during the past week, adolescents who did PA for  $\geq 60$  mins on 1-2 days, 3-4 days, 5-6 days, and all 7 days had 20% (OR 0.80, 95% CI 0.73-0.87), 29% (0.71 [0.64-0.78]), 36% (0.64 [0.58-0.71]), and 37% (0.63 [0.56-0.70]), respectively, lower odds of poor-wellbeing. The odds of poor-wellbeing increased linearly with the increase in duration of ST with the ORs being 1.20 (1.14-1.27) for 3-4 hours/day, 1.39 (1.31-1.48) for 5-6 hours/day, 1.62 (1.51-1.74) for 7-8 hours/day, and 2.03 (1.89-2.18) for  $\geq 9$  hours/day when compared with ST  $\leq 2$  hours/day. Sex-stratified analyses suggested that the relationship estimates were greater in males than females for both PA and ST.

Conclusions: Insufficient PA and ST were significantly associated with poor-wellbeing in a dose-response manner, and the dose-responses were more prominent for ST than PA. Promoting activity behaviours, by increasing PA and/or decreasing ST, can benefit adolescents' wellbeing in the region. Prospective studies are needed to understand the causal pathways of these relationships.





## Impact of a father-daughter physical activity intervention: An exploration of fathers' experiences

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#### Other

Purpose: A randomised controlled trial (RCT) was conducted with 115 fathers (29 - 53 years) and 153 daughters (4 - 12 years), who participated in the Dads And Daughters Exercising and Empowered (DADEE) program. This was the first physical activity program internationally to explicitly target fathers as an agent for change to improve their daughters' physical activity levels, sport skills and social emotional well-being. In the pilot RCT, intervention fathers and daughters significantly increased their physical activity levels at post-intervention (2-months), and these increases were maintained at 9-months. In addition, intervention daughters experienced greater improvements in social-emotional well-being, grew closer to their fathers, and improved their sport skills. The purpose of this study was to explore the impact of a father-daughter physical activity program on family functioning and psychosocial outcomes for girls.

Methods: The impact of the program on family functioning and girls' psychosocial outcomes was explored qualitatively through one-on-one, semi-structured telephone interviews with a random sample of 23 intervention fathers (mean (SD) age: 41.4(4.8) years). Audio recordings (mean length (SD): 45 minutes (6.7)) were transcribed verbatim. Transcripts were thematically analysed by an independent researcher using a mixed inductive and deductive thematic approach.

Results: Fathers reported that the program had a positive effect on their daughters' social emotional well-being. For example, daughters were willing to try new challenges and became more persistent. Fathers improved their own lifestyle behaviours as a result of new knowledge and parenting skills and a determination to be a better father for their daughter. Moreover, fathers felt a physically and emotionally closer bond with their daughters. Participants also identified a range of improvements within the family, including improved communication with their wife/partner and enhanced family dynamics. Almost all fathers gained a newfound understanding of the negative impact gender stereotypes had on their daughters' development. Finally, a number of strategies were identified as to how the program improved these outcomes.

Conclusion: Engaging fathers and daughters in physical activity programs and improving their knowledge and parenting skills may have substantive benefits for daughters' well-being as well as holistic benefits for fathers and their families.





## Is device-based total and domain-specific sedentary behaviour associated with psychological distress in Flemish workers?

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Other

Purpose: Mental health is an important global indicator for health and well-being. Psychological distress, referring to symptoms of depression and anxiety, is related to increased risks of chronic diseases and mortality. To prevent and manage psychological distress, there is a need to better understand its modifiable lifestyle factors. There is increasing interest in the association between sedentary behaviour (e.g. sitting), a highly prevalent behaviour in modern society, and psychological distress. The limited evidence is mixed and mainly based on studies using self-reported sedentary time. Few studies have investigated device-based total sedentary time, and none have examined device-based domain-specific sedentary time in relation to psychological distress. This study aims to investigate whether device-based total and domain-specific sedentary behaviour were associated with psychological distress among adults.

Methods: Flemish employees (n=401; 20-64 years; 42.6% male; 83.6% in 'physically active' occupation) of seven organisations in service and production sectors participated. Sedentary behaviour (exposure) was assessed by two Axivity accelerometers (one on thigh, one between shoulders) for 2-4 consecutive working days. Based on diary completion, domain-specific sedentary behaviour (leisure vs work) was assessed. The 12-item General Health Questionnaire (GHQ) was used to assess psychological distress (outcome). Adjusted hierarchical multiple regression models were conducted to test the associations between total, leisure and work-related sedentary behaviour and psychological distress.

Results: About 35% had high levels of psychological distress (GHQ score  $\geq 2/12$ ). The average sedentary time was 7.2 hours/day in total, 4.6 hours/day during leisure and 2.8 hours/day at work. Device-based total (B=-0.009, 95%CI: -0.087,0.068), leisure-time (B=0.001, 95%CI: -0.017,0.018) and work-related (B=0.004, 95%CI: -0.006,0.015) sedentary behaviour were not significantly associated with psychological distress.

Conclusion: This study did not show significant associations between accelerometer-based total and domain-specific sedentary behaviour and psychological distress among employees, working in a physically active occupation. Since this is one of the first studies looking at this association using device-based exposure variables, more research using a similar approach is needed.





## Complete mental health status and associations with physical activity, screen time, and sleep in youth

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Other

Purpose: Mental well-being can be conceptualized as two intersecting continua: mental illness (presence/absence of mental illness) and mental health (languishing/flourishing). Consequently, it is possible to both have a mental illness (e.g., depression) yet still flourish. Together, mental illness and mental health combine to form an individual's complete mental health status (CMHS). The purpose of this study was to examine if youth CMHS is associated with adherence to the Canadian 24-hour Movement Guidelines for Children and Youth (physical activity (PA), total screen time (ST), sleep).

Methods:This study reports cross-sectional student-level data from Year 7 (2018-19) of the COMPASS study. Canadian secondary school students (grades 9-12) completed questionnaires assessing health behaviours, flourishing/languishing (F/L), and high/low depressive symptoms (+DS/-DS). Students were classified into one of four mental health states: F/-DS,F/+DS, L/-DS, L/+DS. Generalized linear models were used to compare adherence to the PA, ST, and sleep guidelines between the groups, after controlling for sex, age, ethnicity, weight status, school location and household income.

Results: A total of 29,133 students (49.8% female, Mage=15.3yrs) were included in the analyses as F/-DS (n=11,749), F/+DS (n=2951), L/-DS (n=3940), or L/+DS (n=10,493). Regarding ST, individuals who were F/-DS ( $\beta$ =1.12, SE=0.06), F/+DS ( $\beta$ =0.87, SE=0.10), or L/-DS ( $\beta$ =0.50, SE=0.10) were more likely to meet the ST guidelines compared to those who were L/+DS (p's<.0001). Similarly for sleep, individuals who were F/-DS ( $\beta$ =1.05, SE=0.03), F/+DS ( $\beta$ =0.82, SE=0.04), or L/-DS ( $\beta$ =0.57, SE=0.04) were more likely to meet the sleep guidelines compared to those who were L/+DS (p's<.0001). Likelihood of meeting the PA guidelines was higher for individuals who were F/-DS ( $\beta$ =0.39, SE=0.03), or F/+DS ( $\beta$ =0.42, SE=0.05) compared to those who were L/+DS. However, individuals classified as L/-DS ( $\beta$ =-0.18, SE=0.04) were less likely to meet the PA guidelines (p's<.0001).

Conclusion: This is the first study to show relationships between the two-continua model of mental well-being and engagement in movement behaviours. Youth CMHS was associated with both ST and sleep. Youth who self-report flourishing were more likely to achieve PA guidelines irrespective of depressive symptoms. These findings reinforce the need for research examining positive mental health constructs independent of mental illness.





## O.2.30 - Dietary assessments and epidemiology

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## A Single Summative Global Score of Disordered Eating Attitudes and Behaviors: findings from Project EAT

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Interrelated disordered eating attitudes and behaviors may exist on a single dimension. In this study, we examine the appropriateness of creating a global score from five disordered eating attitudes and behaviors, examine the track the fit over time, and examine its convergent validity.

Methods: Five disordered eating attitudes and behaviors were assessed among 1492 participants in a longitudinal cohort (Project EAT, age 11 to 18 at 1998-1999). The appropriateness of creating a global score was examined by confirmatory factor analysis. To examine whether the individual variables functioned differently in relation to the overall latent construct across time, two models were compared: one requiring indicator-level factor loadings to remain equivalent across three-time points (baseline [EAT-I], five-year follow-up [EAT-II], and 15-year follow-up [EAT-IV]), and the second allowing the factor loadings to vary over time. Convergent validity of the global score was examined by Pearson correlation with body satisfaction, self-esteem, depressive symptoms, and BMI. The correlation was compared across three time-points (EAT-I, II, and IV).

Results: The use of five disordered eating attitudes and behaviors in creating a global score was supported by the goodness of fit indices for a single factor structure (standardized loadings: 0.60-0.87, 0.67-0.89, 0.59-0.77 at EAT-I, II, and IV respectively), which were consistent over time. As expected, the global score negatively correlated with body satisfaction, self-esteem, and positively correlated with depressive symptoms and BMI over time (all p < 0.01).

Conclusions: The five disordered eating attitudes and behaviors can be viewed on a single dimension. The five-point global score of disordered eating attitudes and behaviors is a stable analysis tool to measure the severity of disordered eating attitudes and behaviors in population-based studies.





## Temporal Dietary Patterns, Integrating Energy Amount and Timing, are Associated with Health

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: The distribution of energy intake and amount of energy consumed in a 24 hour period, or temporal dietary pattern, was previously developed using data-driven methods and associated with dietary quality. A pattern of three moderate-energy eating events spaced from morning to evening had the highest dietary quality compared with other patterns. This study determined the relationship of temporal dietary patterns with health outcomes.

Methods: The first-day 24-hour dietary recall data from 1,627 non-pregnant adults 20-65 years in the cross-sectional National Health and Nutrition Examination Survey, 2003-2006, determined the amount of energy intake (kcal), time of intake (min), and sequence of intake throughout the 24-hour day. Modified dynamic time warping, coupled with kernel k-means algorithm, clustered participants into four groups representing distinct temporal dietary patterns. Outcomes body mass index, waist circumference, fasting plasma glucose, hemoglobin A1c, triglyceride, HDL-C, total cholesterol, systolic and diastolic blood pressure, categories for obesity, type 2 diabetes, and metabolic syndrome were constructed from measures from the examination. Multivariate regression models evaluated the relationship of temporal dietary patterns and each outcome, controlling for potential confounders, energy misreporting, and adjusting for multiple comparisons and complex survey design (p<0.05/6).

Results: The temporal dietary pattern cluster with similar average energy intake at three main eating occasions from 8:00 to 23:00 including peaks averaging 175 kcal at 9:00, 13:00, and 19:00, had statistically significant and clinically meaningfully lower body mass index (p<0.0001) and waist circumference (p<0.0001) and 75% lower odds of obesity compared to three other clusters representing patterns with much higher average peak energy of 500 kcal at 13:00 (OR: 4.41; 95% CI: 2.48, 7.86), 530 kcal at 18:00 (OR: 5.32; 95% CI: 2.80, 10.14), and 550 kcal at 20:00 (OR: 6.72; 95%CI: 3.91, 11.58).

Conclusion: Temporal dietary patterns differentiate clusters by body mass index, waist circumference, and odds of obesity among U.S. adults, providing unique evidence of the importance of timing of dietary intake throughout a day to health and supporting previous findings of higher dietary quality among those with similar temporal dietary patterns. Temporal dietary patterns hold promise for the development of future interventions and dietary guidance.





## Social support may be an under-considered confounder in the relationship between diet and mood disorders.

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Few cross-sectional studies examining diet and depression have used formal depression diagnoses as the outcome variable. We aimed to determine if overall diet quality was associated with prevalence of DSM-IV diagnosed mood disorders among a unique cohort of Australian adults followed up at three time-points in young to mid-adulthood. A secondary aim was to examine confounding effects using a wide variety of covariate measures.

Methods: Participants from the Childhood Determinants of Adult Health study were followed up during 2004-06 (n=1,974, 50% male, age: 26-36 years), 2009-11 (n=1,527, 35% male, age: 31-41 years), and 2014-19 (n=1,195, 45% male, age: 36-49 years). A Dietary Guidelines Index (DGI) scores was calculated from food frequency questionnaire data at each time-point. A higher DGI score (range: 0-100) indicated better diet quality. The Composite International Diagnostic Interview was used to determine DSM-IV diagnoses of mood disorder (major depression or dysthymia) during the 12 months prior to each follow-up. Cross-sectional prevalence ratios (PR) and 95% confidence intervals (CI) were estimated using log binomial regression. Analyses were stratified by sex. Covariates included age, BMI, social support index, marital status, parenting status, education, occupation, smoking, physical activity, and usual nightly sleep duration.

Results: A 10-point increase in DGI score was cross-sectionally associated with lower prevalence of mood disorders among females at all time-points. However, the association was only statistically significant at the third follow-up (PR=0.73, 95% CI=0.56-0.94), and was attenuated after covariate adjustment (PR=0.92, 95% CI=0.73-1.17). Among males, better diet quality was associated with lower prevalence of mood disorder at the third follow-up (PR=0.68, 95% CI=0.50-0.92), but was also attenuated after adjustment (PR=0.88, 95% CI=0.65-1.19). Adjustment for social support in the final models attenuated the association for females by 57% (from 18% lower prevalence to 8%), and by 47% for males (from 22% to 12%).

Conclusion: Diet quality was not associated with prevalence of mood disorders after covariate adjustment. Social support was a strong confounder and may be an important variable that is not commonly measured or controlled for in studies examining the relationship between diet and depression.





## "Joint and individual variance explained" computes dietary patterns that are predictive of future consumption and health outcomes

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Joint and Individual Variance Explained (JIVE)1 is an alternative to principle component analysis (PCA) that highlights variability shared across different datasets collected on the same individuals. We have applied this method in a novel context: datasets consisting of food frequency questionnaires administered at different ages. By construction, the components summarizing joint variability encode the aspects of the diet that are predictive of diet observations at later ages. We hypothesize that this method will produce dietary patterns that are more predictive of health outcomes than those derived by PCA applied separately to the data collected for each age group.

Methods: We test the method using food frequency questionnaires administered at ages 3.5, 7, and 11 as part of the Auckland Birth cohort study. 466 individuals have questionnaire responses and health outcomes (BMI z-score, diastolic blood pressure and systolic blood pressure) at all time points. As with principle components, the scores are computed as a linear combination of the original variables, and these loadings can be used to interpret the patterns. The score can also be partitioned into a contribution from each age group. We use the age 3.5 score contributions for the first 2 JIVE components to predict health outcomes at ages 7 and 11 using linear regression, using the same health outcome measured at age 3.5 as a covariate. The standardised regression coefficients are compared to those found when the predictors are taken to be principle component scores of the age 3.5 data.

Results/findings: The first age 3.5 JIVE score and age 3.5 PCA score are both significant (p < 0.05) predictors of BMI at age 7 and 11. However, the standardized regression coefficients for the JIVE scores were 20% and 45% larger (respectively), indicating stronger relationships. The only significant relationship between diet scores and blood pressure was for the age 7 systolic blood pressure and the 2nd PCA score.

Conclusions: By focussing on aspects of the diet that predict consumption at later ages, JIVE produces dietary patterns that have a stronger relationship with BMI.

1Lock et al (2013), Ann Appl Stat 7:523-542.





## Wearable passive methods of dietary intake assessment

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Much concern has been expressed about the high levels of error that affect self-reported dietary intake assessment, to the point some have questioned if there is value in obtaining such data. Wearable measures relying on the passive capture of images and automation of food identification and portion size estimation based on those images have been posited as potentially less biased methods for characterizing intake. The utility of wearable technologies relies on whether they offer accurate measurements of intake, while accounting for cost, convenience, and associated resource considerations. We undertook a narrative review to examine progress made in advancing wearable methods of dietary assessment.

Methods: Relevant literature was identified based on systematic searches of PubMed, Web of Science, and Google Scholar. Synthesis of evidence focused on progress made toward steps in estimating dietary intake using images.

Results: Automating dietary intake assessment using images from wearable devices entails a) participants appropriately wearing the camera and obtaining quality images; b) identifying images that contain foods c) assessing food purchasing, home availability, and preparation practices to inform nutrient estimation; d) segmenting foods on a plate or other surface; e) identifying foods; f) assessing portion sizes (before and after eating); and g) linking information about food identity, preparation and portion sizes with food composition databases to quantify food groups and nutrients consumed. Error can be introduced at each step. For example, images may be missed due to camera malfunction; images containing food may be misidentified; and specific foods and their portion sizes incorrectly identified. Although estimates of the magnitude of error differ depending on the study design and specific devices tested, they are not trivial.

Conclusions: The goal of dietary assessment using wearable measures is to produce objective indicators of dietary intake. A narrative review indicated important advances have been made toward this goal and innovation continues toward automation of steps in the process of quantifying dietary intake. However, given current estimates of error and the fact that error is additive across steps, measures of intake currently yielded by device-based measures may be no more accurate than those from self-reported methods.





## Development of a gold standard tool for measuring household cooking environments

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

PURPOSE: To develop the first gold standard tool to measure household cooking environments.

METHODS: The Home-Cooking Environment and Resource Inventory Observation Form (Home-CookERI<sup>™</sup> OF) was developed in Australia in 2019 as an 80-item online Qualtrics<sup>™</sup> survey. Items included domestic spaces/resources for the storage, disposal, preparation and cooking of food or non-alcoholic beverages. Home-CookERI<sup>™</sup> OF was assessed for face and content validity by 13 experts (i.e. dietitians, nutrition researchers, qualified chefs, a food technology teacher and kitchen designer) and 14 lay people. They considered 95% of items to be clear and 99% to be relevant. In 33 different homes, a pair of research dietitians (i.e. rater 1, rater 2) completed Home-CookERI<sup>™</sup> OF. Raters searched for each item before recording in Home-CookERI<sup>™</sup> OF the presence/absence of each item. To prevent data contamination, home occupants were instructed to only assist with locating non-visible items when asked. Furthermore, the second rater could not see or hear the first rater complete Home-CookERI<sup>™</sup> OF. Inter-rater agreement (IRA) was determined using percent agreement [%] and Cohen's Kappa [κ].

RESULTS: IRA was  $\geq$ 80% for 74/80 items (93%) and  $\geq$ 69% for all items.  $\kappa$  was: perfect [ $\kappa$ =1.0] for 23 items (28.75%), near perfect [ $\kappa$ =0.81-0.99] for 14 items (17.5%), substantial [ $\kappa$ =0.61-0.8] for 18 items (22.5%), moderate [ $\kappa$ =0.41-0.6] for 8 items (10%), fair [ $\kappa$ =0.21-0.4] for 6 items (7.5%), slight [ $\kappa$ =0.1-0.2] for 3 items (3.75%), and chance or worse [ $\kappa \leq$  0] for 8 items (10%). Items with  $\kappa \leq$ 0.2 were either highly common or uncommon items. Hence, item disagreement in one or a few households substantially impacted  $\kappa$ .

CONCLUSION: Overall, Home-CookERI<sup>™</sup> OF has established face/ content validity and is a reliable tool for researchers to measure Australian household cooking environments via direct observation. A self-completed Home-CookERI<sup>™</sup> form for home occupants is being developed to have applications in nutrition epidemiology and nutrition interventions.





## O.3.31 - Sleep inclusive research

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## The impact of summer break on children's obesogenic behaviors: Preliminary outcomes from a natural experiment.

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Children and families (SIG)

Purpose: Changes in obesogenic behaviors (physical activity, sedentary time, screen-time, diet, sleep) during summer break (SB) may explain accelerated summer weight gain. This preliminary study examined changes in obesogenic behaviors of children attending year-round and traditional schools during SB.

Methods: Primary school children (48.7% male, 57.4% African American) attending one year-round (n=73) or two traditional schools (n=117) participated in this study. Fitbits (sleep, activity, sedentary) and daily diaries (screen time, diet) measured obesogenic behaviors over five measurement waves during school (spring 2018, fall 2018, spring 2019) and SB (2018 & 2019). SB was 11 weeks in traditional schools and 5 weeks in year-round schools. Multilevel regressions with schedule (yearround vs. traditional), time (SB weekdays vs. school days), and schedule-x-time as independent variables and engagement in obesogenic behaviors as the dependent variable estimated changes in obesogenic behaviors during SB.

Results: Children provided a mean 67.3 and 44.9 days of Fitbit and 13.7 and 12.9 daily diaries during school and SB, respectively. During SB moderate-to-vigorous physical activity (MVPA) increased for traditional children (5.3min, 95CI: 1.9, 8.7) but decreased for year-round children (-5.9min, 95CI: -10.8, -1.0). Sedentary time increased for traditional (36.1min, 95CI: 28.9, 43.3) and year-round (72.9min, 95CI: 62.6, 83.3) children. Screen time increased for traditional (49.3min, 95CI: 41.1, 57.5) and year-round (54.0min, 95CI: 43.1, 64.9) children. The number of unhealthy foods/beverages consumed increased for traditional children (0.3, 95CI: 0.2, 0.5) while healthy foods/beverages consumed decreased for year-round children (-0.2, 95CI: -0.3, -0.1). Sleep midpoint shifted later for traditional (88.5min, 95CI: 83.9, 93.1) and year-round children (113.9min, 95CI: 107.4, 120.5). Year-round children experienced more unfavorable changes in sedentary (+30.3min, 95CI: 18.6, 42.1), MVPA (-9.3min, 95CI: -14.2, -4.4), sleep midpoint (25.3, 95CI: 17.3, 33.3) and healthy food (-0.2, 95CI: -0.3, -0.1) consumed during SB compared to traditional children.

Conclusions: During SB children experienced unfavorable changes in some obesogenic behaviors with the magnitude of change differing by SB length. Understanding obesogenic behavior changes during SB is essential to interventions targeting accelerated summer weight gain.





## Adolescents' perspectives on factors that negatively influence sleep behaviour in 10-14 year olds in Amsterdam: a participatory study

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### Children and families (SIG)

Purpose During the transition from primary to secondary school adolescents' sleep disturbances and insufficient sleep duration increases. However, the factors underlying this are largely unknown. Therefore, we conducted a participatory needs assessment to identify 1) adolescent-perceived factors that negatively influence sleep, and 2) adolescent-perceived changes in these factors after the transition from primary to secondary school.

Methods During one school year weekly participatory meetings were held with one group of 10-12-year-olds and one group of 12-14-year-olds (n=5-8 per group) facilitated by an academic researcher. During these meetings adolescents actively participated as co-researchers in exploring factors influencing their sleep behaviour and that of their peers (e.g. using interviews, questionnaires, focus groups with peers). Of all identified factors, adolescent-co-researchers selected the most important factors that may negatively influence sleep, and subsequently indicated potential causal pathways.

Results As most important factor influencing sleep, adolescents mentioned social media: the accompanying notifications (e.g. messages from apps or friends on a mobile device) make them curious and anxious to miss out on something and keep them awake. Being energized by this, some adolescents subsequently game at night. Second, adolescents mentioned that a lack of sleep rules from their parents results in later bedtimes and an increased use of social media or gaming at night. Third, adolescents indicated that when experiencing stress at night - for example due to academic pressure - they lie awake more and have more nightmares. Additionally, environmental factors such as lights and ambient noise, and making homework or being physically activity close to bedtime were mentioned. Last, adolescents mentioned that they like to stay awake at night because it is fun; they consume candy and energy drinks to accomplish this. After the transition from primary to secondary school adolescents perceived less sleep rules from their parents, resulting in later bedtimes and an increased use of social media at night.

Conclusions This participatory study identified factors negatively influencing sleep from the perspective of adolescents themselves. This knowledge may be helpful for the development of effective interventions targeting healthy sleep behaviour for this age group.





## Sleep resilience moderates the association between smartphone ownership and summer weight gain among school age youth.

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### Children and families (SIG)

Purpose: An increasing number of elementary age youth own smartphones. Cross-sectional studies have linked smartphone use with childhood obesity, but longitudinal evidence is lacking. Smartphones may be particularly detrimental for children with low sleep resilience (i.e. the ability to re-establish typical sleep following a night of atypical sleep). Given that children are at risk for accelerated weight gain over the summer, the current study examined if smartphone ownership was associated with summer weight gain in children. This association was hypothesized to be stronger among children with low sleep resilience.

Methods: Timeseries data from Fitbits (Charge-2) were collected on 6,642 days from 196 children (median 22 days/child) as part of a larger school-based study. The sample was 53% female, 5-10yrs old with a mean zBMI of 0.75 (SD = 1.2). Dynamic Structural Equation Modeling (DSEM) was used to estimate sleep resilience from Fitbit data, defined as previous night sleep regressed on current night sleep (i.e., autoregression). Parents reported smartphone ownership and zBMI was measured in spring and fall of 2018. Linear regression was used to test sleep resilience as a moderator of smartphone ownership and zBMI change.

Results: 29% of children owned a smartphone. Sleep resilience was unrelated to zBMI change or smartphone ownership. Children who owned a smartphone had greater increases in zBMI over the summer ( $\beta$  = 0.22, 95%CI 0.05 to 0.38). Sleep resilience moderated ( $\beta$  = -2.10, 95%CI -4.14 to -0.06) such that smartphone ownership was associated with zBMI increases among children with low sleep resilience. Smartphone ownership was not associated with zBMI change for children with higher than average sleep resilience.

Conclusions: Owning a smartphone is a risk for accelerated summer weight gain in the context of average or low sleep resilience. Future longitudinal research should explore potential mechanisms and confounders of this association (i.e. if smartphone ownership engenders or exacerbates existing sleep dysregulation perhaps through blue light exposure). Alternatively, high sleep-resilience may indicate environmental context which supports sleep consistency, such as household rules or routines which may protect against negative health sequelae associated with children's smartphone usage.





## Movement behaviours and physical, cognitive, and social-emotional development in preschool-aged children: Compositional substitution analyses

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Children and families (SIG)

#### Purpose

Movement behaviours (e.g., sleep, sedentary behaviour, and physical activity) in isolation have demonstrated benefits to preschool-aged children's development. However, little is known on the integrated nature of movement behaviours and their relationship to healthy development in this age range. Thus, the objective of this study was to examine the relationships between accelerometer-derived movement behaviours and indicators of physical, cognitive, and social-emotional development using compositional substitution analyses in a sample of preschool-aged children.

#### Methods

Children (n=95) were recruited from Edmonton, Canada. Movement behaviours were measured with ActiGraph wGT3X-BT accelerometers, worn 24 hours/day. Physical (i.e., BMI z-scores, percent of adult height, and motor skills), cognitive (i.e., working memory, response inhibition, and vocabulary), and social-emotional (i.e., sociability, externalizing, internalizing, prosocial behaviour, and cognitive, emotional, and behavioural self-regulation) development were measured. Objective height and weight were measured for BMI z-scores and percent of adult height, and the Test of Gross Motor Development-2 was used to assess motor skills. The Early Years Toolbox was used to assess all cognitive and social-emotional development indicators. Compositional substitution models were conducted in R for each development outcome.

#### Results

Children accumulated 11.1 hours of sleep, 6.1 hours of stationary time, 5.1 hours of light-intensity physical activity (LPA), and 1.8 hours of moderate- to vigorous-intensity physical activity (MVPA). Consistent favourable associations were found when adding MVPA while subtracting other movement behaviours for locomotor, object, and total motor skills; except one null association when removing stationary time for locomotor skills. The majority of associations for stationary time, LPA, and sleep were non-significant. However, some additional favourable associations were found when adding MVPA and subtracting other behaviours (i.e., sociability when subtracting stationary time and sleep; cognitive self-regulation when subtracting LPA), and when adding stationary time and subtracting other behaviours (i.e., vocabulary when subtracting sleep; BMI z-scores when subtracting MVPA).

#### Conclusions

When considering the composition of movement behaviours in this sample, the findings confirmed the importance of MVPA for motor skills. Favourable results were found for some other substitutions, but further research is needed in larger and more representative samples to confirm these findings.





## Cross-sectional and longitudinal associations between sleep duration, sleep quality and bone stiffness index in European children and adolescents

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### Children and families (SIG)

Purpose Evidence on the relationship between sleep and bone health in youth is still scarce. The present study aims to examine cross-sectional and longitudinal associations between self-reported sleep characteristics and bone stiffness index (SI) in European children and adolescents.

Methods 4901 children aged 2-11 years from IDEFICS study and 839 children aged 6-15 years from the subsequent I.Family study providing data on all variables of interest were included. Self-reported sleep characteristics were measured as sleep duration (i.e. nocturnal sleep and daytime napping) and sleep quality (i.e. unregularly bedtime routine, have difficulty falling asleep and trouble getting up in the morning). The calcaneus SI of both feet was measured using quantitative ultrasound. Self-reported sex, age, pubertal status, family socioeconomic status, country, physical activity, screen time and body mass index calculated from measured height and weight were used as covariates in all analyses. Linear mixed-effects models were used to analyse cross-sectional and longitudinal associations between sleep duration, sleep quality and SI with taking confounders into consideration.

Results At baseline, there were 11.20% participants defined as short sleep duration, 6.02% participants defined as long sleep duration, and 44.60% participants defined as poor sleep quality. Daytime napping (every 10min/day) was observed to be positively associated with SI percentiles ( $\beta$ =0.74, 95%CI: 0.39, 1.10, p<0.001). Longitudinal results suggested that onlyin children who had poor sleep quality at baseline, extreme sleep duration predicted lower SI percentiles after 4 years ( $\beta$ =-7.75, 95%CI: -13.01, -2.48, p=0.004). While only in children who had extreme sleep duration at baseline, poor sleep quality predicted lower SI percentiles after 4 years ( $\beta$ =-11.68, 95%CI: -20.98, -2.39, p=0.014).

Conclusions Daytime napping was positively associated with SI in children and adolescents. Furthermore, the longterm detrimental effect of extreme sleep duration on SI was only observed in children who had poor sleep quality. Similarly detrimental effect of poor sleep quality was only observed in children who had extreme sleep duration.





## Associations of carbonated soft drink and fast-food intake with anxiety-induced sleep disturbance among adolescents: A global perspective

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### Children and families (SIG)

Purpose: Although the relationship of unhealthy dietary patterns with depression and some mental disorders is well documented, little is known about whether dietary behaviours are associated with sleep problems in adolescents. This study aimed to examine the associations of fast-food and carbonated soft drink intake with anxiety-induced sleep disturbance among adolescents around the world.

Methods: We analysed the Global School-based Student Health Survey data, collected between 2007 and 2016, from 162,526 adolescents aged 12–15 years (49% girls) in 59 countries. Adolescents reported frequency of being so worried that they could not sleep during the past 12 months, and having carbonated soft drinks during the past 30 days and fast-food during the past 7 days. We used multivariable logistic regression to examine country-level associations. Multilevel logistic regression analysis was used to examine the relationships, taking into account the hierarchical structure of the data. Pooled estimates were derived from country-level estimates by using meta-analysis with random effects.

Results: Overall, 7.3% of adolescents reported having anxiety-induced sleep disturbance most or all of the time during the past 12 months (boys: 6.5%; girls: 8.3%). The prevalence of sleep disturbance increased linearly with increased soft drinks and fast-food intake across gender. Adolescents having soft drinks at least daily had 29% higher odds of sleep disturbance than those who had soft drinks less than daily (OR=1.29, 95% CI 1.25–1.34). Adolescents who had fast-food on at least two days/week had 31% higher odds of sleep disturbance than those who had fast-food on at most one day/week (1.31, 1.26–1.36). No apparent gender differences were observed in the association estimates. Meta-analysis showed that adolescents with frequent intake of soft drinks (at least daily) and fast-food (at least two days/week) had 48% higher odds of sleep disturbance than those with infrequent intake (1.48, 1.33–1.57; I2=41.6%). Sensitivity analyses supported the meta-analysis results.

Conclusions: Our findings suggest positive associations between frequent intake of carbonated soft drinks and fastfood with anxiety-induced sleep disturbance among adolescents. Prospective studies are needed to understand the causal pathways of these relationships, which can inform strategies to reduce sleep disturbance among adolescents.





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## Playing a nutritionally focussed educational game: can it improve children's nutrition knowledge?

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#### e-&mHealth (SIG)

Purpose: Poor eating behaviours are common among Australians and are often established in childhood and have a high change of persisting throughout adolescence and into adulthood. Nutrition knowledge interventions have been found to be effective in changing eating behaviour.Primary school children are a popular population for early nutrition education. The use of computer games for the intent of nutrition education has previously been successful in changing health-related behaviours and teaching nutrition. The current study investigates the development and effects of a tablet-based educational game for improvement of nutrition knowledge.

Methods: 'VitaVillage' is a farming-style game, where the user converts a virtual village to a health-promoting village by completing quests posed by villagers in need of healthy foods and advice. The user needs to grow the foods on their farm by correctly answering questions about healthy foods and their nutritional value. Year 5/6 primary school students were recruited into either a control group (mean age: 10.9, SD 0.8, 53.2% female), or an intervention group (mean age: 10.9, SD 0.7, 51.5% female). Both groups completed a nutrition knowledge survey at baseline (T0), and one week later (T1). The control group received no nutrition education, while the intervention group played the VitaVillage game twice for 20 minutes each time.

Results: Results indicated there was a significant increase in total nutrition knowledge scores compared to the control group ( $\Delta$ M2.3, p<0.05, Cohen's d=0.35). On a likeability survey after the study, children reported that they liked the game overall, with mean score of 77 (SD 24.6), on a scale of 0-100. The comments made by the children were overall very positive and will assist in the ongoing development of VitaVillage.

Conclusion: The ability of VitaVillage's efficacy to increase children's nutrition knowledge is promising and the children enjoyed playing the game. Further development and a larger school based randomised controlled including a study arm with traditional nutrition education and measures of dietary intake and longer game exposure is needed to assess efficacy and for consideration of implementation into primary schools in the future.





## Nothing about them, without them. The participatory development of an adolescent health promotion chatbot

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#### e-&mHealth (SIG)

#### Purpose

Early adolescence is an important period for (mental) health promotion. mHealth interventions offer great opportunities; but disadvantages are the small response rate and low engagement to such interventions, especially among vulnerable groups. Studies show that the inclusion of social support increases participants' engagement. This study aims to explore whether a chatbot is useful for that purpose. This presentation describes the iterative, participatory development of a chatbot complementing a self-regulation app (MOV-E-STAR) to motivate adolescents (12-15y) to adopt a healthy lifestyle.

#### Methods

The development of the MOV-E-STAR chatbot follows the five steps of the mHealth Development and Evaluation Framework: 1) conceptualization; 2) formative research; 3) pre testing; 4) pilot testing; and, 5) qualitative research for intervention refinement. In the formative stage, relevant messages (n=319) were retrieved from a free and anonymous online helpline for children and adolescents in Flanders (Belgium) to examine how adolescents ask questions about the included health domains. In addition, six focus groups were conducted to identify preferences for the input and design of the chatbot. Data were analysed using thematic analysis in Nvivo. After inserting all input into Dialogflow, the chatbot was pre-tested by a small group of adolescents (n=6).

A prototype of the chatbot will be pilot tested, followed by a process evaluation with interviews. Results of the pilot study will be available at the time of the conference.

#### Results

Adolescents in the focus groups expressed that they preferred a colourful Messenger/Whatsapp design, that the chatbot should have a human side, that answers from the chatbot should not be too long and must be formulated in a positive way, that answers could be supplemented with emojis, that referrals to websites should immediately lead to clear information, and that the chatbot should have options to personalize.

#### Conclusions

Developing an mHealth intervention is an iterative process, in which repetitive testing with the target group and stakeholders is required. Further development will be informed by adolescents' feedback on their experience of the prototype intervention. Based upon their input, the intervention will be further optimised.





## Screen-based behaviors in Australian adolescents: Longitudinal trends from 2010 to 2014

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e- & mHealth (SIG)

Purpose: High levels of screen time (ST) can be detrimental to adolescent health. However, many Australian adolescents are currently exceeding national ST guidelines ( $\leq 2h/day$ ). Public health concerns may rise, especially now that technology is increasingly part of the adolescent landscape. However, there are few longitudinal studies on ST trends among Australian adolescents. Therefore, the purpose of this study was to examine longitudinal trends in total and domain-specific ST between 2010 and 2014 in Australian adolescents.

Methods: Data were derived from the Longitudinal Study of Australian Children (LSAC). In 2010, 2,179 children (49.7% boys;  $10.3 \pm 1.1$  years) completed a time-use diary, recording their main activities during waking hours. This was repeated with the same sample in 2012 ( $12.4 \pm 0.5$  years) and 2014 ( $14.4 \pm 0.5$  years). Data were analyzed for time spent in several screen-based activities, including TV-viewing, computer use (excluding games), electronic gaming, social networking and online communication. Repeated-measures ANCOVAs were performed to analyze trends in ST, controlling for sex, household income, maturational status, and waist circumference. Trends in ST were also analyzed by sex.

Results: Total ST significantly increased (+85.9min/day) between 2010 and 2014 (P < .001), and the prevalence of adolescents exceeding ST guidelines (>2h/day) increased markedly (2010; 59.5% - 2014; 75.3%), but differed by sex, with a larger increase in boys (2010-2012; +41.6 vs +22.7min/day). Electronic gaming increased in boys (2010-2014; +43.2min/day), and decreased in girls (-16.8min/day). In contrast, girls reported larger increases in TV-viewing (2012-2014; boys: +0.4, girls: +29.1min/day), computer use (excluding games) (2010-2012; boys: +24.8, girls: +34.3min/day) and time communicating online and social networking (2010-2012; boys: +4.3, girls: +15.2min/day).

Conclusions: The amount of time adolescents spend on screens increases as they age, although this differs by sex and ST domain. Findings suggest that future ST reduction interventions should mainly focus on computer use and electronic gaming in boys and TV-viewing and time spent communicating online and social networking for girls.





## A healthy lifestyle app significantly improves some adolescents' and parents' health outcomes – A first look at the Aim2Be (version 1) app

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#### e- & mHealth (SIG)

Purpose: Mobile health interventions are increasingly utilized to support change in adolescents' health behaviours as this age group embraces technologies. However, there is need to develop innovative strategies to support engagement with such technologies. This study evaluated the extent to which Aim2Be version 1 supports adolescents and their parents to adopt healthy behaviours (dietary, physical activity (PA), sedentary behaviours) and whether the app influences the targeted mediators.

Methods: 632 families were invited to use Aim2Be for 4.5 months - a lifestyle behaviour modification app targeted at adolescents and their parents. Aim2Be aligns with current health recommendations; integrates theories and behavior change techniques known to support behaviour change (self-regulation from Self-Determination Theory and social environment from Social Cognitive Theory); uses gamified elements to promote engagement; adds social discussion and live health coach, and links living green with behaviour change. Assessments included adolescents' and parents' self-reports of PA, fruit and vegetable (F&V) consumption, and screen time as well as adolescents' mediators of behaviour change (self-efficacy and intrinsic motivation). Linear regressions, conducted in Stata (v.15), were used to assess changes. Relevant covariates were added (age, gender, socio-economic status, and total time in app measured with web-analytics).

Results: 294 and 312 Canadian adolescents (14.8yrs, 49% boys) and parents (46.3yrs, 66% mothers, 68% Caucasian), respectively utilized the Aim2Be app. Overall, changes in behaviours or mediators were more apparent when time in the app was accounted for. Adolescents who used the app ( $\geq$ 30 minutes) significantly increased F&V intake, reduced consumption of 100% fruit juices, and decreased screen time as well as increasing their intrinsic motivation and self-efficacy related to dietary behaviours. Parents who used the app ( $\geq$ 30 minutes) significantly increased F&V increased F&V intake and decreased consumption of sugar-sweetened beverages.

Discussion/conclusions: Evaluation of Aim2Be provided some initial support for the app in impacting some aspects of adolescents' and their parents' health behaviours and the mediators targeted. These initial findings were used to fine tune the Aim2Be app in preparation for the randomized control trial (e.g., integrating self-monitoring tools and increasing emphasis on PA).





## Animated narrative videos increase physical activity during active videogame play

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e- & mHealth (SIG)

Purpose: Active video games (AVGs) can increase physical activity (PA). Animated narrative videos possess unique immersive and motivational properties and have been found to increase PA via AVG play compared to no video condition. However, there is no evidence of whether that was due to narratives or simply adding an animated video. We investigated the effects of an animated narrative video (NV) vs. an animated non-narrative video (N-NV) on moderate-to-vigorous PA (MVPA) levels during AVG play.

Methods: We randomly assigned 22 children 8-12 years old without previous AVG experience, after consent/assent, anamnesis, and anthropometric assessment, to watch either an NV or N-NV (~11 minutes), after which we instructed them to play an AVG for as long as they wanted. We estimated the time spent (minutes) in MVPA levels from vector magnitude (VM) counts recorded during the AVG sessions with a hip worn-accelerometer. Afterwards, they reported their experience in narrative immersion via a questionnaire. We applied independent two-sample t-tests to compare groups, with Cohen's d to determine the effect size. We used Pearson correlation to test for associations.

Results: The NV and N-NV groups did not differ significantly (age:  $9.45\pm1.13$  vs.  $10.30\pm1.34$ , p=0.14; BMI%:  $41.95\pm24.97$  vs.  $57.23\pm36.16$ , p=0.28). The NV group had significantly higher narrative immersion (Cronbach's  $\alpha$ =0.62,  $3.50\pm0.55$  vs.  $2.91\pm0.59$ , p=0.03, d=1.03) and significantly higher PA levels than the N-NV group (VM:  $91.21\pm34.98$  vs.  $64.24\pm13.71$ , p=0.03, d=1.02; MVPA:  $20.11\pm13.75$  vs.  $7.85\pm5.83$ ; p=0.02; d=1.13). MVPA was positively correlated with narrative immersion (r=0.21; p=0.01).

Conclusions: We are the first to test the effect of a narrative vs. nonnarrative video to motivate children to engage in MVPA via AVG play. The addition of animated narrative videos resulted in higher narrative immersion and PA levels when compared to animated nonnarrative videos.





## Using online canteens to deliver a public health nutrition intervention: Shortterm outcomes of the 'Click & Crunch' Cluster RCT

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### e- & mHealth (SIG)

Purpose: The widespread use of online food ordering systems presents tremendous opportunities for public health nutrition. For example, online school canteen ordering systems are increasingly popular in Australian schools. The leading provider processes over 13 million lunch orders per year, placed by over 250,000 users, across more than 1,200 schools. This research program investigates the potential for a public health nutrition intervention embedded in this online system to improve the healthiness of student purchases. Specifically, the aim was to determine the short-term effectiveness of the 'Click & Crunch' intervention in improving the nutritional i) quality and ii) content of primary school students' online lunches orders.

Methods: 17 non-government schools were recruited to this Cluster RCT. Schools randomised to the intervention received changes to the layout and presentation of their online menu (including menu labelling, item repositioning, prompts, tailored feedback, and incentives) as well as a brief menu feedback report. The application of the intervention strategies (e.g. menu labelling) was based on the classifications stipulated by the NSW Healthy School Canteen Strategy ('Everyday', 'Occasional'). Control schools received no change to their online menu. Intervention effectiveness was determined by comparing the i) the average proportion of 'Everyday' menu items, and ii) the nutritional content of students' online canteen orders (the average energy (kJ), saturated fat (g), sugar (g) and sodium (mg) content), using purchasing data that is automatically collected and stored by the online ordering system. Short-term follow up occurred in the school term immediately following the switching on of the intervention strategies.

Results: During each 10-week baseline and follow-up period, over 3,000 orders were placed. Preliminary analysis indicates that the proportion of 'Everyday' foods purchased increased by 5% and there were decreases in the kilojoule, saturated fat, sodium and sugar content of intervention students' online lunch orders relative to controls, but that these differences were not significant (p>0.05).

Conclusions: There are challenges when embedding public health interventions within real-world online systems. However, the wide-reach of these systems facilitating efficient dissemination at scale warrant further investigation into how to successfully embed behaviour change strategies.





## O.3.33 - Children's environments and school policy

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## Evaluating the impact of an active play policy on licensed childcare environments, policies and practices: a longitudinal analysis

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#### Policies and environments (SIG)

Purpose: Physical activity (PA) and physical literacy are critical to development in the early years and provide a foundation for PA over the life course. Childcare is a key setting to promote PA supportive policies, practices, and environments. In 2017, the British Columbia government enacted the Director of Licensing Standard of Practice – Active Play (AP standards). To support the AP standard, a capacity building intervention [Appetite to Play (ATP)] was also initiated. Surveys were conducted prior to and following policy enactment to determine the impact of the AP standard and capacity building intervention on childcare policies and practices.

Methods: Managers of licensed group childcare centers for children aged 3-5 years completed 2 waves of surveys (n=581 for Wave 1 and n=536 for Wave 2). The surveys asked about AP standard awareness, ATP training and policies and practices for fundamental movement skills (FMS), free play, active play, outdoor play, screen time, PA modelling, and sedentary behaviour. Chi square tests assessed change in the proportion of centers with policies in line with the AP standard. Multilevel logistic regression models in centers with matched data across waves will explore predictors of supportive policies, environments and practices.

Results: A significantly greater proportion of facilities reported supportive PA policies in Wave 2 compared to Wave 1 (p<.01). For example in Wave 1, 41% of managers reported a policy about daily outdoor play time and in Wave 2 it was reported by 79% of managers. Over half of wave 2 participants indicated that in the past year, they had changed their PA policies related to time spent outdoors and FMS development. In Wave 2, 22% of managers had participated in ATP training and participation was significantly associated with having a policy for amount of active play time (p=.03).

Conclusions: A greater proportion of childcare centers were implementing written active play policies following the enactment of the AP standard, and training was significantly associated with policy implementation. The analysis of the matched data set will provide further insight into the mediators and moderators of policy implementation and adherence.





## Empowering children to influence changes in their school environment for learning, physical activity health and wellbeing

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#### Policies and environments (SIG)

Purpose: Outside of home, children spend most of their time in the school environment. Schools are important settings to promote physical activity and healthy eating. This project utilised a Citizen Science community-based participatory research (CBPR) approach to engage children from 2 intermediate schools about barriers and facilitators of the school environment impacting their learning, activity levels, health and wellbeing.

Methods: Utilising the "Our Voice" citizen science methodology to discover, discuss, advocate and change their school environments, 241 children (10-13 years old) were actively involved in four project phases: self-led school walks with a mobile app (Stanford Discovery Tool) to capture barriers to and facilitators of their school environment, action group discussions of the data collected, advocacy training, and presentations to stakeholders. Action group participants (group size=8-10 students; total N=115) reviewed their school data, prioritised issues and brainstormed potential solutions. A subsample of students (N=23) were invited to participate in the advocacy training and co-creation presentation to stakeholders. Both schools' advocacy groups presented videos of their findings. Qualitative thematic analysis was used for narrative data evaluation.

Results: In total, 1236 photos, 401 audios and 918 texts were taken. Barriers identified across both schools included lack of healthy food options, broken basketball hoops, low fencing around the court that didn't stop the balls, and not having shelter in the outdoor activity areas to allow activity when it rained. Providing healthy eating options, a playground, new basketball hoops, higher fencing and a shelter to allow outdoor play year-round were suggested solutions. Specialty classes, fields/courts, and sports days were perceived as facilitators. Subsequently, the principal of one of the schools invited the researchers to conduct a follow-up evaluation to track improvements in early 2020. School 2 has already initiated changes within their school environment.

Conclusions: Integrating citizen science with a CBPR approach empowered children to collect significant and meaningful information about their local school environments, prioritise their concerns, and present their data to school personnel. Engaging in conversations with the schools' principals and Board of Trustees generated practical solutions benefiting the school community. Findings were presented at various dissemination events.





## The impact of traditional school uniforms on primary school student's physical activity: outcomes of a pilot cluster randomized controlled trial

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Policies and environments (SIG)

#### Purpose

Many countries in the world have mandatory school uniforms. An emerging barrier to student physical activity at school, particularly among girls are traditional uniforms that are impractical, i.e. dresses, skirts and black leather shoes. Modifying the school uniform to be more activity enabling may be a simple intervention to improve student's physical activity. The aim of this study was to assess the impact of a uniform intervention on students aged 8-10 years physical activity levels across the segmented school day.

#### Methods

A cluster randomised controlled trial was undertaken in 21 primary schools in New South Wales, Australia with students in grade 2 and 3. School days were randomised to a one day activity friendly uniform intervention, whereby students wore their sports uniform one randomly selected day of the week that they would otherwise wear their traditional uniform. This was compared with up to three other days where traditional uniform was worn. Student physical activity was measured using wrist worn GT-3X accelerometers for 5 school days, Chandler cut points were applied. Repeated measures linear mixed models were used to analyse the data comparing measures of physical activity during segments of the school day (whole school day, combined breaks and classroom time). Physical activity was a combination of light, moderate and vigorous.

#### Results

There were 1215 consenting students of which 475 had valid data. The preliminary findings of the study found that overall students participated in 3.95 [2.74-5.16] (p=<0.001) more minutes per day. When segmented for student sex, both boys and girls participated in significantly more physical activity on the day they wore their sports uniform 4.59min [2.85-6.32] (p=<0.001) and 3.35min [1.66-5.04] (p=<0.001) respectively, compared to the day they wore their traditional uniform.

#### Conclusion

Given the many challenges faced when implementing at scale, school physical activity interventions this study suggests that a school uniform policy change may represent a simple means of improving student physical activity; one that does not require significant resource to build the capacity of schools and their staff to support implementation.





## Extending recess time policy in elementary schools: a pilot study

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#### Policies and environments (SIG)

Purpose: Recess, unstructured break time during the school day that is typically outdoors, is a key opportunity for physical activity, but also has potential benefits for children's physical, cognitive and academic, and socioemotional development. In the United States, only 6 states currently have legislation requiring recess in elementary schools. In 2018-2019, the state of Arkansas ran a pilot of extending recess from 90 minutes of physical activity per week to 60 minutes of unstructured recess per day for all elementary school students. This study was an pilot evaluation of extended recess in three schools matched for socioeconomic characteristics and academic achievement.

Methods: A mixed methods assessment was used to provide a rich description of the pilot extended recess implementation. Interviews and focus groups were conducted with principals, teachers, paraprofessionals and students. Direct observation of recess using the Great Recess Framework was paired with physical activity measured using waist-worn accelerometers (Actigraph GT9x) during recess periods.

Results: Using accelerometers (n=95 children), 33.5 (SD 18.8) percent of recess time was spent in moderate-tovigorous (MVPA) physical activity. Boys were more active than girls (38.8% vs 29.8% MVPA) and older children were less active than younger children (38.6% MVPA in grades K-2 vs 30.6% in grades 5&6). Observational data (n=11 recess periods) found limited organized games or involvement from adults, limited non-fixed equipment, and varying abilities of students to resolve conflicts on their own. Results from the qualitative data (n=23 adult participants, 9 student focus groups) suggested the impact of non-structured extended recess includes physical, social, creative, and cognitive development in students including increased focus and improved student behavior. The challenges include logistical challenges, increased student behavioral problems at recess, and increased equipment needs.

Conclusions: Several characteristics of lower quality recess, including limited time spent in MVPA, were observed. There were several benefits to the extended recess policy, but also several barriers to implementing extended recess. Simply extending recess time does not ensure quality recess time and strategies are needed to improve the quality of recess.





## Designing parks to promote active and social visits among children

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#### Policies and environments (SIG)

Purpose: Neighbourhood parks are important settings for children to explore the natural environment, socialise with others and engage in physical activity. Unfortunately many parks are not being used to their full potential and little is known about what park features are important to promote park visitation from the child's perspective. The aim was to gain an in-depth understanding of park features that may encourage children (8-12yrs) to visit parks and be active and engage with others during their park visit.

Methods: Qualitative one-on-one walk-along interviews were completed between September 2017-February 2018 with 30 children (mean age 9.7yrs [sd 1.3], female n=16). The interviews were conducted in nine parks of varying size (1-30ha) and amenity in varying socioeconomic status areas of Melbourne, Australia. As they walked through the park with the researcher, children discussed features they (dis)liked and shared thoughts regarding park characteristics that may encourage or discourage their visitation, park-based physical activity, and social interactions. They also described their "perfect park". Interviews were recorded and transcribed verbatim and content analysis was performed using NVivo 12.

Results: To encourage visitation children suggested providing more challenging and interesting play equipment, a pond and water play area, more trees/greenery and shade, full sized basketball courts, and improved maintenance. Features most valued for physical activity included: sports courts, ovals and equipment; open space; large playground; bike/walking tracks; trees to climb and nature/rocks. Features most valued for social interaction included: a large size; playground; picnic/bbq areas with sufficient shelter; facilities for a range of ages; sports courts; and grassy open spaces with trees/nature. Key elements of their "perfect park" included: challenging playgrounds; large size; sports ovals and equipment; and green space/nature.

Conclusions: Children offer unique and important views and this research provides an understanding of park features that influence visitation, physical activity and social interaction from children's perspectives. Park designers should consider inclusion of these features, particularly commonly mentioned trees/greenery and natural features, when (re)developing parks to support children to lead healthy and active lives.





## Room to move: School playground space and children's physical activity

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#### Policies and environments (SIG)

#### Purpose:

Increasing population density in urban areas puts pressure on schools to accommodate more children. Many primary schools lose playground area to new buildings, yet no guidelines exist on appropriate or necessary outdoor space required to facilitate students' PA. Previous research has been confined to a small range of playground sizes, has included the modifying effect of loose equipment, and/or not examined total PA or objective physical competence. We analysed the relationship between school playground size and total (PA), fitness, and fundamental movement skills (FMS) of primary school students, accounting for presence/absence of loose equipment.

#### Methods:

Cross-sectional ecological analysis of 5238 students aged 5-12 years participating in the Schools Physical Activity and Nutrition Survey (SPANS) from 43 primary schools in NSW, Australia. Outcome measures were self (for age >11 years) and parent (for age <10 years) report of PA (meeting PA recommendations and number of days meeting recommendations), objectively measured FMS and cardiorespiratory and muscular fitness.

#### Results:

The combined effect of loose equipment and playground space was non-linear and showed having equipment had a positive and rapidly incremental effect on outcomes as the space increased up to 25m2 per student. For example, below 20m2 the probability of a student ( $\leq 10$  years) in a school with loose equipment meeting PA recommendations is 0.17, and 0.56 to be in the healthy range for fitness (student of any age). At 25m2 the corresponding probabilities were 0.26 and 0.75. We observed no relationship between space and FMS and an inverse relationship between population density and PA measures contrary to previous studies.

#### Conclusions:

School space guidelines should specify sufficient playground space for students to be active. Our study is suggestive of better PA outcomes with increasing space up to 25m2 per student. Many schools are in areas which would not allow for expansion, and therefore policymaking must take a systems approach incorporating intersectoral planning and cooperation to ensure sufficient PA among growing school populations.




# O.3.34 - Scaling up physical activity programmes in schools

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# Three-year sustainability of a teacher-led program targeting pre-adolescent girls' motor competence

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Implementation and scalability (SIG)

Purpose: Motor competence (MC) is important to public health outcomes such as physical activity, fitness and weight status. Yet MC levels are low and are particularly low in girls. Although numerous studies address the effectiveness of MC interventions, less research addresses the implementation and sustainability of the interventions. This study aimed to investigate the extent to which teachers continued implementing an efficacious teacher-led program, which significantly improved MC in girls (12 years), three years post-intervention.

Methods: Teachers' ongoing implementation and perceptions of program sustainability were examined utilising the UK Medical Research Council (MRC)'s framework, in three specific domains: i)Implementation (post-evaluation) ii) Mechanism of (sustained) change, and; iii) Context (i.e., barriers and facilitators). All teachers who participated in the original trial (n=18) completed questionnaires followed by focus group discussions (FGs). Descriptive statistics analysed questionnaires. FGs were audio recorded, transcribed verbatim, and analysed in NVivo 11 using a framework approach.

Results: All teachers had continued to implement the program, or elements thereof, three years post-intervention. The structure of the intervention, in particular the alignment to the school, subject and unit configuration, emerged as the most influential factor in regards to ongoing implementation. In regards tomechanism of change, improvement, in regards to both teacher practice and student performance, emerged as a driver of change. The adaptations made to the program post evaluation significantly expanded the reach, and appeared highly influential to program sustainability. The demand or need for the intervention appeared as the most predominant facilitator.

Conclusion: Engagement with the end-user (i.e., teacher), to identity individual need and contextual differences in the early stages of intervention development is integral not only to intervention effectiveness in the short term, but also to program sustainability. Framed by implementation science, these findings provide valuable understanding around the translation of research into practice, and useful information in regards to program sustainability and potential scalability.





# Active Recreation in Children and Adolescents: A Systems Dynamic Approach to Modelling Physical Activity Promotion

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### Implementation and scalability (SIG)

Purpose: Physical activity promotion is embedded within complex systems and active recreation represents an opportunity to improve children's physical activity participation. However, as the factors that influence active recreation are complex, new methodological approaches are required. This study developed an active recreation static systems model by mapping key stakeholders, correlates, and intervention evidence for promoting child and youth active recreation in Victoria, Australia.

Methods: Seven databases were searched for reviews of correlates and interventions of child active recreation, published between January 2013 and July 2018. These were mapped and causal loop diagrams generated. An actor map of stakeholders included six levels of influence: 1) international; 2) government; 3) regulatory and peak bodies, advocacy groups, and industry associations; 3) local government, education, and sport; 4) social environment; 5) individual; and 6) built environment. Stakeholders were invited to face-to-face interviews to provide input to expand and refine the maps and causal loop diagrams.

Results: Three maps and two causal loop diagrams for children and adolescent's active recreation were developed including relevant actors, correlates, and interventions. Literature searches uncovered correlates at the local (n=9), social (n=28), individual (n=35), and built environment (n=21) level. There were 49 variables at the local (n=9), social (n=13), individual (n=19), and built environment (n=8) targeted in interventions. The actor map identified 125 specific actors in relation to active recreation in Victoria. This included: international (n=10), government (n=19), regulatory body and advocacy group (n=44), local (n=16), social (n=20), individual (n=3), and built environment (n=13) levels of influence. Twenty-three individuals participated from 16 stakeholder organisations ranging from public, private, and not-for-profit groups, government, regulatory or advocacy, education, sport, social, and built environment organisations. Only a small number of stakeholders identified active recreation as their core business. Feedback indicated the positive potential for systems modelling approaches as a policy, appraisal, advocacy, and decision-making tool.

Conclusions: By identifying priorities and action areas likely to have system-level impacts, systems modelling approaches represent a vital step in moving beyond cause-effect models of physical activity promotion and could help identify leverage points to effectively promote active recreation in children and youth.





# Optimising a school-based physical activity intervention for scale up

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#### Implementation and scalability (SIG)

PURPOSE: School physical activity policies have been mandated by many jurisdictions internationally however implementation of such policies is poor. Without population wide implementation, the potential benefits of school policies will not be realised. The aim of this paper is to describe how an intervention that increased schools' compliance with a mandatory physical activity policy was taken from efficacy to scale-up.

METHODS: Optimisation is an emerging field within implementation science involving an iterative, data-driven process to improve the impact of an intervention. The optimisation process involved a series of randomised controlled trials (RCT), undertaken between 2016-2018, with the aim of developing the most effective and scalable implementation strategy, that could be delivered by a service delivery organisation. Intervention effectiveness was measured via schools compliance with the mandatory policy and children's physical activity levels measured via accelerometer.

RESULTS: Following extensive formative research which included i) literature reviews; ii) interviews with teachers and iii) observations of teachers' delivery of physical activity the identified barriers/ facilitators to policy implementation were mapped to the Behaviour Change Wheel (BCW) and the Theoretical Domains Framework (TDF). Potential behaviour change techniques and implementation strategies were then identified and presented to an advisory group to assess against the APEASE criteria. Implementation strategies included; executive support, training in-school champions, provision of tools and resources, implementation prompts, reminders and feedback. The findings from each RCT as well as the methods used to modify the implementation strategies of each subsequent trial in terms of behaviour change technique, dose or modality will be presented.

CONCLUSIONS: This is the first study to optimise an implementation intervention to increase schools' compliance with a mandatory physical activity policy. Given the dearth of research, the findings will be important in informing future implementation efforts in this setting. Furthermore, the methodology used may inform the design of other health promotion programs in schools or other settings more broadly.





# What support was actually implemented and did schools uptake it? Fidelity and reach of an implementation support intervention – the scale up of the Physical Activity 4 Everyone (PA4E1) secondary school physical activity program

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### Implementation and scalability (SIG)

Purpose: Schools were randomly allocated to a control arm (n=25) or the Physical Activity 4 Everyone (PA4E1) program group (n=24). Program schools received implementation support incorporating seven overarching strategies to implement seven physical activity practices over 24 months. We address the fidelity and reach of, and modifications to, the implementation support strategies, as these domains are rarely well described. Firstly, to understand if the implementation support was delivered as intended, we specify what components of support were actually delivered to schools (fidelity). Secondly, to explore what support may have been useful or relevant to schools, we specify what support schools actually up-took (reach). Finally, we specify modifications to the implementation support provided.

Methods: We coded the seven implementation support strategies of PA4E1 into 23 sub-strategies and devised both fidelity and reach assessment criteria. Data were obtained from project administrative data; surveys with teachers leading the program and Head Teachers of Physical Education; and from a fidelity monitoring log completed monthly by the research team. Descriptive statistics summarise the dose of the implementation support intervention (fidelity and reach), allowing equal weight to sub-strategies (n=23) within each strategy (n=7). Modifications were recorded via consensus at monthly research team meetings according to the FRAME framework.

Results/findings: At 12 months, fidelity across all schools (n=24) was high, 95.6% (SD 6.4; range 86.1-100%). The reach score was 81.5% (SD 7.5; range 69.0 -91.7%), indicating that schools up-took the majority of sub-strategies. Sub-strategies with the lowest reach were: providing feedback reports to school principals (6/24 schools); the school committees responsible for PA4E1, as schools did not form committees, include an executive member or meet termly (10-15/24 schools); in 12 of 24 schools, less than 70% of PE teachers completed online training. Fidelity and reach at 24 months will be reported also. Modifications across the 24 months were mainly to content and context, and both planned and unplanned. Consensus indicated the impact of modifications was minimal, and none were to core program elements.

Conclusions: The majority of the support provided to schools was implemented as intended, at least over 12 months, and schools up-took the majority of what was offered.





# The effectiveness of a 12-month implementation support intervention to scale up the PA4E1 program

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### Implementation and scalability (SIG)

PURPOSE: 'Physical Activity 4 Everyone' (PA4E1) is a multi-component, school-based program targeting adolescents. PA4E1 has previously demonstrated significant increases in students' mean minutes of moderate-to-vigorous physical activity (MVPA) and significantly lower weight gain at low incremental cost. The aim of this paper is to report the 12-month outcomes of an implementation support intervention to scale up PA4E1. Fidelity and reach are also reported.

METHODS: A cluster randomised controlled trial, utilising a type III hybrid implementation-effectiveness design, was conducted in 49 secondary schools located in lower socio-economic areas across four health districts in New South Wales, Australia. Schools were randomly allocated to a usual practice control arm (n=25) or the PA4E1 program group (n=24), which received an implementation support intervention to support adoption of the seven PA4E1 school physical activity (PA) practices. The implementation support strategies included: executive support, in-School Champion, teacher training, resources, prompts, audit and feedback and access to an external Support Officer. The primary trial outcome was the proportion of schools adopting at least four of the seven PA4E1 PA practices, assessed via telephone surveys at baseline and 12 months follow-up. Exact logistic regression models were used to assess program effects on the primary outcome at 12 months. Intervention fidelity (defined as delivery of the implementation support strategies as intended) and reach (defined as uptake of the implementation support strategies) were assessed via project records and online monitoring tools.

RESULTS: At 12 month follow-up, significantly more schools had adopted at least four of the seven PA4E1 PA practices in the program group than the control group (70.8% V's 4%,p<0.001). Curriculum based strategies were more likely to be adopted that school environment strategies. Fidelity and reach of the implementation support intervention were high (both >80%).

CONCLUSIONS: The 12 month results show that the implementation support intervention was effective in increasing adoption of school PA practices. Given few effective school-based physical activity targeting adolescent are scaled up, these findings are important for informing the scale-up of successful school-based interventions.





# Implementation at-scale of the resistance training for teens program: Moving from effectiveness to dissemination

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### Implementation and scalability (SIG)

Purpose: Current guidelines recommend young people engage in muscle-strengthening activities (e.g., resistance training [RT]) on at least three days per week. Despite this, and global declines in muscular fitness, few school-based interventions have focused on the promotion of RT. Furthermore, few school-based physical activity interventions have been implemented at-scale. The purpose of this study was to evaluate the state-wide dissemination of the Resistance Training for Teens (RT for Teens) program using the Reach, Effectiveness, Adoption, Implementation and Maintenance (RE-AIM) framework.

Methods: RE-AIM data were collected using mixed methods, including analysis: school level data (Reach), workshop enrolments (Reach, Adoption), smartphone application (app) usage (Effectiveness, Implementation), session observations (Implementation), and semi-structured interviews (Reach, Implementation, Maintenance).

Results: Reach: Potential program reach was ~200,000 students, maximized by the varied delivery methods of the program. Effectiveness: Self-report data from the purpose-built RT for Teens smartphone app indicated positive findings for students' muscular fitness. Adoption: To date, 30 workshops have taken place, with 477 teachers, from over 250 schools in attendance. Implementation: Level of implementation varied considerably across schools. Data from the RT for Teens app showed that almost half of participating schools (i.e., schools where at least one teacher had attended the teacher-training workshop) downloaded and used the app as an implementation resource. Process evaluation data indicated most teachers utilized the RT for Teens program resources within their lessons. Maintenance:Interviews with teachers highlighted their intentions to implement the program in the future and share information/resources with fellow staff.

Conclusions: The RT for Teens program had large potential reach, but implementation varied considerably across schools. External support from change agents may be needed to overcome barriers and optimize intervention implementation in schools. Future research is needed to explore the impact and cost-effectiveness of interventions that test different levels of implementation support.





# O.3.35 - Physical activity and socio-economic inequalities

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# Day-to-day pattern of physical behaviours at work and leisure among adults with low socioeconomic status.

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#### Socio-economic inequalities (SIG)

Purpose Most studies on day-to-day patterns of physical activities and sedentary behaviour are based on adult populations of high socioeconomic status (SES) without differentiating between work and leisure. Consequently, little is known about domain-specific day-to-day patterns of physical behaviours and potential correlates of such patterns among low SES adults. Thus, we aimed to characterize the day-to-day pattern among low SES adults and to investigate the influence of day of the week and its interaction with workday, work duration and work physical behaviours on day-to-day leisure physical behaviours.

Method This study included 1012 adults from typical low SES occupations (e.g. manufacturing, cleaning and transportation). The participants wore accelerometers for 1-5 days to measure daily physical behaviours at work and leisure, expressed as 3-part time-use compositions consisting of time spent 1) sedentary, 2) standing or 3) active (i.e. walking, stairclimbing or running). Multilevel linear log-ratio models were used to regress leisure time-use composition on (1) type of day, i.e., work/non-work, (2) day-of-week, (3) work duration, and (4) work time-use composition. Models were adjusted for sex, age, BMI and smoking-status.

Results During leisure, sedentary time increased during the week ( $300 \min/day$  on Monday,  $307 \min/day$  on Friday), while active time decreased ( $42 \min/day$  on Monday,  $38 \min/day$  on Friday). At work, sedentary time decreased during the week ( $176 \min/day$  on Monday,  $167 \min/day$  on Friday), while active time increased ( $83 \min/day$  on Monday,  $90 \min/day$  on Friday). Leisure physical behaviours were associated with type of day (p < 0.005, more sedentary on work days vs. non-work days) and day-of-week (p < 0.005, more sedentary on Friday). There were no associations with work duration or work time-use composition.

Conclusion Our findings suggest that low SES adults' leisure time is more sedentary towards the end of the workweek, while their work time becomes more active. Leisure time was spent significantly more sedentary (and less active) on workdays compared to non-workdays, indicating that these workers might organize their day according to work obligations. Our findings highlight the need to differentiate between domain when investigating day-to-day physical behaviour patterns and its correlates among low SES adults.





# The longitudinal influence of neighbourhood disadvantage on cardiovascular disease in older adults and the mediating effects of physical activity

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### Socio-economic inequalities (SIG)

Introduction: Evidence from longitudinal studies on the influence of neighbourhood disadvantage on cardiovascular disease (CVD) is limited. We investigated the prospective association of neighbourhood-level deprivation with CVD in older adults and whether physical activity (PA) mediated this association.

Methods: Data comes from the HABITAT project, a multilevel longitudinal investigation of health and wellbeing in Brisbane. Data included 11,035 residents in 200 neighbourhoods in 2007, with follow-up data obtained in 2009, 2011, 2013 and 2016. Neighbourhood disadvantage was derived using a Census-based index and divided into quintiles. CVD was defined as reporting one or more medically diagnosed long-term conditions: coronary heart disease, high blood pressure/hypertension or any serious circulatory condition. PA was self-reported, and an overall measure of energy expenditure was derived by multiplying the time (minutes/week) spent in walking, moderate activity and vigorous activity by an intensity value, and summing the products. Hazard ratios were estimated using a multilevel mixed-effect parametric survival model, adjusting for age, sex, education, occupation, and household income. Those with pre-existing CVD at baseline were excluded from the analyses. The mediation effect of PA on CVD was examined using multilevel generalized structural equation modelling.

Results: There were a total of 20,018 observations at five-time points. Observations were clustered into three levels of year, individuals and HABITAT neighbourhoods. The risk of CVD was highest in the most disadvantaged neighbourhoods evidenced by higher hazard ratios (HR) (Q1: HR 1.56, 95% CI 1.24,1.90). HRs of CVD in Q1 were 1.22 (95% CI 1.01,1.47), 1.42 (95% CI 1.14,1.76), 1.38 (95% CI 1.11,1.72) after adjusting for education, occupation and household income, respectively. PA as a mediator had the strongest effect (both total and indirect p<0.001) on CVD among residents of the most disadvantaged neighbourhoods.

Conclusion: Neighbourhood disadvantage was associated with the incidence of CVD, and PA was a significant mediator of this relationship. Future research should investigate which neighbourhood-level features promote or inhibit PA in disadvantaged areas as the basis for policy initiatives to address inequities in CVD.





# Mediating role of lifetime discrimination on associations between neighborhood social environment and TV viewing in Jackson heart study participants

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### Socio-economic inequalities (SIG)

Purpose: We tested the hypothesis that lifetime discrimination mediates associations between perceived neighborhood social environment (PNSE) and TV viewing among African American (AA) adults. This study is innovative because it can shed new light on potential mechanisms linking neighborhood social environment to sedentary behavior.

Methods: Baseline data for 4,716 Jackson Heart Study (JHS) participants (mean age=55.1y), a large prospective cohort study of AAs in Jackson, Mississippi were used. One binary TV viewing outcome was created:  $\geq$ 4 hours/day. PNSE variables included neighborhood violence, problems (higher value=more violence/problems), and social cohesion (higher value=more cohesion). Lifetime discrimination was based on a validated instrument about unfair treatment (workplace), summed to create a mediator. Covariates included demographics, health-related factors, and population density. Multivariable linear regression with bootstrap-generated 95% bias-corrected confidence intervals (BC CIs) was used to test for significant indirect mediation effects (determined by 95%BC CIs [not including one] for logistic regression (odds ratios; OR) adjusting for covariates. Significance of unstandardized coefficients was determined by 95%CIs (not including zero).

Results: Participants (37%) reported TV viewing≥4 hours/day. Neighborhood violence, problems, and social cohesion were indirectly related to TV viewing via lifetime discrimination (OR=1.03, 95%BC CI=1.00, 1.07; OR=1.03, 95%BC CI=0.99, 1.06 [marginal], and OR=0.98, 95%BC CI=0.94, 0.99, respectively). That is, lower neighborhood violence and problems (B=-0.41, 95%CI=-0.64, -0.18 and B=-0.36, 95%CI=-0.53, -0.20, respectively) and higher social cohesion (B=0.11, 95%CI=0.08, 0.53) were associated with higher lifetime discrimination. In turn, lifetime discrimination was inversely associated with TV viewing. No direct associations were observed.

Conclusions: Each PNSE variable was indirectly associated with TV viewing via lifetime discrimination among JHS participants. Unexpected relationships between PNSE, lifetime discrimination, and TV viewing revealed when examining indirect associations warrant further investigation. Future research is needed to pinpoint effective community efforts to reduce discrimination and adverse neighborhood factors, and thereby decrease TV viewing and subsequent cardiovascular disease risk.





# Global prevalence of physical activity, sedentary behaviour, and sleep of immigrant children: A systematic review

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#### Socio-economic inequalities (SIG)

Purpose: Although insufficient physical activity (PA), high sedentary behaviour (SB), and inadequate sleep are fairly common among children, little is known about these behaviours of immigrant children. This systematic review examined the prevalence of PA, SB, and sleep among immigrant children aged 5-17 years around the globe.

Methods: Four electronic databases were searched to retrieve the English language peer-reviewed original articles published between January 2000 and March 2019. Cross-sectional, cohort or longitudinal studies that reported on the prevalence of PA, SB, or sleep-related outcomes among immigrant children were included. Data were extracted independently by two reviewers.

Results: Of 2,724 retrieved articles, 55 were selected for full-text screening and 12 met the eligibility criteria. Included studies were from the USA (n=6), the Netherlands (3), Australia (1), Switzerland (1), and Sweden (1). Five studies were based on nationally representative samples. Five studies (42%) ranked as fair at the quality assessment and the remaining were ranked as poor. Over half the studies (n=7; 58%) assessed only PA, one reported only sleep, three reported both PA and SB, and one reported all three behaviours. While all studies included both male and female adolescents, only one reported gender-stratified prevalence. No study provided age-stratified results. Only one used device-based measure. Assessment of PA and SB varied greatly across the studies with differing definitions of PA/SB. Based on three US nationally (2) and state (1) representative studies, the prevalence of doing  $\geq$ 20 minutes of PA on  $\geq$ 3 days/wk ranged from 48-72%. One study reported that 9 in 10 participants had >2 hrs/day of television-time, and three studies reported an average sedentary time ranging from 1-3hrs/day. One study reported that 13% of immigrant children in the USA had inadequate sleep on <5 nights/wk.

Conclusions: Most of the studies on the prevalence of PA, SB, and sleep among immigrant children are derived from a few high-income countries. Future studies should include all three movement behaviours and use standard assessment tools and definitions.





# Urban design and socioeconomic disparities in cardiovascular disease mortality in an aging population

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#### Socio-economic inequalities (SIG)

Purpose: Cardiovascular disease (CVD) is a serious and prevalent health issue in aging populations. There can be wide geographic variations in CVD mortality. There are disparities in CVD mortality related to area-level socioeconomic status (SES) disadvantage, which may be influenced by built-environment attributes. We examined relationships of objectively-assessed neighborhood walkability attributes with CVD mortality, in high, medium and low SES areas, using linking Japanese national data sets.

Methods: National data from the 1,824 municipalities across Japan were used. The outcome was mortality from CVD (the number of observed deaths from all types of CVD including acute myocardial infarction, heart failure, and cardiac arrhythmias and conduction disorders) for a five-year period (2008–2012) for each municipality. A standard national index of neighborhood deprivation was used as an indicator of municipality-level SES. A nationally-applicable walkability index (based on population density, road density and access to commercial areas) was derived using geographic information systems.

Results: Neighborhood walkability was significantly higher in higher SES municipalities than lower SES municipalities. Higher SES municipalities were also more populated, better connected, and had better access to commercial areas than lower SES municipalities. Compared to higher SES municipalities, relative rates [RR] for CVD mortality were significantly higher in medium SES municipalities (RR = 1.05, 95% CI: 1.04, 1.05) and in lower SES municipalities (RR = 1.09, 95% CI: 1.09, 1.10). There were walkability-related gradients in CVD mortality within the high and medium SES areas, and similar gradients for each of the three individual walkability components; however, walkability-related CVD mortality gradients were not apparent for lower SES municipalities.

Conclusions: Building on and expanding the known associations of socioeconomic disparities with CVD risk, we identified urban design attributes related to the geographic distribution of CVD mortality. CVD mortality rates varied not only by area-level socioeconomic status but also by walkability. In higher and medium SES municipalities, there are walkability-related gradients in CVD mortality, which were not apparent for the lower SES municipalities. Our findings provide a novel element of the evidence base needed to inform socially-and environmentally-focused approaches to CVD prevention in aging populations.





# Exploring incentive-based program components to increase physical activity and reduce sitting time in low socioeconomic populations: A qualitative study

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#### Socio-economic inequalities (SIG)

Purpose: Incentive-based programs are becoming increasingly popular to target physical inactivity and sedentary behaviours. However, little is known about the appeal of such programs among high-risk groups. The aim of this study was to qualitatively explore the appeal of incentive-based program components which aimed to increase physical activity and reduce sitting time in low socioeconomically positioned groups.

Method: Semi-structured interviews were conducted with participants (N=20) aged 40-65 years, who did not meet physical activity guidelines; reported sitting most of the day; and had an income below the Australian median. Interview schedule questions were guided by Adams et al. (2014) framework for documenting financial incentive interventions to change health behaviour. Interviews were transcribed and NVivo 10 utilised to conduct a thematic analysis.

Findings: Participants expressed interest in taking part in incentive programs that aimed to increase their physical activity and reduce their sitting time. Cash rewards and gift vouchers were the most desired incentive type, however most participants expressed the importance of individualising these rewards. The preferred incentive value was around AUD\$10-20 a week. However, a few participants stated that the perceived social contact they might gain from involvement in the program was the strongest incentive. Participants expressed that these programs would be seen as more acceptable if funded by the government; however most believed this would not be possible. Alternative suggestions were for programs to be funded by sporting brands, supermarkets or health insurers who have a transparent partnership with the program. The importance of supplementing these programs with additional support elements was a strong theme. These included social platforms, links to credible educational health resources, transport services, carer services and activity self-monitoring technologies. When discussing ideal program duration most participants suggested that they would be willing to be involved long-term if the program met their needs and held their interest.

Conclusion: Incentive-based programs hold appeal for people with low incomes, particularly if they involve individualised rewards; and include additional components such as social contact and educational and behavioural support. Trialling the feasibility and effectiveness of such programs is an important future priority.





# O.3.36 - Physical activity measurement and epidemiology

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# Temporal Physical Activity Patterns, Integrating Physical Activity Intensity and Timing, are Associated with Health

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Patterns of physical activity (PA) frequency and intensity have been linked to obesity and chronic disease. Integration of the specific timing, intensity, and sequence of PA in a day, to create temporal PA patterns has not been attempted, despite the potential relationship with health outcomes, and is the purpose of this research.

Methods: Objectively measured PA accelerometry data from 1,627 non-pregnant US adults 20-65 years with one random valid PA day collected in the cross-sectional National Health and Nutrition Examination Survey 2003-2006 was used to pattern absolute PA intensity and time of activity using data-driven methods. Clusters representing temporal PA patterns were created using modified dynamic time warping coupled with kernel-k means clustering algorithm. Multivariate regression models controlling for potential confounders, adjusted for multiple comparisons and the complex survey design determined associations between temporal PA pattern clusters and body mass index (BMI), waist circumference (WC), fasting plasma glucose, hemoglobin A1c, triglyceride, HDL-C, total-cholesterol, systolic and diastolic blood pressure and categories obesity, type 2 diabetes, and metabolic syndrome (p<0.05/6).

Results: A cluster representing a temporal PA pattern with the highest average intensity peaking at 11:00 and tapering off throughout the day was associated with significantly lower BMI (p<0.0001), WC (p<0.0001) and 65% lower odds of obesity compared to a cluster with lower average PA intensity peaking at 12:00 and tapering off (95% CI: 0.21, 0.47) and a cluster with the lowest average PA intensity with no distinct activity peaks (95% CI: 0.17, 0.43). Another cluster representing a temporal PA pattern with high average PA intensity peaking at 19:00 was associated with significantly lower BMI (p=0.0003), WC (p=0.001) and 60% lower odds of obesity compared to a cluster with lower average PA intensity peaking at 12:00 and tapering off (95% CI: 0.20, 0.74) and a cluster with the lowest average PA intensity off (95% CI: 0.20, 0.74) and a cluster with the lowest average PA intensity and no distinct activity peaks (95% CI: 0.18, 0.59).

Conclusion: Temporal PA patterns are associated with differences in U.S. adult health status indicators. This study novelly demonstrates that integrating time and intensity to temporal PA patterns differentiates health outcomes and holds promise for future interventions and potential guidelines.





# The development and reliability of a video coding scheme for categorising freeliving physical activity in 8–16 yr old children.

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Machine learning may improve accelerometer-measured physical activity but most studies rely on laboratory data to develop ground truth measures. Studies of free-living activity are hampered by the difficulty of categorising these data. Wearable cameras can provide objective free-living ground-truth data, but there is limited literature that describes the methodological approaches used to classify the copious amount of visual data. The aim of this study is to describe the development of a coding scheme for analysing free-living physical activity video data.

Methods: GoPro videos were obtained as part of a validation of 24-hour movement behaviours in 137 children wearing wrist, hip, lower back and thigh accelerometers. Videos were imported into Noldus Observer XT. A standardized coding protocol was developed based on general movement patterns and refined through group discussion. Inter-rater reliability of second-by-second video coding was established using an iterative cycle of blind-coding (relative to other coders) followed by discussion, with all disagreements resolved by group consensus. This yielded a set of videos with criterion codes from which additional coders could be trained.

Results: Every second of video was assigned to one of 23 movement codes. Behaviour codes included lying, sitting, standing, walking, and running and whether one or both arms were engaged. Other behaviour codes included shuffling/crouching, bending, whole body physical activity, stair ascending/descending, cycling (indoor), cycling (outdoor), inactive transport (on feet), inactive transport (sitting), and swimming. Transitional movements were also coded (e.g., standing to sitting, sitting to standing, lying to standing, and standing to lying). Visual cues in the video were used to inform classification (i.e., knee, leg, and hip positions, position of hands, directional movements, and movements in relation to other objects/people in the video). Images were classified as "undefined" when the camera lens was obstructed. Two researchers independently annotated a random subsample of 30 minutes of video for each child. Inter-rater reliability was assessed using the Kappa statistic.

Conclusions: The methodological processes used in the current study can inform future studies that use wearable cameras in a free-living environment.





# Associations between parent report and accelerometer-measured physical activity and sedentary time in children: Ecological momentary assessment study

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### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

PURPOSE: The use of mobile ecological momentary assessment (EMA) has not been investigated as a measure of young children's physical activity (PA) and sedentary behavior (SB) when reported by a child's parent. Our purpose was to examine the associations between parent EMA-report of child PA and SB and accelerometer-measured sedentary time (ST), light PA (LPA), and moderate-vigorous PA (MVPA), and whether these associations differed by day of week, sex, and season.

METHODS: 140 children (aged 6.4±0.8 years;47% girls) wore an accelerometer for 8 days to measure ST, LPA, and MVPA. Parent report of child PA and SB was measured via multiple daily signal contingent EMA surveys. Accelerometer data was matched to the time period occurring before parent EMA-report of child PA and SB. Generalized estimating equations with interaction-term analyses assessed whether the relationship between parent-EMA report of child PA and SB and accelerometer-measured ST, LPA and MVPA differed by day of the week, sex and season.

RESULTS: Parent EMA-report of child PA and SB was strongly associated with accelerometer-measured ST, LPA, and MVPA. Parent EMA-report of child PA was stronger during weekend than weekdays for accelerometer-measured ST (P = .001) and LPA (P = < .001). For parent EMA-report of child SB, strong associations were observed for accelerometer-measured ST (P = < .001), LPA (P = .005) and MVPA (P = .008). Sex-interaction results indicated the association between parent reported child PA via EMA and accelerometer-measured MVPA was stronger for boys than girls (P = .02). The association between parent EMA-report of child PA and SB and accelerometer-measured ST and PA was similar across seasons (all P > .1).

CONCLUSIONS: When accelerometry-based methods are not feasible in epidemiological research and in contexts where the parent is able to spend more proximate time observing the child's PA and SB, parent EMA-report might be a superior method for measuring PA and SB in young children relative to child self-report methods -given EMA's strong associations with accelerometer-measured PA and ST.





# Criterion Validity of the Fitbit Charge 2 to Measure Physical Activity and Sedentary Behaviour in Overweight and Obese Adults

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Wearable fitness trackers have increased in popularity and could motivate individuals to live healthier lifestyles. However, the validity of wearable fitness trackers has not yet been established in an overweight population. This study aims to determine the criterion validity of the Fitbit Charge 2 in measuring physical activity (PA) and sedentary behaviour in an overweight/obese population under free-living conditions. Fifty-nine (age: M=48, SD=11 vears. female: 69%) overweight/obese adults (BMI: M= 34, SD =4 kg/m2), concurrently wore a Fitbit Charge 2 tracker and an ActiGraph GT3X+ accelerometer for 8 days. Data sets were aligned so that only the same waking wear periods were included in the analysis and time spent (min/day) in sedentary time and moderate-to-vigorous physical activity (MVPA) were estimated using standard cut-points for GT3X+ and proprietary algorithms for the Charge 2. Paired t- tests and mean absolute percentage errors (MAPE) were used to examine differences and measurement errors in estimates between the two devices. Pearson and Spearman correlations and Bland-Altman (BA) plots were used to evaluate the association and potential systematic bias between the Fitbit and GT3X+. The results reflected that in comparison to the GT3X+, the Charge 2 recorded a significantly higher amount of time spent in sedentary behaviour, but had a low MAPE (mean difference [MD] = 33 min/day, p = 0.006, MAPE = 7%), whereas a relatively large MAPE was apparent for time spent in MVPA (MD = 16 min/day, p = 0.004, MAPE = 64%). The Charge 2 underestimated time spent in light PA (MD = -30 min/day, p = 0.001, MAPE = -9%) compared to the GT3X+. Despite the high degree of correlation between the two devices for step count (r=0.94, p<0.111), the Charge 2 recorded around 2000 more steps per day (p<0.001) than the GT3X+. In overweight adults, the Charge 2 overestimated time spent in sedentary behaviour, MVPA and step count compared to the GT3X+, but underestimated time spent in light PA. In this population, the Charge 2 demonstrates mostly good agreement with the GT3X+ and may be a useful tool for self-monitoring of activity.





# Re-evaluating standardised accelerometer cut-points for older adults.

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Participation in physical activity for at least 30-minutes-a-day, and interrupting sedentary time, are recommended for older adults. Research has established standard cut-points to indicate physical activity behaviour for adults. These cut-points are typically associated with levels of activity intensity based on standardised values of resting metabolic rate (RMR). However, as older adults have lower RMR than standardised values, they need to work harder to achieve these same cut-points. Therefore, previously identified cut-points may not be applicable to older adults and lead to inaccurate assessment of time spent in sedentary, light, and moderate intensity. This research aimed to validate GENEActiv accelerometer cut-points for sedentary, light, and moderate intensity activities of daily living, against energy expenditure in older adults.

Methods: Using a test/re-test design, 34 community-dwelling older adults (70-91 years) participated in two laboratory sessions, one-week apart. During the sessions, participants completed activities of daily living, including washing dishes, light gardening, carrying shopping, unpacking shopping bags, laying down, watching television, reading a book, and sweeping. Participants wore a GENEActiv accelerometer on each wrist during the activities, with gas analysis conducted via MetaMax 3B to ascertain energy expenditure; heart rate data were also collected. Data were analysed using a specifically-designed program, Cobra Processing.

Results: Analysis identified that standard cut-points did not accurately describe the energy expenditure of older adults. Further, when worn on the non-dominant hand, the GENEActiv was not sensitive to physical activity behaviour at lower intensities. For sedentary time, both dominant and non-dominant wrist had excellent classification accuracy (sensitivity 0.99 and 0.97; specificity 0.91 and 0.86, respectively). The GENEActiv worn on the dominant wrist generally showed better accuracy.

Conclusions: Based on these findings, it is recommended that standard cut-points be modified for older adults to increase sensitivity to periods of light-to-moderate-intensity activity; and the monitor is worn on the dominant hand. Identification of cut-points that more appropriately reflect the activities of older adults will enable the accurate monitoring of sedentary, light, and moderate intensity behaviour in this population.





# Capturing real-time 24-hour activity and daily weight data from Australian adults using Fitbit devices: Development of remote data collection software Fitnesslink

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Technological advancements in consumer wearables and health technologies present exciting opportunities for remote collection of participant data for health research; however, the cost of data collection services may be prohibitive for large longitudinal studies. We aimed to develop and test software that would collect 24-hour activity and daily weight data from Fitbit devices and would enable real-time monitoring of participant compliance.

Methods: The study was registered with Fitbit to receive access to the Fitbit API and intraday time series feature. Researchers collaborated with Portal Australia to develop software, called Fitnesslink, to extract and store minute-level heart rate and activity data (categorising each minute as sedentary, light activity, moderate activity, vigorous activity or sleep according to Fitbit's proprietary algorithms) and daily weight data. To register, participants click on the provided weblink, log in using their Fitbit username and password and authorize the software to collect their data. On the researcher side, a dashboard displays all authorised devices, battery status, time of last sync, and time of last use. Alpha testing was conducted by 7 users using Fitbit Charge 3 activity trackers and Aria 2 weight scales for an average of 55 days per tester. We compared samples of extracted data with summary data shown in testers' Fitbit accounts, calculated average activity values across the full 385 days, and tested the usability of the dashboard.

Results: Extracted data exactly matched data displayed in Fitbit accounts. Data showed plausible activity values: 757 minutes sedentary; 207 minutes light; 18 minutes moderate; 20 vigorous; 438 minutes sleep per day. The dashboard provided accurate information on device status and use, but it was anticipated to be difficult to identify non-compliance among a longer list of devices. Changes were therefore made so that devices are ordered by longest time since last sync and colours are used to highlight non-compliance (e.g. if devices have not synced, or have synced but no new activity or weight data have been recorded).

Conclusions: We developed user-friendly software that collects accurate real-time Fitbit data. Fitnesslink has potential application for any research which seeks to remotely collect health data using Fitbit devices.





# Lightning Talks





# LT.3.01 - Innovative methods and strategies in nutrition

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# "Not only adults can make good decisions, we as children can do that as well": Evaluating the youth-led participatory action research 'Kids in Action' targeting physical activity and dietary behavior

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Children and families (SIG)

Purpose: Most actions targeting children's health behaviors have limited involvement of children in the development, potentially explaining the disappointing effectiveness. In the 3-year 'Kids in Action' study, 9-12-year old children from a low socioeconomic neighborhood were involved as co-researchers in the development, implementation and evaluation of actions targeting healthy physical activity and dietary behaviors. We will present the process and effect evaluation of 'Kids in Action'.

Methods: Children from four intervention and four controls schools participated in the study. We used the RE-AIM framework to assess reach, effectiveness, adoption, implementation and maintenance, including assessments of children's empowerment, collaboration between researchers and stakeholders, and satisfaction with the actions. Data collection took place in eight focus groups with children (N=40) and eight interviews with community partners (N=11). Content analysis was used where transcripts were analyzed using evaluation and provisional coding. Dietary behavior, sports participation, self-rated health, moderate-to-vigorous physical activity, sedentary time and neuromotor fitness were assessed at baseline, one and two year follow-up using self-report (N=556), accelerometers (N=408) and fitness tests (N=485). Linear mixed model analyses were performed, adjusting for relevant confounders.

Results: Both children and community partners perceived an improvement in several skills in children who participated in Kids in Action, such as confidence, critical awareness, leadership and collaboration, leading to increased feelings of empowerment. Children felt involved in decision making and enjoyed being part of the development of actions. Children and community partners became more aware of health behavior. Effects on dietary behavior, physical activity, sedentary behavior and fitness, will also be presented. Community stakeholders were eager to continue child participation and focus on health behavior. For successfully conducting YPAR, a strong relationship between researchers, children, and community partners who value child participation is key. Involving more children, parents and school staff in co-creating actions may lead to even more support for the co-created actions and wider empowerment.

Conclusions: Actively taking part in Kids in Action improved children's empowerment, child participation and awareness of health behavior in the community. YPAR has the potential to improve children's health behaviors, however, many resources are required to reach effects on a large scale.





# Validity of self-reported intakes of school meals by older children using meal photography

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### Children and families (SIG)

Purpose: Understanding the relative accuracy of dietary instruments to assess what children eat at school is critical to evaluate the impact of school-based nutrition programs. We examined the validity of a self-reported, web-based, time-use diary that records dietary intakes of children from a local primary school in Singapore.

Methods: Children were trained to record their food intake and daily activities on a web-based, time-use diary daily for four days. Pictorial images on the web-based diary were provided for selection of food items and portion sizes that best corresponded to what they consumed. Their school recess meal (includes school-bought foods and/or foods brought from home) was observed using the digital photography method for two of the four days to validate the accuracy of their self-reported records.

Results: Of 36 children (11 year old; 47% males), five children did not report their school recess meals on the webbased diary and were excluded from subsequent analysis. Based on the photographed food images (n=66 food items), 65% of food items were reported in the diaries, of which 23% were inaccurately reported (e.g. incorrect cooking method, type of juice). The remaining one-third (35%) of food items photographed were omitted from the self-report and were typically ingredients of a composite dish, such as 'Meat and Fish' and 'Vegetables and Mushroom' food items. From diary records (n=59 food items), around one in four food items reported (27%) were not captured in the photographed food images, and were mostly single items such as bread with spreads, snacks, and drinks. Portion sizes of 50% of food items were accurately reported in the diaries. Composite foods from the 'Noodles, pasta and potatoes' and 'Rice and porridge' category tended to be overestimated, while beverage portions were mostly well-estimated.

Conclusion: This study suggests that 11-year-old children could report 65% of food items consumed and correctly report portion sizes for 50% of food items through the web-based diary. This is comparable to other web-based questionnaires administered to children of similar age, where reporting accuracy ranged from 43% to 81.4%. The present web-based diary is thus a promising tool for assessing dietary intake among children of this age.





# The use of wearable cameras in assessing children's dietary intake and exploring risk factors for childhood obesity in China

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### Children and families (SIG)

Purpose: The use of lifelogging device in dietary assessments can reduce misreporting and underreporting of foods, which are common in previous studies using conventional method among adults. However, no similar study among children has been conducted. This is the first study in Chinese children that applied the wearable cameras in assisting dietary recall, and exploring dietary risk factors for childhood obesity.

Method: Children (n=52) wore the wearable cameras (Narrative Clip 2) for seven consecutive days, during which they completed a 3-day 24-h dietary recall at home (DR). Then children modified their dietary recalls at school by reviewing the photos taken by the wearable camera, with the assistance of the investigator, and generated the camera-assisted 24-h dietary recalls (PDR). Children's satisfaction with the wearable camera was measured by a short questionnaire at the end of the study. Foods consumed, energy and nutrients intakes recorded by DR were compared against that from PDR. Binary logistic regressions were performed on the PDR data, to identify the dietary risk factors for childhood obesity.

Results: Compared with PDR, 8% (n=160) and 1% (n=11) of food items were underreported and misreported by dietary recalls without camera-assistance (DR), respectively. DR underestimated daily energy intake by  $149 \pm 182$  kcal/d (8%) in comparison to the PDR results. Foods consumed on the snacking occasions (40%) were more likely to be underreported than those consumed at main meals (P<0.001). Beverages (37%), fruits (30%), snacks and desserts (16%) were foods most likely to be inaccurately reported. Children were satisfied with the wearable cameras, with a median score of of 5.0 for most features. Children who were infrequent to dine with family members had higher risk of obesity (OR=14.59, 95% CI: 1.83, 116.22), after controlling for potential confounders.

Conclusions: Wearable cameras hold promise for improving accuracy of dietary intake assessment in children, providing rich objective information on dietary behaviours, and received high level of satisfaction and compliance of the users. Our results suggest that eating with others may be a protective factor for childhood obesity.





# Nudging fruit and veg consumption in primary schools: A cluster randomised trial

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### Children and families (SIG)

Purpose: Few children in the UK are eating enough fruit and vegetables to support optimum health. The present study extends the findings of previous research into the effectiveness of choice architecture changes to promote fruit and vegetable consumption in primary schools, to include those children who brought lunch from home, as well as those who consumed school dinners.

Methods: We recruited four primary schools in Conwy, North Wales, and randomly allocated them to either the intervention or control condition. Baseline data were collected over two days in each school. Following this, nudges to promote visibility, accessibility, appearance, and convenience of fruit and vegetable choices were introduced in the intervention schools at lunchtime. No changes were made in the control schools. Data were collected using a validated direct-observation digital photography protocol to approximate fruit and vegetable consumption in grams.

Results: The preliminary data from the first pair of schools indicate that the intervention was effective. At baseline, children who ate school dinners consumed some vegetables but seldom choose fruit; the children who brought their lunches from home often had neither. A significant increase in fruit consumption was identified in those participants consuming school dinners (Z = -3.36, p = .001, r = .75.), whilst a significant increase in vegetable consumption was observed in those participants consuming food from lunchboxes (Z = -2.21, .03, r = .64), in the intervention schools. No differences in consumption were identified in the control schools.

Conclusions: The present study indicates that choice architecture interventions can be successful in promoting healthful eating behaviour in primary school children. To our knowledge, this is the first school-cafeteria based nudge intervention to also include participants who brought lunch in from home. In both groups, it seems that lack of consumption may in part be attributed to absent or poorly presented fruit and vegetables, and that this can be remedied without much effort or expense. The results also show that vegetables, as well as usually studied fruit, can be successfully targeted by simple behavioural nudge interventions.





# Family meal characteristics in racially/ethnically diverse and immigrant/refugee households by food security status: An ecological momentary assessment study

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Children and families (SIG)

PURPOSE: Little is known about family meal characteristics and how these might differ by food security status among diverse populations. Our purpose was to examine family meal characteristics by family food security status in a sample of racially/ethnically diverse and immigrant/refugee families.

METHODS: 149 families with children (5-7 years old; 47% girls; n=~25 each African American, American Indian, Hispanic/Latino, Hmong, Somali, and White) were included in this analytic sample. Using a mixed-methods approach, family food security status was measured by a 6-item validated survey; family meal characteristics were measured via Ecological Momentary Assessment surveys completed by the parent every time they shared a meal with their child; and in-home qualitative interviews were conducted with the parent to explore family meal characteristics. Descriptive statistics assessed family meal characteristics by food security status. Qualitative data analyses were used to synthesize the key themes related to meal characteristics that emerged from the interviews by family food security status.

RESULTS: About a fifth of the families reported being food insecure (FI). FI families were more likely to report serving "only pre-prepared" foods at family meals while food secure (FS) families were more likely to report serving "homemade" foods. Additionally, FI families were more likely to eat "on a couch" compared to "on a table" relative to FS families. FI families were also more likely to report serving less "fruits and vegetables" and more foods with "added sugar" (e.g., sugary drinks) at family meals than FS families. Qualitative data results showed that compared to FS families, FI families had more unhealthy parent feeding practices (e.g., pressure to eat, restriction); served more pre-packaged foods or take-out meals; had "to stretch their money" for family meals; and reported not enough time to eat family meals and having to eat meals quickly (e.g., eating on the go).

CONCLUSIONS: In this sample, FI families reported more unhealthy meal characteristics compared to FS families. Screening families for food insecurity and developing intervention strategies to support FI families are needed to help families cope with economic hardships and associated stressors.





# Family dog ownership, dog walking and dog play associated with increased preschooler physical activity

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Children and families (SIG)

Purpose: Childhood obesity and physical inactivity are major public health issues. Almost every second household in Australia has a dog. Dog ownership leads to greater physical activity (PA) in adults and school-aged children. We examined if dog ownership and dog-facilitated PA was associated with higher PA in pre-schoolers.

Methods: A secondary data analysis of the 'Play Spaces & Environments for Children's Physical Activity' study cohort (2015-2018) was undertaken. Data was collected for 1490 children 2-5 years from 122 long day-care centres in Perth, Western Australia. Parent-report surveys measured socio-demographic factors, dog ownership, child-dog play and dog walking, structured and unstructured PA and sedentary screen time.

Results/findings: Compared with non-dog owners, dog-owning pre-schoolers did 6 minutes/day more home yard play, 5 minutes/day less park play and 8 times/week more unstructured PA (all p<0.05). Dog-owning pre-schoolers who played with their dog  $3 \ge$  times/week did 25 minutes/week more structured PA, 12 times/week more unstructured PA, 31 minutes/day more home yard play and 8 minutes/day more park play (all p<0.05). Pre-schoolers who walked their dog  $\ge$  1 time/week did 8 times/week more unstructured PA, 12 minutes/day more home yard play and 17 minutes/day more park play (all p<0.05). Pre-schoolers walking the dog  $\ge$  1 time/week did 126 mins/week less sedentary screen time (p=0.003).

Conclusions: Findings suggest family dog ownership is associated with outdoor play, structured and unstructured PA and screen time, and indicates dog play and dog walking may be viable strategies for increasing pre-schoolers' PA levels.





# Kids in a Candy Store: An objective analysis of children's interactions with food in convenience stores

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### Children and families (SIG)

Purpose: Increasing rates of childhood obesity worldwide has focused attention on how the obesogenic food environment influences dietary behaviour and bodyweight in children. The neighbourhood convenience store is a key setting in children's food environments. The Kids'Cam study enabled the objective measurement of the world in which children live, their interaction with it and its potential impact on health. The aim of this study was to determine the nature of the convenience store environment and children's interaction with it.

Methods: Kids'Cam NZ was a cross-sectional study conducted from July 2014 to June 2015 in the Wellington region of New Zealand, where 168 randomly selected children aged 11-14 years wore a wearable camera for a 4-day period. The camera captured a 136° image of the children's surroundings every seven seconds. In this ancillary study, 'Kids'Cam Convenience Stores', camera images from children who visited a convenience store were manually coded for food availability, food marketing, purchase and consumption.

Results/Findings: Twenty-two percent of children (n=37) visited convenience stores on 62 occasions during their 4-day data collection period. Non-core food items dominated the food available, at a rate of 8.3 to 1 (means, 300 non-core food to 36 core foods). The food marketed in-store was overwhelmingly non-core, and promoted using prominent placement at a child's height, price offers, product packaging and signage. Most of the 70 items children purchased were non-core foods or drinks (94.6%), and all of the purchased food or drink subsequently consumed by children was non-core.

Conclusions: This research highlights convenience stores as a key source of unhealthy food and drink for children, where unhealthy food and drinks are marketed, available, and subsequently purchased and consumed. Although the study was based in New Zealand the findings are likely applicable to other Western countries. There is an urgent need for policies to reduce the role of convenience stores in the obesogenic food environment in which children live.





# Children's screen time: home environmental characteristics and parental perceptions

#### Ms. Carolina Bassul<sup>1</sup>, Ms. Clare A. Corish<sup>2</sup>, Mr. John M. Kearney<sup>1</sup>

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#### **Children and families (SIG)**

Purpose: The aims of this cross-sectional, mixed-methods study were i) to quantitatively evaluate the home environmental characteristics associated with screen time (mainly television viewing) in pre-school children and ii) to qualitatively explore parents' perceptions of their children's screen-related sedentary and eating behaviours. The study contributes to our understanding of the mediating influence of home environmental factors on children's screen time.

Methods: Children's screen time (television viewing) and home environmental characteristics (demographic, behavioural and physical) were reported by parents of 332 children aged 3-5 years using validated questionnaires. These quantitative data were analysed using bivariate and multivariate binary logistic regression. An online deliberation platform was used to qualitatively explore 54 of these parents' attitudes and perceptions about their children's screen time behaviours. The qualitative data were thematically analysed.

Results/findings: The quantitative, multivariate analysis showed that the home environmental characteristics positively associated with children's television viewing were: parents own television viewing (OR 1.66, 95%CI 1.09-2.52, p=0.017), parents allowing their children to eat snacks while watching television (OR 2.66, 95%CI 1.17-6.06, p=0.019) and less outdoor play time (OR 2.03, 95%CI 1.05-3.93, p=0.035). The qualitative analysis highlighted parental concerns about the addictive nature of screen behaviours and that screen time should be limited. Positive aspects to screen time were also noted, for example, its use as a safe 'babysitter'. Although some parents perceived that eating while watching television may result in mindless and/or overeating, others believed that if they offer healthy snacks, such as fruit and vegetables, television viewing does not negatively affect their children's diet.

Conclusion: The quantitative and qualitative results of this study enhance our understanding of the home environmental factors associated with television viewing and parents' perceptions of the effects of screen time on the sedentary and eating behaviours of their children. These data can be used to inform interventions aimed at addressing increasing screen time exposure in young children.





# A Novel Children's Perceived Cooking Competence Measure: Development and Validation

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### Children and families (SIG)

Purpose: Cooking research has been criticised for its lack of systematic measurements. While progress has been made in the adult measurement area through the development and validation of cooking/food related tools, issues remain in relation to children, where parent-report measures are commonly used. Therefore, this research aimed to develop an evidence-based, age appropriate perceived cooking competence measure for children.

Methods: Publicly available cooking recommendations were sourced, critically reviewed and deconstructed for underpinning motor skills, numeracy and literacy skills and safety concerns. From this, 14 culturally neutral skills were identified as frequently occurring in the publicly available recommendations. An expert panel including an educational researcher, a primary school teacher, an early year's educator, movement scientist and Home Economists, reviewed the skills for age appropriateness and level of difficulty and proposed an age range for each skill and level of difficulty. A published perceived motor competence measure was used as the template for the developmental assessment of each skill. Illustrations showing each skill performed by a child-friendly character, was drawn by a graphic designer in consultation with a chef and reviewed by the research team for accuracy in an iterative process. The developed measurement tool was piloted with over 1000 primary school children, with 6-7 year olds shown 10 skills and 10-11 years olds shown 14 skills. The tool items were presented to the children from easiest to hardest. Psychometric properties, internal consistency reliability, temporal stability, as well as construct validity were investigated using SPSS V25. User feedback was also collected.

Results: Findings indicate that the measure has a good internal consistency and reliability in the different age ranges and had a high level of construct validity for older age children, which significantly correlated (P<0.001) with an adult cooking measure. Positive feedback was received from users in the different age ranges.

Conclusions: The perceived children's cooking competence measure is a positive step in the development and validation of child measures in nutrition which traditionally has limited validated measures. This novel measure is applicable to different age groups and can be used in both survey and intervention studies.





# Do current school lunchboxes meet national dietary guidelines?

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### Children and families (SIG)

Purpose: To assess the provision of food groups in lunchboxes of primary schools aged children, focusing on food groups that have previously been identified of particular concern in childhood nutrition, including fruit, vegetable, dairy/alternatives and discretionary/occasional items. Make a comparison to the Australian Guide to Healthy Eating and current advice recommending that children should consume one third of their daily intake whilst at school.

Methods: A cross-sectional study was conducted in 12 Catholic primary schools in the Hunter region of New South Wales, Australia. Parental consent was gained to photograph children's lunchboxes and analysis was undertaken using a validated lunchbox audit tool, to determine the number of fruit, vegetable, dairy/alternative and discretionary/occasional serves packed in the lunchbox. Results were compared to one third of the Australian Dietaey Guideline recommendations for children aged 4-12 years.

Results: A total of 1799 lunchboxes were analysed across Kindergarten to Grade 6. Fruit was packed in 86.7% (n=1560) of lunchboxes, with 26.7% containing more than one serve, and 8.9% (n=160) exceeding the daily recommendation for this age group. In contrast, only 20.5% (n=369) of lunchboxes contained vegetables, and only 2.8% (n=51) met the minimum calculated recommendation. Similarly, only 21.0% (n=378) of lunchboxes contained dairy/alternatives, with only 19.2% (n=345) meeting the calculated recommendation. Conversely, 86.9% (n=1561) of lunchboxes contained at least on discretionary/occasional item, with 59.5% of lunchboxes exceeding the maximum calculated recommendation. Furthermore, 14.6% of lunchboxes contained more discretionary/occasional items than the maximum daily recommendation for children.

Conclusion: Foods currently being packed in the lunchbox are not meeting the majority of recommendations based on the Australian Dietary Guidelines. Of particular concern is the low provision of vegetables and dairy/alternatives and the likelihood that the by providing of excessive amounts of discretionary/occasional foods core food groups may be displaced in the lunchbox. Interventions seeking to improve the overall nutritional quality of lunchboxes may benefit from exploring barriers to packing certain food groups, particularly vegetables and dairy/alternatives. In addition identifying and addressing enablers to packing discretionary/occasional foods will support the development of programs that adopt a more targeted approach.





# LT.3.02 - Inovative studies in the digital realm

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# Using machine learning to categorize 0 to 12 monthsphysical activity levels in the NoHoW trial: Associations with motivational variables

Dr. Catarina Coutinho<sup>1</sup>, Other Jorge Encantado<sup>2</sup>, Dr. Sofus Larsen<sup>5</sup>, Prof. Berit Lilienthal Heitmann<sup>5</sup>, Dr. Cristina Duarte<sup>3</sup>, Prof. Graham Horgan<sup>4</sup>, Dr. Inês Santos<sup>2</sup>, Prof. James Stubbs<sup>3</sup>, Dr. Marta Marques<sup>6</sup>, <u>Associate Professor António Palmeira<sup>1,2</sup></u>

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### e-&mHealth (SIG)

Purpose: Machine learning (ML) can be used to recognize activity patterns resulting from cross-sectional wearable data. Daily or weekly physical activity (PA) levels are made easily available from wearable tracking devices but longitudinal recognition of patterns, i.e., physical activity for sustained or discrete periods, remains a challenge, despite being the most critical PA variable to attain health benefits.

This study aims to use an ML procedure to identify long-term (12 months) PA levels in participants involved in a large weight regain prevention trial. To further explain the results, motivational variables known to be associated with sustained PA, were analyzed.

Methods: Data was gathered in the NoHoW trial conducted in Denmark, UK, and Portugal. After data cleaning, 1139 participants (68.7% Female, 44,0±11.9 y) were included in the analysis.

Minute-by-minute steps, heart rate, and PA level were gathered for 12 months, 24/7. Baseline and 12-month questionnaires assessed PA's Motivational Regulations (BREQ-3) and Basic Psychological Need Satisfaction (BPNS). A data hub stored all the information.

ML involved PCA and K-Means clustering procedures, using an unsupervised learning algorithm. Python was used to develop the ML code. Group comparison statistics looked for differences in the motivational variables.

Results: The algorithm and PCA identified two clusters, 453 Highest PA level (HPAL 39.8%) and 686 Lowest PA Level (LPAL; 60.2%). As expected, HPAL presented higher values of steps, distance and caloric expenditure, and lower heart rate (all p<.001). Autonomous motivation was higher in HPAL at 0 and 12-months, and BPNS was higher in this group at 12-months. External motivation and amotivation were higher in LPAL at 0 and 12 months (all p<.05). Autonomous motivation increased from 0-12 months in HPAL. Interestingly, autonomy decreased in this group for the same period (all p<.05).

Discussion: Efficient and scalable identification of longitudinal PA patterns remains a challenge. ML procedures, such as the one proposed in this study, are an innovative solution that, however, needs further validation. In this study, the association with motivational variables provided evidence that the unsupervised algorithm correctly identified participants' 0-12 months PA level. Deep-learning procedures are the next steps needed to move this line of research forward.





# Parent acceptability of an ehealth intervention to improve childcare lunchbox contents using an existing childcare parent communication app

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### e- & mHealth (SIG)

Purpose: Interventions delivered via ehealth represent a promising approach to improving dietary intake among children and adults. However, to our knowledge, no studies have investigated the acceptability of the use of ehealth apps to support parent packing of healthy lunchboxes in childcare settings. The purpose of the study is to describe the parent reported acceptability of an intervention to decrease packing of discretionary foods in child lunchboxes, delivered via an existing childcare-parent communication app.

Methods: An eleven week intervention was delivered to seventeen childcare services (eight intervention, nine controls) in the Hunter New England region of NSW, Australia as part of a randomised controlled trial. Eleven brief messages were sent to parents from the intervention services (one message per week) via push notifications delivered through an existing childcare parent communication app. Messages aimed to address known parent barriers to packing healthy lunchbox foods and were developed using the Behaviour Change Wheel framework. Consenting parents from the intervention arm were invited to participate in a seventy-five item online survey, including questions to determine acceptability and self-reported use of the app.

Results: The survey response rate was 37% (n=70). Of these, 79% (n=55) had the intervention app on their phone. The majority of parents 76% (n= 42) recalled reading any of the messages. Self-reported reading of weekly messages decreased over time with 57% (n= 24) reporting reading message 1 and just 21% (n=9) reporting reading message 11, with the average reading rate for any message being 41%. Only 33% of parents (n= 14) reporting clicking through to further links for additional information. Parents reported they felt it was appropriate to receive lunchbox information via the existing app (80%, n= 40/50), found the information easy to use 88% (n=36/41) and 76% (n=31/41) found the information helpful. Parents found the frequency and timing of the messages acceptable (100% n= 41/41).

Conclusion: Delivery of a lunchbox intervention using a series of weekly push notifications via an existing childcare communication app appeared to be highly acceptable to parents, however reasons behind less than expected parent viewing of weekly messages requires further investigation.





# Investigation of user-requirements to tailor a smartphone app integrated in primary child health care to promote a healthy diet and physical activity in priority populations

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#### e-&mHealth (SIG)

Purpose: The effectiveness of a smartphone app (MINISTOP 1.0) targeting Swedish-speaking parents, with the aim to improve eating and physical activity behaviours in preschool aged children, was evaluated in 2015. Interest and requests for implementation of the app into primary child health care have since then been expressed. Prior to that, the app needs to be translated and tailored for priority populations such as families with a migrant background and/or low socioeconomic position to optimize accessibility. The aim of this study was to investigate user-requirements among parents and child health care nurses, in terms of content and technical features to tailor the app (MINISTOP 2.0) for priority populations.

Methods: Pilot studies over four months in the autumn of 2019, to pre-test the content of the MINISTOP 2.0 app were conducted at the primary child health care, Linköping, and included three semi-structured focus groups with Somali-, Arabic- and Swedish speaking parents (5 parents/group), and 14 one-on-one semi-structured interviews with nurses.

Results: Preliminary results can be summarized as follows. Parents requested strategies on how to handle difficult situations around eating and screen time. A common theme for all parent groups was the need for parental strategies in situations where a child is picky or refuses to eat. Nurses expressed that parents often are more worried about their child being underweight rather than overweight, especially in the Somali- and Arabic populations. Nurses also requested clear information on portion sizes and strategies to reduce parents' concerns about their child not eating enough.

Conclusion: Parents requested information and strategies on how to handle challenging eating situations, especially picky eating. This was independently confirmed by the nurses that requested concrete information on portion sizes and eating behaviours to reduce parental concerns.





# Recruiting and engaging young adults; lessons from a contemporary purpose built healthy eating website: 'No Money No Time'.

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#### e-&mHealth (SIG)

Purpose: Recruiting and engaging young adults with nutrition advice is a major challenge. We explore attributes related to successful reach and user-engagement from our co-designed healthy eating website (No Money No Time).

Methods: No Money No Time (https://nomoneynotime.com.au/) hosts free resources with components targeted to young adults. Cross-disciplinary input from professionals across health, computer science, digital marketing and design have contributed to novel approaches to reach and engage young adults. Recruitment strategies include: search engine optimisation (SEO), conversion rate optimisation, public relations, referral strategy from existing media sources, re-contacting users from existing mailing database and social media promotion. Engagement strategies include: heightened user-experience and design, personalised content updated weekly, email automations personalised to individual motivators and social media promotion of trending content. Objective data from Google analytics will detail acquisition and engagement with the site in the first three months since launch (July 17th to October 17th 2019)

Results: Recruitment: Over 3-months there were 9469 site visitors, with half (51%) 18-34 years and mostly female (76%). Smartphones were most commonly used to access the site (64%), with user acquisition predominantly (n=3271) from direct sources (typing URL of website into search bar). This demonstrates success of our public relation strategy. This was followed by organic search (i.e., entering information into search engine such as Google) (n=2795) which demonstrates effectiveness of our SEO strategy. The outreach and referral was also effective, acquiring 2519 users; with the most common referral source being nib (health insurers). Social media promotion was effective acquiring 1243 users, with most coming from Facebook (n=1047) after the site was promoted by a podcast resource. Engagement: a total of 61,497 page views, with average session duration of 3 min 56 seconds and 4.89 pages viewed per session. A third (32%) of users completed the embedded Healthy Eating Quiz (validated tool to assess diet quality). For content, the recipe page which included a filter option by ownership of specific kitchen equipment, motivators and dietary preferences had highest engagement (43,391 page views).

Conclusion: A cross-disciplinary approach using novel strategies demonstrates potential to heighten reach and engagement of young adults with nutrition advice.





# Usage of a commercial physical activity app over 12 months: Data from 40,447 users of the Carrot Rewards App

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#### e-&mHealth (SIG)

Background: Half of smartphone users have downloaded a health and fitness app—tracking physical activity (PA) is the most common reason for downloading. However, these apps typically fail to engage users long term to attain desirable outcomes. This study examined the prevalence of, and sociodemographic predictors associated with, duration of use and non-usage attrition of a commercial PA app over 12 months.

Methods: We analyzed first year usage data from 40,447 Canadian users who enabled the Carrot Rewards App "Steps" program between June 13 and July 10, 2016. Sociodemographic information and app usage data were automatically recorded. We measured three usage indicators: 1) duration of app use is the total number of weeks that users had non-zero step count in the weekly aggregated data; 2) non-usage attrition is the first occurrence of having zero step count for a minimum of 2 weeks; 3) resumption of app use occurs when participants resumed using the app with at least 2 weeks of non-zero step count after non-usage attrition. Kaplan-Meier survival curves plotted non-usage attrition and resumption of app use. Linear regression and cox regression models examined predictors associated with usage indicators.

Results: Twenty-nine percent of users used the app for 52 weeks, 17.4% for 41-51weeks, 17.5% for 24-40 weeks, 17.9% for 11-23 weeks, 16.3% for 1-10 weeks, and 1.8% were non-users. 50% of users experienced non-usage attrition after 18 weeks; 50% of users resumed app use at 15 weeks after non-usage attrition. Being male (vs. female) was associated with increased duration of use. Being male, living in an area with greater proportion of people with post-secondary education or higher PA levels at baseline was associated with reduced risk of non-usage attrition and increased probability of resuming app use after a lapse.

Conclusion: Users of the Steps program showed relatively high usage with 2/3 of users used  $\geq 6$  months over 12 months. Future studies that examine reasons for discontinuing and resuming app use after a lapse may inform future PA apps in designing strategies to reduce periods of non-use (e.g, chance-based reward) and encourage return after lapse (e.g, push notification).





# A web-based menu-planning intervention to improve early childhood education and care service implementation of dietary guidelines: process evaluation of a randomised controlled trial.

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### e- & mHealth (SIG)

Purpose: Despite recommendations, few early childhood education and care services in Australia, and internationally, provide foods consistent with sector dietary guidelines. A web-based menu planning program (feedAustralia), was designed as an innovative method to support services with implementing dietary guidelines. This process evaluation aimed to report service adoption and use of the web-based program, fidelity to the implementation strategies, and acceptability of the intervention.

Methods: Twenty-seven services randomised to the intervention arm of a parallel group randomised controlled trial conducted in NSW, Australia received access to a web-based menu-planning program (encompassing audit and feedback, educational materials, and reminders), in addition to a range of implementation strategies delivered by a health promotion officer (including educational outreach visit, ongoing consultation, technical assistance, change equipment, and involve executive boards and consumers). Process evaluation was measured at 12 months follow-up, including i) childcare service adoption and use of the web-based program assessed via google analytics; ii) fidelity to the implementation strategies assessed via internal records maintained by the project team; and iii) acceptability of the intervention assessed via computer assisted telephone interviews with childcare service staff.

Results: At approximately 12 months' follow-up, all intervention services had adopted the web-based program, logged in an average of 40.4 (SD 31.8) times, and spent an average of 47.1 (SD 65.2) minutes in the program per login. Fidelity to the delivery of individual implementation strategies was relatively high (>78%) across intervention services. Acceptability of the intervention was high with over 90% of services staff reporting the web-based menu planning program to be useful, and over 95% of staff reported their menus improved as a result of using the web-based program.

Conclusions: Findings indicate the innovative web-based program was highly acceptable to childcare service staff. As engagement with web-based interventions is associated with a range of health behaviours, and the extent of use varied amongst intervention services, future research exploring perceived barriers and enablers to use of the





program, and identification of strategies to best support end-user engagement with the web-based program is warranted.




# Mobile APPlications targeting exercise in pregnancy: Quality and APPropriateness of behaviour change techniques

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#### e-&mHealth (SIG)

Purpose: Pregnancy presents a unique opportunity to positively influence exercise behaviours. Access to information, education and monitoring through m-health, including mobile applications (apps), may facilitate behaviour change. However, app quality and the presence and appropriateness of Behaviour Change Techniques (BCTs) used in apps is unknown. This study reviewed pregnancy apps to assess their quality and the prevalence and appropriateness of BCTs.

Methods: A review of mobile apps was conducted (Apple AppStore and GooglePlay Store) using a systematic approach. Search terms (iterations of physical activity and pregnancy) resulted in 7,207 apps; 19 apps met criteriabased eligibility (app user rating of 4.5/5 or higher, English language and specific focus on exercise during pregnancy). Each app was then allocated to two independent reviewers for user-testing and assessment. App quality was assessed using the MARS (Mobile Application Rating Scale) tool (19 items). The inclusion of BCTs (26 items) were assessed using a taxonomy of BCTs, specifically those likely to influence the main determinants of exercise behaviours during pregnancy (intention formation; goal setting; review of behavioural goals; self-monitoring; feedback and social comparison).

Results: Of the 19 apps reviewed, most were free to download (n=18) and accessed via Apple (n=6) and GooglePlay (n=13). MARS scores (out of 5) suggested a moderate level of quality (m= $3.5\pm0.52$ ). Functionality (m= $4.2\pm0.5$ ) and aesthetics (m= $3.7\pm0.6$ ) were the highest scoring domains whilst subjective app quality (m= $2.5\pm0.6$ ) and likelihood for behavioural impact (m= $2.5\pm0.6$ ) were the lowest. Overall, MARS quality ratings were positively correlated with the number of MARS theoretical background/strategies (rho=0.67, p<0.01). Apps included an average of four to five BCTs (range 2-10), with the most common being 'provide instructions' (95%) and 'provide information on consequences' (89%). Eleven apps included BCTs associated with change in determinants of exercise during pregnancy (range 1-3), with the most common being 'provide opportunities for social comparison' (n=8) and 'prompt self-monitoring of behaivour' (n=7).

Conclusions: Popular pregnancy exercise apps were user-friendly with moderate overall quality. However, the incorporation and promotion of BCTs was scarce, especially those likey to influence the main determinants of exercise behaviour. Currently available apps are unlikely to inadequately support exercise behaviours among pregnant women.





# Focus groups inform a mobile health intervention to promote adherence to a Mediterranean diet and engagement in physical activity among people living with HIV

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#### e-&mHealth (SIG)

Purpose: Despite effective antiretroviral therapy, persons living with HIV (PWH) continue to experience a high incidence of neurocognitive deficits and comorbid disorders such as cardiovascular disease. A personalized mobile health intervention (iSTEP) aims to promote a Mediterranean diet and increase physical activity (PA), thereby improving neurocognitive functioning and cardiovascular health among PWH. This article describes a qualitative study conducted to develop iSTEP for PWH, including assessment of diet habits and preferences for tracking PA.

Methods: Two focus groups, with seven and 13 PWH respectively, discussed barriers and facilitators of a healthy diet and provided feedback to refine iSTEP components, including the feasibility of using of a Fitbit and the content of text messages designed to encourage improved diet and PA. Study participants were predominantly male (80%), ethnically diverse (non-Hispanic white, 40%; black, 40%; Hispanic, 20%), reported concerns about their diet quality, and expressed interest in improving their eating habits.Focus group transcripts were independently coded by two investigators with high agreement (kappa = 0.85), based on emergent categories related to diet habits, barriers to a healthy diet, and facilitators of a healthy diet. Data analysis was conducted with MAXQDA Analytics Pro 12.3.1 qualitative data analysis software.

Results: Focus group discussions revealed several healthy diet barriers, including housing instability, time required for food preparation, cost of healthy food, depression, gastrointestinal issues, physical disability, and changes in appetite since HIV diagnosis. Participant-identified healthy diet facilitators included affordable price options for healthy food, a structured food plan, desire to modify appearance or weight, access to medical professionals, motivation for disease prevention, and social support. Participants endorsed wearing a Fitbit on the wrist and receiving text messages as useful methods to monitor and encourage a better diet and greater physical activity.

Conclusions: Conducting effective PA and diet interventions in PWH remains challenging due to physical and socioeconomic limitations in this population. These findings assisted the development of a low cost, feasible mHealth intervention supporting a Mediterranean diet and increased PA in order to improve neurocognitive and cardiovascular outcomes among PWH.





# A blended approach to support physical activity in older adults

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#### e- & mHealth (SIG)

Purpose. A blended intervention was developed to support older adults in performing home-based exercises. A tablet and a personal coach were provided to facilitate the self-regulation of exercise behavior. The objectives of this study were a) to assess the long-term usability of the tablet and b) to explore how the intervention supported older adults in performing home-based exercises.

Methods. Mixed-methods were used. At baseline, older adults participating in the blended intervention were asked to fill out a questionnaire about their general experience with ICT devices and rate their own skill level. After 6 months participants filled out the USE-questionnaire to assess the usefulness, satisfaction and ease of use of the tablet. With a random selection of participants in-depth interviews were held to explore how the tablet and coach supported the self-regulation. The interviews were double coded and analyzed with the Directed Content Analysis method.

Results. 65 participants filled out the baseline survey, 37 participants the USE questionnaire and with 7 participants follow-up interviews were held. Their average age was 71-73 years old. The baseline questionnaire showed that the large majority already had experience with a tablet. After 6 months of use, the participants rated the usefulness, satisfaction and ease of use of the tablet as 3.8, 4.2 and 4.1 on a 5-point scale. The interviews show that participants felt that the tablet supported action planning, behavior execution and self-monitoring. On the other hand, especially during the first few months, the personal coach had added value during the goal setting, behavior execution and evaluation phases of self-regulation.

Conclusions. The process evaluation has shown that older adults are positive about a blended intervention that was designed to support them in performing home-based exercises. They reported that the tablet helped them to perform the exercises better, more frequent and safely. It supported them in various phases of self-regulation. The availability of personal coach was nevertheless crucial. To support physical activity in older adults a blended approach is promising.





# Effects of a mobile phone text messaging program on health behaviour change in people with type 2 diabetes: Results from a randomised controlled trial

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#### e-&mHealth (SIG)

Background:Diabetes is a significant health challenge in many developing countries with increasing prevalence and healthcare costs. Mobile phone health programs have shown to improve health outcomes at low cost. However, there is currently a paucity of information on such interventions on self-management behaviour change in a developing setting. The aim of this study is to determine the effect of a mobile phone text messaging interventions on health behaviour change in type 2 diabetic patients in Bangladesh.

Methods: A prospective, parallel-group, randomized, controlled clinical trial was performed at a tertiary hospital in Dhaka, Bangladesh. Patients with type 2 diabetes were recruited and randomized to a text messaging intervention plus standard care or standard care alone. The intervention group received daily text messaging for 6 months, with the content of the messages promoting treatment adherence and healthy lifestyle habits. Health behaviours (maintaining foot hygiene; walking/exercising; measuring blood pressure; and monitoring weight) were self-reported and assessed via questionnaires taken at 6 months. Logistic regression models adjusted for age, sex, education and occupation were performed to determine the effects of text messaging on health behaviour change.

Results: A total of 236 patients were randomized to either the intervention (n=118) or standard-care (n=118). At baseline, groups did not differ in health behavioural outcomes. Individuals that received the text messaging intervention were more likely to report caring for their feet within the last week (Odds Ratio 2.2, 95% CI 1.21–3.87). No statistically significant differences were observed for the other health behaviour outcomes, as well as the total health behaviour measure.

Conclusions: Mobile phone text messaging was shown to be effective in promoting foot care among people with type 2 diabetics in our study.Larger studies with a longer longitudinal design need to be performed to obtain more reliable conclusions on health behaviour outcomes.





# LT.3.03 - Current evidence on healthier choices in nutrition and physical activity

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# Effects of more prominent shelf placement of healthier food products on supermarket purchases: A co-designed pilot study

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Policies and environments (SIG)

#### Purpose

A retailer-academic collaboration aimed to co-design and pilot commercially sustainable strategies to increase sales of healthier foods relative to less healthy foods within a product category in a major supermarket chain.

#### Methods

Two co-design workshops were held, involving supermarket corporate strategy staff and public health nutrition academics, to identify potential interventions. These were mapped against choice architecture frameworks and retailer strategic priorities before one intervention, more prominent shelf placement of healthier products within one category (breakfast cereals), was selected for piloting. A 36-week pilot study (12-weeks each, baseline, intervention and follow-up) was undertaken in six supermarkets (three intervention and three control stores) in Auckland, New Zealand. Products were ranked by nutrient levels and nutrient profile, and healthier products were placed at eye level and less healthy products were placed on lower shelves. No changes were made in matched control stores. The primary outcome was change in sales of healthier products relative to total category sales. Secondary outcomes included nutrient profile of category sales, in-store promotions, customer perceptions, and retailer feedback.

#### Results

Overall, there was no difference in the sales of more prominently positioned products between intervention (56%) and control stores (56%) during the intervention. There were also no significant differences in sales across the study time periods nor the nutritional composition of product sales. Intervention stores were found to have a greater number of in-store displays compared to control stores (685 vs 583) with a higher proportion of less healthy less prominent products (57% vs 43%) displayed. A significant interaction was evident between in-store promotions and sales. Most customers (265, 88%) supported shelf placement as a strategy to improve purchases but noted that brand preferences and price could override product choice.

#### Conclusions

Shelf placement alone was not an effective strategy to increase purchases of healthier products. Other important influences within the retail environment, including space management logistics, in-store promotions, and habitual shopping habits in the breakfast cereal category, may have diluted the effect of the shelf placement intervention.





# Engaging citizen scientists to build healthy park environments in Colombia

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#### Policies and environments (SIG)

Purpose: Promoting healthy behaviors requires focusing on priority communities. In Colombia, where women are less physically active than men, the Bogotá government offers free physical activity (PA) classes in public parks through the Recreovía program. Despite broad uptake, especially among women, there is notable variability in participation across Recreovía sites. We aimed to 1) evaluate built and social environmental factors associated with Recreovía local park environments; 2) identify perceptions that influence Recreovía engagement; and 3) facilitate an advocacy process among community members, policymakers and academic researchers to improve uptake of the program.

Methods: Using an explanatory sequential mixed methods design, we first collected contextual quantitative data using the System for Observing Play and Recreation in Communities and the Physical Activity Resource Assessment. We assessed participants' anthropometrics, sociodemographic characteristics, and PA levels (using accelerometers). The qualitative component involved the Our Voice citizen science model in which community members use a mobile application to identify park features that promote or hinder PA, then analyze and use data to advocate for changes to enhance PA. We selected two public parks, representing the lowest and highest 10% in Recreovía attendance. We used descriptive statistics to analyze park and users' characteristics. Qualitative data were thematically analyzed.

Results: Although both parks presented similar levels of moderate to vigorous PA (P=0.290), one had better quality than the other (P=0.009). Participants (n=48) were primarily women (65%) who were meeting PA recommendations (93%), and highly satisfied with Recreovía (97%). Factors influencing use of the program included perceptions that it enhanced social and individual well-being, improving the friendliness of the park environment, and fostering self-confidence, social capital, mental health and civic engagement. Reported barriers to usage were related to park cleanliness, and safety. Presentations to stakeholders sparked planning aimed at reducing these barriers.

Conclusions: This study provides an adaptable framework for using technology-driven participatory methods to evaluate park-based interventions and understand factors supporting community-based PA behaviors. The Our Voice process elicited community dialogue, empowerment, and advocacy, facilitating interaction among stakeholders to optimize the Recreovía program and facilitate active living.





# Spatial availability of food outlets and presence of overweight among Malaysian youth

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#### Policies and environments (SIG)

Introduction: Conflicting evidence on the association between community food environment (CFE) and weight status has been reported in developed countries and evidence from developing countries is scarce. Purpose: To examine the association between availability of franchised food outlets (FFO) and overweight, including obesity (OW) in 6-17-year-old Malaysians in states of Perak (high OW prevalence) and Terengganu (low OW prevalence).

Methods: Information on residential location and body mass index (BMI) based on measured weight and height for individuals residing in Perak and Terengganu was extracted from the National Health and Morbidity Survey 2015. The International Obesity Task Force BMI criteria was used to define OW. CFE data was obtained from the official websites of FFO, including supermarkets (SM), fast food outlets (FF) and convenience stores (CS). Spatial analysis was performed using ArcGIS 10.5 to assess the CFE. Availability of the FFO was defined as the presence of  $\geq 1$  FFO within 1000m radius from individual residence. Log-binomial regression was performed to quantify the associations between CFE and OW, adjusted for sociodemographic factors (age, sex, race, residential area and household income).

Results: In total, a complete data was available for 880 of 932 individuals and 916 FFO were identified (SM=321, FF=314, CS=281). The age-standardised OW prevalence was 30.1% in Perak and 13.6% in Terengganu (p<0.001). A significantly higher number of FFO within 1000m radius of individual residence was observed in Perak than Terengganu (p<0.001). In Perak, availability of CS (PR 2.27;95%CI 1.35, 3.80) and SM (PR 1.63;95%CI 1.00, 2.64), but not FF (PR 1.05; 95%CI 0.66, 1.67) were associated with higher OW prevalence. The respective associations were insignificant in Terengganu.

Conclusions: Disparities in the availability of FFO between states in Malaysia exist. FFO within walkable distance from individual residence were more common in the state with high prevalence of OW, and the availability of convenience stores and supermarkets was associated with higher prevalence of OW in that state. Future research should incorporate other built environment features including physical activity environment, and individual behaviours.





Social and built environmental context-by-intervention status interaction in evaluation of child overweight/obesity across five years in the state-wide community-level South Australia Obesity Prevention and Lifestyle (OPAL) initiative

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Policies and environments (SIG)

Purpose: Childhood overweight and obesity is a major public health issue in Australia with 25.8% of children aged 2-17 years overweight/obese. The \$45M South Australian OPAL intervention applied a whole-of-community approach in a multi-site childhood obesity prevention initiative across metropolitan and regional areas. This evaluation assessed the main effect of OPAL and the contextual factors modifying it. Methods: OPAL involved 5 years of implementation for 20 intervention communities matched with 20 comparison communities. Effectiveness was assessed using the non-equivalent control group quasi-experimental evaluation design with 5 years pre-intervention and 2 years post-intervention measures. Change over time was assessed for the annual community prevalence of overweight/obesity based on body mass index derived from measured height and weight for 4-5-year-old pre-school children (n=68,763 records) with addresses geocoded and assigned to suburbs nested in communities (n=216 intervention, 225 comparison suburbs). Analyses accounted for baseline differences in overweight/obesity prevalence and the social (median suburb income and education) and built (suburb fast-food outlet density, walkability, dwelling density) environments. Results: Exposure to OPAL yielded reductions in overweight/obesity for 4-5-year-old children in the intervention relative to comparison condition. This continued in the two years after funding ceased. The preventive fraction was 12.2%. OPAL advantaged higher SES areas: overweight/obesity decreased for suburbs in the highest education and income tertiles for the intervention but not comparison condition. For suburbs in the intervention but not comparison condition, overweight/obesity decreased in the highest walk score tertile. Overweight/obesity increased over time for suburbs in the highest fast-food tertile. High dwelling density was associated with reduced overweight/obesity. Conclusions: In Australia, from 2007/8 to 2014/15 the prevalence of overweight/obesity in 5-12-year-old children rose from 21.8% to 26.3%. This evaluation shows that for the same time frame, in South Australia, OPAL was associated with a 12.2% reduction in overweight/obesity prevalence for 4-5-year-old children. Both social and built environments modified OPAL's impact. That high walk scores amplified the impact of OPAL, but high concentrations of fast-food outlets attenuated and reversed the otherwise positive intervention effect suggests future interventions need to account for built environmental factors that can block the success of an otherwise positive program.





# Gender differences in college student physical activity, campus recreational facility use, and campus recreational facility comfort

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#### Policies and environments (SIG)

Purpose: Many college students accumulate insufficient aerobic and/or muscle strengthening activities to benefit their health, despite the availability of physical activity resources. The purpose of this study was to examine disparities in physical activity, as well as campus recreation facility use and comfort at a large university located in Northeastern United States of America.

Methods: This cross-sectional mixed-methods study collected data from students using an online survey that assessed demographics, physical activity behaviors (aerobic and muscle-strengthening), campus recreation facility use, comfort using campus recreation facilities, as well as reasons for discomfort, and strategies used to feel comfortable.

Results. The majority of participants (n = 319) identified as women (68.9%), non-Hispanic Caucasian (81.6%) and heterosexual (93.3%). While aerobic physical activity did not differ between men and women, women reported significantly less muscle-strengthening activity (p < 0.001,  $\eta 2 = 0.06$ ), lower frequency of weight use (p = 0.035,  $\eta 2 = 0.02$ ) and informal sport participation (p < 0.001,  $\eta 2 = 0.07$ ), and higher frequency of cardio equipment use (p < 0.001,  $\eta 2 = 0.08$ ) and group exercise participation (p < 0.001,  $\eta 2 = 0.09$ ) compared to men. Women also reported significantly lower comfort using facilities in general (p=0.002,  $\eta 2=0.05$ ), as well as machine weights (p < 0.001,  $\eta 2 = 0.11$ ), free weights (p < 0.001,  $\eta 2 = 0.15$ ), and indoor running tracks (p = 0.023,  $\eta 2 = 0.03$ ) compared to men. The presence of men, a lack of skill, and self-consciousness/judgement emerged as dominant themes explaining women's discomfort using campus recreational facilities, in particular weight training areas. Regarding strategies used to feel comfortable, the most common theme was using music to tune into working out and/or tune out the surrounding environment, followed by going with friends for social support, gaining knowledge pertaining to facility and equipment use, and selecting clothing for comfort or appearance reasons.

Conclusions: Meaningful differences in physical activity behaviors and comfort using campus recreational facilities emerged between men and women. Administrators should consider making changes to environments and/or policies to provide equitable physical activity opportunities.





# Equitable access to active transport: The case for more nonprofit, community bike shops

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#### Policies and environments (SIG)

#### Purpose

Well-connected cycling infrastructure creates a transportation environment that promotes physical activity. To choose active transport underserved users need access to affordable bicycles and bike maintenance, elements often overlooked by urban planners. Nonprofit, community bike shops provide refurbished bicycles and mechanical assistance at low cost or through sweat equity programs. This study documents the role of community bike shops in providing equitable access to bikes and bike maintenance and makes the case for their inclusion in public policy.

#### Methods

A thirty-six question survey was sent to the 205 US community bike shops. Eighty-eight completed surveys were returned (42.9%). Question categories consisted of Likert scales and qualitative data regarding bike shop goals, barriers, programming, and communities served. Neighborhood demographics (race, sex, education, median income, poverty rate) and transportation mode (car, public transportation, walk, bike) were compared to averages using 2017 US Census Data and analyzed using a one-way t-test.

#### Results

Findings supported the hypothesis that community bike shops provide needed services to help underserved populations mode shift to active transport. Primary goals reported in the survey were to provide bicycles for active transport (88.1%) and to empower people in the community (88.1%). Sweat equity opportunities for bikes and maintenance are provided at 62.5% of the shops. They serve diverse populations: low income/underemployed (98.9%), homeless (89.8%), unemployed (89.8%), refugees (82%), veterans (84.1%), LGBTQ (88.6%), underserved teens/youth (86.4%), and individuals with disabilities (73.9%). They provide services to minority communities – significantly below the national average for whites (p=0.001) and significantly above the average for blacks (p=0.002), and are located in areas significantly below the median income (p<0.001) and significantly higher in poverty (p<0.001). People served are significantly less likely to use a car to commute (p=0.005) and significantly more likely to use public transportation (p=0.004), walking (p<0.001), and biking (p<0.001).

#### Conclusions

Nonprofit, community bike shops are needed to ensure equitable access to active transport and to increase physical activity in underserved populations.





# Using co-design and ecological trial to encourage healthier choices in supermarkets

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#### Policies and environments (SIG)

Purpose: This research aims to improve healthfulness of choices in a supermarket in two stages: (1) co-design with consumers and staff, and (2) an ecological trial that modified real supermarket environment. Ecological models suggest that health is determined by both, individual factors and surrounding influences, including retail settings. Retail environments have been shown to (usually, negatively) influence healthfulness of food choices. In developed countries, over 70% of food comes from supermarkets – a major opportunity to improve healthfulness of food choices.

Methods: Stage 1 Co-design: five qualitative 90 minute co-design sessions were conducted with 24 consumers and eight retail staff. The tasks included: discussion on past experiences of making healthy and not choices; feedback on 28 previous campaigns; creating own campaign ideas in the form of colourful 'mud maps'. All workshops were voice recorded and photos were taken of all 'mud maps'. The thematic analysis was undertaken by two independent researchers, through the process of triangulation using the Seven Ps social marketing framework.

Stage 2 Ecological trial: Based on co-design findings, researchers and supermarket staff developed an intervention campaign "A healthy choice". The three-month campaign consisted of: displaying shelf talkers on supermarket shelfs against 200 products identified as 'healthy' based on the levels of sugar, total/saturated fat, salt and fibre; cooking demonstrations, label reading supermarket tours, and a community-wide information campaign.

Results: Product and Price strategies were the most frequently mentioned by consumers and staff. Interestingly, consumers wanted competitive offer, rather than just 'cheap' for healthy products. In Process, consumers desired enhanced in-store experiences (cooking demonstration, label reading workshops). The People aspect, suggested to bring other experts to retail environment (ie dieticians, chefs). Comparison of total sales (in units) for the 200 products labelled with "A Healthy Choice" campaign over the 14 weeks period, with the same period in the previous year (2018), shows a 3.7% increase in sales (or 606 units). This increase is substantive for the supermarket industry, considering there was no discounts offered, and the overall sales in that supermarket declined slightly compared to the previous year.





# Time spent in daily moderate-vigorous intensity physical activity among elementary and middle school teachers is associated with healthier physical activity-related classroom practices

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#### Policies and environments (SIG)

Purpose: Numerous schools have implemented programs to address childhood obesity; however, few have evaluated obesity-related health behaviors of classroom teachers implementing these programs. This cross-sectional study examined daily physical activity (PA) including time spent engaged in light PA and moderate-vigorous (MVPA) and PA-related classroom practices (e.g. punishment by withholding recess; role modeling healthy PA habits) among teachers in 20 urban, suburban and rural U.S. schools participating in a childhood obesity prevention intervention.

Methods: Light and MVPA were assessed using 24-hour accelerometry (Actical) worn on the ankle for seven consecutive days. PA-related classroom practices were assessed via survey (7 items; sum score range: 0-35; alpha=0.80; higher score=more health promoting practices). Demographics included gender, race, self-reported height/weight (calculated BMI; >30kg/m2=obese), grade taught, years teaching experience, and education level. Analyses included linear mixed regression models, accounting for within-school effects and adjusting for demographic covariates.

Results: Classroom/special area teachers and teaching assistants with complete survey data and one or more 24hour periods of accelerometry data were included (n=290, 90% female; 63% elementary school; 60% white; aged 43.2+11.3 years; 41% obese). The majority of teachers had <20 years teaching experience (73%) and 62% had a graduate degree. Means and standard deviations were calculated for average minutes/day spent in light (399.2+85.2) and MVPA (24.1+14.4) and PA-related classroom practices sum score (22.4+4.9). From linear regression models, for every one-minute increase in MVPA, there was a 0.06 increase in PA-related classroom practices sum score (SE=0.02; p<0.01). Fewer years teaching ( $\beta$ :-2.03; SE:0.74, p=0.01) and female gender ( $\beta$ :-2.25; SE:1.06, p=0.03) were significantly associated with lower sum scores; whereas, elementary school teachers had higher scores ( $\beta$ :3.56; SE:0.67, p<0.01). Light PA was not associated with PA-related classroom practices sum score.

Conclusions: Teachers with higher MVPA were more likely to engage in classroom practices that could positively impact their students' PA patterns. Future studies in school settings should incorporate evaluations of teacher health behaviors and explore whether improvement of teacher health behaviors subsequently impacts student health behaviors.





# The healthiness of Australian supermarket food environments

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#### Policies and environments (SIG)

Purpose: Few comprehensive assessments of the availability and prominence of healthy and less healthy (discretionary) food in supemarkets have been undertaken using the protocols developed by the INFORMAS network. This study aimed to evaluate Australian supermarket environments and determine if the marketing of discretionary food varied by supermarket chain and/or socioeconomic disadvantage.

Methods: The study was a cross-sectional supermarket audit conducted in metropolitan areas of Melbourne and Geelong, Victoria, Australia during 2019. A random sample of 104 stores was audited from four supermarket chains (Coles, Woolworths, ALDI, Independent), stratified by area-level socioeconomic position.

Measures included: i. Proportion of shelf-space in square metres allocated to selected discretionary foods (chips, chocolate, confectionery, sweet biscuits, soft/energy drinks) and healthy foods (fresh/frozen fruit and vegetables); ii. Percentage of end-of-aisle, checkout and island bin displays containing a discretionary food item; and iii. Proportion of space within end-of-aisle, checkout and island bin displays devoted to discretionary food. Linear regression adjusting for the clustered sample design was used to test for differences between supermarket chain and interactions with socioeconomic position.

Results: Shelf space devoted to discretionary food was greater for Independent stores (75.3%) compared with Woolworths (65.7%), Coles (64.8%) and ALDI (63.2%) (all p<.0001). The proportion of shelf space devoted to discretionary food was 7.0% higher in the most compared to least disadvantaged areas (p<0.01). Across all stores, 87% of staffed checkouts and 55% of end-of-aisle displays facing the store front included displays of less healthy food. Less healthy discretionary food accounted for >70% of display space at i. Island bin displays near end-of-aisles, ii. self checkout displays, and iii. island bins near checkouts. ALDI was less likely to display discretionary food in both fixed displays and island bins at prominent end-of-aisles and checkout locations.

Conclusions: Extensive marketing of discretionary food in all Australian supermarket chains is likely to strongly influence purchasing patterns and diets at a population scale. Private and public sector policies to reduce consumer exposure to discretionary food in-store are recommended.





# Staff and volunteer experience of participating in a behavioral economics intervention to transform food pantries

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#### Policies and environments (SIG)

Purpose: SuperShelf is an innovative values-based intervention that uses behavioral economics and systems change to transform food pantries into welcoming environments for communities to access healthy, appealing foods. SuperShelf values include good food, respect for all, collaborative partnership, evidence-based practices, and systemic thinking. The effect of SuperShelf on pantry and client outcomes is being evaluated in a group-randomized study. Food pantries are challenging sites for intervention, and the SuperShelf intervention requires a high degree of organizational buy-in; thus, monitoring the successes and challenges of implementation of this values-based intervention is essential.

Methods: This study used qualitative interviews with food pantry managers and volunteers to explore their experience of transforming into a SuperShelf. Semi-structured interviews were conducted pre (n= 16) and post (n=16) transformation at 4 intervention sites and 4 control sites. Interviewers were audio recorded and transcribed verbatim. NVivo12 was used to facilitate analyses. A constructivist approach to grounded theory was used to conduct the analysis, allowing for themes to emerge and to be considered alongside the intervention values.

Findings: SuperShelf values of 'good food' and 'respect for all' were evident in emerging themes pre and post transformation, in control and intervention sites, illustrating the commitment at all sites to provide a dignified client experience and food that was healthy, appealing, and culturally appropriate. However expression of these values was greatly enhanced post-transformation in intervention sites. The value of 'systemic thinking', 'evidence based practices' and 'collaboration' were not evident in the thematic analysis pre-transformation, but did emerge post-transformation in intervention sites. Additionally some indication of increased 'systemic thinking' also emerged in control sites, indicating a shift in the broader hunger relief system. Finally, the physical transformation of pantries was described as particularly meaningful for participants, and formed a conduit around which a broader cultural transformation of values were experienced.

Conclusion: The SuperShelf transformation process was experienced positively by intervention sites; the physical transformation was particularly impactful and served to facilitate adoption of all the SuperShelf values. Systems-wide changes may be experienced in non-intervention sites. Food pantries can successfully transform to integrate a values-driven, systems-change approach to improving the client experience.





# LT.3.04 - Food policy and practice: Are we there yet?

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# Global Implementation of Obesity Prevention Policies: a Review of Progress, Politics, and the Path Forward

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Policies and environments (SIG)

Purpose: To review global progress on adoption of obesity prevention policy across five areas: taxation, nutrition labeling, media/marketing, built environment, and school based initiatives.

Methods: A review of the literature yielded 173 peer-reviewed articles, which serve as the basis for reported findings.

Results/Findings: Globally, the adoption of obesity prevention policies has been slow and inconsistent. Efforts to shape the information environment and the political environment have been central in determining outcomes. Governments have lacked sufficient political will. The food industry has aggressively, and effectively, manipulated the information environment (through marketing and advertising, mass media, sowing doubt, bias in obesity science, promoting physical activity to minimize nutrition) and the political environment (through lobbying, cooptation, preemption) to support their commercial interests. Three approaches hold promise. First, there is a need to unsettle the power/influence of the food industry and other commercial interests, and to increase their accountability. The recent and growing work on countering the corporate and commercial determinants of health holds promise. Research in political science focused on advancing knowledge related to policy and issue regimes, which promote long-term stable power arrangements in a given policy system and facilitate resistance to fundamental change (e.g., food industry and politicians collaborate to maintain current food policies) should be explored, with a goal of restructuring/reducing the existing influence/control of commercial interests on food policy and obesity prevention. Second, despite calls for greater emphasis on advocacy and mobilization of civil society, implementation of these efforts remains inadequate. Increased use of available frameworks and guidance for producing increased engagement and stronger collective advocacy is needed. Third, prioritizing equity in the application of policy and regulatory approaches is vital. Sub-populations experiencing social disadvantage often have greater exposure to obesity-producing influences and the resulting higher prevalence. Failure to target vulnerable populations most affected by obesity will limit the effectiveness of the global campaign to mitigate it.

Conclusion: Global action on obesity prevention policy has been slow/inadequate. No country to-date has significantly improved its overall food environment or reversed its obesity epidemic. There is an urgent need to reshape the information and political environments to support healthy behaviors.





# The emergence and use of the term 'food literacy': A scoping review

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#### Policies and environments (SIG)

Purpose: The term 'food literacy' emerged to address the skills, behaviour and knowledge needed by individuals to navigate the complex food environment and meet day-to-day food needs. Despite extensive publications and use of the term in the past 20 years, little has been done to track the progression of the concept over time. Therefore, this study aimed to describe the change in the use and reach of the term 'food literacy' over time and analyse the context and outcomes of academic papers with respect to the year of publication.

Methods: A scoping review was conducted using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, across several databases (PubMed, ScienceDirect, Embase, Scopus, EBSCOhost, ProQuest, Google Scholar), using the term 'food literacy'. Papers were reviewed, and those which were i) not in English, ii) grey literature iii) did not mention the term 'food literacy' or iv) had no full-text available were removed. The year, country, context and outcomes of the publication were extracted and compared.

Results: 436 academic papers were extracted from the literature. The first journal article which included the term 'food literacy' appeared in 1998, with the literature steadily increasing over time, with 108 journal articles published in 2018. The term has been published in academic literature across 37 countries, with the highest number of publications in Australia (109), followed by Canada (89), United States (85), United Kingdom (31) and Italy (13). The context of publications on food literacy tend to take a health and environmental frame.

Conclusions: This review found that the concept of food literacy has transitioned from primarily future research recommendations to defining and conceptualising, measuring and more recently, investigating proposed relationships between food literacy and diet quality. Additionally, the relevance of the term indicates that harmonisation of measurement and cross-country comparison of food literacy may be possible, which could assist in improving health and nutrition by addressing food literacy in a multi-tiered approach, world-wide.





# Barriers and enablers to implementing healthy food and drink policies delivered at scale

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#### Policies and environments (SIG)

Purpose: Policies that support healthier food environments, including healthy retail food availability and promotion, are an important strategy for obesity prevention. The aim of this rapid review is to examine the evidence for barriers and enablers to successful implementation of healthy food and drink policies, delivered at scale. Implementing healthy food environment policies at scale is needed to achieve greater impact and this is the first review of both barriers and enablers to implementing such policies at scale.

Methods: MEDLINE, SCOPUS and INFORMIT were searched (1979-May 2019) for peer-reviewed studies. Google and Google Scholar were searched for grey literature. Studies of any design relating to a healthy retail food and drink policy delivered at scale (>10 sites) in government and non-government based settings and that reported on implementation barriers and/or enablers were included. Studies in commercial retail environments were excluded. Studies were appraised for quality and key information was extracted and summarised. Barriers and enablers were grouped into overarching themes relating to perceptions of the policy itself, organisational and contextual factors influencing policy implementation, stakeholder responses to the implemented policy and perceived policy impacts.

Results: Of 19 studies, 16 related to policies implemented in schools, 2 in hospital/health facilities and 1 in a sport/recreation setting. The most commonly cited barriers across themes were: lack of stakeholder engagement/prioritisation (10 studies in schools, 1 in hospital/health facility); concern over profitability, revenue and/or commercial viability (6 studies in schools, 1 in hospital/health facility, 1 in sport/recreation setting); and resistance to change from stakeholders/customers (7 studies in schools, 1 in hospital/health facility). Enablers most commonly raised were: stakeholder engagement, whole school approach and/or prioritisation (9 studies in schools); information/guidance/training support from policy level or higher level support (5 studies in schools, 1 in hospital/health facility); and leadership, school/policy champion, management commitment and/or organisational capacity (4 studies in schools, 1 in sport/recreation setting).

Conclusions: Key considerations for policy implementation ranged from building stakeholder support, prioritising policy implementation within organisations to implementing strategies that address financial concerns and implementation barriers.





# Sugar-sweetened beverage tax pass-through rates: A systematic review

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#### Policies and environments (SIG)

#### Purpose

Numerous jurisdictions have implemented health-oriented taxes on the manufacturers of sugar-sweetened beverages (SSBs), with the expectation that these taxes will translate into increased prices for consumers. The higher the price, the more effective a tax policy will be at producing behaviour change and positively impacting population health. A number of studies report 'pass-through' rates. The current study's purpose was to conduct the first known systematic review of real-world SSB tax pass-through rates.

#### Methods

Following the PRIMSA checklist, the databases Scopus, PubMed, EconLit, and Google Scholar were systematically searched for articles published from January 2000-July 2019. Peer-reviewed English-language articles from any country were included if they reported the change in prices from real-world SSB excise tax interventions. Data was extracted and synthesized on tax policy, study design, methods, and pass-through rates (eg, by beverage type, brand, retailer type, package size). The articles were critically appraised for quality.

#### Results

The review included 14 studies with 15 study designs from seven jurisdictions: Mexico (n=3), Berkeley (n=3), Philadelphia (n=3), Chile (n=2), Barbados (n=1), France (n=1), and South Africa (n=1). The type of taxes varied and included volumetric, sugar-based, and ad valorem. There was evidence of undershifting (<100% pass-through) and overshifting (>100% pass-through), but the majority of SSB taxes were undershifted (median of 67% pass-through). Variations in the pass-through rates were found both within and across jurisdictions and by beverage type, brand, retailer type, and package size. The majority of study designs (93%) scored as high quality.

#### Conclusions

This systematic review found strong evidence that SSB prices increased following the enactment of SSB taxes, but the taxes were undershifted and did not result in a full tax price increase for consumers. If policymakers wish to maximise the health impact of SSB taxes they may need to consider higher taxes and supplementary interventions. Future research, forthcoming in early 2020, includes a novel meta-analysis of the pass-through rates included in this review.





# Public acceptability of a sugar-sweetened beverages tax and its associated factors

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#### Policies and environments (SIG)

Purpose: A food pricing strategy that has received considerable attention in recent years is taxation of sugarsweetened beverages (SSBs). Although evidence of the effectiveness of taxation of SSBs is an important consideration for governments in the decision-making process, the extent to which an SSBs tax is likely to be acceptable to the public is also affecting policy adoption and implementation. Therefore, the aim of this study was to investigate the level of public acceptability of an SSBs tax and its associated factors.

Methods: Dutch adults aged  $\geq 18$  years representative of the Dutch population completed an online selfadministered questionnaire (n = 500). Acceptability of an SSBs tax was measured on a 7-point Likert scale (strongly disagree to strongly agree). Associations between acceptability and sociodemographic factors, body mass index, SSB consumption, and beliefs about effectiveness (9 items, e.g. 'An SSBs tax would reduce people's SSB consumption'), appropriateness (7 items), socioeconomic and economic benefit (5 items), implementation (1 item) and mistrust (3 items) were assessed using multivariable linear regression analyses.

Results: Of the participants, 40% supported (5-7 on the Likert scale) and 43% opposed (1-3 on the Likert scale) an SSBs tax in general. Moreover, 42% supported (43% opposed) an SSBs tax as a strategy to reduce overweight and 55% supported (32% opposed) an SSBs tax if revenue is used for health initiatives. Participants with a low educational level (B = -0.82; 95%CI = [-0.32, -1.31]), overweight (B = -0.49; 95%CI = [-0.89, -0.09]), moderate or high SSB consumption (B = -0.86; 95%CI = [-1.30, -0.43] and B = -1.01; 95%CI = [-1.47, -0.56], respectively) and households with adolescents (B = -0.57; 95%CI = [-1.09, -0.05]) scored lower on the Likert scale for acceptability of an SSBs tax than their counterparts. Moreover, twenty-two of the twenty-five beliefs were associated with acceptability (P<0.001).

Conclusions: Acceptability of an SSBs tax tends to be higher if revenue is used for health initiatives. Sociodemographic factors, body mass index, SSB consumption and several beliefs about effectiveness, appropriateness, socioeconomic and economic benefit, implementation and mistrust are associated with acceptability and should therefore be taken into consideration in the introduction of such a policy.





# Sugar-sweetened beverage taxes in the Pacific with evaluation results from Tonga

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Policies and environments (SIG)

Purpose:

Pacific leaders have acknowledged a non-communicable disease (NCD) crisis impacting on the health and wellbeing of their populations. The aims of this research were to: (i) describe the introduction of SSB taxes in Pacific Island countries and territories (PICTs) since 2000; and (ii) evaluate the impact of SSB taxes in Tonga (using import volumes, manufacturing and expenditure by household income).

Methods:

SSB taxes in the Pacific introduced from 2000-17 were identified by systematically searching online legislation, government websites and library databases. Interrupted time series analysis was used to compare beverage import volumes and manufacturing trends in Tonga after SSB tax introduction, when compared to a counterfactual based on existing trends, with adjustment for autocorrelation and changes in GDP, visitor numbers, exchange rates and season. Household soft drink and bottled water expenditure measures were compared before and after the introduction of the SSB tax (2009 and 2015/16), and findings were compared by equivalised household income tertiles, household age composition, and island of residence.

Results:

Over half of PICTs have introduced SSB excise policies or increased existing import tariffs. In the year after the 2013, 2016 and 2017 Tonga SSB tax increases, imports of sweetened beverages decreased by 10.4% (-23.6 to 9.0), 30.3% (-38.8 to -20.5) and 62.5% (-73.1 to -43.4) respectively. Juice imports decreased by 54.2% (-93.2 to -1.1), and sachet drinks by 15.5% (-67.8 to 88.3) after the 2017 tax increase. Tonga water bottling increased by 143% (69 to 334) after the 2016 tax increase and soft drink manufacturing increased by 20% (2% to 46%, albeit with only a 5% market share). From 2009 to 2015/16 household expenditure measures decreased for soft drinks and increased for bottled water. The soft drink declines appeared to be greater in low-income than high-income households for prevalence of any purchasing, per capita expenditure and food budget share, but vice versa for income share.

#### Conclusions:

SSB taxes are a widely used NCD control strategy in the Pacific. In Tonga SSB taxes were associated with reduced taxed beverage imports and expenditure, and increased bottled water production and expenditure. Low-income households appeared to have benefited from greater declines in soft drink expenditure.





# Effects of salt reduction on cardiovascular risk factors. The STRIVE-study. A 4month randomized controlled study among healthy families.

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#### Policies and environments (SIG)

Potential adverse effects of reducing salt intake has been heavily discussed. This study aims to explore the effect of gradually reducing salt intake in a real-life setting.

The study was a 4-month cluster randomized controlled study with families randomly assigned to either A) salt reduced bread, B) salt reduced bread and dietary counselling or C) standard bread (control) Participants in intervention A received bread gradually reduced in salt content from 1.2 g salt/100g (regular) to 0.6 g salt/100g in ryebread and 0.4 g salt/100g in wheat bread. Participants in intervention B received the same bread as intervention A but in addition, they received dietary advise on how to further reduce their salt intake and promote potassium. The control group received regular bread. Changes in outcomes were assessed using linear mixed models.

Results: A total of 89 Danish families (155 adults) participated in the study; 94% completed the study. Intention to treat analyses showed a significant decrease in salt intake (g/day) in intervention group B (-1.4 [-2.4; -0.5] and a non-significant decrease in intervention group A (-0.7[-1.9, 0.5]) compared to the control group. Furthermore, in group A, a significant reduction total plasma cholesterol (-0.29 mmol/l [-0.5-; -0.1], LDL cholesterol (-0.08 mmol/l [-0,3—0.0]), plasma renin pmol/l (-0.23(-0.4, -0.0), adrenaline (-0.03 (-0.1, -0.0) and body fat percent (-1.5%[-2.5; -0.5]) was found compared to the control group. A significant decrease in total plasma cholesterol (-0.15 [-1.0; -0.2]) was found in group B compared to the control group. No significant effects were found for diastolic and systolic blood pressure, triglyceride, HDL cholesterol, aldosteron, noradrenaline and BMI.

Subgroup analyses among participants in the intervention groups that decreased their salt intake by at least 20% from baseline to 4-month follow-up, showed a significant decrease in diastolic (-3.5 mmHg; P<0.0001) and systolic (-6.3 mmHg; P<0.0001) blood pressure, total cholesterol (-0.25 mmol/l; P=0.0009), LDL cholesterol (log.transformed) (-6%; P=0.03) and plasma triglyceride (log.transformed) (-17%; P=0.04).

Conclusion: Reducing salt intake had beneficial effects on several cardiovascular risk factors. No adverse effects were observed.





# Use of research evidence in state health policymaking: Menu labeling policy in California

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#### Policies and environments (SIG)

Purpose: Addressing the translational gap between research evidence and state health policy requires an understanding of the current use of research evidence in the state policymaking process in the United States (U.S.). In 2008, California was the first state to enact a mandatory menu calorie labeling policy in the U.S. In this study, we explore the use of research evidence to inform the legislative debate about restaurant nutrition labeling policy in California.

Methods: Using a qualitative approach, we examine data sources and types of evidence used in legislative documents (n=87) related to six menu labeling bills introduced in California's state legislature between 2003 and 2008. Qualitative coding focused on: 1) identifying references to technical knowledge and their sources and 2) categorizing these references into Type 1, Type 2, or Type 3 evidence. Type 1 evidence focuses on defining the causes of disease and the magnitude, severity, and preventability of the disease burden. Type 2 evidence identifies specific interventions that work (or fail) to promote health. Type 3 evidence characterizes the context under which interventions were implemented and their acceptability.

Results: Federal and state-level government agency reports were the most frequently cited sources of technical knowledge. Advocacy coalition members who were active participants involved in the policy debate were also cited as experts. Five of the six bills included evidence in related legislative documents. While documents included considerable evidence on the magnitude and severity of the obesity problem to justify policy enactment, there were a limited number of statements referring to policy effectiveness and only one statement identified attesting to implementation context and acceptability. Reference to evidence on related policy (i.e., National Labeling and Education Act of 1990) suggests policy precedence may also play an important role in policy decision making.

Conclusions: There is a need to improve the dissemination of obesity policy effectiveness and implementation studies in a politically time sensitive manner to influence state health policy debates in the U.S. Strategies are discussed to effectively integrate the use of research evidence in state health policymaking processes or in similar legislative environments elsewhere.





# Food marketing and its place in the marketing landscape

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#### Policies and environments (SIG)

Purpose: In recent years, the scope and scale of marketing to children has substantially increased. The negative effects of this commercial pressure on children's health and wellbeing have been well documented. However, children's actual exposure to marketing across all media and in multiple settings remains unknown. This study aimed to: 1) Document children's daily exposure to commercial marketing; 2) Identify the proportion of this marketing attributed to food marketing; and 3) Identify the most pervasive food marketing brands.

Methods: One-hundred and sixty-eight children (aged 11 to 13 years) from Wellington, New Zealand, wore a wearable camera on four consecutive days, capturing images every 7s. Images from a random sub-sample of 90 children (30 NZE, 30 Māori & 30 Pacific) were coded for brand exposures by setting, marketing medium and product category. Daily exposure rates to marketing brands were determined using negative binomial regression models.

Results: Initial findings will be reported on the place of food marketing in children's total daily marketing exposure. Food marketing accounted for 18% of total marketing exposures – the highest of any category. The most pervasive food marketing brands were Coca Cola (6.3 exposures per day), Cadbury (1.8 exposures per day) and Bluebird (1.3 exposures per day). Over half (54.9%) of children's daily unhealthy food marketing exposure was linked to eight transnational companies. There were significant differences in marketing exposures by setting, marketing medium and sociodemographic factors, including higher exposure rates to 'Unhealthy' brands (non-core food, alcohol and gambling) in street settings and higher exposure to 'Unhealthy' brands among high-deprivation children.

Discussion: Our research demonstrates the pervasive scale of commercial marketing to children through multiple mediums and settings. Children were exposed to unhealthy brands at a much higher rate than healthy brands. The findings provide further support for marketing restrictions to reduce children's exposure to marketing of non-core food and other unhealthy commodities.





# How frames can influence public opinion towards nutrition policy options

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#### Policies and environments (SIG)

Purpose: There has been no mandatory regulatory nutrition reforms in Australia during the past decade despite evidence demonstrating their effectiveness. One reason cited for this lack of action is concern that such measures will not be acceptable to the general public. Research from the field of communication has shown that how a message is framed can influence public acceptability of that message. This research sought to explore public opinion on different regulatory options and to examine how message frames can affect level of support.

Methods: We undertook 2 studies to inform this work: street intercept interviews and an online experimental survey. The street intercept interviews occured in a metropolitan location and 4 regional towns (n = 76) and incorporated qualitative and quantitative questions designed to explore the attitudes of regional and urban Australians towards nine different public health nutrition policy options. These results informed the development of 4 values-based message frames which were then tested in a randomised online experimental survey. A nationally representative sample (n=1300) was recruited for the online survey. Each participant was assigned to one of four message conditions. Descriptive and logistic regression analysis were used to examine the association between message condition, demographic variables and support for regulation. Framing analysis was used for the qualitative data.

Results: Most participants supported the full range of policy options presented with lowest levels of support for reformulating food products and a 20% tax on sugar-sweetened beverages. Analysis of the online experimental survey is currently underway. Early results indicate that political ideology is not a guaranteed variable to predict support for regulatory nutrition policy. However, the message frame of 'protecting teenagers' is showing moderate levels of support.

Conclusion: The findings of this study suggest there is broad public support for the Australian government to use a variety of regulatory policy options to address nutrition-related diseases. The results from this empirical analysis provide valuable insights that can be used when advocating for the adoption of effective public health nutrition actions.





# LT.3.05 - Current issues in physical activity and nutrition

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# Translation of two healthy eating and active living support programs for parents of 2-6 year old children: preliminary results of a parallel partially randomised preference trial (the 'Time for Healthy Habits' trial).

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#### Children and families (SIG)

#### Purpose

Parents are key decision makers and role models in establishing and maintaining healthy behaviours in preschoolaged children. Interventions involving parents have been shown to be more effective than those that do not. However, there are barriers to group participation, which telephone-based and online programs have the potential to overcome. Efficacy trials have previously been conducted on two such interventions - Healthy Habits (telephonebased) and Time2bHealthy (online) with promising results. Further research is now required to determine their effectiveness and cost-effectiveness in a real-world context.

#### Methods

Time for Healthy Habits is a three-arm partially randomised preference trial to evaluate the effectiveness of two theory-based healthy eating and active living programs for parents of 2- to 6-year-old children (Healthy Habits Plus (telephone) and Time2bHealthy (online)), compared to a comparison group (written materials). It is planned to recruit 636 participants primarily from five Local Health Districts in New South Wales, Australia. The partially randomised preference design initially allows for participants to decide to be randomised or select their preferred intervention, a design recommended to test effectiveness in a real-world setting. Interventions provide practical information on healthy eating, physical activity, sedentary behaviour and sleep over 12 weeks. Outcomes are assessed post-intervention and at 6-month follow-up. Participants also complete a process evaluation questionnaire post-intervention. Outcomes include fruit and vegetable intake (primary outcome), discretionary food intake, weight status, physical activity, sedentary behaviour, and sleep habits.

#### Results/Findings

Of the 218 participants who had a strong preference for study group, 61% chose the online intervention, 29% chose written materials and 10% chose the telephone intervention. A limited number of participants have completed the





interventions at the time of submitting this abstract. Post-intervention outcome and process results for participants who have completed the intervention will be presented at the ISBNPA meeting.

#### Conclusions

To our knowledge, this is the first translational research trial evaluating the effectiveness of a healthy eating and active living intervention in the 2- to 6-year age group. Results will build the evidence base regarding the translation of effective childhood obesity prevention interventions and inform the implementation and delivery of publicly funded childhood obesity prevention programs.





# Effects of exergaming on preschool children's physical activity, sedentary behavior, and cognition: A cross-over study

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#### Children and families (SIG)

Purpose: Early childhood physical activity (PA) interventions may help promote preschoolers' healthy lifestyle habits and optimal development. However, effects of innovative exergaming interventions on preschool children's PA and cognition remain largely unanswered. In response, this study was designed to examine the effectiveness of a home-based exergaming program on preschool children's PA, sedentary behavior, and cognition in a randomized cross-over trial.

Method: A total of thirty-two preschool children (16 boys; 59.4% Asian; Mage = 4.72, SD = ± .73) were recruited from the Twin Cities, MN in the U.S. During baseline testing, preschoolers' percentages of time in light PA, moderate-tovigorous PA (MVPA), sedentary behavior, and cognition were assessed via ActiGraph accelerometers and Dimensional Change Card Sort Test. Children were then randomly assigned to 1) an intervention condition: engaging in home-based LeapTV exergaming at least 30 minutes/session 5 times/week for the first 12 weeks and then resumed their regular PA patterns without exergaming during the second 12 weeks; or 2) a delayed-intervention control condition: maintaining their regular PA patterns for the first 12 weeks, and participated in the same dose of home-based exergaming during the second 12 weeks. Identical assessments were conducted at the 13th and 25th weeks.

Results: Data were analyzed with PROC Mixed in SAS. Results suggested significant interaction effects of treatment by period for percentage of time in MVPA, F(1,26) = 1.94, p = 0.049; and cognition, F(1,28) = 2.02, p = 0.04, favoring the exergaming intervention. In addition, there was a significant sequence effect for percentage of time in MVPA, F(1,26) = 5.08, p = 0.03. No other effects were identified. For example, there were no interaction effects of treatment by period for percentage of time in light PA, F(1,28) = 1.06, p = 0.44; and in sedentary, F(1,26) = 1.02, p = 0.48.

Conclusions: Home-based exergaming has the potential to positively impact cognitive functions and percentage of time in MVPA in preschoolers, although its significant effects on light PA and sedentary behavior were not evident in this study. Thus, the novel exergaming intervention program may be a good PA alternative for home-based interventions.





# Supporting migrant mothers with infant feeding and healthy growth: qualitative evaluation of the culturally adapted Healthy Beginnings program

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Children and families (SIG)

Background/Aims

Promoting healthy behaviours during infancy is critical for establishing healthy growth in early childhood and the early prevention of obesity. Healthy Beginnings is an established evidence-based program in Sydney, Australia, led by child health nurses to promote and support best-practice infant feeding, nutrition and physical activity. To reduce inequalities and extend reach to culturally and linguistically diverse families, a feasibility study was conducted to culturally adapt the Healthy Beginnings program for Arabic and Chinese communities. This study aimed to explore program successes, satisfaction and suggested improvements through interviews with staff and mothers involved in the adapted program.

#### Methods

The culturally adapted program was piloted with 94 Arabic- and 69 Chinese-speaking women from their third trimester until their baby was aged 6 months. Mothers were offered adapted and translated health promotion materials and text messages, and telephone support from bi-cultural nurses. At program completion, all implementation staff and mothers were invited to participate in a semi-structured interview to contribute to program evaluation. Interviews were audio-recorded with consent and transcriptions were analysed using descriptive thematic analysis.

#### Results

10 implementation staff, 22 Arabic-speaking mothers and 19 Chinese-speaking mothers participated in individual interviews. Analysis highlighted positive factors, particularly the key role of bi-cultural nurses in providing not only quality tailored infant feeding and care advice, but also culturally sensitive support for the mother's health and wellbeing. Suggested enhancements included greater availability of nurses to receive calls, options to connect mothers through groups or online forums, and strengthened community partnerships to support the cultural adaptation process and referrals.

#### Conclusions

The culturally adapted Healthy Beginnings program shows potential for continued delivery and scale-up. These qualitative findings provide opportunities to enhance the program adaptations to further the relevance among Chinese and Arabic migrant families. Learnings from this study offer insights for future cultural adaptations of maternal and child health promotion programs to reach culturally and linguistically diverse families and provide culturally appropriate support for healthy infant feeding and the early prevention of obesity.





# Effectiveness of a novel digital platform for the development of fundamental movement skills in 3- to 6-year-old children

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#### Children and families (SIG)

Purpose: Fundamental movement skills (FMS) are the foundational building blocks for lifetime participation in physical activity (PA). However, with less than half of Australian children proficient in FMS, there is a need for effective interventions to promote FMS. To date, programs to promote FMS development have been primarily delivered in child care and school-based settings. To our knowledge, no studies have evaluated the effectiveness of an interactive digital platform, designed to be co-used by the parent and child, to increase FMS proficiency in preschool-aged children. Therefore, the current studyevaluated the effectiveness of a digital platform application known as Moovosity™ to promote FMS in 3- to 6-year-old children.

Methods: A RCT was conducted involving 34 parent-child dyads randomly assigned to either the 8-week intervention (n=17) or wait-list control (n=17) condition. Participants completed assessments of FMS proficiency (TGMD-2), PA (Burdette Checklist), and parental support for PA (Trost et al. 2003) at baseline (prior to randomization) and 8-weeks follow-up. Participants randomized to the intervention were given access to freely use Moovosity<sup>™</sup> over a period of 8 weeks. Wait-listed controls were given free access to the app at the end of the 8-week intervention period. Group differences in post-test scores for object control, locomotor skills, parental support for PA, and child PA were evaluated for statistical significance using analysis of covariance (ANCOVA), adjusting for baseline values and child age.

Results: Children randomized to the intervention exhibited significantly higher post-test scores for object control [28.0 vs. 22.6; mean difference = 5.4, 95% CI = 1.4 - 9.4]. Intervention children exhibited higher locomotor standard scores than wait list controls [34.1 vs. 30.7]; however, the p-value for the difference [3.42 (95% CI = -7.2 - 0.34) was marginally significant (P=0.07). No significant differences were observed for child PA or parental support for PA.

Conclusions: An 8-week exposure to a digital platform to promote motor competence within a family environment was effective in improving FMS proficiency in preschool-aged children, in particular, object control skills. The results are encouraging and warrant further investigation in larger trials involving more families, objective measures of PA, and longer follow-up periods.





# The association between sociodemographic variables, body composition and intake of healthy and unhealthy foods in 5–9 year old South African children

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#### Children and families (SIG)

Purpose: Poor dietary habits in children are associated with an increased risk for adult obesity. The purpose of this study was to assess the association between sociodemographic variables, body composition and intake from healthy and unhealthy food groups among young children in the North West Province, South Africa.

Methods: In this cross-sectional study 1065 children aged 5-9 years were selected from eight schools, stratified according to sex, race and socio-economic status. Frequency of intake from healthy (meats, milk, fruit, vegetables) and unhealthy food groups (fast food, cold sugar sweetened beverages (SSB), hot sweetened beverages, salty snacks, sweets/candy, cookies) was assessed. Height, weight and socio-demographic information were collected and body mass index (BMI) z-scores were calculated based on the WHO reference. Physical fitness was assessed using a pacer test to determine number of 20m laps successfully completed. Principal components analysis was applied to identify food group patterns. Associations between these food pattern scores, sociodemographic variables and BMI z-scores were assessed using multivariable regression analysis.

Results: Most of the children had normal weight, while more children were overweight/obese (19.4%) than underweight (3.8%). The median frequency of intake from healthy food groups was 3-4 days/week, for unhealthy food groups it was 1-2 days/week, except for SSBs (5-6 days/week), while staple foods were eaten daily. Three food group patterns were identified, namely 'Animal source protein foods-SSBs', 'Fast food-Snacks' and 'Fruit-Vegetables'. Positive associations between household income and 'Animal source protein foods-SSBs', as well as 'Fruit-Vegetables' patterns were found, while household income was negatively associated with scores on the 'Fast food-Snacks' pattern. Household income and child age were positively associated with BMI z-score, whereas physical fitness and 'Fruit-Vegetables' pattern score were negatively associated with BMI z-score.

Conclusions: Low household income limits access to more expensive foods, such as meats, dairy products, fruit and vegetables, rich in nutrients for child development, but not to cheaper snacks and fast foods. Physical activity and fitness among young school-age children contribute to lower BMI z-scores.





# Coffee and cigarettes: Examining the association between caffeine consumption and cigarettes and e-cigarettes among youth in the COMPASS study

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#### Children and families (SIG)

Background: In adults, coffee, sugar-sweetened beverage (SSB) and high energy drink (HED) consumption have been related to increases in risky behaviour, including smoking. However, these relationships are not well understood during adolescence. Further, limited work has been done to examine the strength of the relationship between different types of caffeinated/sugar-sweetened beverages and smoking behaviour (including e-cigarette use). The purpose of this study was to examine the relationships between beverage consumption and nicotine use among Canadian adolescents.

Methods: Using data from the COMPASS study (2016-2017; n=30,454), four models were developed to investigate whether beverage consumption explained variability in smoking behaviour in adolescence (age=15.7±1.2)); 1) smoking status; 2) e-cigarette status; 3) days smoking cigarettes per month; and 4) days using an e-cigarette per month. Models were corrected for demographic factors. Model 1 and 2 used multiple logistic regression, while models 3 and 4 used multiple linear regression.

Results: Irrespective of the model, there was an association between the frequency an individual consumed SSBs, coffee/tea or HEDs and nicotine use. The greater the beverage consumption, the higher the odds of being a current smoker (OR = 2.46 (2.02, 2.99)), a former smoker, (OR = 2.50 (1.53, 4.08)), currently using an e-cigarette (OR = 4.66 (3.40, 6.40)) with the best predictor in all models being drinking HEDs on 4 or 5 days of the school week. Higher beverage consumption is also associated with more days smoking/using an e-cigaretteper month (OR = 2.67 (1.92, 3.70) and 3.45 (2.32, 5.12), respectively).

Conclusion: There was a clear and consistent relationship between high consumption of SSB, HEDs and coffee/tea and increased the likelihood of being a current smoker or e-cigarette user and frequency of smoking/using an e-cigarette per month among adolescents. Future work should examine the directionality of this relationship and explore further the potential mechanisms contributing to this relationship. Given the health consequences of smoking and excessive SSB consumption, policy initiatives to prevent smoking initiation and restrict access to SSB and especially HEDs.





# New directions in understanding appetite self-regulation in childhood

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#### Children and families (SIG)

Purpose: Difficulty with appetite (food-related) self-regulation (ASR) has been recognised as a possible pathway in the development of overweight or obesity in some children. ASR research and theory has begun to draw on the constructs, evidence, theories and methodologies associated with general self-regulation (GSR, i.e., self-regulation of emotions, behaviours and cognitions). However, despite some cross-fertilisation, there is no systematic comparison of research and theory from ASR and GSR, and this is an impediment to research and theory on ASR. The purpose of this narrative review was to conduct a reciprocal analysis of self-regulation in the food and non-food domains in childhood through an examination of (1) key concepts and processes in ASR and GSR, (2) evidence about the possibility of common processes underpinning ASR and GSR, and (3) the extent to which GSR could be implicated in ASR-related outcomes.

Methods: Databases and major journals were searched using terms such as self-regulation, appetite self-regulation, or self-regulation of energy intake, together with associated constructs (e.g., Executive Function, Effortful Control, delay-of-gratification). This was followed by backward and forward snowballing. Articles were mainly limited to those that addressed children or childhood, with a focus from infancy to age 6 or 7 years.

Results/findings:The review suggests there are some overlaps between ASR and GSR including in the overall meaning of self-regulation, in the application of constructs such as Executive Function, Effortful Control and delayof-gratification, and the recursive interplay between bottom-up (reactive, emotion driven, approach or avoidance) and top-down (cognitive, conscious decision-making) processes. However there are also factors unique to ASR that are associated with psychological, biological and neurological responses to food and bottom-up processes.

Conclusions: Research and theory about GSR and ASR should be integrated, with ASR included as a domain under the umbrella of GSR along with existing domains (i.e., behaviours, cognitions and emotions). This will generate a cross-fertilisation of areas of research that have the potential, in turn, to advance knowledge about both GSR and ASR which could inform intervention and prevention efforts in childhood.





# Intervening with physical activity in the early years (ages 3-5) improves healthrelated quality of life: A secondary analysis of the Activity Begins in Childhood (ABC) trial

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#### Children and families (SIG)

Objective: In youth and adult populations, physical activity is positively associated with physical health and psychosocial health outcomes, including health-related quality of life (HRQoL). Limited research has measured the effect of physical activity (PA) interventions on HRQoL among pre-school aged children. The Activity Begins in Childhood (ABC) is a cluster-randomized controlled trial designed to increase physical activity in the early years (ages 3-5). This study evaluates the effect of the ABC trial on changes in HRQoL.

Methods: ABC was a three-armed trial in which 18 daycares were randomized; for the current study the two PA groups were combined (PA; 1. PA information delivered to daycare providers 2. PA information delivered to daycare providers and parents) and a standard daycare curriculum group (3. Control; C). The secondary analysis included 215 children (PA n=161, C n=54). Parents completed the proxy Generic Core Scale (PedsQLTM 4.0) to measure HRQoL at baseline and at the end of the 6-month trial. Scores were analyzed in three domains: physical, psychosocial, and total. Mean changes in scores [95% confidence intervals] were measured using absolute values. A withinbetween ANOVA for repeated measures was performed to test group differences over time. Bonferroni correction was used for multiple comparisons. Statistical significance was accepted as p<0.05.

Results: At baseline, there were no group differences for the physical- (PA=90.72 $\pm$ 12.54, C=93.55 $\pm$ 7.29, p=0.12) and psychosocial-related HRQoL scores (PA=82.79 $\pm$ 11.03, C=85.58 $\pm$ 8.58, p=0.09), however total HRQoL score was higher in the C group (PA=84.82 $\pm$ 11.97, C=88.51 $\pm$ 7.29, p=0.034). A significant time (p=0.031; np2=0.022) and group effect (p=0.008, np2=0.032) for psychosocial HRQoL scores were observed. Multiple comparisons showed that only the PA group improved psychosocial-HRQoLscores after 6-months (PA mean difference=2.178 [0.205, 4.152], p=0.031; C mean difference=2.051 [-1.031, 5.132], p=0.188). For the total HRQoL score, a significant time effect was found after correcting for baseline between-group differences (p<0.001; n2=0.791). The multiple comparisons showed that total score improved for the PA group only (PA mean difference=2.834 [1.827, 3.840], p<0.001; C mean difference=0.192 [-1.773, 2.157], p=0.845).

Conclusion: Results of this secondary analysis suggest that introducing a physical activity intervention early by incorporating the daycare and home environment may increase children's HRQoL.





# Differences in dietary patterns and dietary adaptations in women with and without gestational diabetes in New Zealand

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#### Children and families (SIG)

Purpose: Women frequently make dietary adaptations during pregnancy. Diet is thought to play a critical role in the development and management of gestational diabetes mellitus (GDM). This study is the first to explore differences in dietary patterns and dietary adaptations among pregnant women with and without GDM in New Zealand.

Methods: Pregnant women participating in the Growing Up in New Zealand study completed a 44 item food frequency questionnaire and questions relating to dietary changes and information received during pregnancy. Dietary patterns were previously identified using principle component analysis. Diagnosis of GDM was determined using coded clinical data and plasma glucose results meeting the New Zealand Society for the Study of Diabetes diagnostic criteria. Data on dietary patterns, reported dietary changes and sources of information leading to dietary change were compared between women with GDM (n=280) and women without GDM (n=5104) and between women with GDM diagnosed before (n=124) and after (n=109) the antenatal interview.

Results: Women with GDM had lower adherence scores than women without GDM for 'Junk' (mean (SD) score -0.28 (0.95) versus 0.02 (1.01) p<0.0005) and 'Traditional/White bread' dietary patterns (-0.18 (0.93) versus 0.01 (1.01) p=0.002). A greater proportion of women with GDM than women without GDM reported avoiding foods high in fat and sugar (25.3% versus 5.7%, p<0.0005) and adding milk and milk products (53.4% versus 36.6%, p<0.0005). More women with GDM reported receiving information from a dietitian or nutritionist (27.0% versus 1.7%, p<0.0005) or obstetrician (12.6% versus 7.5%, p=0.007) compared to women without GDM. Differences were greater in women diagnosed before compared to those diagnosed after the antenatal interview (46.9% versus 6.0%, p<0.0005 for information received from a dietitian or nutritionist). More women with GDM reported to trust information from these health professionals and fewer trusted 'other' sources of information.

Conclusions: Dietary patterns and dietary adaptations are different in women with and without GDM. Women with GDM appear to trust and respond to dietary advice received from health professionals.





# Breakfast skipping is related to the inadequacy of vitamins and minerals intake among Japanese female junior high school students: A cross-sectional study

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#### Children and families (SIG)

Purpose: Breakfast skipping is a public health issue which affects the nutrient intake among adolescents worldwide. However, there have been few reports comparing intake and reference values to assess the deficiency of nutrient intake between breakfast consumers and skippers. Therefore, this study aimed to examine the relationship between breakfast skipping and adequacy of total habitual nutrient intake among junior high school female students.

Methods: The participants were 516 Japanese female junior high school students. Frequency of breakfast, lunch, dinner and snack eating per week were asked in the lifestyle questionnaire. The participants were classified into two groups according to the frequency of breakfast eating: breakfast consumers (7 times/week, n=427) and breakfast skippers (0-6 times/week, n=89). Dietary habits during the preceding month were assessed using a brief self-administered diet history questionnaire (BDHQ15y). Inadequacy of each nutrient intake was assessed by the cutpoint method, based on the estimated average requirement (EAR) for 14 nutrients (protein, vitamin A, vitamin B1, vitamin B2, niacin expressed as niacin equivalents, vitamin B6, vitamin B12, folate, vitamin C, calcium, magnesium, iron, zinc, and copper) and on dietary goal (DG) values for five nutrients (total fat, carbohydrate, total dietary fibre, salt-equivalents, and potassium) in the Dietary Reference Intakes for Japanese, 2015 version (DRIs).

Results: Breakfast consumers were likely to have lunch and dinner every day in comparison with breakfast skippers (both p<0.001). Additionally, the proportion of students eating snacks before dinner every day was significantly higher in breakfast consumers than in breakfast skippers (p=0.003). Adequacy of vitamin A, vitamin B1, vitamin B2, vitamin C, calcium, iron, zinc, and potassium were significantly higher among breakfast consumers than among skippers (all p<0.05). The total number of nutrients not meeting EAR among breakfast consumers was lower than that among breakfast skippers, while the total number of nutrients not meeting DG did not differ significantly between the two groups.

Conclusions: Our findings suggest that breakfast skipping was related to deficiencies in vitamin and mineral intakes among Japanese female junior high school students.





# LT.3.06 - Diet, physical activity and weight control

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# Transiting from army to civilian life: understanding the drivers of weight change in young adult men

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose A higher prevalence of obesity in men compared to women, particularly amongst those 18 to 40 years of age, has been observed in Singapore. We hypothesized that poor adaptation during the transition from obligatory military training to civilian life in our young men may contribute to weight gain and sought to understand the underlying drivers.

Methods In-depth interviews were conducted with 26 healthy, normal weight young men, who completed military service the previous year. The interviews were guided by the health belief model to elicit perceived factors influencing weight change during the transition period, and barriers and motivators in weight management. Data was collected and cross-checked by two researchers who analysed using the thematic analysis approach.

Results The participants generally perceived themselves to be less fit and healthy compared to being in army and felt that changes in their physical activity levels and eating behaviors were contributing to their perceived weight gain. They, however do not have immediate concerns about their weight changes, citing that effects were reversible or only observed later in life.

While most were aware of the benefits of regular physical activity, benefits of healthy eating were less mentioned. Many do not view these lifestyle behaviors as current life priorities, citing reasons such as a lack of time, poor fit into current lifestyle or having little self-motivation. Other barriers included peer influence on food choices and a lack of common leisure time to exercise with peers. Motivators for these lifestyle behaviors were mostly intrinsic, including interest in a particular sport, making a personal choice and having personal fitness goals. The need to compensate for the lack of physical activity or unhealthy food consumption through healthy eating was also mentioned. Extrinsic motivators were related to peer influence, accessibility to sports facilities and healthy food options and monetary incentives.

Conclusions There remains a need to educate our young men, particularly correcting their misconceptions about lifestyle, weight and health. A healthy environment and appropriate incentives would be important to facilitate lifestyle changes in these men, who are at risk of weight gain during this transition phase.




## Correlates of weight loss maintenance: a systematic review of weight control registries

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Several countries established weight control registries, with the aim of identifying the main sociodemographic, psychological and behavioral characteristics of individuals successful at weight loss maintenance in their contexts. The purpose of this study is to identify and systematically synthesize the correlates of the magnitude of weight loss maintenance (WLM) in successful weight loss maintainers.

Methods: A comprehensive search of peer-reviewed articles was conducted in three electronic databases: PubMed, Web of Science and SCOPUS (all articles published until November 2018). Searches included various combinations of the following terms: weight loss maintenance, weight control registry, national weight control registry, Portuguese, Greek, Finnish, German. Studies were selected for this review if the sample included participants of weight control registries. The MOOSE guidelines were used to extract relevant information. The methodological quality of the studies was assessed using the Effective Public Health Practice Project – Quality Assessment Tool for Quantitative Studies. All associations identified through Pearson and Spearman correlations were considered. In some specific cases, linear and multiple regressions, odds-ratio/relative risk and X2 (with post-hoc tests) were also considered.

Results: The search yielded 159 potentially relevant studies after title and abstract screening. After full-text screening, 52 articles met the eligible criteria and were included. Thirty sociodemographic, behavioral and psychological correlates of the magnitude of WLM were identified across 16 studies. Age was the only sociodemographic variable showing an association (negative) with the magnitude of WLM. Physical activity was the most frequently studied correlate (k=5) with all of the studies reporting a positive association with the magnitude of WLM. Energy intake and fat intake were identified as negative correlates (k=3), contrary to protein intake (k=1). General (k=3) and internal eating disinhibition (k=2) were identified as psychological negative correlates.

Conclusions: Behavioral and psychological factors seem to play a key role for maintaining weight loss, contrary to sociodemographic variables. Systematically identifying and summarizing the sociodemographic, behavioral and psychological correlates of the magnitude of WLM in successful weight loss maintainers can contribute to inform future obesity prevention and treatment initiatives towards better long-term outcomes.





## The Multiple Food Test: A New Online Tool to Measure Food Choices

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Measuring food choices in health and nutrition research is challenging. Given the trend that more and more research is conducted online, there is a strong need for reliable and valid measures that can be efficiently used in online research. Therefore, we developed the Multiple Food Test as a tool for measuring food choices in online and laboratory settings.

Methods: The Multiple Food Test is a picture-based selection task consisting of 18 trails. In each trial, participants see four food items (ranging from 1 = unhealthy to 4 = very healthy) and are asked to indicate which of the depicted foods they would choose to eat. Across all 18 trails a mean is computed that informs about the healthiness of choices. In three studies we examined the validity and reliability of the Multiple Food Test. In Study 1 (N = 425), the relationship between choices in the Multiple Food Test and health- and eating-related variables was assessed. Study 2 (N = 201) tested the validity of the Multiple Food Test via assessing its relationship to existing scales to measure related constructs. In Study 3 (N = 40), it was tested whether choices in the Multiple Food Test can predict real choice behavior.

Results: Study 1 revealed that healthier choices in the Multiple Food Test are related to viewing health as a changeable construct (p < .05), eating healthily more often (p < .01), viewing a healthy diet as more important (p < .01), and holding a stronger health versus taste motive (p < .001). In Study 2, positive relationships with self-control (p < .05) and habitual fruit (p < .001) and vegetable consumption (p < .05) were found. Study 3 showed that choices in the Multiple Food Test predict real food choice behaviour (p < .001).

Conclusions: The Multiple Food Test offers new opportunities to study variables or to evaluate interventions that influence food choices and eating behavior. Furthermore, it can be easily adjusted to cultural eating differences. Because the Multiple Food Test is nearly language free it can also be used to study children's food choices.





# No bouts about it: Comparing time spent walking in 10min bouts with total walking time

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Physical activity is commonly measured as time spent in bouts of at least 10 minutes, however each minute of physical activity (PA) achieved per day is now considered to be beneficial for health by breaking up sitting time, changing posture and adding to daily PA minutes. This study compared the difference in the self-reported total time spent walking in a week to time spent walking in 10 minute bouts over the same 7 day period through a university population sample.

Methods: A census-style, online survey was used to collect PA data from staff and students at The University of Sydney. One measure, from the validated Active Australia Survey (AAS) reports walking in bouts of 10min or more over seven-days, the second measure reports total estimated time spent walking over the seven day period. Data from n= 4582 was analysed and a paired t-test was performed to determine any difference between the mean time participants reported to walk in 10 min bouts and the mean total time they reported to walk over the same 7 day period.

Results/findings: Our finding suggests very strong evidence that more walking was done in short bursts of less than 10 minute bouts. Over a seven day period, participants engaged in a mean of 352 minutes of walking in total compared with 235 minutes of walking in 10 minute bouts. When comparing the reported minutes of walking in either 10min bouts or total minutes, there was a significant 117min/week difference (p<0.001).

Conclusion: Significantly more walking is done in short bursts across a week. Walking in this way contributed to an extra 16min/day of physical activity which is beneficial for health even when completed in bouts less than 10 minutes. Measuring total walking minutes rather than only in bouts of at least 10 minutes may provide a more useful estimate to monitor population trends and evaluate PA interventions.





## Development and testing of a new nutrition knowledge survey for Australian children ages 8-12: the CNK-AU

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Poor dietary habits are established in childhood and often persist into adulthood. As higher levels of nutrition knowledge has been found to be related to healthier eating patterns, there is a pressing need to enhance children's nutrition knowledge in Australia. However, interventions concerned with nutrition knowledge improvement need appropriate measurement tools to test their effectiveness. Unfortunately, few reliable and valid measurement tools exist and the aim of the current study was to develop and test a nutrition knowledge questionnaire for Australian children.

Methods: A team of nutrition and education experts developed a nutrition knowledge questionnaire for Australian children aged 8-12 years (the CNK-AU), based on an existing validated Belgian survey. The questions were translated and adapted to align with Australian culture and national dietary recommendations. The CNK-AU was test for content-, internal- and external validity among primary school children aged 8 to 12.

Results: The new tool consists of eight nutrition-related topics (i.e. healthy choices, AGHE serves, balanced meals, portion sizes, food safety, -groups, -functions and -sources). Year 5/6 students at a primary school in Newcastle, Australia were recruited and completed the nutrition knowledge survey twice; at baseline (T0: n=186, age=10.9, SD=0.76, 56% female) and after one week (T1: n=94, age=10.9, SD=0.76, 53% female). Teachers were asked not to teach any nutrition during the study. It was possible to pair 94 of the participants with their results on the T0 CNK-AU, as the remaining participants were sorted into the intervention arm of a simultaneous nutrition education program. Content was validated in a previous pre-test, item-analyses found varied item difficulty and discrimination, the internal reliability was low to moderate for all categories and the total score. A test-retest showed all (except 'AGHE serves') categories and total score of T0 and T1 to be significantly correlated ( $\Delta M=0.646$ , r=0.756,p<0.001), confirming the test-retest validity of the survey.

Conclusions: Using the item analysis results, future studies should establish a shorter version of the CNK-AU and in addition test the CNK-AU on a younger population. The test-retest shows the CNK-AU is reliable, but indicated AGHE serves as a gap in the children's knowledge.





## Co-producing a physical activity programme for women with previous gestational diabetes using a secret Facebook group

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Co-production is reliant on consensus between participants, but in-person meetings and workshops are nearimpossible for time-constrained and hard-to-reach groups. An innovative new method of consensus-gathering was needed to further understand physical inactivity and how to intervene in a time-constrained group. A lay advisory group meeting resulted in the decision to hold a workshop over a secret Facebook group with participants to develop a theory of change and theory of action.

Purpose: To test the feasibility using a secret Facebook group to co-produce an intervention with a time-constrained group, women with previous gestational diabetes.

Methods: The researchers created a secret Facebook group with content that sequentially progressed to develop a programme theory. We evaluated the feasibility and acceptability of the group by analysing Facebook analytics and a post-workshop survey. The researcher posted 1-2 times per day for 14 days. Messages and content were typically posted between 15:30 and 17:30 GMT, as suggested by the lay advisor group as mothers will be returning from work and may have a short break before dinnertime.

Results: Twenty-one participants took part. In total, 521 comments were provided in response to 18 posts of polls, video, text or photos (average = 28.9 comments per post). The total word count of participant comments was 21,142 words. The workshop was viewed positively, with 20 of 21 participants saying they liked the workshop somewhat or a great deal, and felt the group was a safe and open environment to share opinions. When asked if they would take part in something like this again, 15 of 21 said "Yes". Participants mentioned the format was convenient to fit into their day; it allowed them to reflect on their own experiences; and how they liked helping research progress. The six participants who didn't reply "yes" said it was still difficult finding time and it depended on what else was going on.

Conclusion: Using a secret Facebook group to develop a physical activity interventions proves to be a feasible and acceptable method. This holds significant potential for a diverse group of hard-to-reach groups who could benefit from this method of co-production.





## A social network analysis of power in the policymaking process to restrict unhealthy food and beverage products to children in Mexico

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Background: Social network theory offers explanations for how relationships among actors influence action. Effective policies to prevent obesity and achieve the 2013 World Health Organization goal to reduce non-communicable diet-related (NCD) mortality rates by 25% by 2025 are dependent on social networks composed actors able to enact power and positively influence the policy making process. However, there is limited evidence on the nature of the connections among actors involved in food and nutrition policies. The goal of this study is to explore the dimensions of power in the social networks of actors who influence the policy making process to restrict unhealthy food and beverage products to children in Mexico.

Methods: The study uses the Gaventa's powercube framework developed by the Institute of Development Studies. This research collects a social network data using semi-structured interviews based on a snowball sampling method to identify relevant actors in networks of interest. For network data, we conduct 2-mode analysis to examine which actors are most powerful and how correlated various power networks are with one another. To analyze we use measures of centrality (in-degree, betweenness, and eigenvector) and Quadratic Assignment Procedures (QAP). To visualize the networks structures and actor relationships graphs are generated using UCINET software package.

Results: The results map actors into power networks (e.g. levels, spaces and forms of power) and connectedness networks (e.g. relationships). This study highlights the dynamics of power in the policy making process between and within actors from Mexican government, academia, civil society, private foundations, international non-governmental organizations, media, and food and beverage firms or industry trade associations. This network analysis identifies interactions and power dynamics between the actors that may influence decision-makers and the policy process.

Conclusion: Social network analysis provides a powerful method that can be used in policy research to improve nutrition, physical activity, and sedentary behaviors among populations. This study provides insights to help policymakers and other actors to develop strategies to increase support to effectively implement supportive policies that protects children, prevent and manage obesity and NCDs.





## Using arts-based methods as enquiry for non-communicable disease prevention in Tanzania and Malawi

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Sub-Saharan Africa (SSA) is experiencing a rapidly-increasing epidemic of chronic non-communicable diseases (NCDs). By 2030, NCD mortality is expected to overtake combined communicable, maternal and perinatal disease mortality. Effective NCD prevention interventions require careful understanding of local NCD drivers, which are complex and influenced by many socio-cultural (including lifestyle) factors. For example, physical inactivity is associated with higher socio-economic status in Tanzania and Malawi, and a larger body size culturally valued. Meanwhile, western influence is leading to increased consumption of processed, high sodium, energy-dense foods and sugar-sweetened drinks. Arts-based activities have been used in socio-culturally appropriate communicable disease prevention (e.g. HIV/AIDS), but little attention has been paid to using arts for NCD prevention. This study aimed to explore the role of arts in understanding local communities' lived experiences of NCDs and NCD lifestyle risk factors to inform socio-culturally sensitive NCD interventions.

Methods: A participatory approach with communities in Tanzania and Malawi to inform a new arts-based methodology (ABM) for exploring local socio-cultural contexts around NCDs/NCD risk factors. The ABM was piloted in four creative workshops (CWs: each N=7-9, men and women separately) involving three activities: verbalised senses, embodied images and performance. We also held four traditional focus group discussions (FGDs: each N=8-10, men and women separately). Thematic analysis of researcher reflections, fieldnotes and written transcripts compared the two methods.

Results: Workshop participants chose to explore diabetes (Tanzania men and women), cancer (Malawi women), and hypertension (Malawi men) as NCDs of major concern locally. ABM activities allowed participants to depict local practices and beliefs around food and drink (including alcohol), physical (in)activity and obesity. When compared to FGDs, the CWs appeared more inclusive, promoted engagement and supported community members to direct the enquiry. Through the ABM, participants expressed values, sentiments and fears in relation to NCDs ("Snake's poison is similar to diabetes' poison" CW\_men\_Tanzania) more freely than in FGDs. However, these (often negative) expressions may precipitate stigma and blame.

Conclusions: The ABM provides a promising approach to inform development of socio-culturally appropriate NCD prevention interventions, but further reseach is needed and careful attention required to minimize risk of unintended consequences.





# Optimising the daily activity mix for best overall health: a new approach to informing activity guidelines

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Current evidence for optimal activity durations is largely limited to studies exploring one activity in relation to one health outcome. But daily activities are intrinsically linked – one activity cannot change without other activities also changing to compensate. In addition, the best mix of daily activities may differ across health outcomes. This study aimed to develop novel analytical methods to optimise the mix of daily activities for multiple health outcomes.

Methods: Participants (n=664, 11-12 y, 50% boys) were from the Child Health CheckPoint module of the Longitudinal Study of Australian Children. Daily activity behaviours (sleep, sedentary time, light physical activity [LPA] and moderate-to-vigorous physical activity [MVPA]) from 8-day, 24-h accelerometry were expressed as isometric log-ratios. Outcomes were composite z-scores for fitness (VO2maxfrom cycle ergometry and standing broad jump) and fatness (measured waist-to-height ratio, body mass index and body composition [fat-to-fat free mass isometric log-ratio]). Compositional linear models regressed activity behaviour isometric log-ratios against fitness and fatness scores, adjusted for age, sex, puberty and socioeconomic status. The models were used to predict fitness and fatness for all possible empirical activity mixes. The best quartiles of activity mixes (optimal time-use zones) for fitness and fatness were plotted in quaternary tetrahedrons. The overlapping area of optimal fitness and fatness zones was described as the overall optimal time-use zone.

Results: The daily activity mix (isometric log-ratios) was associated with fitness and fatness (both p<0.001). The optimal time-use zones for both outcomes had relatively high MVPA and low sedentary time, but the optimal zone for fitness had higher LPA and lower sleep than the optimal zone for fatness. The overall optimal time-use zone for fitness and fatness was between 9.0 and 10.7h sleep; 7.3 and 10.0h sedentary time; 2.5 and 4.8h LPA; 1.8 and 2.5h MVPA.

Conclusions: The analytical methods developed in this study offer a way to optimise the mix of daily activities for multiple valued health outcomes. Findings provide evidence to underpin 24-hour activity guidelines and lifestyle behaviour interventions. Future work will refine models using machine learning, non-linear response surfaces, higher-dimensional activity compositions and a wider range of health outcomes.





# UPnGO with ParticipACTION: A process evaluation of the commercialization of a physical activity intervention for the workplace

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: UPnGO with ParticipACTION (UPnGO) is a 1-year Canadian workplace physical activity (PA) intervention to increase habitual PA (steps) at work. Core intervention components include (1) self-monitoring of steps and action planning behaviours using a web/mobile app with incentives and (2) organizational support, including senior management's role modeling and program endorsement. After piloting, UPnGO was made available nationally to companies for a fee (~\$100/employee). The purpose of this study is to describe the process evaluation of the commercialization of UPnGO.

Methods: The process evaluation was guided by the RE-AIM framework. Platform analytics were used to determine registration, engagement, and PA through daily step counts. Off-platform surveys collected self-reported PA at baseline and 12 months of the program. Field notes were taken by the evaluation team during the program.

Results: Reach: In the first 2 years, 17 companies from 6 provinces paid to participate in UPnGO. These companies varied in size (30-4100 employees) and structure including municipalities, health authorities, and corporate offices. Engagement: Across these companies, 1362 participants registered for UPnGO, representing 21% of 6393 total employees. At baseline, 69% of participants did not meet PA guidelines and 46% of respondents sat for  $\geq$ 6 hours during the workday. Adoption: Significant declines were observed in daily step count at 12 months (Baseline: 7879±3802 steps, 12-Months: 7131±3615 steps; p=0.002). Program engagement, measured by unique platform logins, averaged 49% of users over 12 months; however, engagement declined from 94% in Month 1 to 31% in Month 12. Monthly step tracking rates ranged between 32%-43% of participants. Implementation: Evaluator observations revealed senior leadership support, identified as a key factor in the success of the pilot, was not tracked in the national implementation. Company expectations for a purchased product did not meet available resources for supporting implementation. Maintenance: Two organizations renewed their contract beyond the first-year commitment.

Conclusions: The commercialization of UPnGO has demonstrated limited success. Initial adoption and reach of the program were successful; however, engagement and steps significantly declined over 12 months. UPnGO is being modified to further explore the viability of commercializing workplace PA interventions.





## LT.3.07 - Health impacts on older adults

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# Digitally supported dietary counseling increases protein intake in community dwelling older adults: subgroup-analysis of the VITAMIN RCT.

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#### Ageing (SIG)

Purpose: For prevention of sarcopenia and functional decline in community dwelling older adults, a higher daily protein intake is needed in addition to increased exercise. A new e-health strategy for dietary counseling was used with the aim to increase total daily protein intake to optimal levels (minimal 1.2 g/kg/day, optimal 1.5 g/kg/day) through use of regular food products.

Methods: The VITAMIN (VITal AMsterdam older adults IN the city) RCT included 245 community dwelling older adults (age  $\geq$  55y): control, exercise, and exercise plus dietary counseling (protein) group. The dietary counseling intervention was based on behavior change and personalization was offered by a dietitian coach, by use of face-to-face contacts and videoconferencing during a 6-month intervention. Dietary intake was measured by a 3d dietary record at baseline, after 6-month intervention and 12-month follow-up. The primary outcome was average daily protein intake (g/kg/day). Sub-group analysis and secondary outcomes included daily protein distribution, sources, product groups. A Linear Mixed Models (LMM) of repeated measures was performed with STATA v13.

Results: Mean age of the 224 subjects was 72.0(6.5) years, a BMI of 26.0(4.2) and 71% were female. The LMM showed a significant effect of time and time\*group (p<0.001). The dietary counseling group showed higher protein intake than either control (1.41 vs 1.13 g/kg/day;  $\beta$  +0.32; p<0.001) or exercise group (1.41 vs 1.11 g/kg/day;  $\beta$  +0.33; p<0.001) after 6-month intervention and 12-month follow-up (1.24 vs 1.05;  $\beta$  +0.23; p<0.001 | 1.24 vs 1.07  $\beta$  +0.19; p<0.001). Additional analysis revealed the higher protein intake was fully accounted for by animal protein intake.

Conclusions: This study shows digitally supported dietary counseling improves protein intake sufficiently in community dwelling older adults with use of regular food products. Protein intake increase by personalized counseling with e-health is a promising strategy for dietitians with the upcoming rising ageing population. Keywords: Ageing, Behavior change, Nutrition, Physical Functioning, Sarcopenia





# Recruiting older people to physical activity programs: analysis of a novel approach used in the Coaching for Healthy Ageing (CHAnGE) trial

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#### Ageing (SIG)

Purpose: Recruitment into physical activity programs can be difficult and as such, challenges and successes in recruitment strategies should be explored in process evaluations of clinical trials. The CHAnGE trial, is a 2-arm cluster RCT of healthy ageing, targeting recruitment of established community groups in a metropolitan (Sydney) and regional (Orange) location in Australia. Groups of participants were randomised to receive either a physical activity behavioural intervention or a nutrition intervention. This study summarises the recruitment approach and highlights key effective aspects and barriers.

Methods: Community groups e.g. service, social, sports, religious, retirement villages were approached and if agreeable, a talk on healthy ageing was provided by research physiotherapist at their regular meetings.

In order to engage with possible participants with different values we took a holistic approach and spoke about healthy ageing rather than fall prevention or physical activity alone. At the end of the talk, group members were invited to participate in the 12-month trial, with expressions of interest recorded and followed up later to confirm interest and eligibility.

Results: Six hundred and six participants were recruited (mean age 72 (SD 7.3), 426 (70%) females) from 72 community groups between September 2015 and September 2018. Forty-two groups participated in Sydney (306 participants, representing 48% of those attending group presentations) and 30 groups in Orange (300 participants, 44% of those attending presentations). Recruited groups ranged in size from 4 to 17 participants.

The successful aspects of the approach include the emphasis on healthy ageing broadly at group presentations. Spending time talking individually with potential participants after the presentation was also important. The participation of many community groups at the regional site indicates that future studies should consider sites in regional locations as older people there seem open to research.

One challenge with this recruitment approach was the required delay in randomising participants until all within each cluster had completed baseline measures.

Trial results will be explored to determine if group-based recruitment influenced people being active together.

Conclusions: Direct approaches to community-based groups is a useful way to recruit older people to health coaching interventions within regional and urban centres.





## The impact of sedative load on movement behaviour of older adults in residential aged care.

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### Ageing (SIG)

Purpose: Physical activity across the lifespan is important, and for older adults specifically, it is important to be physically active and break up sedentary time, as a means of maintaining function and preventing the development of major mobility disability (MMD). For older adults, particularly those in residential aged care, medications with anticholinergic or sedative effects are frequently used, but can affect cognition and increase the risk of falls and adverse events. The purpose of this study was to examine the impact of medications with sedative effects on movement behaviour.

Methods: Twenty-eight older adults (68 to 97 years; 23 females) living in residential aged care in metropolitan Australia participated. Medication data were collected from participants' medical charts and anticholinergic burden and sedative load were determined. Seven-day movement behaviour was objectively assessed by a wrist-worn triaxial accelerometer (GENEActiv). Raw accelerations were converted to sleep, sedentary time, and time in light, moderate, and moderate-to-vigorous physical activity, using a purpose-designed program, Cobra Processing. Stepwise regression analysis was performed to assess the relationship between anticholinergic or sedative load and movement behaviour.

Results: Cross-sectional analysis indicates that anticholinergic burden was not associated with movement behaviour; however, sedative load was, accounting for 27% variance in moderate intensity physical activity (r2 change = 0.27, Beta = -.45, p<0.01) and MVPA (r2 change=0.27, Beta = -.46, p<0.01). The mean number of medicines used per participant was ten. Participants spent 50.3% of their day sedentary and 44.2% of their day sleeping, with only 5.5% of their day spent being physically active, on average.

Conclusions: The findings of this study suggest that sedative load due to medicine use may have a negative impact on an individual's movement behaviours. Using accelerometers, to objectively examine the movement behaviours of older adults in residential aged care facilities, may enable monitoring of sedative load and its subsequent impact on movement behaviours. This may contribute to the maintenance of movement behaviour sufficient to prevent the development of major mobility disability (MMD).





## Participation in sports and active recreation in mid-age Australian adults

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#### Ageing (SIG)

Purpose: The WHO Global Action Plan on Physical Activity and Health 2018-2030 advocates the promotion of participation in sports and active recreation is an essential strategy for increasing population levels of physical activity across the lifespan. The aims of this study were to 1) describe participation in specific sports and active recreation by gender and age in a cohort of mid-age Australian adults; and 2) investigate whether participation in sports and recreation is associated with achieving current physical activity guidelines.

Methods: We analysed data from 10,809 participants in the HABITAT study, a population-based cohort of adults aged 40-65 years in 2007 and living in Brisbane, Australia. Mail- surveys in 2007, 2009 and 2011 were used to collect data on the frequency of participation in 15 recreational sports and active recreation in the past 12 months, and time spent physical activity overall.

Results: At baseline, home-based exercises (26.0%), weights exercises (19.4%), and running (16.3%) were the most commonly reported weekly activities, with slight differences between men and women. Frequencies were higher among men than women for running, cycling, golf and team sports, and higher in women than men for home-based exercises, exercise classes, swimming and yoga/Pilates/t'ai chi/qigong. Reported weekly running, cycling, swimming, participation in team sports and weight training decreased with age, while participation in golf and lawn bowls increased with age. Over 60% of participants achieved the current recommendations for physical activity ( $\geq$  500 MET.minutes/week). Overall, those who reported participation in sports and recreational activities were more likely to meet current recommendations for physical activity, than those who did not.

Conclusion: In this large population-based cohort of mid-age Australian adults, the participation in a wide range of recreational sports and active recreation varied by gender and age. These findings support the notion that increasing participation in sports can be beneficial for achieving physical activity guidelines and, consequently, improve health in mid-age.





# Higher levels of physical activity buffered the negative effect of pain severity on an index of physical functions in older adults

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Ageing (SIG)

Background: Chronic pain is associated with a reduction in physical functionality and higher levels of disability in older adults. On the other hand, an increase in physical activity has been shown to improve physical functions in frail older adults. This cross-sectional study examined if physical activity buffered the effect of chronic pain on the physical functions in older adult adults.

Methods: Study participants were 116 adults (mean age 71.27 (SD 6.64), 73% female, 57% Hispanic/Latino) recruited from a community center for older adults. The participants performed the five-time sit to stand, 6-minute walk for distance, and forward lean test, which were summarized as an index measure of physical functions. The Brief Pain Inventory was used to measure pain severity and pain interference. Levels of physical activity were evaluated as meeting or not meeting the physical activity recommendation (150 minutes of moderate and vigorous physical activity a week) by accelerometry. A hierarchical regression on physical function index was performed, separately for the pain severity and pain interference. In step 1, age, gender, obesity status, poverty status, and race/ethnicity were entered in the model; in step 2, pain severity (or pain interference) score was entered in the model; in step 3, levels of physical activity was entered in the model; and in step 4, an interaction term between physical activity and pain severity (or pain interference) score was entered in the model. The level of significance was set at p < .05.

Results: There was a significant interaction between the levels of physical activity and pain severity score (B=.12, p <.037, 95%CI .008,.238) in the regression model on the physical function index. This result suggested that higher levels of physical activity buffered the negative effect of pain severity in older adult's level of physical functions. No mediation effect of physical activity was found between the physical function index and pain interference score.

Conclusion: Higher levels of physical activity were associated with a protective effect on declining physical functions among older adults experience high levels of severity of pain.





# Temperament and physical activity from adulthood to midlife – Northern Finland Birth Cohort 1966

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#### Ageing (SIG)

Purpose Temperament and physical activity (PA) and sedentary behavior (SB) have been studied in children, but less is known about these associations in midlife. The present study examined association between temperament traits, self-reported and objectively measured PA levels and sedentary time in midlife.

Method The study comprised 5049 subjects from the Northern Finland Birth Cohort 1966. In this study temperament was measured with Cloninger's Temperament and Character Inventory (TCI).TCI includes four dimensions of temperament [Novelty seeking (NS), Harm avoidance (HA), Reward dependence (RD), Persistence (P)] and their subscales. Cluster analysis was used to identify groups that have similar temperament traits. LTPA was self-reported with the following question: how often and for how long do you participate in light and brisk physical activities/exercises during leisure time.PA was objectively measured at the age of 46 using wrist-worn uniaxial accelerometer (Polar Electro Ltd, Finland. The participants were instructed to wear the activity monitor 24 h/day for 14 days on their non-dominant hand. Measured PA was classified at four levels (SED: 1-1.99 MET, light: 2<3.49 MET, moderate to vigorous:  $\geq$ 3.5 MET and total PA $\geq$ 2.0 MET). Daily sitting time (ST) was assessed by self-administered questionnaire. The one-way analysis of variance was used to determine whether there were statistically significant differences between the PA levels and SB amongst temperament clusters. Also linear regression analysis was used to analyse the statistical significance of the association between individual temperament dimensions, PA at different intensity levels and time spent sedentary.

Results Individuals with high HA reported lowest brisk PA levels in both genders. Similar findings was observed with objective measurement, however statistically significant differences were observed only among women. Participants with high NS reported highest ST in both genders. Post hoc comparison showed that the SED was statistically significantly lower among women with high P and RD compared to individuals with high NS.

Conclusion This large population-based study indicate that there are temperament-specific differences in physical activity levels and sedentary behavior. The findings of this study can be used in identifying adults who are heightened risk for sedentary lifestyle.





# The BEST at Home Program: a scalable home-based physical activity program to promote healthy ageing in community-dwelling older people

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### Ageing (SIG)

Purpose: There is strong evidence that exercise can reduce falls in community-dwelling older people, but low rates of population uptake highlight a need for innovative broad-reaching strategies to increase participation in effective programs. Home-based programs appeal to some older people due to their low cost and convenience. The Otago Exercise Programme is an evidence-based home-based falls prevention program involving balance and strength exercises, however it's delivery, involving five nurse or physiotherapist home visits, means that it may be too expensive for widespread implementation.

We developed the BEST at Home Program, comprising lower limb exercises targeting balance and strength (based on the Otago Programme) and exercises to improve shoulder function, with the aim of preventing falls and promoting healthy ageing. In order to reduce the burden on health service resources BEST at Home exercise programs are delivered via three group-based exercise workshops led by physiotherapists and involving 12 participants per group.

This study evaluated participant impressions of the BEST at Home Program to inform possible future scale-up and implementation.

Methods: Design: Process evaluation from a randomised controlled trial.

Participants: Community-dwelling people aged 65 years and over, living in Illawarra and Shoalhaven regions of New South Wales, Australia.

Measures: Perceived program benefit (rating out of 10), confidence to complete exercises at home (proportion of people), intention to continue exercise program (proportion), and recommendation of the program to others (proportion).

Analyses: Descriptive statistics were used to summarise participant responses.

Results: Four hundred and seventy three participants (mean age 72.9, SD 6.0) were included in the analyses. The mean rating of program benefit was 7.6/10 (SD 2.2). At three-month follow-up, 436 participants (97%) felt confident completing the exercises at home, and 374 (80.8%) intended to continue to do the exercises. Overall, 435 (93%) of participants would recommend this program to other people aged 65+.

Conclusions Participation, acceptance and perceived benefit of the BEST at Home Program was high. This innovative method of delivery has potential for translation into population-level delivery models for older people which could be integrated within existing health services.





# Stand When You Can: Development and Pilot Testing of a Multi-Level Intervention to Reduce Sedentary Time in Assisted Living.

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### Ageing (SIG)

Purpose: As older adults transition to assisted living, the need to complete domestic chores is removed and many people accumulate excessive sedentary time which can increase the risk of functional decline. The purpose of this study was to develop and pilot test an intervention to reduce sedentary time (ST) and increase breaks in ST in assisted living residences (ALR).

Methods: Intervention strategies were developed based on a review of literature and focus groups with AL residents (N=31). Residents discussed barriers and motivators for reducing ST; many were individual (e.g.: lack of motivation, pain, fatigue) while others were associated with the organizational and social environment, including safety concerns, lack of evening and weekend activities, and social norms that promote sitting. Thus, the Stand When You Can (SWYC) intervention was developed to target multiple levels of the social ecological model by promoting individual behaviour change, modifying the social and physical environment, and encouraging organizational changes. Potential strategies were presented to AL staff (N=16) for expert validation. Ten residents (82.2 ± 8.7 years; 90% female) at two different ALRs participated in a 6-week pilot study of SWYC. Participants completed pre- and post-intervention assessments of physical function [Short Physical Performance Battery (SPPB)], quality of life (QoL)[EQ-5D and ICECAP-O questionnaires], and daily movement behaviour [activPAL4 and self-report].

Results: Post-intervention consultation with residents and staff suggested SWYC is feasible and acceptable, but better staff education and engagement is necessary to achieve organization-level change. Although there were no improvements in function or QoL in the whole sample, participants in one ALR (N=5) demonstrated a clinically meaningful increase in SPPB over 6 weeks (p = 0.035). There were no significant changes in device-measured ST and there was a non-significant decrease in self-reported sitting (142 minutes/day; p=.086).

Conclusions: Most ST interventions for older adults target only individual behaviour change, but SWYC is a novel, multi-level approach to reduce ST and promote more standing and moving. SWYC is evidence-based and co-created, with good potential for low-cost implementation and scale-up. Preliminary results suggest that with a longer intervention SWYC could help delay functional decline among older adults in assisted living.





## Can you be age-friendly without active transportation infrastructure in your city?

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Ageing (SIG)

Purpose: To understand the perceived constraints that older adults must negotiate to engage in active transportation, and to determine whether these perceptions of constraints align with characteristics of the built environment.

Methods: We used a mixed-methods design. Nine semi-structured focus groups were conducted with a culturally and socioeconomically diverse group of older adults (n=52). An online survey was circulated to older adults in the same city (n=110). Using postal code data, survey data were linked with Active Living Environment data from the Canadian Urban Environmental Health Research Consortium and WalkScore data on walkability, cycling, and public transit. Newell's model of constraints was used to inform the analysis of the focus group data, and the development of the survey.

Results/Findings: Three main themes were identified: constraints (environmental, individual, and task) and the interactions between constraints, neighborhood perception, and promoters. Interactions were observed between each type of constraint, indicating that non-modifiable (e.g. functional ability) interacted with modifiable constraints (e.g. weather or icy sidewalks). Older adults of low socioeconomic status as well as those who were new to Canada had more positive neighbourhood perceptions. Many older adults indicated that the constraints to active transportation were so significant, that it limited their mobility in their community.

Data from the survey and linked environmental datasets indicated clear differences between the different neighbourhoods examined. The top five constraints cited by residents of each of the neighborhoods varied, and indicated some interesting trends. In particular, in one of the neighbourhoods examined, 100% of the participants indicated that a lack of bike lanes with barriers was a constraint to active transportation. This aligned with the neighbourhood's low bike score (37.4); the lowest bike score of the four neighbourhoods examined. This neighbourhood also had the lowest points of interest (34.8) but none of the constraints to proximity or density were constraints; this may be because residents rely on personal vehicles as active transportation is simply is not feasible.

Conclusions: Data from these two studies indicate that understanding and investing in active transportation is essential to building a truly age-friendly community.





## From Seat to Feet: A participatory action approach to developing a sedentary behavior intervention for older adults

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#### Ageing (SIG)

Purpose: Older adults' perceptions about sedentary behavior (SB) are often inconsistent with current messaging regarding the negative effects of SB. This may limit the effectiveness of SB interventions through traditional "top-down" approaches. Therefore, in this study we developed an intervention to reduce SB in inactive older adults using a collaborative approach driven by older adults' perspectives.

Methods: Community-dwelling older adults (N=4; age=78.3 $\pm$ 7.2) were recruited from a local community center to co-create a SB intervention with researchers. Using a participatory action research (PAR) approach, the intervention was developed with participants over the course of 7 interactive weekly meetings. Each 90-minute meeting followed a semi-structured outline and discussion guide to address a specific topic or aspect of the intervention development. The Heath Action Process Approach was utilized as a guiding theory. Data were collected using audio recording, questionnaires, worksheet tasks, and field notes. Following each meeting, the audio recording was transcribed and data were coded, segmented into categories, and grouped into themes. The findings were summarized in a narrative form and member-checking of the data was performed the following week. The intervention was finalized at the last meeting and then reviewed by a separate focus group (N=6; age=75.0 $\pm$ 4.1). Feedback from the focus group participants was used to revise the implementation procedures and refine the intervention workbook and worksheets.

Results: Participants co-created an 8-week SB intervention tailored to inactive community-dwelling older adults. Key components of the intervention included: a workbook that includes both educational resources and worksheets to encourage and support behavioral change, multiple home and telephone visits, activities to build self-efficacy, goal-setting and action-planning activities, self-monitoring, journaling, and strategies to interrupt SB. Emerging themes included the importance of social support and flexibility in the implementation of the intervention. As the development of the intervention progressed, participants expressed a growing sense of ownership and empowerment over their work.

Conclusion: Using a PAR approach to co-create a SB intervention for older adults shows promise and may improve the relevance and appropriateness of these programs. Further research is needed to evaluate the feasibility of the developed intervention.





## LT.3.08 - Lightning talks on behavioral nutrition and physical activity

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# Neighbourhood fast food exposure and fast food consumption: The mediating role of neighbourhood norms

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Other

Purpose: The relationship between the fast food environment and diet has gained growing attention, but it remains poorly understood how the food environment relates to eating behaviours. There are initial indications that the physical food environment contributes to social consumption norms, yet, this has not been studied on the neighbourhood level. This study aimed to investigate residents' neighbourhood fast food consumption norms as a potential mediating pathway between residential fast food outlet exposure and consumption.

Methods: A cross-sectional study was conducted. A nationwide sample of 1038 respondents living across the Netherlands recruited through a panel bureau completed a survey. Respondents reported their fast food consumption (amount/week) as well as descriptive and injunctive norm perceptions regarding fast food consumption in their neighbourhood. The Locatus database provided addresses of all fast food outlets in the Netherlands. Fast food exposure was measured as the count of fast food outlets within a 400m street-network buffer around the respondents' zip-codes. Regression models were used to assess associations between fast food exposure, fast food consumption, and norm perceptions. A bootstrapping procedure was used to test indirect effects.

Results: There was no direct association between fast food exposure and fast food consumption (OR=1.02, p=.22). Residential exposure to fast food outlets was positively associated with descriptive norms (B=.05, p<.001), and injunctive norms (B=.03, p<.001), which in turn were associated with increased odds of consuming fast food (OR=1.16, p=.03, and OR=1.44, p<.001, respectively). There wasevidence of indirect effects of fast food exposure on fast food consumption, via descriptive norms (B=.01, 95% CI =.0003 to .013) and injunctive norms (B=.01, 95% CI =.004 to .017).

Conclusions: Individuals who have a higher residential availability of fast food outlets, perceive fast food consumption in the neighbourhood as more common and appropriate. Future research may explore how the changing food environment may shift consumption norms. Insights may support policymakers in urban planning to develop healthier neighbourhoods and ultimately stimulate healthier consumption.





## Summer body composition trajectories of young adolescent children

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#### Other

Objectives: Accelerated gains in weight, particularly age and sex-specific body mass index (zBMI), during summer break from school are well established in elementary age children (6-11yrs.). It is unclear if young adolescents (12-14 yrs.) experience increases in zBMI or percentage body fat (%BF) during summer break. This study examined the summer trajectories of zBMI and %BF via bioelectrical impedance (BIA) in a sample of young adolescents.

Methods: Two middle schools in the southeastern United States participated in this observational study. Measures of height, weight, and %BF measured via the Tanita DC-430U (Tanita Corporation of American, Arlington Heights, IL) were conducted in the spring (T0), just before summer break from school, and again in the fall (T1), as students arrived for new school year approximately 12 weeks apart. All students who provided body composition measures were included in this analysis. Separate multilevel mixed effects linear regression with measures nested within participants estimated change in zBMI and %BF. Age, sex, and race/ethnicity were included in the models as covariates. A sex-by-time interaction was included to examine differences in zBMI and %BF change over summer by sex.

Results: A total of 73 adolescents (45% female, 52% non-white) were measured at both T0 and T1. At T0 (baseline). Unadjusted regression models showed zBMI and %BF increased over the summer by 0.09 (95%CI 0.02, 0.15) and 1.37% (95%CI, 0.69, 2.04), respectively. Adjusting for age, sex, and race/ethnicity, %BF increased over the summer by 2.13% (95%CI=0.28, 3.99), but zBMI showed no statistically significant increase (0.03, 95%CI=-0.16, 0.23). Sexby-time interactions indicated no statistically significant difference in %BF or zBMI change by sex.

Conclusions: Summer appears to be associated with increases %BF in young adolescents and possibly increases in zBMI. It is unclear if this represents an acceleration in %BF and zBMI gains when compared to the school year. To understand and compare summer vs. school body composition change, a third measurement is planned in the spring of 2020 following school.





# SuperShelf: Can food pantries adopt a more nutrition-focused and client-centered approach?

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Othe

Purpose: SuperShelf transforms food pantries, creating welcoming environments for communities to access healthy, appealing foods. Using a 6-step process, SuperShelf goes beyond typical behavioral economics-based interventions and supports both nutrition and client-centered practices by considering how food-insecure individuals may make choices in food pantry settings. SuperShelf methods aim to make the healthy choice the easy choice, while respecting individual preferences, cultural appropriate options, and creating a dignified experience. This presentation will focus on the feasibility for pantries to implement practices that are both nutritionally focused and client-centered, as measured by an environmental implementation tool.

Methods: The SuperShelf evaluation is an NIH-funded study conducted in two waves. Pantries (n=16) are randomized into "transformation" or "delayed-transformation" groups and evaluated over one year. Implementation is measured by a pre/post tool (total score range 0-100), comprised of four subscores that measure practices encouraging healthy choices while respecting individual preferences: stocking standards (29 points), healthy food prominence/appeal 21 points), unhealthy food placement/competition (22 points), and aesthetics/use of space (28 points). We measured all 16 food pantries with the implementation tool pre/post and calculated changes in total scores and subscores.

Results: Among wave 1 pantries (n=8), transformation site implementation scores increased 32.1 points on average, while delayed-transformation site decreased 1.2 points on average. All four subscores also increased among transformation sites and delayed-transformation sites did not change. For example, the healthy food prominence subscore increased an average of 6.5 points and the unhealthy food placement subscore increased an average of 6.6 points, while the delayed-transformation site subscores decreased less than 1 point each. Results from all 16 pantries will be presented.

Conclusion: Score changes in the transformation groups indicate adoption of the SuperShelf model. Although interventions in food pantry settings are challenging, implementation of an intensive model such as SuperShelf is possible and shows promise for improving health equity and the client experience among food insecure populations. Additional evidence evaluating implementation and the factors that translate to a more client-centered food pantry are forthcoming.





# Are all jobs equal? Work-related physical activity and psychological distress among women in different occupations.

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Othe

Purpose: Current physical activity guidelines encourage individuals to be active during any life domain. However, recent evidence shows that work-related physical activity does not have the same mental health benefits as leisure-time physical activity. This is particularly important given that many people participate in large amounts of work-related physical activity without engaging in any leisure-time physical activity. Work-related physical activity however is likely to include a variety of different behaviours for people with different occupations. As such, the purpose of this study was to determine if occupation type moderated the association between work-related physical activity and psychological distress.

Methods: A randomly selected sample of 1,080 women from Melbourne, Australia completed the International Physical Activity Questionnaire (IPAQ) and General Health Questionnaire (GHQ-30), and reported their current occupation.

Results: Linear regression analyses indicated that occupation significantly moderated the association between work-related walking and psychological distress (F [8, 55] = 2.26, p = .036). Given evidence of moderation, we fitted linear regression models to test the associations between work-related physical activity and psychological distress for three separate groups: professionals, sales and services workers, and tradespersons. Female tradespersons who engaged in a low (B = -3.81, p = .006) or high amount of work-related walking (B = -3.23, p = .029), had significantly lower psychological distress symptoms than those who engaged in no work-related walking. There were no significant associations between work-related physical activity of any intensity and psychological distress for professionals, or sales and service workers.

Conclusions: Physical activity at work is not consistently associated with psychological distress as the relationship varies between different occupations. As such, a number of mechanisms and potential moderators need to be investigated before we can truly understand how to best promote mental health through workplace physical activity. Nevertheless, walking at work for female tradespersons may reduce psychological distress, and therefore, work-related physical activity should not be completely discounted in terms of its potential for improving mental health.





## Play to play, or play to eat? Exploring food rewards in youth sport

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Other

Purpose: Children involved in organized sport report higher levels of physical activity (PA) than those who are not in sport. However, children who are meeting PA guidelines also have the unhealthiest diets. This may be due in part to the pervasive use of unhealthy "treats" as rewards within the culture of youth sport. Therefore, the purpose of this study was to explore the use of food as a reward related to youth sport participation.

Methods: A constructivist paradigm with a relativist ontology guided this project. An instrumental case study explored food as reward in youth soccer. Criterion-based sampling was used to recruit children aged 4-12 (N = 24), parents (N = 7), and coaches (N = 6) within Ontario, Canada. Data generation included surveys about sport participation, focus groups with parents and children, and one-on-one interviews with coaches. Transcribed audio recordings underwent thematic analysis.

Results: Key themes included: the use of food (treats) as a reward for effort, time constraints dictating food choice, friends as motivators, and the role of sponsorship in youth sport. Parents, coaches, and athletes indicated food, typically from a fast-food restaurant chain because of limited time, is given as a treat or reward for motivating and praising effort. Children consistently reported their friendships with teammates as a primary motivator for participating in sport; parents and coaches explained that snacks foster those friendships and promote comradery. Monetary support of sponsorship was seen as critical to the success of youth sport, regardless of the sponsor. Parents and coaches indicated fast-food sponsorship did not influence their choice of rewards for their child.

Conclusions: Although parents, coaches, and children agreed that participation and effort in soccer would continue without external motivators, food rewards are still offered to motivate and celebrate performance. Given the children claimed they are intrinsically motivated to play soccer, it begs the question of why treats are offered at all. Knowing that using food as a reward is not required to motivate children's participation suggests a need to educate parents on what truly motivates their child, and how to celebrate success and effort in a healthier way.





# More than translation: culturally tailoring health education for Chinese Australians with type 2 diabetes

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Other

Purpose: Robust evidence on the most effective delivery of health education to the Chinese remains limited, both in Australia and worldwide. The current practice of Chinese diabetes education relies on language-translating Western evidence-based material. Such translated health education however, was shown to conflict with Chinese expectations, creating additional stress, frustration and anger. Type 2 diabetes disproportionately affects the Chinese population yet there are no structured Chinese diabetes education programs in Melbourne. This project aimed to develop and evaluate a pilot diabetes group education program specifically for Chinese Australians.

Methods: A culturally-tailored group education program (Not Scared of Sugar<sup>™</sup>) was developed and piloted with Melbourne-based Cantonese-speaking people with type 2 diabetes. Program teaching styles were aligned with the Confucian process of learning and incorporated cultural strategies to promote healthy behaviour change. Thirty-four individuals (35% male) attended five education sessions over ten weeks, delivered by a Cantonese-speaking facilitator and multidisciplinary clinicians. Data was collected from participants at baseline, on program completion and at 6 months follow-up. Differences between baseline and follow-up data were determined using paired sample t-tests or Mann-Whitney U tests.

Findings: Mean participant age was 69 ±9 years, with a mean time of 25.7 ±10.8 years in Australia and a median duration of diabetes of 10(IQR=2.8, 20.5) years. On completion of the program, participant waist circumference was reduced from 90.5 ±9.9 cm to 88.9 ±9.9 cm (P<0.001) and was maintained at 6 months. There was a significant increase in the number of diabetes self-care behaviours undertaken (American Association of Diabetes Educators Questionnaire Score: 30(22, 32.3) versus 34(30.3, 35.8), P<0.001) at 6-month follow-up. HbA1c was unchanged after 6 months (6.8 ±0.7% versus 6.7 ±0.7%, P=0.318). Participants rated the program very highly.

Conclusions: Culturally tailoring health education is more than language-translation of the materials. To optimise clinical effectiveness and participant experience, health education should align with cultural learning orientation and incorporate specific behaviour change motivators.





# Gender targeted versus gender-neutral interventions targeting nutrition, physical activity and/or obesity in young adults: What is more effective?

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Othei

Purpose: Young adulthood has become synonymous with the development of poor lifestyle behaviours associated with an increased risk of preventable chronic disease in later years. Interventions aiming to improve health behaviours may be more engaging and effective if they are targeted to males or females than gender-neutral. This review is the first to examine the outcome effectiveness of gender targeted (males or females only) versus gender-neutral (males and females collectively) interventions targeting nutrition, physical activity or obesity in young adults.

Methods: Six electronic databases were searched for RCTs published up to October 2018 that evaluated nutrition, physical activity or obesity interventions in young adults (17-35 years). An effective intervention was one where the change in one or more primary outcome was positive and statistically significantly different from baseline, compared with control, or if no control comparator, compared with another active intervention. Effectiveness of outcomes was compared between gender targeted and gender-neutral studies.

Results: A total of 18,779 manuscripts were identified, and 94 RCTs were included. Sixty-seven studies were genderneutral (71%) and 27 were gender targeted (29%, 20 female and seven male targeted). Primary outcome/s were adiposity (n=31, 33%), nutrition (n=26, 28%), or physical activity outcomes (n=25, 27%), or a combination (n=12, 13%). A greater proportion of gender targeted than gender-neutral studies were effective in improving nutrition (n=5, 100% and n=15, 71% of studies respectively) and physical activity outcomes (n=6, 86% and n=10, 56% respectively). A greater proportion of gender-neutral studies were effective in improving adiposity outcomes (n=11, 61% and n=5, 38% respectively). No differences were statistically significant.

Conclusions: Although differences in outcome effectiveness were identified between gender targeted and genderneutral studies, these were not significantly different. This is likely due to an insufficient number of studies to detect a difference. However, the findings indicate a potential difference. To truly determine the effectiveness of gender targeted interventions, well-designed RCTs comparing gender targeted interventions with gender-neutral and control are needed.





## Influence of pilot and small trials in meta-analyses of behavioral interventions: A meta-epidemiological study

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Other

Background: Meta-analyses (MA) of behavioral interventions represent the highest level of evidence for public health recommendations. Conclusions from MA could be misleading if they include pilot and small sample size trials because effects from such trials are associated with inflated estimates of intervention effectiveness. This study examines the impact of including pilot and small trials within MA on topics related to childhood obesity.

Methods: Searches were conducted across four databases for MA published since January 2016 of behavioral interventions on topics related to the prevention/treatment of childhood obesity (e.g., physical activity, sleep, weight loss/maintenance). The computed meta-analytic effect sizes (ES) were extracted from each MA and constituent articles. Articles were classified as a self-identified pilot (feasibility, preliminary efficacy, exploratory) trials, or small (N<100), mid (N=101-191), and large trials (N>191, median sample size). Effects were compared across trial classifications using multi-level meta-regressions.

Results: A total of 1,602 ES were extracted from 48 MA containing 604 unique articles (avg. 22 per MA, range 2 to 108) including 227,217 participants. On average, MA were comprised of 22% (0-58%) pilot and 21% (0-83%) small trials. Across all MA, ES from large trials (0.128, 95CI 0.053-0.203) were significantly smaller compared to ES from pilot (0.245, 95CI 0.165-0.324) and small trials (0.382, 95CI 0.259-0.505). At the MA level, the agreement between statistically significant (p<.05) ESs from the original MA and re-estimated ESs restricted to large trials was low-to-moderate (kappa 0.52), with 33% of significant ES reported in the original MA rendered non-significant, whereas 9% of non-significant ES were rendered significant using only large trials. Every 10% increase in the proportion of pilot or small trials included within a MA was associated with a 5-11% increase in the ES absolute difference from the original MA estimated ES.

Conclusions: Summary ES should be interpreted with caution when MA of behavioral interventions include a substantial proportion of small or pilot trials.





# Development and pilot testing of an innovative food literacy curriculum for high school-aged adolescents

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Othei

Purpose: To develop a food literacy curriculum utilizing theoretical frameworks and to pilot test the curriculum with adolescents in underserved communities.

Methods: Development of the curriculum, informed by Social Cognitive Theory and constructivism, followed a Backward Design approach. Curriculum concepts were guided by the definition of food literacy and its components described by Vidgen and Gallegos (2014). Knowledge and skills in three fundamental areas were determined as essential for achieving food literacy: agriculture/food systems, nutrition, and cooking. After internal pilot testing, the draft curriculum was reviewed by an expert committee and revisions were incorporated into the final draft for pilot testing within target populations. Two low-income communities participated in the pilot. Modules were implemented by the same trained facilitator and observer within both communities. Any necessary revisions to the curriculum were made within a 4-month period between pilots. Structured observations were completed by the facilitator and observer to assess whether each lesson met the defined learning objectives and authentic assessments.

Results: The resulting curriculum, Teens CAN: Comprehensive Food Literacy in Cooking, Agriculture, and Nutrition, includes twelve modules featuring experiential lessons. The first pilot demonstrated that adolescents were able to achieve authentic assessments for almost all lessons. Results from the first pilot led to minor modifications throughout to improve clarity. Additionally, three procedures were rewritten to better align with lesson objectives and aid in achievement of authentic assessments. Lastly, two lessons with similar learning objectives were combined into one for brevity. The second pilot confirmed that adolescents were able to achieve authentic assessments for all lessons and that revisions made following the first pilot were successful. Only slight revisions were needed following the second pilot to further improve lessons.

Conclusions: Achieving food literacy has the potential to improve nutrition-related behaviors and health outcomes. To our knowledge, Teens CAN is the first comprehensive curriculum developed for high school-aged adolescents that incorporates the components of food literacy as defined by Vidgen and Gallegos (2014). Teens CAN is currently being implemented to test for effects on food literacy knowledge, skills self-efficacy, and dietary behaviors.





## Experiences with conflicting health and nutrition information

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Other

Purpose: Health information is more available and accessible than ever. However, information from multiple sources is often conflicting, making it difficult for people to form judgments in order to make health-related decisions. Research in educational psychology has proposed the importance of epistemic beliefs as a way to explain how people process and comprehend information. In addition, research on the public understanding of science has proposed that the public's understanding of the topic may depend on the way they explain the existence of the disagreement. Therefore, this research examines individuals' experiences with conflicting information related to health and nutrition, their epistemic beliefs and the way they explain conflicts.

Methods: Cross-sectional data are collected through a survey administered to University students (n=188). Validated scales are used for the measurement of epistemic beliefs and explanations for scientific disagreement. We use correlation analyses to explore associations between the different measures and compare those with more versus less advanced epistemic beliefs.

Results/findings: We describe people's experiences with conflicting information related to health and nutrition and explore associations between their epistemic beliefs and the attributes they use to explain scientific disagreement. Preliminary analysis indicates that those with more advanced beliefs use a wider variety of explanations for expert disagreement and are more likely to attribute such conflicts to the complexity and uncertainty of the scientific process. Associations with a set of covariates, including socio-demographic characteristics, health consciousness, and topic involvement are analysed.

Conclusions: Implications for the potential role of a manipulation of epistemic beliefs to improve one's ability to handle conflicting information are discussed.





## LT.3.09 - Healthy choices of nutrition and physical activity

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## Role of norms and price in making portion-size decisions of energy-dense foods

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#### Motivation and behavior change (SIG)

Purpose: Large portions have been regarded as one of the drivers behind the rise in obesity, as they encourage individuals to consume food above the needed energy level. Large portions of energy dense foods are especially problematic, such as large portions of sweets and crisps. The objective was to study how consumer's portion size norms and price are linked to choices and portion size decisions.

Method: We conducted an online survey experiment (n=1020; age 18-65 years) where consumers chose an appropriate portion to eat, portion they would like to eat and the portion they normally eat of sweets or crisps from eight pictures that varied in size. The portion size pictures varied from 50 to 400 g for sweets and 25 to 300 g for crisps. Participants were also asked to make a choice between three packaging sizes at two price points from eight choice sets in both products. Data were analysed using t-tests and multiple regressions.

Results: The survey on sweets received 528 valid responses, and the survey on crisps received 492 valid responses. Respondents eat significantly larger portions of sweets and crisps than what they feel is appropriate ((t-test, p<0.001; Msweets= 95 g vs 72 g; Mcrisps= 108 g vs 87 g), but less than what they would have liked to eat or what they thought other people like them ate. Respondents tended to choose small or medium sized packages of both sweets and crisps, but price did have an impact. When participants had to choose between packages with a high price per kilo, only 2,3 and 2,6% choose the largest package. However, when the large package had a relatively low price per kilo, compared to the two smaller packages, the large package was chosen significantly more (t-test, p<0.005).

Conclusion: Consumers are aware that they should eat smaller portions of energy dense foods, than they do. Rather than telling them to eat less, we should focus on ensuring that larger packages are not priced relatively lower than smaller packages, through pricing strategies.





# Cycle Nation Project: feasibility and acceptability of a workplace-based intervention to encourage employees to cycle more

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#### Motivation and behavior change (SIG)

Purpose: In the UK, 28% of adults currently cycle less than once a month but would like to cycle more regularly. Designed in partnership with a major bank and UK cycling organisation, the Cycle Nation Project (CNP) is a workplace-based initiative to encourage staff who cycle infrequently to cycle more. At the heart of CNP is a practical cycling programme, where bank staff are offered a loaned bike to attend a nine-week foundation (or six-week intermediate) group training course delivered by self-identified cycling enthusiast colleagues trained for two days as CNP Cycle Champions. This study aimed to explore the feasibility and acceptability of the practical cycling programme to inform its optimisation for a future full-scale randomised controlled trial.

Methods: The CNP programme was delivered in 90-minute sessions at four bank offices across the UK between August 2019 and April 2020. Observation of weekly sessions, and end-of-programme participant focus groups and Cycle Champion interviews were analysed thematically.

Results: Sessions were feasible to deliver. Appropriate locations were found near each office for off- and on-road cycle training. Accessing additional storage for participants' loaned bikes proved difficult. Fidelity was high: Cycle Champions found the delivery protocol easy to follow and felt the programme's 'hands-on' approach was appropriate for the participant group: "[the] practical nature of building up week by week people's confidence... was very good" (CC101, male). The goal setting component was least well delivered: few participants used the goal-setting tool in their CNP handbooks, and in-session goal review was often rushed. Participants were extremely positive about the programme content. Attendance was good initially, but dropped as the weeks progressed, with work commitments and winter weather cited as contributing factors. Despite the bank's Cycle to Work Scheme being promoted throughout, few participants utilised it to replace their loaned bike by the end of the programme, raising questions about sustainability.

Conclusions: The CNP practical training programme was well received, but adaptations are needed to improve delivery of goal setting and attendance at later sessions, and to promote maintenance of cycling post-programme.





# Perceived barriers and Its effect on physical activity in geographically Isolated rural communities

<u>Ms. Natalie Jones</u><sup>1</sup>, Dr. Heather Norman-Burgdolf<sup>1</sup>, Ms. Rachel Gillespie<sup>1</sup>, Ms. Emily DeWitt<sup>1</sup> <sup>1</sup>University of Kentucky, Lexington, United States

#### Motivation and behavior change (SIG)

Purpose: Research shows that inactivity increases risk of cardiovascular diseases (CVD), diabetes, obesity, some cancers, osteoporosis, and psychological disorders. Individuals residing in rural Appalachian areas in the eastern U.S. are some of the least likely to meet physical activity (PA) recommendations compared to urban and suburban counterparts. This qualitative research aims to understand perceived barriers and limitations of the built environmental that influence PA engagement in a geographically isolated rural Appalachian community.

Methods: Lead by grounded theory, this qualitative study included five focus groups in one highly obese (>40%) rural Appalachian county. Participants included community leaders and residents (n=34), ages ranged from 32-72, and 24% (n=8) reporting an annual household income <\$20,000. Focus groups lasted 53-76 minutes with an average of 7 participants per session. A semi-structured facilitator guide was developed to reveal community barriers and environmental factors influencing PA participation of individuals in the county. Each focus group was digitally recorded and transcribed verbatim prior to thematic content analysis.

Results/Findings: Participants indicated disinterest and a lack of motivation as major barriers to PA participation, specifically walking. Participants conveyed safety as a major concern for engaging in PA. Several reported it being unpleasant and dangerous to walk throughout the community, and described street design, lack of sidewalks, and no crosswalks as hindrances. Thus, individuals are forced to rely on vehicles for routine daily travel within the county. Conversely, residents who reported activity engagement recognized social support as a key facilitator for PA behavior.

Conclusions: These findings reveal that PA participation and engagement is scarce within this distinctive population. Pedestrian-oriented design and infrastructure enhancement can alleviate multiple barriers, like safety, to support PA engagement. Community-based efforts focused on modifying aspects of the built environment are needed to advance sustainable solutions to reduce obesity by encouraging daily PA. Continued investigation of active living in rural Appalachian communities should consider autonomous motivation and self-efficacy to specifically address individual PA behavior.





# Occupational sitting time and its multilevel influencers in Malaysian office workers: A mixed methods study

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#### Motivation and behavior change (SIG)

Purposes: Workplace sitting is a major cause of sedentary behaviour. Aim 1 was to assess occupational sitting time in Malaysian office employees in the government sector. Aim 2 was to investigate the multilevel determinants of occupational sitting time and enquire the potential strategies to interrupt and reduce occupational sitting time.

Methods: To achieve Aim 1, we invited employees from all federal ministries in Malaysia (N = 24) via email to complete an online questionnaire containing socio-demographic questions and the Occupational Sitting and Physical Activity Questionnaire which is used to enquire about time spent sitting, standing, walking, and heavy labour during work hours. Descriptive statistics were used to assess sitting time. To achieve Aim 2, we conducted five Focus Groups (with between 5 to 8 employees in each group) who spent at least seven hours sitting at work daily. We enquired about knowledge, awareness and perceptions related to prolonged sitting time, and used the socio-ecological framework to enquire about barriers and facilitators to occupational sitting time. We also enquired about potential intervention strategies. Thematic analysis was used to analyze qualitative data.

Results: Of 26,647 employees invited, 1,338 completed the questionnaire. Mean daily occupational sitting time was 5.96 hours (SD = 1.37 hours). None of the socio-demographic factors were associated with sitting time. Focus Groups revealed employees were generally aware of prolonged sitting time but could not elaborate the definition. Prolonged sitting time was mainly influenced by organizational factors (job nature and load of work). In addition, the social (behaviour of employees), physical environment (layout and office design), and policy (no plan for employees to be active) in the organization also affected sitting time. Participants expressed a preference to break sitting time if prompted by a message or instruction. In terms of potential strategies, a smartphone intervention with educational and motivational messages was preferred.

Conclusions: Office-based Malaysian government employees spent a significant amount of sitting time at work. There are multiple factors operating at different levels of the Socio-Ecological Model for health behaviour that influence office-sitting time. A smartphone-based intervention to interrupt sitting could be considered and is currently being tested.





## Red meat consumption patterns in adolescent females: associations with diet and motivations for food choice

<u>Other Tessa Scott</u><sup>1</sup>, Dr. Meredith Peddie<sup>1</sup>, Associate Professor Lisa Houghton<sup>1</sup>, Associate Professor Anne-Louise Heath<sup>1</sup>, Other Liz Fleming<sup>1</sup>, Other Chaya Ranasinghe<sup>1</sup>, Other Neve McLean<sup>1</sup>, Associate Professor Caroline Horwath<sup>1</sup>, Dr. Jillian Haszard<sup>1</sup>

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#### Motivation and behavior change (SIG)

Purpose: The reduction of red meat consumption in developed countries is recommended for environmental sustainability and population health. Female adolescents may be receptive to dietary change messages but may also be at highest risk of inadequate intakes of some nutrients. Our objective was to determine the dietary and motivational correlates of red meat consumption patterns in female adolescents.

Methods: Female adolescents, aged 15 – 18 years, were recruited through participating high schools across New Zealand as part of the SuNDiAL project (Survey of Nutrition, Dietary Assessment and Lifestyles). The dietary habits questionnaire assessed red meat consumption patterns (including processed meat, beef, lamb, pork, and venison) as well as other dietary habits, such as fruit and vegetable consumption. Red meat consumption was categorised into three groups: high consumers (more than 5 times a week), moderate consumers (2-4 times a week), and low consumers (once a week or less). Nutrient intake was assessed using two 24-h diet recalls with adjustment to usual intake. The Food Choice Questionnaire assessed eleven different motivations for food choice. Regression models estimated differences between red meat consumption groups.

Results: Thirteen schools participated with 242 girls completing the dietary habits questionnaire. On average, low red meat consumers (n=48) consumed 0.7 more serves of vegetables (95% CI: 0.3, 1.1), and 2.0 more serves of legumes (95% CI:1.2, 2.7) and were 18 times more likely to consume vegetarian meat alternatives (95% CI: 6, 56). They also had lower saturated fat, protein, zinc and B12 intakes and greater polyunsaturated fat and dietary fibre than those who consumed red meat more frequently. High red meat consumers (n=103) consumed more fast food, and sweet snacks. Low red meat consumers were more motivated in their food choices by environmental concerns and animal welfare, whereas high red meat consumers were more motivated by mood and convenience.

Conclusions: Female adolescents with a low red meat consumption pattern generally consumed a healthier diet, but attention must be given to protein, zinc and B12 intakes. Making red meat alternatives convenient and appealing will be important if we wish to decrease the red meat consumption of female adolescents.





## Self-Determination Motivational Sequence: The Role of Past Behavior in Health Clubs Exercisers

#### Prof. Diogo Teixeira<sup>1, 2</sup>, Prof. Diogo Monteiro<sup>2, 3</sup>, Prof. Luís Cid<sup>2, 3</sup>, Prof. Filipe Rodrigues<sup>2, 3</sup>

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#### Motivation and behavior change (SIG)

Purpose: Understanding how to sustain long-term exercise practice is a contemporary preoccupation. For that matter, several theoretical approaches focused in motivational process have emerged in order to support a better understanding of exercise continuous adherence. The present preliminary work addresses the motivational sequence proposed by Self-Determination Theory (SDT) and aims to test the effect of past behavior on intention and future exercise behavior (i.e., supportive behaviors > basic psychological needs > behavioral regulation (autonomous motivation) > enjoyment > intention > future behavior).

Methods: In present study, 293 (of a total of 567) health club exercisers aged between 18-65 (M=36.57  $\pm$  SD=11.25) years completed a survey of motivational, emotional and cognitive-related variables. Exercise frequency was measured using computer records. Past and future behavior scores were obtain through the sum of previous 6 months exercise frequency, and the sum of the future 6 months of practice, respectively. Structural equation modeling (SEM) procedures were developed with IBM SPSS AMOS v. 23.0 in order to test the proposed model adjustment and variables interactions.

Results: Descriptive analysis were made for each motivational variable, enjoyment, intention, past and future behavior. Psychological variables presented mean scores slightly higher that the middle point of their Likert response scales. Both models (with and without past behavior) presented a good model fit (CFI/TLI > .90; RMSEA/SRMR < .08). Results present support for the SDT expanded motivational sequence, where positive and significant direct effects appeared in all tested relations. When past behavior was added to this sequence, a strong and significant direct effect appeared with future behavior ( $\beta$  = .93; and independently of intention) and a 87% of explained variance of the model was reported.

Conclusions: Considering the study purpose, it was possible to observe that the motivational sequence tested presented a good model fit, as expected in SDT framework. Moreover, past behavior was found to offset the direct effect of intention on future behavior and the indirect effect of all other variables under analysis on intention. This may suggest that past behavior may act as an important determinant of future exercise behavior, and warrants further research in this particular context.





## Self-control attenuates the effect of hedonic hunger on eating behaviour.

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#### Motivation and behavior change (SIG)

Purpose: The desire to consume food for pleasure in the absence of caloric need is termed hedonic (pleasure-based) hunger. This study aimed to explore whether self-control moderates the associations between hedonic hunger, as measured by the Power of Food Scale (PFS), and overeating frequency, snacking frequency and palatable food intake. This has rarely been examined in a large randomly selected adult sample.

Methods: Data from the Swiss Food Panel 2.0 study was analyzed (N=5,238 from the German- and French-speaking parts of Switzerland, 51% men). Measures included the PFS, dispositional self-control, overeating frequency, snacking frequency, intake of high-fat salty snack foods, and intake of high-sugar foods assessed with a semiquantitative food frequency questionnaire. Pearson correlations between variables were calculated. Four moderation analyses were conducted, using the PROCESS macro for SPSS developed by Hayes (2013), with overeating (Model 1), consumption of high-sugar foods (Model 2), consumption of high-fat salty snack foods (Model 3) and overall snacking frequency (Model 4) as dependent variables. Simple slope analyses and graphical displays for PFS scores on eating variables for people low (-1 SD), moderate and high (+1 SD) in self-control were conducted.

Results: Higher scores on the PFS and lower self-control were correlated with higher overeating frequency and higher food consumption. Four separate moderation analyses revealed that the effect of power of food on overeating frequency, snacking frequency, and palatable food intake was significantly attenuated by self-control. For example, simple slope analyses revealed that PFS was positively related to overeating frequency when self-control was low (one SD below the mean: B=0.50, t(4747)=19.71,p<.001). This positive association was attenuated when self-control was high (1 SD above the mean: B=.09, t(4747)=2.94,p<.003).

Conclusions: Hedonic hunger was associated with overeating, snacking, and palatable food intake when it occurred together with low self-control. Self-control may lead both directly to less overeating, snacking, and palatable foods intake, in addition to attenuating the effects of hedonic hunger on these behaviours.




# Behaviour change techniques for weight management in postpartum women: a systematic review and meta-analysis

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### Motivation and behavior change (SIG)

Purpose: Postpartum weight retention is a significant contributor to obesity in women. Identification of the effective core components, such as behaviour change techniques (BCTs), within the successful implementation of postpartum lifestyle interventions has not been investigated in postpartum women. This systematic review and meta-analysis aimed to describe the associations between BCTs and changes in weight, diet and physical activity in postpartum women.

Methods: Databases including MEDLINE, CINAHL, EMBASE, and PsycINFO were searched to identify randomised controlled trials of lifestyle intervention in postpartum women (within 2 years post-delivery) published up to 3rd May 2019. BCTs were extracted according to the Behaviour Change Technique Taxonomy (v1). Univariate regression analyses were conducted to determine the effect of individual BCTs on body weight, physical activity and energy intake.

Results: From 5000 articles, 46 articles were included (n=3,905 women, age 23-36 years). Meta-analysis showed that postpartum lifestyle interventions resulted in significant improvement in weight (MD -2.46 kg, 95% CI -3.65 to -1.27), and physical activity (SMD 0.61, 95% CI 0.20 to 1.02) but not in energy intake. The average number of BCTs per study was 7.0+3.0. No individual BCT was significantly associated with weight or physical activity outcomes. On meta-regression, the total number of BCTs ( $\beta$ =-0.36, P=0.019), specifically BCTs on problem solving ( $\beta$ =-1.74, P=0.045), goal setting of outcome ( $\beta$ =-1.91, P=0.046), review outcome goal ( $\beta$ =-3.94, P=0.007), feedback on behaviour ( $\beta$ =-2.81, P=0.002), self-monitoring of behaviour ( $\beta$ =-3.20, P=0.003), behavioural substitution ( $\beta$ =-3.20, P=0.003) and credible source ( $\beta$ =-1.72, P=0.033) were associated with lower energy intake.

Conclusions: The total number of BCTs and the provision of certain BCTs including problem-solving, goal-setting of outcome, review outcome goal, feedback on behaviour, self-monitoring of behaviour, behavioural substitution and credible source were associated with greater decreases in energy intake. All lifestyle intervention studies for postpartum women should include these strategies as part of the core components. Further research is required to identify effective BCTs for increasing physical activity and promoting weight loss in postpartum women.





# Willingness to reduce cancer risk through nutrition-related behaviour. An application of the health belief model

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### Motivation and behavior change (SIG)

Purpose: Associations between nutrition and health related outcomes such as obesity, diabetes, and cancer are well established. However, individuals continue to make poor dietary decisions. Using the Health Belief Model (HBM) as a theoretical framework, the current study aimed to explore the acceptability of different nutrition-related behaviours to reduce the risk of cancer due to consumption of arsenic in rice. At present, research results in this area are limited and use specific samples. Using a diverse sample across multiple countries this study aimed to identify whether a) adopting a specific cooking method, b) using a newly developed rice cooker, or c) buying reformulated rice might be most acceptable to consumers. The suitability of the HBM to predict these behaviours was also examined.

Methods: A total of 3,081 individuals across six European countries completed a cross-sectional online survey (nationally representative to +/- 5%). Alongside relevant sociodemographic questions, participants answered questions measuring the constructs of the HBM: perceived severity, susceptibility, benefits, barriers, and self-efficacy. IBM SPSS and AMOS were used to analyse the data, with structural equation modelling used to explore the application of the HBM to the data.

Results: Participants were most willing to use reformulated food as a method of reducing risk (70%), compared with the specific cooking method (61%) and the new cooker (52%). Frequency of rice consumption and knowledge were consistent significant predictors of all three behaviours. In addition, gender was a significant predictor of using the specific cooking method and reformulated rice, and age was a significant predictor of using the new cooker and the cooking method. Country was a significant predictor of using the cooker. SEM indicated that the HBM could be applied to willingness to use each of the behaviours.

Conclusions: The majority of participants would prefer to reduce their risk of disease using the most convenient method rather than changing their cooking behaviour. Thus, future efforts to change nutrition-related behaviour or consumption might be most effective at the environmental or industry level.





# Development and evaluation of the evidence-based exercise and depression toolkit

<u>Ms Krista Glowacki<sup>1</sup></u>, Ms. Daniah Zumrawi<sup>1</sup>, Dr. Guy Faulkner<sup>1</sup> <sup>1</sup>University of British Columbia, Vancouver, Canada

### Motivation and behavior change (SIG)

Purpose: To describe this systematic and phased process used to develop and evaluate the evidence-based collaborative Exercise and Depression Toolkit for health care providers (HCP) working with adults with depression.

Methods: The four phases of development included a review of relevant literature, formative interviews, an expert panel meeting, and toolkit development. The Theoretical Domains Framework (TDF) and the Behaviour Change Wheel were used to guide analysis and to determine behaviour change techniques (BCTs) to be included in the toolkit. Various stakeholders were involved throughout the process including health care providers, adults who have lived experience with depression, researchers, and exercise professionals who have experience working with adults with depression. The Appraisal of Guidelines, Research and Evaluation (AGREE) II tool was consulted throughout the developmental phased process, and used to guide toolkit content and dissemination strategies. Dissemination of the toolkit (www.exerciseanddepression.ca) was tracked to understand reach and implementation of the toolkit in practice using google analytics and case study evaluation through interviews and daily logs.

Findings: Recommendations from the consultation process resulted in the toolkit being depression tailored including common barriers that individuals with depression face to engaging in physical activity and practical strategies they can use. The toolkit promotes collaboration and a person-centered approach, with different sections for the intended audience of HCP and/or adults with depression. BCTs were included to target the Emotion and Social Influences domains of the TDF. In the first three months 1201 people have downloaded the toolkit from over 20 different countries. Half (n=608) identify as healthcare providers and 370 are individuals seeking help for their depression. In case studies, HCP reported having used the toolkit at least once in practice over a one month period, and perceived the toolkit to be acceptable, easy to use, and adaptable to their practice context.

Conclusions: The development of the collaborative evidence-based Exercise and Depression Toolkit is the first step in bridging the gap and implementing treatment guidelines for depression and the consideration of exercise as a treatment option in practice.





# Poster Session P.1





# Development of a planning tool to prevent obesity in childhood and youth

Ms. Maike Schröder<sup>1</sup>, Ms. Stefanie Mielitz<sup>2</sup>, Prof. Birgit Babitsch<sup>2</sup>, Prof. Holger Hassel<sup>1</sup>

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### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

#### Purpose

Systematic and theory-based planning is an essential criterion for a successful intervention as well as for its sustainable continuity. Studies have shown that overweight prevention programs for children are of an unsystematic and non-evidence-based planning quality. The development of high-quality programs to prevent childhood obesity is very complex and needs effort in time and personnel. Thus, it is hardly possible to perform a systematic and target-group-specific project planning in professional life of health promoters. Aim of the project 'WEPI' is to develop an evidence-based and user-oriented planning tool to support and optimize the planning process of prevention programs for obesity in childhood and youth.

#### Methods

A Systematic Literature Review (SLR) was conducted in the databases PubMed, LIVIVO and Cochrane to identify existing tools for planning prevention and health promotion. Furthermore, expert interviews were carried out in schools and communities. The first functions of the WEPI planning tool were developed and optimized in focus groups with future user.

#### Results

The SLR revealed 628 hits of which 56 full texts were considered for further analysis. The four most comprehensive and evidence-based planning tools were chosen for a detailed comparison of the planning steps and context requirements. Components of planning were identified. Besides clarifying the experts meaning of planning and identifying difficulties in the planning process, the interviews also revealed the need for supporting a systematic planning process. Results were aggregated in the development of the WEPI planning tool. First functions were tested in focus groups and an optimized version of the WEPI planning tool can be presented. Subsequently the tool will be converted into a web-based application and tested in schools and communities.

#### Conclusions

The WEPI planning tool supports the development of evidence-based prevention planning and contributes to the standardisation and quality assurance of interventions as the planning process becomes transparent and comparable. The participative development of the tool and the subsequent transfer into a web-based application allows meeting the needs and the conditions of the user. The project is supported by the Federal Ministry of Health, Germany.





# Breakfast habits and dietary intakes of school-going children from 1 primary school by food groups and eating location in Singapore

<u>Dr. Airu Chia<sup>1</sup></u>, Mr. Muhammad Naeem Jia Sheng Chew<sup>1</sup>, Ms. Huiying Eunice Tong<sup>1</sup>, Ms. Sarah Yi Xuan Tan<sup>1</sup>, Prof. Lynette Shek<sup>2, 3</sup>, Prof. Seang Mei Saw<sup>1, 4</sup>, Dr. Falk Müller-Riemenschneider<sup>1</sup>, Dr. Mary Foong-Fong Chong<sup>1,2</sup>

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Children and families (SIG)

Purpose:

Dietary habits are established in childhood and may have lifelong influences on health outcomes. We aim to examine the prevalence of breakfast skipping and key food groups consumed by children at home and out-of-home, including school and other locations.

### Methods:

Children aged 11-12 years were recruited from a primary school in Singapore and were asked to record their dietary intakes, eating location, and activities over a 4-day period using a self-administered time-use web-based diary. Breakfast skipping was defined as not eating (except water) between waking and the commencement of morning school classes at 0800 for weekdays and 1100 for weekends.

### Results

Among 114 children (55% males), the proportion who completed 4-day, 3-day and 1 to 2-day diaries were 61%, 9%, and 30% respectively. Nearly half of the children reported consuming breakfast on all days while 42% skipped breakfast on some days and 11% never ate breakfast. Based on intakes averaged over 1 to 4 days, about half of the children reported not consuming any fruits or vegetables per day. Even for children who reported consuming fruits and vegetables, the majority had less than 2 servings of fruits or 2 servings of vegetables per day. Fruits and vegetables were consumed by 40% and 70% of the children at home, respectively. A large proportion of the children reported not consuming any dairy products or wholegrains per day (72%, 65%). Most of those who consumed dairy products had less than 1 serving per day and mostly consumed at home. Three-quarter of the children reported consuming sugar-sweetened beverages (SSB) per day and consumed them at multiple locations. About one-third of SSB consumers had more than 1 serving per day.

### Conclusions:

Less than half of the children consume breakfast regularly and intakes of fruit, vegetables, dairy, and wholegrains were generally inadequate, while daily consumption of SSB was common. A large proportion of the healthier food groups was consumed at home. These highlight the need to further review the food environment of children to increase their uptake of healthier foods.





# How can we use family meals from the past to understand family meals today?

<u>Ms. Georgia Middleton<sup>1</sup></u>, Dr. Karen Patterson<sup>1</sup>, Prof. Rebecca Golley<sup>1</sup>, Prof. John Coveney<sup>1</sup> <sup>1</sup>*Flinders University, Adelaide, Australia* 

### Children and families (SIG)

Purpose: What was the family meal like thirty years ago? What can the past tell us about the present and future? How can behavioural nutrition benefit from archival data? These are the questions we sought to answer by analysing thirty-year-old interview data on the family meal for the first time. The purpose of this research was to investigate the family meal, its involved processes and expectations thirty years ago, allowing us to further our understanding of experiences of the family meal over the last three decades.

Methods: In 1992-1994, qualitative interviews regarding family eating behaviours were carried out with parents across South Australia. For the present study, transcripts from this sample were selected via purposeful sampling, which continued until theoretical saturation was achieved. Drawing on the methodology of grounded theory, data were analysed through the cyclical process of initial coding, 474ocused coding, memo writing and team meetings. This is the first time this data has been thoroughly analysed.

Findings: A total of 49 transcripts from 16 families were analysed. Analysis of the data shows that thirty years ago there were numerous considerations and processes involved in getting the family meal on the table. Parents spoke about needing to be flexible to achieve a family meal that fit their lifestyle, often requiring numerous strategies. Some parents upheld the traditions of their childhood, where others specifically changed their practices from those they remembered growing up. Some parents were adamant about sitting at the table and communicating, where others were more flexible in their renditions of the family meal, eating separate meals, at separate times, in separate places.

Conclusion: This data represents a time capsule of what the family meal was like thirty years ago. It is a baseline of data from which we can build, compare to the present and project into the future. It is a look into the past without relying on recollections and the memories of participants. With this information, we can gain a greater understanding of what was, which may help us with understanding what is, and what the future may hold for family meals.





# Promoting Food Literacy in older adults – Participatory development of the intervention "GUSTO" in Germany

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Ageing (SIG)

#### Purpose

Food Literacy (FL) as a component of Health Literacy (HL) is the ability to organize one's everyday nutrition in a selfdetermined, responsible and enjoyable way. In the context of an aging population and an increasing life expectancy, the challenge of aging healthy is growing. The aim of the project "Enjoyable aging – Municipality-based improvement of FL in older adults(GUSTO)" is an improvement in HL and in particular FL of persons aged 65 or above. The intervention includes a group programme with peer-moderated self-reliant working groups of older adults. This group programme was developed in a participatory process with the target group.

### Methods

A literature search on the nutritional situation of older adults was conducted. The results were compared with the dutch "self perceived food literacy scale" by Poelman et al. (2018) and the "nutritional competence scheme for basic education" of FL by the German Federal Centre for Nutrition (2019). From this data, different topics for the focus group discussions were deduced and discussed with the participants. Six guided focus group discussions were realized with the help of practice partners in different institutions for older adults in six municipalities. The answers of the participants were summarized and clustered.

### Results/findings

Overall 44 people aged between 62 and 88 years (mean age:  $73.1 \pm 6.1$  years) participated in the focus group discussions. 22.7 % were men. The focus group discussions revealed resources and barriers concerning FL as well as contents of nutrition among older adults. With regard to the FL of persons aged 65 or above, the discussions revealed that the appraisal of information, due to the large amount and equivocality of information, and its practical use are difficult. The desired topics, for example best-before date, use of food waste and herbs and spices, were added to the intervention.

#### Conclusion

The participatory proceeding is important to develop an intervention that is adjusted to the needs of the target group. The close collaboration with the practice partners in the municipalities ensured the successful implementation of the focus group discussions and an effective acquisition of older adults.





# Food insecurity is linked to maternal weight-related cognitions

<u>Dr. Carol Byrd-Bredbenner</u><sup>1</sup>, Ms. Kaitlyn Eck<sup>1</sup>, Dr. Jennifer Martin-Biggers<sup>1</sup> <sup>1</sup>Rutgers University, New Brunswick, United States

### Socio-economic inequalities (SIG)

Purpose: Food insecurity is negatively associated with diet quality and health; however, links between food insecurity and maternal weight-related cognitions are understudied. Thus, this study explored relationships between food insecurity level and maternal body dissatisfaction, perceptions of their children's BMI, and concerns about their children's future weight status.

Methods: Mothers of children aged 2-5 years (maternal age= $32.25\pm5.80$ SD years) completing an online survey were divided into groups using responses to Hager's Food Insecurity screener (alpha=0.84): experiencing no (n=175), low (n=172), moderate (n=129), and high (n=74) food insecurity in the past 12 months.

Results: ANOVA and Tukey post hoc procedures revealed the no food insecurity group scored significantly (P<0.01) lower on the Eating Disorder Exam Questionnaire 4-point body dissatisfaction indicator item, indicating mothers experiencing no food insecurity were significantly more satisfied with their bodies than all other groups. A root cause of this dissatisfaction likely is linked to maternal BMI which also increased with food insecurity (high food insecurity mothers had significantly higher BMIs than other mothers; P=.01). Maternal selections of the silhouette representing their own children's body size from 7 sex-specific child silhouettes of increasing BMI revealed a significant (P=.04), positive Spearman rank order correlations with food insecurity level and scores on the 2-item, 5-point Likert Maternal Concern about Children's Future Weight Status scale (alpha=0.91) (higher scores indicate greater concern child will be overweight) were significantly (P=.03), positive.

Conclusions: Findings support previously reported links between food insecurity and BMI and expands this to links between food insecurity and maternal weight-related cognitions of body dissatisfaction, maternal recognition of higher child BMIs, concern about their children's future weight status. Future research should examine the interrelationships among maternal BMI, body dissatisfaction, and food insecurity continuum along with the impact of the psychological burden of mothers' concern about their children's current and future weight status and strategies for ameliorating this burden.





# What can families gain from the family meal? A mixed-papers systematic review

<u>Ms. Georgia Middleton</u><sup>1</sup>, Prof. Rebecca Golley<sup>1</sup>, Dr. Karen Patterson<sup>1</sup>, Ms. Fairley LeMoal<sup>2</sup>, Prof. John Coveney<sup>1</sup> <sup>1</sup>Flinders University, Adelaide, Australia, <sup>2</sup>Institut Paul Bocuse, Ecully Cedex, France

### Children and families (SIG)

Purpose: The family meal has been associated with health and wellbeing benefits for both adults and children. However, majority of the research is correlational, and thus unable to prove a causal relationship between family meals and positive outcomes. Our systematic review set out to determine the causal relationship between family meals and health and wellbeing and explore family members' perceptions of the family meal. This is the first systematic review to investigate the impact the family meal has on the health and wellbeing of children and parents, and which collates parent and child perspectives on the family meal.

Methods: A systematic search across five databases was employed and aimed to capture family meal intervention and qualitative studies published between 2008-2019. To be included, interventions had to have an active intervention and control group, target the family meal and measure family meal and health outcomes postintervention. Qualitative studies had to employ focus groups or interviews with parents or children, focusing on the family meal. Two reviewers were involved in screening of studies, appraising included articles and extracting data. Quantitative data was synthesised in narrative form, and qualitative data underwent meta-aggregation

Results: Thirty-two articles were deemed eligible for inclusion. Only one intervention included in this review exclusively targeted the family meal, the remaining studies included other target strategies as part of their intervention (e.g. physical activity, snacking, sleep routines). Only two of the eight interventions reported statistically significant differences between control and intervention groups for family meal frequency or quality. The qualitative studies identified multiple barriers to the family meal, including scheduling conflicts, exhaustion and lack of time, and reported family connection and communication as the main perceived benefits of the family meal

Conclusions: There is a gap between the benefits and barriers to the family meal identified through qualitative research, and current intervention strategies, with few interventions exclusively targeting the family meal. Interventions that are informed by qualitative literature and exclusively target the family meal are needed to further investigate the causal relationship between family meals and potential health and wellbeing outcomes for adults and children.





# Development of My Eating Journal as A Tool to Improve Healthy Eating on Elementary School Children

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<sup>1</sup>Department of Community Nutrition, Faculty of Human Ecology, IPB University, Bogor, Indonesia

### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Food diary is often used to track eating habits and dietary behavior change. This study aimed to develop a food diary called My Eating Journal as a guidance tool for elementary students to eat diverse food groups and its recommended portion according to Balanced Nutrition Guidelines.

Methods: Subjects were 9-11 years old children from elementary schools in Bogor, Indonesia. The study used quasi experimental design and was divided into two stages. The first stage was to create a prototype (consist of food list and food frequency graph) and test for media acceptance level (content, attractiveness, easiness to use). The second stage was to validate the ability of My Eating Journal to improve eating habit. Subjects (n = 35) were asked to fill My Eating Journal every day for four weeks at school under teacher supervision. Data of knowledge, attitude, and practice related to Balanced Nutrition Guidelines were collected at baseline and post-intervention. At the end of week-4, consumption frequency for each food groups during intervention were assessed. Data were then analyzed using paired sample t-test.

Results: The results showed that My Eating Journal are accepted by majority (85,7%) of subjects. Most of the subjects (87,6%) have no difficulty in converting their eating frequency of each food group from the food list into food graph. There is no significance differences in knowledge and practice between baseline and post-intervention, but subjects' attitude is significantly increased (p = 0,029). Almost half of the subjects (49,1%) are lacking on vegetable consumption (2,2 ± 1,3 times/day). There is no change on eating habit observed throughout the four weeks of filling in My Eating Journal.

Conclusions: My Eating Journal can be easily used by elementary school students to assess their eating habits. The increase of attitude shows that there is a possibility of dietary behavior improvement if the parents provide vegetables and other healthy foods.





# Links among breastfeeding history and subsequent weight-related behaviors of mother: Child dyads

Ms. Kaitlyn Eck<sup>1</sup>, Dr. Carol Byrd-Bredbenner<sup>1</sup>

<sup>1</sup>Rutgers University, New Brunswick, United States

**Children and families (SIG)** 

Purpose: Breastfeeding has beneficial effects on maternal and child health; however links between breastfeeding history and subsequent weight-related behaviors of mothers and their preschool-aged children are understudied. Thus, this study examined links among breastfeeding history and weight-related behaviors of mother: child dyads 2 to 5 years post breastfeeding.

Methods: Mothers (age=32.25±5.80SD years) of preschool children (age=3.47±1.09SD) completed an online survey assessing weight-related behaviors (dietary intake, child feeding strategies, sleep duration, eating behaviors, physical activity) of themselves and one of their randomly selected children aged 2-5 years. Mothers were divided into 2 groups based on breastfeeding history: 135 did not breastfeed and 415 had breastfed their child.

Results: T-tests revealed mothers who had breastfed had significantly (P<0.05) lower BMIs than never breast feeders (27.23 $\pm$ 7.53SD vs. 29.10  $\pm$ 8.82SD). Sugar-sweetened beverage intake was significantly lower for mothers who had breastfed vs non-breastfeeders (0.83 $\pm$ 0.86SD vs. 1.08 $\pm$ 0.94SD servings/week). Breastfed children consumed significantly less 100% juice than comparators (4.17 $\pm$ 2.70SD vs.5.31 $\pm$ 2.53SD servings/week), although milk intake did not differ for mothers or children. Responses to 5-point Likert scales indicated mothers who had breastfed were significantly more likely to pressure children to eat healthy foods than other mothers (2.22 $\pm$ 0.95SD and 2.01 $\pm$ 0.99SD); no other child feeding behavior (i.e., restriction, control of food choice and timing, rewarding healthy eating) differed. Mothers who had breastfed and their children had significantly longer sleep duration than counterparts (mothers=7.30 $\pm$ 1.88SD and 6.84 $\pm$ 1.71SD hours/night; children=10.60 $\pm$ 2.14SD and 10.13 $\pm$ 1.83SD hours/night, respectively). Mother and child eating behaviors (emotional eating, food neophobia), physical activity, and health status did not differ by breastfeeding history.

Conclusion: Breastfeeding history is associated with some, but not all, maternal and child weight-related behaviors 2-5 years post breastfeeding. Future studies should examine how length of breastfeeding affects mother: child dyad weight-related behaviors to identify temporal links and how they may support adherence to breastfeeding recommendations.





# Investigating the relationships between lifestyle physical activity and diet on vascular health among older adults

Dr. Catherine Elliot<sup>1</sup>, Dr. Michael Hamlin<sup>1</sup>, Ms. Hannah Hill<sup>1</sup>

<sup>1</sup>Lincoln University, Christchurch, New Zealand

Ageing (SIG)

#### Purpose

This research aimed to investigate how behaviours of lifestyle physical activity (LPA) and diet predict and correlate with vascular health in older adults using the gold standard measure of pulse wave velocity (PWV).

#### Methods

This cross-sectional study analysed 83 adults aged 64-91 years (M=78±6.44) residing in independent living communities. Dietary questions were taken from the Harvard disease risk tool. The Yale physical activity survey allowed the calculation of metabolic equivalents of task (METmins). PWV was collected using a non-invasive device (applanation tonometry).

A hierarchical regression was calculated whereby covariates of taking blood pressure medication (BPM) and age (both known to affect PWV) were controlled in model 1 and diet and METmins were added into model 2. Pearson correlations were then calculated to determine individual correlations with PWV by subgroups of sex and age.

### Results

The model 1 regression (R2=.29; F(2,79)=16.00, p<.001) indicated that covariates of BPM and age accounted for 29% (p $\leq$ .000) of the variance in PWV, but when diet and METmins were added in model 2 (R2=.31; F(4,77)=8.56, p<.001) they only contributed 2% more (non-significant change, p=.35) to the prediction of PWV. Healthier arteries in males correlated significantly with higher METmins (r=-.54, p=.004) and younger participants (r=.40, p=.027). Healthier arteries in females correlated significantly with younger participants (r=.49, p=.000), no BPM (r=.36, p=.002), and higher METmins (r=-.25, p=.029). Among 64-78 year olds, healthier arteries were correlated with no BPM (r=.35, p=.011), and healthier diets (r=-.26, p=.046), but not with METmins. Alternatively, 79-91 year-olds showed healthier arteries correlated with higher METmins (r=-.36, p=.012), but not with diet.

### Conclusions

After controlling for age and BPM (model 1) in the regression, diet and METmins (model 2) were unable to significantly contribute to the prediction of arterial stiffness in older adults. Both males and females showed correlations between healthier arteries and higher METmins, but not between arterial health and diet, suggesting LPA is more correlated to arterial health than diet. Those aged 64-78 had healthy arteries in correlation with a healthy diet, whereas 79-91 year olds had healthy arteries in correlation with higher METmins.





# Diet quality of Canadian preschool children: Associations with sociodemographic characteristics

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### Socio-economic inequalities (SIG)

Background: Understanding socio-demographics disparities in diet quality can inform health policy and populationbased interventions aimed at reducing nutritional and health inequities. Socio-demographic differences in diet quality have been described in adults, school-aged children, and adolescents, but few studies have explored these associations in preschoolers. Objective: To describe the diet quality of Canadian preschool-aged children and explore its associations with socio-demographic characteristics.

Methods: Data from 100 children participating in the Guelph Family Healthy Study pilot, a family-based cohort-study, were used in this cross-sectional analysis. Children's dietary intake was measured with three-day food records and diet quality was determined using the Healthy Eating Index (HEI-2015). Linear regression analysis was used to explore associations between diet quality and socio-demographic characteristics.

Results: Children's mean± SD HEI-2015 score was  $68.9\pm9.31$  and 86% had HEI-2015 score in the "needs improvement" category (51-80 out of 100). Children's overall HEI-2015 score was inversely associated with children's age ( $\beta$ = -0.19, 95%CI -0.37, -0.02); specific components of HEI-2015 score that decreased with children's age included total fruit ( $\beta$ = -0.19, 95%CI -0.37, -0.02), whole fruit ( $\beta$ = -0.24, 95%CI -0.45, -0.03), refined grains ( $\beta$ = -0.57, 95%CI -0.93, -0.21), and sodium ( $\beta$ = -0.62, 95%CI -1.01, -0.24). Parental education was positively associated with children's overall HEI score ( $\beta$ = 9.58, 95%CI 3.81, 15.35) and with scores for total fruit ( $\beta$ = 1.00, 95%CI 0.39, 1.76), total vegetables ( $\beta$ = 1.11, 95%CI 0.03, 2.18), total protein foods ( $\beta$ = 1.06, 95%CI 0.28, 1.84), and seafood and plant protein ( $\beta$ = 1.67, 95%CI 0.43, 2.89). Children who identified as Caucasian ( $\beta$ = 4.29, 95%CI 2.46, 6.14), had Caucasian parent ( $\beta$ = 3.01, 95%CI 0.78, 5.25), or had parent born in Canada ( $\beta$ =2.32, 95%CI 0.53, 4.1) had higher scores for dairy component of HEI-2015.

Conclusion: These results suggest that diet quality of Canadian preschoolers needs improvement and that there are disparities in diet quality across certain sociodemographics.





# Psychometric properties of an instrument designed to measure parenting practices and children's obesity-related behaviours from Brazil

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### Children and families (SIG)

Purpose: Childhood obesity has increased remarkably in low-middle income (LMIC) countries; however, validated measures of obesity-related behaviours and parenting practices are lacking. The current study evaluated the psychometric properties of an instrument designed to measure parenting practices and children's physical activity (PA), screen time (ST), and sleep (SL) adapted to Brazilian families.

Methods: Phase 1 involved translation of the instruments to Portuguese. The selected instruments included, the PA parenting practices questionnaire – PAPP (Vaughn, 2013), the bedtime routine questionnaire – BRQ (Henderson, 2010), the outdoor playtime recall (Burdette, 2004), and screen time and sleep items from the InFANT Study (Hesketh, 2013). Phase 2 involved cognitive interviews with 24 parents from urban and rural Caruaru, Brazil addressing the format, content and clarity of the items. Seventy-eight parent-child dyads then completed the adapted instrument as an interviewer-administered survey twice within 7 days. Child PA, sedentary time and SL were concurrently assessed using an ActiGraph GT3X+. Internal consistency and test-retest reliability was assessed using Cronbach's alpha and Intraclass Correlation Coefficients (ICC). Concurrent validity was evaluated by calculating Spearman correlations between parent reported outcomes and objectively measured behaviours.

Results: Cronbach alphas for the PAPP and BRQ scales were acceptable and ranged from 0.66 - 0.88. The scales "limiting outdoor play due to weather" ( $\alpha$  = 0.39) and "maladaptive activities on sleep" ( $\alpha$  = 0.16) were excluded due to low internal consistency. Test-retest reliability of the parenting practices were acceptable and ranged from ICC = 0.82 - 0.99. Parent reported PA was positively correlated with objectively measured LMVPA (r=0.43, p < .05) and MVPA (r=0.39, p < .05). Parent reported SED time was positively correlated with objectively measured SED (r = 0.26, p < .05), and inversely correlated with LMVPA (r = -0.35, p < .05) and MVPA (r = -0.29, p < .05). Parent reported SL duration was positively correlated with objectively measured SL on weekdays (r = 0.29, p < .05), but not weekends.

Conclusions: Previously published instruments to measure children's obesity-related behaviours and parenting practices, translated and adapted for use in Brazilian families, exhibited acceptable evidence of validity, internal consistency and test-retest reliability.





# Unpack the Salt: Interim assessment of the Victorian Salt Reduction Partnership's media activities

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### Implementation and scalability (SIG)

Purpose: Australians are consuming almost double the recommended maximum salt intake. The Victorian Salt Reduction Partnership was established to coordinate efforts to reduce salt intake in the state of Victoria. As part of an intervention strategy, media and advocacy strategies were used to raise public awareness and stimulate industry and government action on salt reduction. This included periodically scheduled media releases of product category reports, which highlight the salt content of different processed foods within a category. This study aimed to perform an interim assessment of outcomes and identify if there are characteristics of the media strategy that led to better uptake and engagement.

Methods: Descriptive quantitative analysis of indicators of media coverage (media items, cumulative audience reach, advertising space rate) and food industry engagement (number of food manufacturers engaged, number and type of follow up actions) were performed for six product category reports (bread, cooking sauces, ready meals, dips and crackers, processed meats, Asian-style sauces). A qualitative analysis of the content and framing of the media release statements, which accompanied the product category reports, was also conducted in NVivo.

Results: A total of 759 media items (print and online news, radio and TV) were generated. On average, the cumulative audience reach was over 5.6 million Australians, and this ranged from less than one million to more than seven million. Approximately one-quarter of food manufacturers contacted were directly engaged by the VSRP, with between one and three manufacturers being engaged per report. The qualitative analysis of the media releases identified three main themes: general salt information (e.g. current salt intake, salt intake and health outcomes), outcomes of the product category report (e.g. range in salt levels, contribution to maximum daily salt intake) and calls to action (e.g. industry to reformulate, government to set salt targets). Differences in the themes and framing of product category reports were identified.

Conclusions: The media can be used as a tool to reach consumers with salt reduction messages and to engage food manufacturers in discussions about salt reduction. Further research is needed to determine what characteristics increase the effectiveness of media advocacy for nutrition interventions.





# Comparison of weight measures in Butterfly Girls, an obesity intervention trial for African American girls

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### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Obesity prevalence is greater in 6-11 year old girls than Non-Hispanic black (NHB) girls. Risk factors include unhealthy eating and home media use. This study examined the association of diet diversity and body weight change in NHB girls and media use patterns. Examining these associations is highly innovative given the controversial evidence of diet diversity on child growth with limited knowledge in NHB girls.

Methods: 8-10 year old NHB girls enrolled in a 6-month 3-group randomized controlled trial (intervention (I), comparison (C), wait-list control (WLC)) were observed over 3 timepoints: baseline, post 1 (3 mo), post 2 (6 mo). Height, weight, and 2 dietary recalls (Nutrient Data System for Research) were collected at each timepoint (weekday/weekend). Body mass index was expressed as Z-scores (BMIZ) using CDC methods. Diet diversity was estimated from the recalls using serving counts of items within each food group (fruit, dairy (full fat (ff), not ff), vegetable, whole grain, protein/nuts, added sugars/candy) according to 2 methods: counts within food group, Simpson-Index (SI: proportion relative to number of foods within the group). Time child spent using media (TSM (hours/week)) (e.g., TV, videogames) was obtained via parent survey. Dietary and media variables were weighted by weekend/weekday. Mixed models tested the association of BMIZ with diet diversity measures, controlling for covariates (education, free/reduced lunch, day, randomization group and its interaction with age), with random intercept and slope. Models were tested with and without TSM and its interaction with diet.

Results/findings: Child BMIZ at baseline was  $0.73\pm1.29$ . In the I group, SI for dairy (not ff) was lowest at post 2 ( $0.24\pm0.26$ ) compared to baseline ( $0.31\pm0.28$ ) and post1 ( $0.30\pm0.27$ ) (P= 0.04). In mixed models, TSM predicted higher BMIZ (beta=0.04 (Standard Error=0.01)) (P<0.03) irrespective of the diet measure. None of its interactions with diet measures were significant. Diet counts and SI were not associated with change in BMIZ.

Conclusions: Dietary diversity in NHB girls was not associated with BMIZ. Findings are significant, suggesting that higher diet diversity does not equate with weight change among NHB girls, warranting preventive strategies that focus more on media use.





# Exploring experiences of accessing nutritious foods and perceived program outcomes among low-income adults participating in the British Columbia Farmers' Market Nutrition Coupon Program

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### Implementation and scalability (SIG)

Purpose:Low-income households often lack funds to purchase sufficient nutritious foods, which are necessary for health and wellbeing. The British Columbia Farmers' Market Nutrition Coupon Program (FMNCP) provides low-income households with coupons valued at \$21/week to purchase healthy foods in local farmers' markets for 16 weeks during the summer. The purpose of this study was todescribe participants' experiences and perspectives of accessing nutritious foods, and facilitators and barriers to participating in the program; and to explore perceived program outcomes. This study is the first of its kind in Canada and fills gaps in the literature for longitudinal qualitative studies examining participants' experiences of FMNCPs.

Methods: Qualitative description was used to investigate participants' experiences and perspectives of the FMNCP. We interviewed 28 adults from low-income households from three communities in BC who were enrolled in the program. Semi-structured interviews were conducted at two time points by two researchers; during the program, and 4 to 7 weeks after the program ended. Data generation and analysis was guided by Freedman et al.'s theoretical framework for nutritious food access in farmers' markets. Two researchers jointly developed a coding scheme and coded the data using directed content analysis. Themes were developed by coding within and between time points.

Results: Five main themes emerged from the analysis: 1) Coupon Program execution and delivery; 2) Availability of nutritious foods in farmers' market; 3) Nutritional and social outcomes; 4) Enhanced nutritional knowledge 5) Suggestions for program improvement. All participants acknowledged that the program improved access to nutritious foods. Shopping at farmers' markets increased accessibility to fresh produce, provided opportunities for education, and increased social interactions. Barriers such as transportation, limited variety in rural areas, as well as stigmatizing experiences were identified. Participants suggested extending the duration of the program, and allow for more types of foods to be purchased with the coupons.

Conclusion: Participants viewed the program as an opportunity to access fresh and local foods, and identified several positive outcomes from the program. The results elucidate information required to scale-up similar programs to other provinces in Canada, and other parts of the world.





# OzHarvest's school-based FEAST (Food Education and Sustainability Training) program: A pilot study.

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Children and families (SIG)

#### Objective:

This pilot study investigated the feasibility of FEAST, a community-based school program involving students, teachers, and volunteers (caregivers/community). It aimed to promote healthy eating, teach cooking skills, and develop food waste awareness, amongst children.

### Methods:

Children aged 10-12 years in Grades 5-6 from New South Wales (NSW) Australian primary-schools participated in the study. A pre-test/post-test design using mixed methods was used. FEAST is a curriculum-integrated program that provided training to teachers to deliver the program over 10-weeks. It was guided by social cognitive theory and used project-based approaches, which are student-centred and interactive involving theory and cooking activities. FEAST aligned with Australian Dietary Guidelines and has been recognized by the UN's Global Compact Network as a program capable of contributing to 7/17 SDGs. The primary outcomes were changes in self-reported fruit and vegetable (F&V) intakes (serves/day). Secondary outcomes included: (i) F&V variety, (ii) discretionary food intake, (iii) cooking skills, (iv) food waste perceptions and behaviours, (v) sustainability understanding and (vi) satisfaction with FEAST (by students and teachers).

### Results:

Two schools involving six teachers, six classes, 158 students, and 14 volunteers participated in FEAST. Post-FEAST, 84% of students reported meeting recommended fruit intake (2 serves/day), which was a 6% increase from pre-FEAST data. Additionally, 26% of students reported consuming  $\geq$ 4 serves of vegetables/day, which represented a 7% increase. Teachers reported high satisfaction with FEAST, observing children eating more F&Vs and less discretionary foods at school. Cooking activities were the most valuable component, helping students better understand how to prepare nutritious foods, reduce food waste and eat sustainably.

### Conclusions:

The implementation of FEAST across NSW provides an invaluable opportunity to gain scholarly and translational research outcomes. Combining nutrition with wider aspects of food and sustainability may create alternative avenues for promoting nutrition education messages to children.

Given the challenges of promoting healthy and sustainable eating practices, FEAST is well-positioned to play a key student-engagement role by supporting the health-promotion within schools initiative, government-supported public health initiatives, SDGs and the national agenda to reduce food waste.





# Parental influences on physical activity and screen time among preschool children from rural Brazil

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### Children and families (SIG)

Purpose: Childhood obesity is a global problem, with children from low-middle income (LMIC) countries being disproportionately affected. Understanding how parents influence children's obesity-related behaviours would inform interventions to promote healthy lifestyle behaviours and prevent obesity. However, to date, no study has investigated the relationships between parenting practices and young children's physical activity (PA) and screen time (ST) in families residing in rural Brazil. Therefore, the aim of this study was to examine the relationships between supportive and controlling parenting practices and movement behaviours in preschool-aged children residing in rural Brazil.

Methods: Parent-child dyads from rural Caruaru, Brazil (n=78) completed a validated interviewer-administered survey measuring sociodemographic data, parenting practices and children's movement behaviours, including PA and ST. Child PA and sedentary time were also objectively measured using an ActiGraph GT3X+ accelerometer. Spearman correlations were used to assess the relationships between parenting practices and children's PA and ST.

Results: 53% of the children were male, with a mean age of  $4.6\pm0.8$ , and 41% were mixed-race.Parents completing the interview were mostly female (92%), and employed full-time (54%).Rules around active play indoors (rho = -0.31 to -0.35), the use of PA to reward/control child behaviour (rho = 0.27 to 0.48), limiting or monitoring screen time (rho = 0.22 to 0.29), and limiting outdoor play due to weather (rho = -0.23 to -0.36) were controlling parenting practices significantly associated with PA (p<.05). Verbal encouragement for PA (rho = 0.27 to 0.33) and perceived importance and value of PA (rho = 0.34 to 0.35) emerged as significant supportive parenting practices associated with PA (p<.05). Greater exposure to TV (rho = 0.40), limiting or monitoring screen time (rho = -0.56), and explicit modelling and enjoyment of screen time (rho = 0.49) were significant correlates of child ST (p<.05).

Conclusions: Supportive and controlling parenting practices shown to be salient in high-income countries emerged as significant correlates of children's PA and ST behaviours in rural Brazilian families. The findings identify potential targets for family-based interventions to prevent childhood obesity and warrant further investigation in larger, more representative samples of rural Brazilian families.





# A conceptual framework for modelling safe walking and cycling routes to secondary schools

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### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Background: Safe route to school interventions aiming to encourage walking and/or cycling to school are promising strategies to increase adolescent rates of active transport to school. Multiple factors influence whether adolescents walk and/or cycle to school. This article presents a comprehensive conceptual framework for modelling safe walking and cycling routes to secondary school.

Methods: The framework has been developed based on the existing relevant frameworks including: a) the ecological models which account for individual, social, environmental and policy factors as well as traffic and personal safety considerations; b) the Five E's framework of transport planning which includes engineering, education, enforcement, encouragement, and evaluation components; and c) travel mode choice framework for school travel consisting of urban form, mediating and moderating factors.

Findings: The proposed framework takes into account the key components of the existing relevant frameworks and shows how they are interconnected with each other for modelling safe walking and cycling routes to secondary schools. The framework identifies that built environment features (land use mix, walking/cycling infrastructure, neighborhood aesthetics, and accessibility to local facilities) and traffic safety factors (traffic volume and speed, streetlights, safe road crossings, and quality of roadway surface) need to be considered when modelling safe walking and cycling routes to secondary schools.

Conclusions: The framework suggests that modelling of safe school routes should focus on addressing the built environment features and traffic safety concerns. The framework needs to be tested using actual data in different geographical settings. Modelled routes should be evaluated prior to implementation using local data and ideally also incorporating feedback from stakeholders and future users. To be effective, modelling and creation of safe routes to secondary schools should be complemented by other interventions including education, enforcement, and encouragement to minimise perceived active transport-related traffic and personal safety concerns of adolescents and their parents. Future research should utilise multiple tools for assessing the school route built environment features including Geographic Information Systems and environmental scans.





# Innovative recruitment pathways to the ComeBACK trial: discussion of a variety of low cost recruitment strategies.

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### Implementation and scalability (SIG)

Purpose: Participant recruitment to community-based physical activity trials can be challenging. We are trialling different methods to recruit participants to the ComeBACK trial, a 3-arm pragmatic randomised controlled trial investigating the effectiveness of behavioural interventions on physical activity for adults with self-reported walking difficulty.

Methods: Recruitment to the ComeBACK trial is occurring using varied strategies

i) From the end of episode of care at an acute or rehabilitation hospital in New South Wales (NSW), South Australia (SA) and Victoria (VIC). Research staff facilitate screening at sites in VIC and SA.

ii) In each of these states and Queensland recruitment also occurs from the general community using advertisements in social media and through consumer organisations. Patients recruited via this method are directed to a website where they are screened using the eligibility criteria. Research staff then contact the person to assess their interest and confirm their eligibility.

The costs associated with each of these recruitment methods is being collected.

Results/findings: Since the commencement of recruitment in February 2019, 520 people have been screened, 118 participants have been recruited and 113 randomised. 76% of participants recruited are female with an average age of 69 years.

In the first 5 months of recruitment, 1 person (3%) was recruited from the community and 29 (97%) from health services. Social media advertising via Facebook commenced in more recent months in metro regions of Melbourne, Sydney and Adelaide (per advertisement: average cost \$235.00; average length 6 nights; average reach 15,172) and via a NSW government digital newsletter targeting older people. In the last 5 months 83 participants have been recruited, 59 (71%) from the community via advertisement and 24 (29%) from health services.

Conclusions: Several recruitment strategies have been successfully used in the ComeBACK trial. The use of advertising in both social media and with consumer organisations has yielded an increase in recruitment rates compared with recruitment from health services with or without the addition of research staff. Barriers to recruitment of participants directly from health services warrants further exploration to determine the suitability of this type of intervention within the Australian healthcare system.





# Resiliency in the face of migration: How exercise protects against perceived discrimination and fosters well-being

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### Children and families (SIG)

Purpose: Although the proportion of individuals with a migrant background is growing worldwide, migrants are still severely underrepresented in health research. Social Stress Theory (SST) proposes that migrants are at higher risk of being exposed to psychosocial stressors compared to non-migrants, resulting in decreased well-being. However, studies comparing well-being in migrants and non-migrants have shown both, lower well-being (supporting SST) and higher well-being in migrants (Healthy Migrant Effect). Research on individual factors or mechanisms that are associated with well-being in migrant populations is dearly needed. We address this research gap by examining the role of physical exercise for well-being in migrants. We hypothesize that physical exercise buffers the negative effects of experienced stress on well-being and that the more vulnerable migrant populations benefit more from this stress-buffering effect.

Methods: Data from N = 18,714 adolescents from the CILS4EU study, a multinational, longitudinal panel that oversamples migrants, were analyzed with regression analyses to test the moderating effect of migration background on the relation between exercise and experienced stress (perceived discrimination) and well-being (life satisfaction).

Results/findings: In line with our hypothesis, migrants reported more discrimination and exercised less often than non-migrants. At the same time, migrants showed higher well-being. The regression analysis shows that discrimination was negatively ( $\beta = -.24$ , p < .001) and physical exercise positively associated with well-being ( $\beta = .12$ , p < .001). The interaction between discrimination and exercise was significant, such that exercise buffers the adverse effect of discrimination on well-being ( $\beta = .03$ , p < .05). Further, the positive effect of exercise on life satisfaction was stronger in migrants compared to non-migrants ( $\beta = .02$ , p < .05).

Conclusions: Well-being is not only a key determinant of integration but also of general health. Despite lower levels of exercise, migrants benefitted more from exercise for well-being compared to non-migrants. Because health behavior change interventions targeting the general population may not reach migrants, innovative, culturally sensitive interventions could lead to improved health behavior in migrants and, ultimately, resilience in the face of adversity and higher well-being.





# Photographs assist in identifying Socio-Ecological factors influencing dietary behaviors of families living in underserved communities

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### Children and families (SIG)

Purpose: Although diet is an essential component of a healthy lifestyle, diet quality of US children is suboptimal. Disparities exist; children from low-income, minority families are at greatest risk. Because parents influence home food choices, we investigated parent perspectives of factors that influence dietary choices. Family-produced photographs added insight and context.

Methods: Using a convergent mixed methods design (surveys, interviews, photographs), a purposive sample of parents/caregivers of 8-13 year-olds living in underserved communities in a large US city were recruited (n=18). Surveys were completed online; descriptive statistics were calculated. Mobile phones were used to take photographs of factors that make it easy/hard to eat healthfully; photographs were discussed during the interview. Interviews were scripted, digitally recorded, and professionally transcribed. Two coders used hybrid thematic analysis to separately code transcripts. Coders met routinely to compare decisions and resolve differences. A codebook was maintained.

Results/Findings: All parents/caregivers were female and mostly 40-49 years old (61%), minority (56% Black/African-American, 44% Hispanic), and married/living with significant other (61%). Annual household income was \$21,000-\$44,000 (44%). Emerging interview findings reveal that mothers have a strong influence on the home food environment, although child and spouse preferences exert an effect. Opinions vary as to the influence of culture. Availability, cost, convenience, and time are cited as positive and negative influences. Mothers use a variety of strategies to help their families eat healthy foods: involving children in food shopping/preparation, buying food on sale, employing food substitutions, and making food-related activities fun. Technology is used to locate recipes, find substitutions, or view demonstrations. Cooking is seen as an important life-skill, and mothers express interest in attending a cooking class with their children, although opinions vary as who the class leader should be (e.g., chef, nutritionist, knowledgeable/experienced community member). Although mothers want to help their families consume a healthy diet, photographs, supported by interviews, reveal beliefs, practices, and misconceptions that may limit effectiveness.

Conclusions: Understanding family perspectives can provide insight into ways to enhance diet quality of children and families living in underserved communities.





# Gender, parenting practices and adolescent dietary behaviours

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Children and families (SIG)

#### Purpose:

Structured, autonomy supportive and controlling parenting practices have been associated with adolescent's dietary behaviours. To date, little work has considered the interplay between parents' and adolescents' gender on dietary behaviours and parenting practices. Therefore, this study examined whether the associations between parenting practices and adolescents' dietary behaviours are similar by adolescents' gender and examined whether gender of parent moderated these relationships.

#### Methods:

This study conducted a secondary analysis of the Family Life Activity Health Sun and Eating (FLASHE) data. FLASHE recruited a nationally representative sample of US parents and adolescents to complete surveys about their health behaviours and environment. A total of 1633 adolescents (12-17 years; 50% girls) and 1619 (74% mothers) parents were analyzed. Linear regressions were used to assess the relationship between parenting practices and adolescents' dietary behaviours (fruit and vegetable (F&V) or sugar-sweetened beverage (SSB) consumption). All models controlled for known confounders and were run independently for boys and girls. Parent gender was explored as a moderator in each sample of adolescents.

### Results:

Parenting practices seem to have a greater association with boys' dietary behaviours compared to girls. Boys consumption of F&V was found to have a significant positive association with use of structured (b=.24) and autonomy supportive (b=.20) parenting practices. Use of controlling parenting practices had a significant negative association with boys F&V consumption (b=-.12), but positive association with SSBs (b=.11). Girls F&V consumption only had a positive association with structured practices (b=.27). Parent gender did not moderate these associations.

### Conclusions:

The relationship between parenting practices and adolescents' dietary behaviours differed by boys and girls. Controlling and autonomy supportive parenting practices was not implicated in girls but were in boys. These findings raise the possibility that gender may be an important factor in the associations between parenting practices and adolescent dietary behaviours. Further work exploring whether parents use different parenting practices based on gender of their child or whether boys and girls differ in the ways they respond to specific parenting practices is needed.





# Active transport to school correlates in the objective and perceived school neighbourhood built environment for urban and rural areas in Otago, New Zealand

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### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Background: Built environment correlates of adolescents' active transport to school (ATS) have been extensively studied in urban areas whereas limited evidence exists for rural areas. School neighbourhood built environment (SN-BE) features may differ across urbanization settings and warrant further investigation. This study investigated correlations between school-level rates of ATS, objectively measured SN-BE features and adolescents' perceptions of safety along the route to school among New Zealand adolescents living in different urbanization settings and within 4 km of their school (considered a reasonable cycling distance).

Methods: Adolescents (n=1260; 43.6% male; 15.2±1.4 years) were recruited from 23 (out of 27) secondary schools located in large (n=11), medium (n=3) and small urban areas (n=4) and rural settlements (n=5) in the Otago region, New Zealand. Adolescents completed an online survey about their school travel and perceptions of safety. Responses were aggregated to present school-level averages. Home-to-school distance and SN-BE features (intersection density, residential density, mixed land use) were measured using GIS over 0.5 km and 1 km buffers. Walkability index was calculated for each school.

Results: On average, 38.1% of adolescents used ATS (range: 27.8%-43.9%). School-level ATS rates were negatively correlated with SN-BE intersection density (0.5 km and 1 km buffers: r=-0.610; r =-0.589), residential density (r=-0.620; r=-0.604) and walkability index (r=-0.697; r=-0.642) (all p<0.01), whereas weak but significant positive correlation was found with mixed land use (r=0.095; r= 0.070; both p<0.05). School-level ATS rates were negatively correlated with adolescents' concerns about safety of walking or cycling to school (walking: r=-0.763; cycling: r=-0.785), high traffic volume (r=-0.826) and presence of dangerous intersections (r=-0.751) along the school route. Adolescents' perceptions of the presence/absence of footpaths and cycle paths along the school route were not significantly correlated with school-level ATS rates.

Conclusion: When assessed across different urbanization settings and among adolescents living within 4 km of their school, lower rates of school-level ATS were negatively related to SN-BE intersection density, residential density and walkability, and adolescents' concerns about safety of walking/cycling to school, particularly in relation to traffic safety. Future ATS interventions should focus on SN-BE features and minimise adolescents' traffic safety related concerns.





# Mediators of socioeconomic inequalities in dietary behaviours among youth: A systematic review

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### Socio-economic inequalities (SIG)

Purpose: Children and adolescents with a lower socioeconomic position (SEP) have poorer dietary behaviours compared to their counterparts with a higher SEP. A better understanding of the mechanisms behind such socioeconomic inequalities in dietary behaviours would provide useful information about modifiable factors to target in interventions that tackle the inequalities. Hence, this systematic review aimed to summarize existing evidence regarding the mediators of socioeconomic differences in dietary behaviours among youth.

### Methods and results

A systematic literature search of MEDLINE, Embase, PsycINFO, and Web of Science databases yielded 20 eligible studies. The majority of the studies had a moderate methodological quality. The consistent mediators of the effects of socioeconomic position on dietary behaviours among youth were: self-efficacy, food preferences and knowledge at the intrapersonal level; and availability and accessibility of food items at home, food rules and parental modelling at the interpersonal level. No consistent mediators at the organizational, community and policy level were found.

### Conclusions

Our review found several modifiable factors at the intrapersonal and interpersonal levels that could be targeted in interventions aimed at combating SEP inequalities in dietary behaviours. Rigorous studies exploring organizational, community and policy level mediators are warranted.





# Associations of Light Physical Activity, Moderate-to-Vigorous Physical Activity and Sedentary Behaviour with Quality of Life in Men on Androgen Deprivation Therapy (ADT) for Prostate Cancer: A Quantile Regression Analysis

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### Cancer prevention and management (SIG)

Purpose: Men on androgen deprivation therapy (ADT) for prostate cancer experience multiple side effects including reduced quality of life (QoL). No study to date has examined associations between movement behaviours (sedentary behaviour [SED], light physical activity [PA], moderate-to-vigorous physical activity [MVPA]) and QoL among men on ADT. The study objectives are to: a) estimate the prevalence of movement behaviour patterns; and b) determine associations of PA and SED with QoL in this population.

Methods: We conducted a pooled analysis of 106 men on ADT from baseline data of three existing North American intervention studies. Movement behaviour was assessed using ActiGraph accelerometers worn for 7 days. Self-reported QoL was assessed using the Functional Assessment of Cancer Therapy (FACT). Quantile regression was used to examine associations of QoL with light PA, MVPA, and SED at the 25th, 50th, and 75th QoL percentiles.

Results: Men on ADT had a Mage=72.2 $\pm$ 7.6 years, MBMI=27.8 $\pm$ 4.0 kg/m2, 40.6% had surgery, 80.2% received radiation, and 72.6% had localized prostate cancer. Men spent 71.5% of their total time sedentary (8.9 h/day), 32.9% (3.2 h/day) in light PA and 2.2% in MVPA (0.3 h/day). SED in at least 30 minute-bouts was inversely associated with functional well-being (ß= -.003, p=.017) at the 50th percentile. Breaks in sedentary time were positively associated with physical well-being at the 75th percentile (ß=.007, p=.003), and inversely associated with FACT-General at the 50th percentile (ß= -.04, p=.005). Light PA was positively associated with FACT-Prostate at the 25th percentile (ß=.011, p=.020), and with the Trial Outcome Index (TOI)-Prostate at the 75th percentile. MVPA in at least 10-minute bouts was inversely associated with TOI-Prostate (ß= -.03, p=.026), emotional well-being (ß= -.01, p=.034), and FACT-General (ß= -.04, p=.034) at the 75th percentile.

Conclusions: Men on ADT are highly sedentary and engage in few MVPA minutes. Sedentary time, light PA, and MVPA were significantly associated with QoL outcomes, but varied across men reporting the poorest QoL compared to those in the highest QoL distributions. Light PA appears to be beneficial for QoL even among the poorest QoL distributions, suggesting the need to 'move more' after a prostate cancer diagnosis.





# The course of fatigue and physical activity from discharge up to 5-7 years post stroke rehabilitation and the role of activity pacing behaviour: A longitudinal mixed-methods study.

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### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purposes: The course of fatigue and physical activity (PA) from discharge up to 5-7 years post stroke rehabilitation may be influenced by activity pacing behaviour (how people divide their energy and PA during the day). This study aims (1) to explore how people after stroke perceive their course of fatigue and PA post rehabilitation and (2) to explore participants' experience of activity pacing behaviour, and its barriers and facilitators.

Methods: People after stroke (N=303) were followed from 3-6 weeks before discharge (T0) to 14 (T1), 33 (T2) and 52 (T3) weeks after rehabilitation in the longitudinal cohort study Rehabilitation, Sports and Active lifestyle (ReSpAct1.0). Latent Class analyses were used to characterize diversity in the course of fatigue and PA (trajectories from T0-T3), based on questionnaire data. Based on these trajectories and participants' characteristics (gender and age), a heterogeneous subsample of the ReSpAct1.0 study (N=20) will be invited, around 5-7 years post stroke rehabilitation, to fill in a short questionnaire and to participate in a semi-structured interview on how they experience their course of fatigue and PA, and on their activity pacing behaviour. The qualitative data will be combined with individual fatigue and PA trajectories and data on activity pacing behaviour into a longitudinal mixed-methods study. Audiotapes of the interviews will be transcribed verbatim. Both a thematic inductive and a deductive analysis (based on the Behaviour Change Wheel Taxonomy, centred on activity pacing behaviour) will be performed.

Results: Three fatigue trajectories were identified: (1) stable high (N=163), (2) stable low (N=41) and (3) recovery (N=2). Three PA trajectories were identified: (1) moderately active (N=196), (2) active (N=35) and (3) strongly improved PA (N=4). Further results will be presented during ISBNPA2020.

Discussion: We found a large diversity in fatigue and PA trajectories post stroke rehabilitation (T0-T3). Further findings of this study will provide a deeper understanding of the diversity in fatigue in people after stroke and the role of activity pacing behaviour to obtain/maintain a physically active lifestyle.





# Gender plays a role in the deterioration of dietary behaviours as youth transition to secondary school

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Children and families (SIG)

#### Purpose:

Diet is a well-established risk factor for childhood obesity. During the transition to secondary school, dietary behaviours deteriorate with boys engaging more frequently in unhealthy dietary behaviours compared to girls. To date, limited literature has considered the factors that may be affecting this observed shift in boys' and girls' dietary behaviours at this age. The aim of this qualitative study was to explore how individual and environment factors (including household, social, and school factors) relate to the changes in boys' and girls' dietary behaviours as they transition into secondary school.

### Methods:

Twenty-eight semi-structured interviews were conducted with a diverse sample of families from Surrey, BC, Canada. Interviews were conducted separately for one parent and child (11-13 years) from each family with interviewers probing for changes in youth's environments that may be related to dietary behaviours. Codes were triangulated using three trained researchers. Thematic analysis was used to explore differences between boys and girls.

### Results:

The analysis suggests boys' and girls' exposure to parenting practices and expectations surrounding food consumption within the familial environment differed. Specifically, boys' food consumption remained influenced by parental control whereas girls began to experience greater autonomy in food decisions including being more involved in food preparation. Boys further express pressure to consume larger quantities of food to increase body size whereas girls did not. Differences in the social environment also emerged; girls viewed fast food consumption as a key aspect of friendship, suggesting peer influence over this dietary behaviour, whereas boys consumed such foods based on hunger or convenience. Within the school environment, boys and girls experienced greater freedom during their school lunch hour but report using this time differently (boys-satiety or sports vs. girls-socialization).

#### **Conclusions:**

Boys and girls report differences in how parental, social and school environments influence their dietary behaviours as they transition to secondary school. Taking a gendered lens may help ensure that dietary interventions appeal to both boys and girls at this age. Addressing the retention of health promoting dietary behaviours can help protect against the development of childhood overweight and obesity.





# Recipes as a "sticky hook" to engage parents in family meals promotion

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### Children and families (SIG)

Purpose: Nutrition in early childhood is suboptimal internationally, contributing to high rates of overweight and obesity. Family meals are linked to improved child diet and health outcomes, making them a potentially valuable setting for nutrition promotion, but little is known about ways to engage parents on this topic ("sticky hooks"). The aim of this study is to assess parent interest in different types of family meals information, and whether this differs by education level.

Methods: An online survey of Australian parents with children aged 6 months to 6 years was conducted in 2014 (T1), with follow up in 2016 (T2). At T1 parents were asked to rate their interest in various types of information to support family meals (17 options), and how they would prefer to receive information about family meals (15 options). At T2 parents were asked what types of recipe resources they would use (6 items). Parents also reported their education level. Differences by education level (dichotomised to tertiary vs non-tertiary) were tested using Pearson's Chi-Square test.

Results: Participants (n = 890 at T1, n = 387 at T2), mostly mothers (97%), reported high interest in recipes. Most indicated they were "very interested" in: healthy recipes (58%), easy recipes (57%), recipes to prepare with children (59%) and recipes the whole family will enjoy (60%), with no differences by education level. Recipes were more highly rated than other information such as benefits of family meals or ideas about planning or sourcing food. In regard to the method of receiving family meal promotion material, electronically on mobile or computer was rated highest (83% and 88% interested respectively), followed by newsletters (76-79%) and Apps (63%). Overall participants were just as interested in recipes or electronic cookbooks published by a university or health service as by well-known cooks, though those of lower education were less likely to be interested in evidence-based information from health professionals, researchers, or universities.

Conclusions: Knowing that recipes provided in various electronic formats are of interest to parents (a "sticky hook"), this could inform innovative approaches to engaging parents with interventions promoting healthy family mealtimes.





# Does Home-to-School distance matter? Parental perceptions of walking and cycling to high school in Dunedin, New Zealand

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### Children and families (SIG)

Purpose: Parental perceptions of different modes of transport correlate with adolescents' mode choice for school trips. Whether parental attitudes towards active transport to school differ by mode and/or home-to-school distance is unknown. We compared parental perceptions of walking versus cycling to school in adolescents in Dunedin city, New Zealand and examined whether mode-specific motivations and barriers differ by home-to-school distance.

Methods: Parents (n=341; age: 47.5±5.2 years; 77.1% females) completed a survey about their adolescent's (age: 13-18 years; 48.1% boys) transport to school habits and their own perceptions of walking/cycling to school. Participants were categorised into three groups according to home-to-school distance (calculated using Geographic Information Systems analysis): 'walkable' ( $\leq$ 2.25 km), 'cyclable' ( $\geq$ 2.25 and  $\leq$ 4.0 km) and 'beyond cyclable' ( $\geq$ 4.0 km) distances.

Results: Common modes of transport to school differed significantly across the 'walkable'/'cyclable'/'beyond cyclable' categories: car passenger: 25.7%/40.5%/60.6%; public/school bus: 5.5%/15.4%/28.4%; walking: 66.2%/28.2%/1.2%; cycling: 0.0%/7.7%/0.5% (all p<.001). Irrespective of the home-to-school distance, most parents regarded both walking and cycling to work and school as important. As home-to-school distance increased, parents more frequently reported active transport-related barriers and increased convenience of driving and trip-chaining. Compared to walking, parents perceived cycling to school to be less important (walking/cycling: 87.5%/62.5%), with less social support from parents (46.2%/17.1%), peers (20.6%/4.8%) and school (24.5%/12.4%) and more personal barriers (lack of adolescents' interest: 51.5%/68.1%), environmental barriers (lack of footpaths/cycle paths: 35.0%/73.5%) and more safety concerns (35.0%/64.6%; all p<.001). As home-to-school distance increased, parents perceived less social support for walking to school whereas personal, environmental and safety-related barriers increased. Although less consistent, similar findings were observed for cycling to school. Parental perceptions of their adolescents' cycle skills did not differ across the three distance categories. Overall, 68.2% of parents expected to participate in walking/cycling to school decision-making for their adolescent.

Conclusions: Parents favoured walking compared to cycling to school. With increasing home-to-school distance, parental attitudes towards both walking and cycling were changing with less social support and more personal, environmental and safety-related barriers among those living further away. Future interventions should be mode-specific, take into account distance to school and focus on reducing parental concerns.





# Adolescents' food-purchasing patterns in the school environment: Examining the role of maternal monitoring and perceived relationship support

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### Children and families (SIG)

Purpose: To date, there have been relatively little empirical investigations into adolescents' food purchasing patterns in and around their school food environment. This cross-sectional study aimed to give insight in adolescents' specific food purchasing patterns in their the school food environment. In addition, we explored the potential relationship with maternal monitoring and perceived relationship support.

Methods: A total of 726 adolescents (45.8% boys; M age =  $13.78 \pm .49$ ; M zBMI =  $-.33 \pm 1.02$ ) and 713 mothers (M age =  $45.05 \pm 4.45$ ; M BMI =  $24.62 \pm 4.17$ ) participated in this study. Adolescents' frequency of bringing and purchasing foods and beverages was assessed via a short Food Frequency Questionnaire (FFQ). Perceived maternal relationship support and maternal monitoring were measured via self-report questionnaires administered to either the adolescent or mother. Structural Equation Modelling (SEM) was conducted to explore the link between both variables and adolescents' food purchasing behavior.

Results: The vast majority of the adolescents reported to buy foods or drinks less than one day per week in or around their school food environment. In contrast, they reported to bring foods and drinks mostly from home. The extent to which adolescents brought or purchased specific foods or drinks depended upon the degree of relationship support they reported to receive from their mother. No relationship was found between maternal monitoring and adolescents' food purchasing behavior.

Conclusions: The home food environment plays an important role in what type of food or drinks are consumed within the school environment by younger adolescents (i.e. 12-14 years). This specific age group reports to make little use of the food environment in or around their school. This has implications for policy makers who aim to develop and implement measures to improve the school food environment in order to promote (younger) adolescents' eating habits.





# Positive changes in nutrition knowledge and dietary attitudes after nutrition education related to sugars and sodium intakes in Korean elementary school students

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### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: The purpose of this study was to evaluate the effects of nutrition education on reducing sugar and sodium intakes in elementary school students and to establish healthy dietary behaviors for reducing sugar and sodium intakes in them.

Methods: Nutrition education was done for the fifth-grade students (531 total; 258 male and 273 female students) of five elementary schools located in the Incheon Metropolitan City, Korea. It was performed for five months from May to September in 2019. Contents of nutrition education consisted of the role of sugars and sodium, health problems due to their excessive intakes, and methods of reducing sugar and sodium intakes. Data were collected using self-administered questionnaires. Pretest was conducted to check the nutrition knowledge about sugars and sodium and dietary habits of eating sweet and salty foods one week before applying the nutrition education. After nutrition education, posttest was conducted to check for the degree of changes in nutrition knowledge and dietary attitudes. All data were analyzed SPSS program version 20.0.

Results: Average total score of nutrition knowledge significantly increased from 5.6 to 7.0 points (out of 10 points, p<0.001). There were significant increases in average scores of dietary attitudes related to salty eating habits from 32.5 to 38.2 points and sweet eating habits from 32.5 to 37.0 points (out of 50 points, p<0.001, respectively). Dietary behavior that showed the highest intent to act was for "I will check the sugar and sodium contents through nutrition labeling when purchasing processed foods." After nutrition education, students showed a significantly positive correlation between scores of nutrition knowledge and dietary attitudes about sugars and sodium, and the higher the level of nutrition knowledge, the higher was the willingness to dietary practice reducing sugar and sodium intakes (p<0.01).

Conclusions: These results showed a positive effect on changes in healthy dietary behaviors after nutrition education and indicated that the enhancement of nutrition knowledge was extended to the improvement of dietary habits. In addition, systematic and continuous nutrition education is needed for reducing sugars and sodium intakes in elementary school students in Korea.





# Self-esteem among UK adolescents: Temporal trends, gender differences, and protective factors

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**Children and families (SIG)** 

Purpose: This study examined gender-specific changes in self-esteem during adolescence and explored whether selected behavioral factors at age 11 years predict change in self-esteem between age 11 and 14 years among boys and girls in the UK.

Methods: Participants were 9341 (4740 female) UK adolescents. Adolescents reported social media use at age 11 and self-esteem at age 11 and 14 years. Parents reported the physical activity and screen entertainment time of their children at age 11. Independent samples t-test assessed gender differences in self-esteem and change in self-esteem. Sex-specific repeated measures analysis of variance assessed changes in self-esteem. Change in self-esteem was regressed on each behavioral exposure for boys and girls; adjusting for significant behavioral exposures and then confounding factors (ethnicity, family income, body mass index).

Results: Girls consistently reported lower self-esteem than boys (p<0.001) and experienced a greater decline in self-esteem during adolescence than boys (p<0.001). In final models, sport participation positively predicted change in self-esteem among boys and girls (p<0.05). Television viewing and social messaging exposure negatively predicted change in self-esteem among girls (p<0.01).

Conclusions: Sport participation, television viewing and social messaging use are important independent targets for intervention for the optimal well-being of adolescents.





# Implementation of Telerehabilitation Interventions for Self-management of Cardiovascular Disease: A Systematic Review

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### Implementation and scalability (SIG)

Purpose: Cardiovascular diseases are the leading cause of disability and deaths worldwide and secondary prevention is crucial to improve risk factors and reduce disease burden. Accessibility barriers contribute to underutilisation of traditional centre-based cardiac rehabilitation programs and alternative delivery models, including cardiac telerehabilitation, can be effective and cost-effective, but there is inadequate evidence about translating this research into routine clinical practice. This review of pragmatic and experimental studies synthesises current knowledge about implementing cardiac telerehabilitation, which is critical to support broader access to cardiac rehabilitation and improve individual, clinical, and health economic outcomes.

Methods: Four electronic databases were searched from 1990–09/11/2018 for studies evaluating implementation of cardiac telerehabilitation in routine clinical practice or implementation outcomes assessed in experimental trials among adults (>18 y) with coronary heart disease (myocardial infarction, angina, coronary revascularisation). This review follows PRISMA guidelines and is registered with PROSPERO (CRD42019124254).

Results: No studies evaluated cardiac telerehabilitation implementation in routine clinical practice. Eight studies evaluated aspects of implementation within experimental trials (n=1547). Acceptability (N=6), fidelity (N=5), appropriateness (N=4), implementation cost (N=3), and feasibility (N=1) were frequently evaluated from participant perspective. Interventions delivering personalised text-messages were considered useful, safe and appropriate; however, smartphone- or web-based app interventions that provided more comprehensive services, including individualised real-time monitoring and coaching were preferred. Most studies showed high intervention fidelity while few studies signalled potential of cardiac telerehabilitation to improve service access at a lower cost than traditional cardiac rehabilitation. Intervention delivered via mobile phone was found easy for everyday use among participants. Key outcomes, including adoption, penetration and sustainability (all N=0), and perspectives of CR practitioners and health service organisations, have received little attention.

Conclusions: Early experimental trials suggest cardiac telerehabilitation can successfully address the unmet needs of some individuals; however, there is much to learn about how interventions can be successfully, scalably, and sustainably translated into routine clinical practice to realise their potential impact on accessibility and participation rates, as well as person-centred, health, and economic outcomes.




# Evaluation of a voucher scheme to increase child physical activity in participants of a school physical activity trial

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### Socio-economic inequalities (SIG)

Purpose: To describe an opportunistic evaluation, of the impact of a scheme providing financial support for organised sports participation on child physical activity and organised sports participation.

Methods: A longitudinal survey of parents from primary schools (children aged 5-12 years) was conducted in the Hunter region of New South Wales, Australia. The study draws on a panel of parents established at the end of a randomized trial of a school-based healthy eating and physical activity intervention. Telephone surveys with participating parents were conducted at Baseline and approximately 10-12 months after the launch of the scheme that provided parents with a voucher enabling up to \$100 discount on fees for organized sports membership. Parents were asked questions regarding registration and redemption of the voucher for their child, purpose for registering for a voucher and perceived acceptability of the scheme. Additionally, parents were asked whether their child participated in organized team and/or individual sports and the amount of time their child spent being physically active outside school hours.

Results/findings: Of the potential 975 parents who consented to be panel members, 511 completed the telephone surveys at both time points (52.4%). There was a high voucher redemption rate reported by parents within this sample (79.8%). The majority of parents perceived redemption of the voucher did not change their child's physical activity levels. Children who redeemed a voucher were approximately three times as likely as those that did not redeem a voucher to participate in organized team sports (OR = 3.11; 1.41-6.87, p = 0.009). There was a no significant association in measures of self-reported physical activity levels outside of school hours and voucher redemption.

Conclusions: This study describes an opportunistic evaluation of a government voucher scheme to increase child physical activity levels in a large broadly population-based sample. Overall this post intervention sample appeared already highly motivated to participate in sport therefore high voucher usage rates made little difference to their participation in sport. The study highlights the challenges in undertaking naturistic evaluation of large-scale initiatives to improve population levels of physical activity.





# Role of incentive influence on food purchasing behavior in an impoverished rural food environment

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### Socio-economic inequalities (SIG)

Purpose: Populations in rural, geographically isolated areas, such as the Appalachian region of the United States, experience an aberrated food environment relative to those in other rural, urban and suburban areas. At the community level, the food environment shapes purchasing behaviors which has been linked to dietary intake. Interventions aiming to improve variety and quality of food items in persistently impoverished rural communities are lacking. This may contribute to poor dietary intake and higher rates of obesity relative to urban counterparts. Thus, this project seeks to understand how an exogenous shock (incentive) may influence purchasing habits among rural shoppers.

Methods: Receipt data was compiled from individuals (n=111) living in one highly obese (>40%) Appalachian county, that shopped at two local grocery stores. Individuals redeemed their incentive (\$25) as part of data collection funded through the Centers for Disease Control and Prevention High Obesity Program. Food items indicated on the receipt were categorized into the following: fruits and vegetables, meat and dairy protein, and candy/snack items. Additionally, the validated NEMS-GS food environment tool assessed the consumer food environment in one grocery store.

Results/Findings: Individuals purchased the largest percentage of grocery items on meat and dairy protein, contributing 18.31% of receipt subtotals. Fruit and vegetable purchases followed with 13.10% of receipt subtotals, while candy/snack items contributed to 9.95% receipt subtotal. The NEMS-GS audit revealed a score of 18 for food item availability and a pricing score of –1, indicating a depleted food environment.

Conclusions: Recipients commonly expanded their scope of food items to include protein-dense items, which otherwise may not have been purchased due to prohibitive costs. NEMS-GS further revealed the food access and environmental barriers residents face in rural Appalachian communities. These results support food environment enhancements within grocery stores to promote healthy food purchases among customers in rural areas. Intertwining targeted marketing and in-store promotions, may aid in the purchasing of items that could be viewed as seemingly unattainable to regularly purchase. Future interventions should sample receipt data and sales without an incentive to assess purchasing habits.





# Estimation of maximal oxygen consumption based on sedentary behavior and physical activity assessed by Worker's Living Activity-time Questionnaire (WLAQ)

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### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Sedentary behavior (SB) and cardiorespiratory fitness (CRF) are important issues in occupational health. The Worker's Living Activity-time Questionnaire (WLAQ) was developed in a previous study to assess worker's sitting times, and the WLAQ could be renewed for evaluating worker's CRF if additional physical activity (PA) information were provided. The purpose of this study were to investigate criterion validity of an equation model using WLAQ for estimating maximal oxygen consumption (VO2max).

Methods: A total of 198 working adults completed anthropometric measurements, treadmill exercise test for VO2max, and the modified WLAQ (m-WLAQ) which provided additional questions about PA information with the original WLAQ. Multiple regression analyses were used to develop prediction equations for VO2max. The generated models were cross-validated by the PRESS method. Of all the participants, the data of 97 participants, who completed the m-WLAQ twice with a 1-week interval, were used to calculate intraclass correlation coefficients (ICC) for the m-WLAQ's test-retest reliability analyses.

Results: Age (r = -0.29), sex (r = 0.48), body mass index (BMI) (r = -0.20), total sitting time (r = -0.15), and PA score, i.e., total points of PA information, (r = 0.47) were significantly correlated with VO2max. The models including age, sex, and BMI accounted for 43% of the variance in measured VO2max (SEE = 5.04 ml·kg-1·min-1). The percentages increased to 59% when the PA score was included into the models (SEE = 4.29 ml·kg-1·min-1). Cross-validation analyses demonstrated good stability of the VO2max prediction models, while systematic under- and over-estimation of VO2max were observed in individuals with high and low fitness, respectively. The ICC of the PA score was 0.87 (0.82–0.91), indicating excellent reliability.

Conclusions: The PA score rather than sitting times derived from the m-WLAQ was correlated well with measured VO2max. The equation model using the PA score as well as age, sex, and BMI had a favorable validity in estimating VO2max. Thus, the m-WLAQ can be a useful questionnaire to assess workers' SB and CRF concurrently, which makes it a reasonable resource for future epidemiological surveys in occupational health.





# Neighbourhood disadvantage, individual-level socioeconomic position and insufficeint physical activity: a longitudinal multilevel study

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### Socio-economic inequalities (SIG)

Introduction: Physical inactivity is a major health concern as it is a determinant chronic disease and obesity. Crosssectional studies show that residents of disadvantaged neighbourhoods and individuals from low socioeconomic groups are more likely to be insufficiently active. Little is known about the longitudinal patterns and influences of neighbourhood disadvantage on physical activity (PA) change in mid-aged adults.

Methods: Data comes from the HABITAT project, a multilevel longitudinal investigation of health and wellbeing in Brisbane, Australia. Data included 11,035 residents in 200 neighbourhoods in 2007, with follow-up data obtained in 2009, 2011, 2013 and 2016. Neighbourhood disadvantage was derived using a Census-based index and divided into quintiles. PA was self-reported (in the previous week), and an overall measure of energy expenditure was derived by multiplying the time (minutes/week) spent in walking, moderate activity and vigorous activity by an intensity value based on metabolic equivalent rates (Met.mins), and summing the products; 500Met.mins/week was defined as insufficient PA. Individual-level socioeconomic measures include education, occupation, and household income. Multilevel binomial logistic regression models were applied to investigate the impacts of neighbourhood disadvantage on having insufficient PA at five-time points.

Results: The probability of being classified as doing insufficient PA was highest among residents of the most socioeconomically disadvantaged neighbourhoods (OR: 1.74, 95%CI 1.45, 2.10), the least educated (OR: 1.84, 95%CI 1.57, 2.16), blue collar workers (OR: 1.34, 95%CI 1.13, 1.59), and members of lower income families (OR: 1.48, 95% CI 1.23, 1.79). Each of these same groups reportedly engaged in fewer Met.mins of total PA at each wave.

Conclusions: Key findings indicated that the likelihood of doing insufficient PA is greatest for low socioeconomic groups and residents of disadvantaged neighbourhoods. Policies and interventions aimed at creating supportive environments for physical activity, especially among the socioeconomically disadvantaged, should be a priority.





# Pattern and predictors of sedentary behaviours over five years among women from socioeconomically disadvantage neighbourhoods

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### Socio-economic inequalities (SIG)

Background: Sedentary behaviour (SB) is linked to adverse health outcomes, and socio-economically disadvantaged women are at high risk of both SB and poor health. This study aimed to 1) describe patterns of sitting, television (TV) viewing and computer use over time, and 2) determine the predictors of sitting, TV and computer use over time amongst women living in socioeconomically disadvantage neighbourhoods.

Methods: Data were collected three times over five years from women living in Victoria, Australia (2007-08= 4347, 2010-11=1912, 2012-13=1520). Women self-reported weekly sitting, TV and computer time, socio-demographic and health information. Sitting, TV and computer time assessed by reliable established measures. Multilevel-mixed modelling determined baseline sociodemographic and health predictors of change over time in sitting (linear regression), and in TV and computer use (negative binomial regression), adjusting for confounders.

Results: Mean sitting time decreased (40.9 to 40.1 hours/week), median TV time decreased (16.5 to 16.0 hours/week) and median computer time increased (9.5 to 14.0 hours/week) over five years. SB was highest amongst women who were younger, urban, highly educated, working full-time, never-married and with no children (sitting and computer), living with obesity and poor health (sitting and TV). Highest TV time was also evident in women with low education, lower income, not-working, smokers, those never-married and with no children. Annually, the average sitting time decreased by 30mins/week in women working full-time but increased by 6mins/week in not-working. Similarly, annual sitting decreased by 48mins/week in women with no children but increased by 12 and 48mins/week among those with two and three/more children, respectively. Average computer time increased annually by 5% among those with low education but decreased by 1% among those with high education. Women not-working and with children increased computer time by 7% and 5% per year respectively.

Conclusion: Sitting and TV viewing time decreased while computer time increased over five years among women from socioeconomically disadvantaged neighbourhoods. Those with low education, not-working and with children appear at particular risk of increasing SB over time. Interventions aimed at preventing increases in SB could focus on women with these high-risk characteristics.





# Optimal timing and method for promoting adherence to lifestyle and body weight recommendations in postmenopausal breast cancer survivors – First results of the OPTIMUM study

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### Cancer prevention and management (SIG)

Purpose: Adherence to lifestyle and body weight recommendations can improve health outcomes among postmenopausal breast cancer (PMBC) survivors. However, the majority does not adhere to these recommendations and there is a lack of insight on when and how sustained adherence should be promoted. Therefore, the OPTIMUM-study aims to gain insight into the optimal timing and method for promoting sustained adherence to lifestyle and body weight recommendations in PMBC survivors.

Methods: The OPTIMUM-study is guided by the first three steps of Intervention Mappingand has a mixed-methods design: a longitudinal observational study with measurements at 4-6 months after cancer diagnosis (T0), 1 year after diagnosis (T1), and 2 years after diagnosis (T2), semi-structured interviews, and focus groups.1100 PMBC survivors are recruited from 16 hospitals across the Netherlands. The PROFILES registry is used for data collection management (http://www.profilesregistry.nl).

To assess optimal timing, questionnaires are used to assess adherence to lifestyle and body weight recommendations, readiness for change, and need for support, and qualitative research is used to assess their determinants and perceptions on optimal timing. To assess the optimal method, changeable determinants are matched to evidence-based methods using the Behavior Change Technique Taxonomy, and qualitative research is conducted to assess the acceptability of the selected methods.

Generalized Linear Mixed Models are conducted for longitudinal data analyses, multivariable (logistic) regression analyses are conducted per time point, and thematic analyses is conducted for qualitative data analysis using the paper-pencil method.

Results: Currently, 155 participants have been included (participation rate 66%). In June 2020, inclusion of participants will have completed. First results will be presented on adherence, readiness for change, need for support, and their determinants at T0 and T1, as well as the holistic, bottom-up approach used to obtain the ultimate results: a toolbox with numerous intervention ingredients (i.e., building blocks) from which the right 'tools' to construct an individually-tailored intervention can be selected.

Conclusions: The OPTIMUM study leads to scientific evidence on when and how to promote sustained adherence in which postmenopausal breast cancer survivorsthat will be incorporated into clinical oncology guidelines (www.oncoline.nl).





# Differences in adiposity, cardiorespiratory fitness and daily physical activity levels of adolescents with different BMI status at 6 years of age

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Children and families (SIG)

#### Purpose

Cardiorespiratory fitness, the amount of daily moderate-to-vigorous physical activity (MVPA) and excessive adiposity, are recognized as important factors influencing overall health. This study aimed to assess if adolescents who were overweight at the age of 6 years old, present differences in cardiorespiratory fitness, daily time of MVPA and adiposity, when compared to adolescents who had normal weight at 6 years of age.

#### Methods

Retrospective study with 324 adolescents (181 girls, 143 boys) with a mean age of 13.9±1.63 years, conducted in five schools in the north and centre of Portugal. Anthropometric data at the age of 6 years were retrospectively collected from individual child health booklets records [Boletim de Saúde Infantil e Juvenil] provided by each participant, to calculate age and gender adjusted BMI percentiles according to World Health Organization references. Current weight, height and waist circumference were measured, and BMI and waist-to-height ratio were calculated. Body fat percentage was estimated by bio-impedance. Cardiorespiratory fitness was estimated using the 20-meter shuttle run test and physical activity was objectively measured by accelerometer.

#### Results/findings

Tracking of excessive adiposity from childhood to adolescence was confirmed for both genders, characterized by various measures of adiposity. In addition, and regardless gender, it was also found that the adolescents whom were overweight at the age of 6yr-old had significant lower levels of cardiorespiratory fitness in adolescence. However, no differences in the daily time of MVPA were found.

#### Conclusions

Early prevention of an overweight condition in childhood may be important in facilitating the acquisition of higher cardiorespiratory fitness values, and in the maintenance of a favourable adiposity status in adolescence.





# Using Gait Speed to Identify Mobility Disability Risk in Older Cancer Survivors Compared to Older Adults without Cancer History

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### Ageing (SIG)

Purpose: To use a validated clinical gait speed test to assess mobility disability risk in older cancer survivors by examining: 1) differences in gait/walking speed for older cancer survivors v. older adults without cancer history, 2) variation by cancer site and 3) other clinical risk factors (e.g., BMI, multimorbidity) that could be useful in early detection of mobility limitations.

Methods: We analyzed data from a nationally representative sample of US community-dwelling Medicare beneficiaries (n=5,676), including adults diagnosed with cancer (n=1046) from the 2011-2012 National Health and Aging Trends Survey (NHATS). NHATS used a 3-Meter walk test as part of a brief assessment of physical performance. The results were scored on a scale of 1-4 (1=worst, 4=best) using criteria supplied by the National Institute on Aging. We calculated mean overall walking scores for all survivors and non-cancer adults and analyzed using multivariable logistic regression models, controlling for age, gender, education, race/ethnicity, multimorbidity, BMI, and pain.

Results: Overall, cancer survivors had lower mean walking speed scores (2.27) than non-cancer controls (2.39), indicating greater risk for mobility disability. The best overall mean walking score was for prostate cancer survivors (2.52) and the worst score (2.19) was observed in breast and kidney cancer survivors. In regression models, survivors were 23% less likely than non-cancer controls to perform well on the walking test (OR=0.77, p<.01). The older survivors (75+ years) were 57% less likely (OR=0.43, p<.001) and the oldest (85+ years) were 83% less likely (OR=0.17, p<.001) to achieve the highest score on the walking test compared to adults 65-74 years. Being underweight, overweight, Black, having  $\geq$  three medical conditions and experiencing pain that limited activity were also all associated with worse performance on the walking test (all p<.05).

Conclusions: Survivors were generally at greater risk for mobility disability than non-cancer controls and this varied by cancer site. Based on our data, prostate cancer survivors demonstrated the greatest mean walking speed, especially compared to breast and kidney cancer survivors. The 3-meter gait speed test provides a robust method on which to assess mobility disability risk and could inform interventions to facilitate an active lifestyle in cancer recovery.





# Is meeting the 24-hour movement guidelines associated with a reduced risk of adiposity among children and youth?

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Children and families (SIG)

Purpose: The purpose of the study was to analyze the cross-sectional associations between the adherence to the 24-hour movement guidelines and adiposity among children and youth.

Methods: An analysis was performed in 679 Czech children and youth (57% girls) aged 8–18 years. The amount of time spent in moderate-to-vigorous physical activity (MVPA) and SL duration were measured using wrist-worn ActiGraph accelerometer. Accelerometer data were processed using the GGIR open-source R package. Entertainment screen-time (ST) was investigated by two questions with nine response options. BMI z-score, fat mass percentage, and visceral adipose tissue (VAT) were used as adiposity indicators. Children were classified as meeting the overall 24-hour movement guidelines if they accumulated  $\geq 60 \text{ min/day of MVPA}$ , and engaged in less than 2 h/day of ST and uninterrupted SL of 9–11 hours for those younger than 14 years and 8–10 hours for those aged 14 years and over.

Results: In the total sample, 34.6% of children did not meet any component of the 24-hour movement guidelines, 42.3% met one, 18.7% met two, and 4.4% met all components. Children who met only the ST component had significantly lower odds of having excess VAT (odds ratio [OR]=0.44, 95% confidence interval [CI]: 0.21–0.92, p=0.028) in comparison with children who did not meet any component of the 24-hour movement guideline. A significant joint association of meeting the ST and SL guideline with VAT was confirmed (OR=0.10, 95% CI: 0.01–0.79, p=0.026). Children who met any two components of the 24-hour movement guidelines had 3.2 lower likelihood of having excess VAT (OR=0.31, 95% CI: 0.14–0.69, p=0.004).

Conclusions: Meeting multiple components of the 24-hour movement guidelines was associated with a reduced risk of excess central adiposity. However, only a small proportion of children met all components of the 24-hour movement guidelines. A combined effect of physical activity, sedentary behavior and SL should be considered in designing effective intervention strategies to prevent childhood obesity.





# The headcam caregiver-infant interaction assessment tool: testing the feasibility and acceptability in Soweto, South Africa, using participatory engagement

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### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: The aim of this study was to test the feasibility and acceptability of the headcam caregiver-infant interaction assessment tool in Soweto, South Africa.

Methods: 19 mother and infant (6-24 months) pairs were included in this study. Mothers and infants were asked to wear headcams (first person observation) while participating in both group (3 groups), and individual activities. Detailed instructions on headcam use were provided to mothers before and during these activities. Mothers were then asked to take the headcams, as well as photoframe cameras (context of the interactions), home and attempt to use them in at least three 30 minute caregiver-infant engagement sessions of their choice over a one week period. Thereafter, focus group sessions using a semi-structured interview guide with a relatively flexible framework for discussion were conducted. These focus group discussions were coded according to emerging themes using a constant comparison method. The interview guide focussed on the acceptability and feasibility of the headcams in the home setting.

Results: The majority of mothers reported that they enjoyed using the headcams. However, some mothers reported difficulties with the headband placement of the camera on the infant and suggested different methods of attachment. Mothers found the instructions given to be useful and sufficient, but reported they would have preferred leaving the cameras on for the entire day. Mothers reported that other family members did not mind the use of cameras in the home, and in fact enjoyed being involved. Acceptability, as well as feasibility of the data was better in younger infants due to decreased autonomy of movement and better compliance. All mothers reported that they would wear the headcams again, and were interested in viewing the footage obtained; and, in general, were not concerned about breaches in privacy or the use of their data.

Conclusions: Headcams proved feasible and acceptable for use in this population. Mothers provided valuable information for improvement of the protocol for using the devices, which will be incorporated into future studies in order to ensure compliance. The data obtained from the headcams was of sufficient quality, and improvements in the protocol will optimise data quality.





# The validity of the youth activity profile for assessing moderate-to-vigorous physical activity in youth from Czech Republic

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### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Previous research has supported the validity and utility of the Youth Activity Profile (YAP) for providing accurate group-level estimates of physical activity (PA) and sedentary behavior (SB) in youth. The present study evaluated the cross-cultural validity of newly refined algorithms from the U.S. in a sample of youth from the Czech Republic.

Methods: Data sample consist of 570 youth from 7 schools in a mid-sized metropolitan area. The sample included 318 males (mean age = 14.2±2.81) and 252 females (mean age = 14.3±2.68). Participants wore an ActiGraph accelerometer on non-dominant wrist for a full week and then completed a customized version of the YAP at school to report PA levels in school (5 items), outside of school (5 items) and SB (5 items). The raw YAP data were converted into estimates of PA and SB using the prediction algorithms. The accelerometer data were processed using the R-based GGIR package to obtain estimates of MVPA minutes per day and averages were computed for weekdays and weekends. Standard measurement agreement methods were used to evaluate the agreement of corresponding estimates obtained from the YAP prediction algorithms. Agreement was examined separately for males and females and for distinct age groups using correlations and computed values of Mean Absolute Percent Error (MAPE). Equivalence testing was used to directly compare the equivalence for the different age and gender sub-groups.

Results: Correlations between the YAP and the accelerometer ranged from 0.14 to 0.50 for weekday and from 0.30 to 0.57 for weekend PA estimates. The MAPE values ranged from 3.7% to 34.9% for weekday and from 10.7% to 58.7% for weekend PA estimates. Error rates tended to be higher for the younger group than the older group on weekend PA estimates. Girls' PA estimates shows less error rates than boys' in both variables. Equivalence testing results revealed that estimates of PA were in the equivalence zone only for youngest group on week day.

Conclusions: Results provide preliminary evidence to support the cross-cultural validity of the YAP for estimating PA and SB in youth, but improvements in accuracy may be possible with country-specific calibration approaches.





# Barriers to dietary and physical activity intervention for weight loss among obese adult patients

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### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Obesity is a widespread health issue. Behavioral lifestyle interventions including dietary and physical activity modification have failed to achieve clinically significant weight loss. The review discusses the barriers to weight loss among obese adults.

Methods: Potentially eligible original studies including adult participants with BMI > 25 kg/m<sup>2</sup> with controlled metabolic conditions, presenting without any secondary causes of obesity or psychological illness were identified through systematic search of databases (Cochrane Library, PubMed, Scopus, Wiley Online Library and WHO virtual health library) from January, 2009 to January, 2019. This was followed by critical appraisal and qualitative analysis of chosen studies.

Results: A total of 4433 studies were identified in the initial search, of which 28 studies were finally analysed. Lack of patient's readiness to change, low motivation and schedule incompatibility were identified as barriers to intervention initiation. Body image issues, musculoskeletal ailments, non compliance,lack of nutrition knowledge and cooking skills, emotional eating were challenges at the individual level. Obesogenic environments at home (lack of support, difficult family dynamics, cultural cooking style), work (job site, sedentary job, shift work, no recreational areas, unhealthy meal facilities) and neighbourhood (safety, walkable land use, pricing, concentration of fast food) were also found to hinder compliance. Biological adaptation due to consistent calorie restriction was responsible for weight plateau leading to dropouts from weight loss programmes.Sub-optimal behavioral skills like goal setting, stimulus control, self monitoring, problem solving and cognitive restructuring were associated with weight regain.

Conclusion: The review highlights the need for addressing weight loss barriers among obese adults. A patient-centric and intensive counselling approach using cognitive behaviour therapy may be adopted for effectively modifying their diet and physical activity.





# A systematic scoping review of physical activity and sedentary behavior research in Indonesian children and adolescents

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Children and families (SIG)

Purpose: The majority of reviews on physical activity (PA) and sedentary behaviour (SB) include English language studies only, which may exclude studies from low- and middle-income countries, including Indonesia. This study aimed to map PA and SB literature in Indonesian children and adolescents.

Methods: This study conforms to the "PRISMA Extension for Scoping Reviews (PRISMA-ScR)". A systematic search for accessing both published and grey literature was performed inception on the 10 August 2018. The following platforms and websites were accessed: (1) EBSCOhost Megafile ultimate; (2) Pubmed; (3) ProQuest dissertations and theses A&I; (4) Web of Science; (5) Google Scholar; (6) Google; (7) Neliti (Indonesian Science Repository); and (8) Electronic Repository Gadjah Mada University. Inclusion criteria for the literature: (1) targeted Indonesian children and adolescents, age 7 – 18 years old; (2) conducted on PA, physical inactivity, and/or SB; (3) written in Indonesian or English language, and (4) published as a journal article, conference proceeding, student thesis at Master or Doctoral level in full or abstract form, or report. Any research methods were eligible for inclusion. The evidence is presented in a descriptive narrative format.

Results: Out of 9,776 documents screened, 134 met the selection criteria. Most studies were journal articles (82.8%) and the majority of the full texts were in Indonesian language (Bahasa) (80.6%). The most popular design was cross-sectional (54.8%) and utilised self-report measurements (PA: 89%, SB: 96%). Rarely did studies employ qualitative, mixed methods, and longitudinal design. The most common topic studied was PA only (PA only: 76.1%, SB only: 10.4%). The majority of the studies examined the outcomes of PA and/or SB (39.3%) and the correlates of PA only (31.1%).

Conclusions: Future studies need to focus more on interventions, validation, the prevalence of SB in large-scale samples, correlates of both SB only and PA plus SB, and determinants of SB. More studies need to be conducted to reveal in-depth personal views of PA and SB. More studies using device-based measurements, qualitative approaches, and mixed-methods are warranted.

Keywords: physical activity, sedentary behaviour, review, children, adolescent, Indonesia





# Understanding Independent and Joint Associations of Physical Activity and Dietary Behavior with Older Adults' Lower Limb Strength

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### Ageing (SIG)

Purpose: Although previous studies have found that sufficient levels of physical activity and balanced dietary behavior were independently associated with physical function in older populations, the joint associations remain unclear. This cross-sectional study examined the independent and joint associations of physical activity and dietary behavior on older adults' lower limb strength.

Methods: Data was collected by recruiting 122 community-dwelling older Taiwanese adults (mean age:  $69.9 \pm 5.0$  years). Moderate-to-vigorous physical activity (MVPA) was objectively assessed using a triaxial accelerometer and balanced dietary behavior was subjectively measured using one valid item. Lower limb strength was measured through the performance of five times sit-to-stand (STS) test. According to recommendation from WHO (30 min of MVPA per day) and Taiwanese dietary guideline (six essential nutrients per day), MVPA and dietary behavior were categorized into "meet" or "not meet" group, respectively. Sex-specific median time of STS test were also classified into poor or better group. Binary logistic regression analyses were performed to examine the independent and joint associations of recommended level of MVPA and balanced dietary behavior with lower limb strength.

Results: After adjusting potential confounders, for independent association, 30 min of MVPA per day or balanced dietary behavior was not related to lower limb strength. For joint association, older adults who both met recommended level of MVPA and had balanced dietary behavior were more likely to have better lower limb strength (odds ratio = 4.85) compared with those who neither met the recommended level of MVPA nor dietary behavior. By contrast, no significant associations were found in other two groups that only met one recommendation of physical activity or dietary behavior.

Conclusions: Both MVPA and balanced dietary behavior contirbute to better performance of lower limb strength among community-dwelling older Taiwanese adults. Health promotion initiatives addressing disability prevention for older adults need to consider both promoting MVPA and balanced dietary behavior.





# Brief Physical Activity Counselling by Physiotherapists (BEHAVIOUR): description of implementation strategies for a hybrid type II implementation-effectiveness cluster randomised controlled trial

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### Implementation and scalability (SIG)

Purpose: The Brief Physical Activity Counselling by Physiotherapists (BEHAVIOUR) study aims to support physiotherapists working in South Western Sydney in Australia to deliver physical activity counselling within routine care. The purpose of this paper is to describe the implementation strategies to be used with physiotherapy teams within this study.

Methods: Pre-implementation planning for a hybrid type II implementation-effectiveness cluster randomised controlled trial. The Consolidated Framework for Implementation Research (CFIR) has been used as an overarching framework to guide implementation development. The Capabilities, Opportunities, Motivation- Behaviour (COM-B) behaviour change theoretical model was used to develop implementation strategies with consideration of evidence supporting behaviour change in healthcare and a local behavioural diagnosis. Extensive consultation with local stakeholders was undertaken to ensure strategies were context specific and have potential for scalability within the Australian healthcare setting if found to be effective and cost-effective.

Results: Two education and training workshops will be delivered to teams of physiotherapists 3-months apart with support and audit and feedback between the workshops to build clinicians' Capabilities, Opportunities and Motivations to delivering physical activity counselling within routine care.Psychological capabilities will be addressed using the intervention functions of education, training and enablement and using behaviour change techniques (BCTs) such as 'instruction on how to perform a behaviour'. Reflective and automatic motivation will be addressed using the intervention functions of persuasion, modelling, environmental restructuring and enablement and include BCTs such as 'credible source'. Physical and social opportunity will be addressed using the intervention functions of modelling, environmental restructuring and include BCTs such as 'prompts/cues'. Two key constructs from the CFIR have been important in implementation development; adaptability of the physical activity counselling intervention to suit different health conditions, different physiotherapy patterns of practice and inclusive of culturally diverse populations; andthe implementation climate with consideration of workshop locations, length and timing.

Conclusions: Implementation strategy development using theory, evidence and local stakeholder input increases the likelihood of successful behaviour change in physiotherapists and in turn physically inactive people receiving





physiotherapy. This project is testing a potentially cost-efficient model of care to tackle the global burden of physical inactivity.





# Correlates of walking among disadvantaged groups: A systematic review

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### Socio-economic inequalities (SIG)

Purpose: Socioeconomically disadvantaged groups are less likely to be physically active. Walking is important to public health, therefore understanding correlates of walking will inform the development of targeted interventions. The aim of this systematic review was to examine the correlates of walking among socioeconomically disadvantaged adults.

Methods: PubMed and Scopus were searched up to May 2018 and titles/abstracts and full-texts were screened against eligibility criteria. Methodological quality was assessed. Correlates were synthesized when two or more comparisons were available. 32 studies were selected for synthesis. 19 examined overall walking, 15 examined leisure-time walking and 9 examined walking for transport (9 examined one or more types of walking).

Results: Employment status, home ownership, self-rated health, density or number of social ties, perceived neighborhood aesthetics, perceived walkability and perceived individual safety were positively associated with overall walking. Perceived neighborhood aesthetics, perceived walkability and perceived individual safety were positively associated with leisure-time walking. Objective walkability, perceived walkability and perceived individual safety were availability and perceived walkability and perceived are positively associated with walking for transport. Most studies were cross-sectional and used a validated measure of physical activity, few reported response rates of greater than 50%.

Conclusions: Strategies to improve self-rated health, social ties, neighborhood aesthetics, walkability and perceptions of individual safety should be the focus of interventions that aim to improve walking among socioeconomically disadvantaged groups. Recommends include that future studies: focus on leisure-time walking and walking for transport; place a greater focus on males; use longitudinal designs and examine variables relating to psychological, social, behavioral attributes and skills.





# Healthy adults' and recently-retired elite athletes' physical activity and physiological outcomes during exergaming and traditional exercise: A causal-comparative study

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: To examine mean differences in physical activity (PA) and physiological outcomes during exergaming and traditional exercise in healthy non-athlete adults and recently-retired elite athletes.

Methods: In a causal-comparative study design, twenty healthy non-athlete adults and twenty recently-retired elite athletes were matched for sex, age, and BMI (18 females/group;  $\bar{X}age = 27.8$  years,  $\bar{X}BMI = 22.7$  kg/m2). Participants completed three separate 20-minute exercise sessions: (1) Just Dance; (2) Reflex Ridge; and (3) treadmill walking. We measured participants' time in sedentary behavior (SB), light PA (LPA), and moderate-to-vigorous PA (MVPA) and energy expenditure (EE) using hip-worn ActiGraph GT3X+ accelerometers. We used the Omron HEM-705CP digital BP cuff to evaluate systolic and diastolic blood pressure (BP) change (BPpost – BPpre). Finally, we employed Borg's rating of perceived exertion (RPE) scale every four minutes during each exercise session to assess subjective PA intensity. A 2x3 ANOVA (2 cohorts [healthy adults vs. elite athletes]; 3 exercise sessions) examined mean differences for these outcomes.

Results: Significant main effects for cohort across all exercise sessions were observed for EE, systolic BP change, and RPE. In detail, compared to recently-retired elite athletes, non-athlete adults had a significantly higher overall change in systolic BP ( $15.0 \pm 9.7 \text{ mmHg}$ ;  $10.5 \pm 8.3 \text{ mmHg}$ , respectively; p = 0.02,  $\eta 2 = 0.04$ ) and had significantly higher EE overall ( $128.3 \pm 45.9$  kcalories;  $107.2 \pm 38.9$  kcalories, respectively; p = 0.02,  $\eta 2 = 0.05$ ). Moreover, despite no significant differences between cohorts insystolic BP and time at different PA intensities (p > 0.05), non-athlete adults reported significantly higher RPE compared to recently-retired elite athletes ( $11.2 \pm 1.7$ ;  $9.4 \pm 1.5$ , respectively: p < 0.001,  $\eta 2 = 0.3$ ).

Conclusions: Exergaming and traditional exercise elicited similar PA intensities in healthy non-athlete adults and recently-retired elite athletes while significantly increasing systolic BP change and EE in healthy adults. Therefore, health promotion programs in recently-retired elite athletes may require higher intensities to confer the same physiological health benefits seen in non-athlete adults, regardless of the PA modality.





# Can fitness tests be used to predict the vascular health of physically active older adults?

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Ageing (SIG)

#### Purpose

There is an increased risk of cardiovascular diseases among older adults. This research aimed to determine which fitness tests could predict the vascular health of older adults using the gold standard pulse wave velocity (PWV) (applanation tonometry).

#### Methods

This cross-sectional study analysed 81 physically active adults (n=57 females) aged 64-91 (M=78±6.42) residing in independent living communities. A four-component fitness test included the 4-stage balance test (balance and falling assessment), six-minute walk test (SMWT) (aerobic exercise capacity), 30-second sit-to-stand test (postural hypotension and falling assessment), and the grip strength test (upper body strength) along with a PWV measurement. A regression use the four fitness tests as predictors of PWV for all participants. Pearson correlations then analysed these variables by subgroups of sex and age.

#### Results

When including all 81 participants, the four-component fitness test significantly accounted for 20% of the variance in PWV (R2=.20; F(4,76)=4.70, p=.002) among older adults. Of the four components, higher sit-to-stand scores correlated with having healthy arteries ( $\beta$ =-.27, p=.027), but higher grip strength scores correlated with having unhealthy arteries ( $\beta$ =.23, p=.036). Neither the SMWT nor the balance test significantly contributed to the regression model.

Pearson correlations indicated for men that better balance correlated significantly with healthy arteries (r=-.47, p=.011). For women, higher sit-to-stand scores (r=-.43, p  $\leq$ .001) and better balance (r=-.23, p=.045) correlated significantly with healthy arteries. Among 70-79 year olds, higher sit-to-stand scores (r=-.41, p =.002) and better balance (r=-.32, p=.014) correlated significantly with healthy arteries. Among 80-89 year olds, higher SMWT (r=-.40, p =.024) correlated significantly with healthy arteries.

#### Conclusions

The four-component fitness test did significantly predict arterial stiffness in older adults, but grip strength scores were unexpectedly negatively related to healthy arteries whereas sit-to-stand was positively related. In most groups, better balance and higher sit-to-stand scores were correlated to healthy arteries which was somewhat surprising. Finally, older participants were the only subgroup which showed a correlation between healthier arteries and higher SMWT scores. Given the SMWT is an aerobic exercise capacity assessment, it is surprising it did not correlate stronger to PWV.





# Post-diagnosis dietary changes in prostate cancer survivors

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### Cancer prevention and management (SIG)

Purpose: Most men with a diagnosis of prostate cancer (PCa) will become survivors of the disease and will be at increased risk of PCa recurrence, secondary cancers, and other chronic health conditions. Diet has been identified as a modifiable risk factor that can help improve health-related outcomes for PCa survivors. Limited New Zealand-based data exists that has qualitatively examined dietary behaviour in PCa survivors. The aim of this study was to identify if men had made dietary changes as a result of their PCa diagnosis.

Methods: Sixteen prostate cancer survivors from Auckland took part in the present study. Participants ranged in age from 57 to 88 years of age 71.3 $\pm$ 7.4 years). Time since diagnosis ranged from 1 to 17 years (6.5 $\pm$ 5.6 years). Six men were currently on androgen deprivation treatment. The remaining ten men were in complete remission and were treatment free. An interview schedule was developed for this study. Participants were individually interviewed. Interviews were audiotaped and transcribed. Data were analysed using an inductive thematic approach.

Results: Four main themes were identified in relation to changes men made to their diet post-diagnosis: (1) Reduction or elimination of certain foods (i.e., red meat, carbohydrates and sugar), (2) Consumption of more fruit, vegetables, and fish, (3) Introduction of new foods (i.e., ketogenic diet) and, (4) Dietary changes for other health condition(s) (i.e., diabetes).

Conclusions: The findings of the present study illustrate that PCa survivors are responsive to making dietary changes for heatlh-related reasons. There is evidence that dietary changes that result in the consumption of increased vegetables, fruit and fish, and a decrease in simple carbohydrates and meat consumption can positively benefit the body at a cellular level. International dietary interventions that have been carried out with cancer survivors have been successful in achieving long-term dietary change. However, dietary advice is not part of usual care practice for PCa survivors. Specific dietary advice or tailored dietary interventions administered or endorsed by healthcare practitioners can have an important role in influencing the dietary behaviour of PCa survivors.





# Sport or exercise group membership predicts sustained physical activity and longevity in older adults compared to physically active matched controls

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Ageing (SIG)

Purpose: Physical activity tends to decline in older age, despite being key to health and longevity. Several demographic and individual-level predictors of older adults' sustained physical activity have been identified (e.g., age, gender, health status, attitudes), yet growing evidence indicates that social factors also have a salient impact on physical activity behaviours. This study examined whether engaging in physical activity in the context of sport or exercise groups (as opposed to outside these social group contexts) can (a) protect against age-related physical activity decline, and (b) enhance longevity.

Methods: Drawn from the English Longitudinal Study of Ageing, participants were members of sport or exercise groups aged 50 and over (N=2015) as well as non-sport or exercise group member controls (N=1881), who were matched at baseline for age, sex, and physical activity levels. Longitudinal mixed effects models were used to assess the effect of sport or exercise group membership on moderate and vigorous physical activity over a 14-year follow up. A binary logistic regression was used to test whether sport or exercise group membership predicted longevity over a 10-year follow-up. Finally, a binary logistic mediation model was used to test whether the effect of sport or exercise group membership on longevity was mediated by changes in physical activity.

Results: Members of sport or exercise groups experienced an attenuated decline in both moderate (b=.03 [SE=.005], p<.001) and vigorous (b=.02 [SE=.005], p<.001) physical activity over a 14-year follow-up compared to physically active matched controls. Over a 10-year follow-up, the odds of dying for those who were not sport or exercise group members at baseline was 1.27 times the odds of dying for those who were sport or exercise group members at baseline. The effect of sport or exercise group membership on longevity was mediated through sustained moderate physical activity (indirect effect b = -.05 [CI: -.07, -.03]).

Conclusions: Promoting membership in sport and exercise groups may be a beneficial strategy for supporting sustained physical activity and health among older people.





# Scaling up a pilot-tested health literacy program for older adults in Germany – GeWinn

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Implementation and scalability (SIG)

#### Purpose:

Inadequate health literacy (HL) and social isolation are risk factors for older adults. In the first phase of GeWinn, a community-based HL intervention aiming to counteract both risk factors, was developed and pilot tested. The intervention resulted in improved HL scores and was well-accepted by the participants. Moreover, the programs structure was shown to support self-reliant working groups of older people. After the revision and adaption of the program, in the second phase the current aim is to develop and implement strategies to scale up the intervention by reaching other regions of Bavaria, South Germany.

#### Methods:

A webinar was performed to inform regional multipliers of a health insurance about the intervention as well as instruct them to reach out to municipal stakeholders. A 4-step scaling up program was implemented with each participating community concerning information, co-operative planning, networking and kick-off meetings for the target group.

#### Results/findings:

In total, 40 multipliers participated in the webinar. Four of the 71 districts were acquired and participated with 12 municipalities after six months. The communities tended to need more time to implement the program. For example, it took six to eight months instead of four as originally scheduled to organize cooperative planning and networking. The communities needed frequent contacting to ensure general willingness and create a network of local stakeholders.

#### Conclusions:

Close cooperation with the participating communities is shown to be helpful in the acquisition of local partners and the promotion of the program's implementation. Networking meetings are well received and therefore good means to enhance the communities' readiness. At the end of the intervention, there will be a meeting with stakeholders of the communities to discuss tailored methods for sustainable actions to establish and strengthen regional structures as well as improve HL in older adults. Therefore, the implementation of the intervention will not only support individuals but has the potential to promote whole regions in their health promotion.





# A novel interdisciplinary approach to the co-creation of a children's cooking intervention by mapping to motor skills

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### Children and families (SIG)

Purpose: Learning cooking skills (CS) at younger ages is associated with positive dietary outcomes and skill retention in later life. However, the next generation is no longer learning CS in the home, leaving a generation without these life skills. Furthermore, recent research has highlighted that children are not developing fine motor skills (FMS) at the normative rate, and therefore may not be physically able to perform CS proficiently. Thus, this research aimed to co-create with the research team, a chef and children, an age-appropriate cooking intervention based on motor skills and to evaluate the effectiveness of this interdisciplinary co-creative method of design.

Methods: A controlled short duration, high intensity cooking camp intervention underpinned by Social Learning Theory and Experiential Learning based on age appropriate motor skills was conducted. A range of different CS, based on current research, was covered by the intervention in a fun and engaging manner. The intervention content was co-created with Home Economists, a chef and human movement scientist and participants. The camp ran for one week – 3 hours/day for 5 days. Participants aged 10-11 years, with no exposure to Home Economic classes were recruited. Sixteen children took part in week one of the camp with pre and post measurements including perceived cooking competence and enjoyment. The control group (delayed intervention) did the same measurements in week one, receiving the intervention in week 2. The feasibility of the intervention was analysed using SPSS v25.

Results/findings: Results indicate a significant improvement in the intervention group's perceived cooking competence (P<0.001) compared to the control group.

Conclusions: The novel interdisciplinary approach to the design of the intervention content ensured it was age appropriate by mapping cooking skills to motor skills. This is an effective method to designing successful cooking interventions and should be considered as a useful strategy in future studies.





# Neighbourhood deprivation, the built environment, physical activity and the body size of children

Dr. Victoria Egli, Dr. Niamh Donnellan, Prof. Melody Smith <sup>1</sup>The University of Auckland, Auckland, New Zealand

### Socio-economic inequalities (SIG)

Purpose: Children residing in highly deprived neighbourhoods often experience poor health outcomes, including a greater likelihood of excess body size. While built environments that promote physical activity are considered important for children's overall physical activity levels, less is known about how neighbourhood deprivation, physical activity and child body size are linked. The objective of this study is to determine possible associations between neighbourhood deprivation and the physical activity built environment with child body size, adjusting for the potential mediating influence of individual physical activity.

Methods: 1029 children (8-13 years), from eight diverse regions across Auckland, New Zealand participated in this child-centred, cross-sectional study. Using Geographic Information Systems, physical activity built environment features were objectively captured within individual, child-specific neighbourhood buffer boundaries. Associations between neighbourhood deprivation, the built environment and objectively measured body size (waist-to-height ratio; WtHR), through the pathway accelerometer-derived physical activity data, are being investigated using structural equation modelling in Mplus v.8.0.

Results: Preliminary results indicate neighbourhood deprivation and individual physical activity levels are associated with children's WtHR (p<0.01). However, the physical activity built environment was not associated with physical activity (p=0.630), or WtHR (p=0.930). Boys and children of Pacific ethnicity had a greater WtHR than girls, as did children living in neighbourhoods of high deprivation (p's<0.01). Further tests of mediation and model fit are currently being undertaken and will be reported.

Conclusions: Greater neighbourhood deprivation and lower overall physical activity levels are associated with excess body size in children. The role of the physical activity built environment in mediating this relationship is yet to be determined. Greater understanding of the pathways of association between neighbourhood deprivation, the physical activity built environments and child physical activity levels and body size is important in order to effectively target public health interventions to the level of the environment.





# Factors associated with excess visceral fat among Hispanic children

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### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Background: The high prevalence of pediatric obesity in the U.S. is a healthcare burden; children with obesity are more likely to stay obese, leading to adverse health consequences. Obese children with waist circumferences over the 90th percentile are at a higher risk for insulin resistance compared to obese children with waist circumferences under the 90th percentile. Hispanic children are disproportionately burdened by overweight and obesity in the U.S. We must understand risk factors for obesity and high waist circumference among this population.

Methods: Participants were 209 primarily Mexican-American overweight and obese children and their guardians who completed baseline assessments for the Health4Kids pediatric obesity management study in San Antonio, TX. We also assessed past week time in moderate-to-vigorous physical activity (MVPA) via accelerometry. Research staff measured children's and adult's waist circumference with MyoTape to the nearest 0.1cm. Waist circumference was dichotomized to above and below the 90th percentile as a measure of excess visceral fat for the child. Waist circumference was dichotomized based on Hispanic-specific waist circumference cut-points to signify an increased risk for coronary heart disease for the adult. Logistic regression analyses were run to examine the relationship between excess visceral fat (child), moderate to vigorous activity (child), and waist circumference cut-points (adult).

Results: Children were 8.7 years old (95% CI [8.57, 9.03]) and female (51.7%). Children's MVPA was associated with waist circumferences (child) over the 90th percentile (OR=.99, p= .01), therefore increased time spent in MVPA was associated with smaller waist circumference. Having a guardian above the cut-point for waist circumference was associated with having an excess of visceral fat (90th percentile) (OR=2.16, p=.06).

Conclusion: Weight management programs should involve guardians to decrease the risk of excess visceral fat among both children and guardians. Even though a small association, moderate to vigorous physical activity, is still an integral part of obesity management, including reducing odds of excess visceral fat.





# Comparison of adolescents' physical activity measured by the Youth Activity Profile and the International Physical Activity Questionnaire – long form

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### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: An advantage of physical activity (PA) surveys over monitor-based measures is the useful information available on the context of the behavior. Triangulation of outcomes from different surveys also offers insights about how they compare. The present study examines the distributions of PA behavior obtained from two different survey tools, the Youth Activity Profile (YAP) questionnaire and the International Physical Activity Questionnaire (IPAQ) – long form. A secondary goal is to investigate differences in rates of adolescents who meet the PA recommendation based on the data from these two questionnaires.

Methods: The research was conducted between 2018 and 2019 at seven school from the Czech Republic and seven schools from Poland. In total, 637 girls and 383 boys aged 15–19 years took part in the study. To estimate weekly PA, we used the YAP and IPAQ questionnaires in the International Database for Research and Educational Support web application. Both the questionnaires were modified for secondary schools. The respondents completed the questionnaires during the single ICT lesson.

Results: The YAP and the IPAQ provided complementary assessments of PA when estimates were expressed as percentages of the total weekly PA. Proportions were similar for transportation (YAP: 26.2% / IPAQ: 24.3%), school PA (YAP: 24.4% / IPAQ: 30.8%) and recreation outside school (YAP: 27.1% / IPAQ 28.2%). The only statistically significant difference was for school PA (p = 0.001). The percentage of youth meeting PA recommendations (i.e. at least 60 minutes of moderate-to-vigorous PA on 5 or more days) were also similar for both boys (YAP: 48.8% / IPAQ: 48.6%) and girls (YAP: 37.8% / IPAQ: 43.3%).

Conclusions: The comparison of PA in school day segments measured by YAP and IPAQ differs only in PA in the school, where the differences in the questions of both questionnaires are most pronounced. Further analyzes of PA types and day segments in both questionnaires are needed. The YAP questionnaire is less demanding to be completed and allows for more comprehensible feedback on school day PA for adolescents.





# Simulating physically active job-redesign: A novel application of the Goldilocks Principle to the Australian rail work environment

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### Ageing (SIG)

Purpose: Rail is a safety critical industry with a rapidly ageing workforce; in Australia, 60% of this workforce is now over 45 years old and facing a health crisis. As an occupation, rail driving is characterised by sedentariness, shiftwork, high stress, performance demands and elevated risk of cardiovascular disease. Workplace sedentariness has increased considerably over the past 50 years as tasks, activities and changes in cab design have minimised requirements to move. This paper presents findings from a qualitative benchtop simulation study, aiming to examine whether rail driving could be conceptually redesigned using a new preventative approach called the 'Goldilocks Principle'.

Methods: The study was held through a Workshop at the TransFORM 2019 Physiotherapy Research Conference. Participants were given a paper time scale for a 12-hour day, spanning 0700-to-1900, to capture non-occupational activity. Participants then created task descriptions on paper colour-coded to the posture and movements involved in each task. Following this, a presentation on the Goldilocks Principle was given, and participants were asked to rearrange tasks and introduce new ones to obtain a better pattern of physical demands.

Results: Relative to the initial design, the results showed a marked decrease in sedentary behaviour in follow-up designs. In most cases, participants elected to introduce health-promoting work and task modifications by engineering-out sitting time and substituting it with additional train inspections and platform review activities requiring movement, and technological innovations within the cab which promoted movement whilst maintaining driving. Based on their cognisance of increasing levels of automation, participants also extended train supervision and managerial features of the role and introduced additional safety checks.

Conclusions: Contrary to popular belief, future rail systems are unlikely to remove a human out of the cab altogether. Instead, the job is likely to be adapted to encompass passive monitoring roles that are even more inactive than current tasks. Study findings suggest that redesigning work in line with the Goldilocks Principle has strong potential to promote sustainable health environment policy and research, stimulating action and advocacy for physically active work in rail and in other seemingly intractable environments.





# Protein and Omega-3 Fatty Acid Supplementation for 16-Weeks Improve Sleep and Wellbeing in Postmenopausal Women: A Pilot Study

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### Ageing (SIG)

Purpose: Body composition shifts as we age, resulting in loss of skeletal muscle mass with concurrent increase in fat mass. This leads to increased risk for obesity. As obesity rates increase in older populations, there is an increase in deleterious shifts in sleep-wake rhythms. Recent data suggests that diet composition (e.g. diets higher in protein or omega-3 fatty acids (O3FA)) can impact sleep in older adults. Therefore, the objective of this study was to determine the ability of protein and O3FA intake to regulate sleep and other markers of wellbeing in postmenopausal women.

Methods: Postmenopausal women were recruited to participate in this randomized, controlled, single-blinded, 16week dietary intervention. Once enrolled, participants were assigned to one of 5 groups: 1) control, no intervention (n=6); 2) protein (PRO; 25 g; n=4) supplementation; 3) O3FA; DHA/EPA; 4.3 g; n=10); 4) PRO + corn oil (4.3 g) placebo (n=6), and 5) PRO + O3FA (n=8). Sleep (via Pittsburgh Sleep Quality Index; PSQI) and mood (via Profile of Mood States; POMS) were assessed at baseline, 4, 8, 12, and 16 weeks. Sleep quality was measured at baseline, 8, and 16 weeks using a wrist Actigraph. Data were analyzed using two-way ANOVA to assess changes in diet, sleep, and wellbeing over time between groups.

Results: Overall, there was a significant effect of dietary intervention on sleep efficiency (p=0.03), with no effect of total sleep time. Dietary intervention also improved PSQI global scores (p=0.01). There was also an effect of dietary intervention on depression (p=0.02) and vigor (p<0.001), with a trend for diet intervention on fatigue (p=0.08). PRO, alone, had no effect on markers of sleep and mood. However, PRO + O3FA and O3FA alone improved the outcomes described above.

Conclusions: Taken together, this pilot study suggests that PRO + O3FA and O3FA alone, have the potential to improve sleep and mood in postmenopausal women. However, additional research is needed to understand the long-term effect of PRO and O3FA on sleep and wellbeing over time.





# 24 h activity patterns of New Zealand adolescent girls. Results from the SuNDiAL Project.

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Children and families (SIG)

Purpose: To describe the accelerometer measured patterns of sleep, sedentary behaviour and physical activity in adolescent females in New Zealand

Methods: The SuNDiAL Project is a cross sectional study aimed at describing the dietary intakes, nutritional status and lifestyle patterns of New Zealand adolescent females. 282 participants were recruited from 14 high schools throughout New Zealand in either March – April 2019 (n=145) or July – September 2019 (n=130). Of those participants, 158 wore an ActiGraph Gt3x+ 24 h a day for seven days on an elasticated belt around the waist, with the accelerometer positioned over the right hip. Participants completed a wear time diary over this time. Sleep was identified using the Sadeh algorithm (constrained by bedtimes reported in the wear time diary). Sedentary behaviour, light intensity and moderate-to-vigorous physical activity was identified using Freedson cutpoints.

Results: 135 participants provided valid accelerometer data with an average wear time of  $22.5 \pm 1.84$  h. On average, this sample of adolescent girls (age  $16.8 \pm 0.9$  years, 33% overweight or obese) slept for  $7.11 \pm 1.75$  h per day, accumulated  $3.58 \pm 1.17$  h per day of light intensity activity,  $0.81 \pm 0.54$  h per day of moderate to vigorous physical activity and  $11.47 \pm 1.8$  h per day of sedentary time. Sedentary time was interrupted with more than a minute of activity  $60 \pm 20$  times per day during waking hours. On average, only one bout of sedentary time lasting greater than 30 min was accumulated each day, but the mean duration of this bout of sedentary time was 98.6  $\pm$  123.6 min. Thirty six participants (27%) met the New Zealand physical activity guidelines for this age group, and only 29 participants (21%) were sleeping more than 8 h per night.

Conclusions: Adolescent females in New Zealand spend a high proportion of their time sedentary, but accumulate a high number of breaks in sedentary time. Few individuals are meeting the physical activity or sleep recommendations. Interventions aimed at re-proportioning the 24 h day to better meet 24 activity guidelines are clearly warranted.





# Core outcome domains for clinical research on physical activity and sedentary behaviour in older adults hospitalised with an acute medical illness: Findings from an International Delphi survey

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### Ageing (SIG)

Purpose: Few studies have tested the impact of interventions specifically addressing physical activity or sedentary behaviour during acute hospitalisation. A limitation to progress is the heterogeneity in outcomes and their measurement. This study aimed to generate consensus on important types of outcomes (core domains) to measure in research studies of PA or SB in older adults (aged  $\geq 65$  years) hospitalised with an acute medical illness.

Methods: A 4-Round online Delphi consensus process was conducted. International researchers, multidisciplinary clinicians, academics from national activity guideline development teams, and patients were invited to participate. Round 1 sought open-ended responses to the questions of "what are the benefits: of reduced SB; increased PA" and "what are the risks of: prolonged sedentary time; low PA" in the target population. Responses were mapped to the 'Core Outcome Measures in Effectiveness Trials' taxonomy for rating of importance using a Likert scale (1-9) in Rounds 2-4. Consensus was defined a priori as:  $\geq$ 70% of respondents rating an item as "critical" (score  $\geq$ 7) and  $\leq$ 15% of respondents rating an item as "not important" (score  $\leq$ 3). Participants were asked to rate the importance of evaluating each item in all research studies of PA or SB in older adults who are hospitalised with an acute medical illness.

Results: 49 participants from nine countries were invited to each Round; response rates were 94%, 88%, 81% and 71% from Rounds 1-4 respectively. In Round 2, 9/25 outcomes reached consensus agreement (physical functioning, general, role functioning, emotional functioning, global quality of life, hospital, psychiatric, cognitive functioning and career burden). In Round 3, eight types of outcomes reached consensus agreement (adverse events, perceived health status, musculoskeletal, social functioning, vascular, cardiac, mortality and economic). Round 4 participants reviewed all 17 items that met consensus criteria in previous rounds. Four types of outcomes were rated critically important to evaluate: physical functioning, social functioning, cognitive functioning and hospital outcomes.

Conclusions: Consistency in outcomes and reporting may accelerate the field of research in PA/SB for older adults while hospitalised. This preliminary work provides a starting point for developing a core-outcome set.





# A content analysis approach to gain novel insights into adolescents' exposure to social media food marketing.

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### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Food marketing to adolescents via traditional channels (e.g. television and print media) predominantly promotes energy dense nutrient poor foods and beverages. This has the effect of enhancing attitudes, preferences and increased intake of these foods in adolescents, with detrimental consequences for adolescent health. While the use of social media applications in adolescents has proliferated, little is known about the content of food marketing within these applications. This study aimed to explore the characteristics of food marketing content on Dutch and Australian adolescents' (13-16 year olds; n=20) favourite social media accounts.

Methods: Adolescent participants were invited to the University of Newcastle to meet with a researcher and to login to a maximum of three of their favourite social media account(s). They were asked to scroll through their social media feeds accompanied by a researcher who instructed them on how to identify and then extract food marketing content with screenshots (text, images) or recordings (videos, games) using a screen recorder application. The researcher ensured that no personal data was captured.

Results: The study protocol and the results of a quantitative analysis of the extracted food advertisements are presented, providing insight into all food marketing content encountered on social media sites, including sponsored content, advergames (i.e. games promoting products) and social influencer advertising (e.g. video blogs promoting products). Ethical considerations and methodological strengths and limitations that are concerned with social media research are also discussed.

Conclusions: The outcomes of this study contribute to a relatively unexplored research area, by providing valuable insights into the food and beverage marketing content on adolescents 'social media applications. This will help prioritise future research on the effects of social media food marketing targeted to adolescents.





# Conceptualising 'positive ageing' in place for community-dwelling older adults: Preliminary results of a scoping review

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Ageing (SIG)

#### Purpose

Older adults often aspire to remain in their communities as they age, with many choosing to be physically active in their local spaces and places. However, existing reviews on 'positive ageing' have rarely considered the importance of 'place'. As part of a broader PhD project exploring environments of community-dwelling older adults in relation to 'positive ageing' in place, this scoping review uses Arksey and O'Malley's framework to bring together heterogenous terminology and conceptualisations of 'positive ageing'. Thus, this study aimed to construct a multidimensional definition and assessment of 'positive ageing' for community-dwelling older adults ( $\geq 65$  years), while clarifying the role of 'place' for 'positive ageing'.

#### Methods

Systematic searches of six electronic databases (CINAHL, Embase, Web of Science Core Collection, Medline, Scopus, PsycINFO) and manual searches of seven relevant systematic reviews yielded 6,340 results. To be eligible for inclusion, published peer-reviewed primary studies needed to be available in English and report a conceptual or operational definition of 'positive ageing', or procedures for assessing 'positive ageing' for community-dwelling older adults. Perspectives of researchers, clinicians, practitioners, and non-specialist older adults were considered. No publication period or study type limits were applied. Methodological quality assessment will be completed and extracted findings will be presented using descriptive and thematic summaries.

#### Results

At abstract submission, full-text screening of 906 potentially relevant results was underway. Fifty-two of 357 screened results met all inclusion criteria. Key findings to-date include viewing 'positive ageing' as a multidimensional concept, informed by complex components spanning policy, community, built and home individual levels. Considerable differences environment. social, and were noted between researcher/clinician/practitioner and older adult perspectives of 'positive ageing', as well as between different cultures. In addition, physical activity and mobility (social, spatial, physical) was supported by community resource availability and accessibility, while 'place' was largely viewed as a physical entity, separate from social and symbolic meaning.

#### Conclusions

'Positive ageing' for community-dwelling older adults is conceptualised from a range of components and should be viewed as a continuum, specific to individual and cultural values. Results will inform the development of a conceptual model aimed at assessing and enhancing 'positive ageing' in place.





# Factors associated with ongoing participation in physical activity among people aged 50 years and older

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### Ageing (SIG)

Purpose: To document the characteristics of unique long-term participants aged 50+ years in a local government group physical activity (PA) program (Strong Seniors), and to investigate the motivators and barriers to ongoing PA.

Methods: We used a self-report survey among current Strong Seniors program participants and conducted a mixedmethods study involving both quantitative and qualitative analyses. We coded survey responses into six major themes identified in a previous systematic review about older people's perspectives on physical activity participation. The major themes were (a) social influences, (b) physical limitations, (c) competing priorities, (d) access, (e) personal benefits of exercise, and (f) motivation and beliefs.

Results/findings: Overall, of 176 potential participants contacted, 93 (53%) completed the survey. The mean participant age was 67 years (SD = 8.5), most were female (n = 81, 87%). On average, participants had been attending the Strong Seniors program for 4.9 years (SD = 4.6) and ranged from 3 weeks to 13 years. The average frequency of attendance at Strong Seniorsclasses was three times/week (SD = 1.3). "Personal benefits from exercise" was the most commonly cited theme for prompting people to start regular PA participation (54 responses, 43%) and for keeping them engaged and motivated to attend regularly (113 responses, 88%). "Social influence" was the most commonly cited theme as the reason for joining and maintaining participation in the Strong Seniors program (119 responses, 66%). "Competing priorities" was most common theme associated with barriers to initiating a habit of regular PA, endorsed by 17 respondents (31%). Of the participants who still encountered barriers to taking part in regular PA, "physical limitations" was the most common theme (13 responses, 41%) with specific examples including poor general health and chronic conditions.

Conclusions: Personal benefits of exercise and social influences were the most common motivators for regular PA. Barriers to participation included health problems and lack of time. This study suggested that PA programs for older adults that emphasise associated health benefits and promote social support, as well as take into account physical limitations, and have flexible timetables may be more likely to facilitate long-term attendance.





# 24 Hour total energy expenditure calculation using android application: "24 ARM-Activity recall method"

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### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Malnutrition refers to deficiencies, excesses or imbalances in a person's intake of energy and/or nutrients and can be the ground for both communicable and NCDs. Nutrition is essential and Energy Expenditure (EE) assessment in an individual's daily routine is the key to it as both undernutrition and over nutrition are detrimental. Currently, an individual is categorized as sedentary/ moderate/ heavy worker based on the Metabolic Equivalents (METs) of the activity and the duration it is performed. MET values are given for the activity as such but using this to classify an individual sedentary or moderate or a heavy worker is not appropriate especially when the duration of activity is less than 10 minutes. As there is no single effective tool available to calculate Total Energy Expenditure (TEE), a new concept was developed to calculate TEE using its 3 components Resting Energy Expenditure (REE), Activity Energy Expenditure (AEE) and Diet Induced Thermogenesis (DIT). (Copyright office, GOI Registration Number: L-84886/2019) Based on this concept, a simple android application has been developed, 24 hour Activity Recall Method abbreviated as "24 ARM".

Key Words: Physical activity, Energy expenditure, METs, Resting energy expenditure, Activity energy expenditure, Diet-Induced Thermogenesis





# Increasing translation of research evidence for optimal park design: A qualitative study with stakeholders

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### Implementation and scalability (SIG)

Purpose: Understanding the use of evidence to inform park design is critical to reduce the research-practice-policy gap and maximise the public health impact of park infrastructure. The aim of this study was to explore stakeholder perceptions regarding factors that influence the use of research evidence to inform park planning and design, and potential strategies to enhance effective translation of research evidence into practice and policy.

Methods: One-on-one key-informant interviews were conducted between May-July 2018 with 23 stakeholders (65% male) in Australia. Stakeholders held a variety of positions in both government and non-government organisations within the park design, planning and management sector. Participants were asked to share experiences regarding: factors that influence park development and design; current policies in place in their organisation in relation to park development; ways to facilitate use of evidence to inform park design; and priorities for research evidence to support their work. The interviews were recorded and transcribed verbatim and content analysis was performed using NVivo 12 software.

Results: Research evidence is used by stakeholders and considered important; however, several barriers to using evidence were highlighted including: time and cost constraints; difficulties locating and accessing research; and limited research relevant to specific needs. Developing partnerships between researchers and park developers and providing more accessible evidence communicated in an informative way such as short summaries and reports, infographics, presentations, regularly disseminated park research updates and dedicated research databases emerged as key enablers. Two main research gaps were identified including research into park features that would encourage visitation and cost-benefit analyses studies.

Conclusions: This research is a first step to better understand potential strategies to promote more effective uptake and use of research evidence to inform future park planning and design. Researchers must generate policy-relevant research in a readily accessible, timely and user-friendly format. Findings from this research also highlight that multi-sectoral collaborations between relevant fields is essential to enhance park design, park visitation and ultimately public health. The strategies and lessons learnt could be applied to other fields of research and topic areas.





# National and international physical activity guidelines for children and adolescents: a systematic literature review and analysis

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### Children and families (SIG)

Purpose: Global and international physical activity guidelines for children and youth provide recommendations to improve health outcomes and impact the prevalence of chronic disease in a world where physical activity is declining and sedentary behaviour is increasing in children and youth. This research aimed to systematically identify and compare national and international physical activity guidelines for children and youth. The guidelines were appraised as a means of promoting best practice in guideline development.

Methods: The systematic review was reported using the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines and registered in the International Prospective Register of Systematic Reviews (PROSPERO). Only national and international physical activity and/or sedentary behaviour guidelines were included in the review. Included guidelines targeted children and adolescents between the age of 5 and 18 years. A grey literature search was undertaken incorporating electronic databases, targeted websites, customized Google search engines and international expert consultation. The 'Appraisal of Guidelines for Research and Evaluation II Instrument' (AGREE II) was used to assess guideline quality.

Results: Fifty countries were identified as having a national or international guideline for children and youth. There were twenty-five different national guidelines and three international guidelines (European Commission, Nordic countries, World Health Organisation (WHO)). There was variability in the guidelines in relation to targeted age group; guideline wording regarding type, amount, duration, intensity, frequency and total amount of physical activity; and date of release (2008 to 2019). Sedentary behaviour was included in 22 guidelines and three included sleep. There was marked variation in guideline quality. Total scores for all domains of the AGREE II assessment ranged from 25.8% to 95.3%, with similar variability in each of the six individual domains.

Conclusions: International and national physical activity guidelines demonstrate considerable variability in relation to quality, development and recommendations, highlighting the need for rigorous and transparent guideline development methodologies to ensure appropriate guidance for population-based approaches. If countries do not have the resources to ensure this level of quality, the adoption or adolopment of the WHO guidelines or guidelines of similar quality is recommended.

Reference: PROSPERO 2017 CRD42017072558




# A culinary nutrition framework to improve nutrition knowledge and skills among dietitians

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### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Culinary nutrition is an emerging strategy and evidence-based approach to increase healthy food consumption is through the utilization of experiential cooking skills that help expose participants to delicious tasting healthy foods, and offer solutions to cost, preparation, culture and specific health conditions. However, healthcare providers including Registered Dietitian Nutritionists (RDNs), those responsible for counseling patients in nutrition, do not typically receive formal training in experiential culinary nutrition. There is a critical gap in the education of healthcare professionals in practical and useful nutrition information that is tangible and useful for low-income minority populations including cooking skills, culturally relevant foods, language and messaging. We will present the methodology used to used to develop the framework of a comprehensive culinary nutrition training curriculum to improve knowledge and skills for RDNs, including a qualitative study to understand facilitators and barriers to healthy eating and overall food literacy through focus groups conducted with patients and RDNs at a large county healthcare system in Harris County, Texas, and pilot testing of the training curriculum. Three focus groups each with patients (n=40) and RDNs (n=17) were conducted in fall 2019. The data analysis conducted using NVivo identified themes and subthemes of the patient focus groups to understand dietary habits including culturally specific foods, typical eating patterns, frequency of cooking and barriers and facilitators to cooking. A Social Cognitive Theory framework was used to develop the RDN training curriculum consisting of 6, three-hour sessions of basic cooking skills (e.g., knife skills, vegetable roasting, culinary nutrition training, counseling strategies, and mock patient education). Our proposed framework includes a three step method for each session, 1) taste - provides participants the opportunity to consume delicious "healthy food" in order to change negative outcome expectations of "healthy food" tasting bad; 2) see - demonstration of recipes (cooking techniques) involves modeling and observational learning; and 3) do – gives participants the ability to increase behavioral capacity and self-efficacy through handson experiential preparation recipe(s) (cooking techniques). We will evaluate the training curriculum in fall 2019spring 2020 and present the results of the evaluation.





## Longitudinal reallocation of time between daily movement behaviours are associated with adiposity among elderly women.

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### Ageing (SIG)

Purpose: Studies with longitudinal exposures are required to provide evidence on how changes in time use, specifically how reallocating time between movement behaviours, are associated with health outcomes. This study aimed to use compositional data analysis to: 1) investigate the prospective associations between changes in daily movement behaviours and adiposity among elderly women; and 2) to examine how the reallocation of time between movement behaviours was associated with longitudinal changes in adiposity.

Methods: This is a 7-year longitudinal study in older women (n=158, baseline age 63.9±4.4 years). At baseline and follow-up, light-intensity physical activity (LIPA), moderate-to-vigorous physical activity (MVPA) and sedentary behaviour were measured by accelerometer and body adiposity (body fat percentage [%BF]) was assessed from bioelectrical impedance analyser. Compositional regression with robust estimators and compositional longitudinal isotemporal substitution analysis explored if, and how, changes in movement behaviours were associated with adiposity.

Results: Over 7 years, the prevalence of obesity in the sample increased by 14.6% according to %BF, and time spent in sedentary behaviour increased by 14%, while time spent in LIPA and MVPA decreased by 14% and 21%, respectively. The increase in sedentary behaviour at the expense of LIPA and MVPA during the seven-year period was associated with higher %BF at follow-up (p<0.01). The increase in LIPA or MVPA at the expense of sedentary behaviour was associated with reduced %BF at follow-up. To obtain the same difference in %BF units (-0.65 units) estimated for reallocating 30 minutes from sedentary behaviour to MVPA, 71 minutes could be reallocated from sedentary behaviour to LIPA. In our sample, the largest change in %BF (1.28 units; 95% CI: 0.48-2.09) was associated with longitudinal reallocation of 30 min from MVPA to sedentary behaviour.

Conclusion: We found an association between longitudinal changes in daily movement behaviours and adiposity among elderly women. Our findings support public health programs to increase or maintain time spent in higher intensity physical activity among elderly women.

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# Gender and age differences in weight status and eating habits among a cohort of college students

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

#### Purpose:

Healthy eating habits helps to improve overall health and fitness, and reduces risk of chronic diseases. Dietary behaviors are influenced by several factors, such as social demographic status and lifestyle practices. This study assessed gender and age differences in weight status and eating habits among a sample of college students at a southeastern university in the United States.

#### Methods:

This cross-sectional study assessed eating habits, demographic and anthropometric characteristics of college students (n=1271, aged 18-24) using an online survey. Body mass index (BMI) was calculated and categorized (underweight, normal, overweight, obese) using conventional cutpoints. For age, the participants were grouped into two categories (18-21 and 22-24). Descriptive statistics were used to characterize the study participants. Chi-square analysis assessed age and gender differences in weight status, while independent sample t test assessed age and gender differences in eating habit. Statistical analyses were performed using the Statistical Package for Social Sciences (SPSS), version 25.

#### Results:

In total, 72.6% of the participants were female, 87.3% were Caucasian, and 36.4% were overweight/obese. The male group's average BMI= 25.79±5.0 with an average age of 20.7±1.8, and the female group's average BMI= 24.46±5.87 with an average age of 20.4±1.7. There was a significant gender difference in the participant's weight status,  $\times^2$  (1, N=1271) = 49.05, P <.001. A greater proportion of males were overweight (33.3%) and obese (15.5%) compared to females (17% and 14.6%, respectively). There was a significant difference between the eating habit scores of 18-21 years old students (M=56.56, SD=12.94) and 22-24 years old students (M=58.32, SD=12.02), t (1269) =2.17, P=.03. There was no significant age difference in participant's weight status, and no gender difference in their eating habit scores.

#### Conclusions:

The findings suggest that gender and age are influential factors of the study participants' weight status and eating habits. By implication, it is recommended that interventions aimed at helping college students to achieve healthy eating should consider gender and age.





# Moderate-vigorous physical activity in adolescents from Brazil: testing the Structured Days Hypothesis

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### Children and families (SIG)

Purpose: According to the Structured Days Hypothesis (SDH) children engage in more physical activity during school weekdays (WD) compared to days without school, such as weekend days (WED). However, most evidence for the SDH is from high-income countries. The aim of this study is to compare moderate-to-vigorous physical activity (MVPA) on WD vs. WED days and during school hours of adolecents from Brazil.

Methods: Data were obtained from baseline of an RCT targeting increases in PA and improvements in cognition. All first year high-school students (n=1296) of full-time (7:30am–5pm) public schools (n=11) from one educational district of Pernambuco state were invited to participate. Physical activity was obtained using Actigraph (GT3X+) onthe hip via a 7-day protocol. To be included in the day analysis (WD vs.WED) participants had to provide at least 10 hours of valid wear time. MVPA during school hours was also estimated. Separate ANOVA analyses by gender were performed to test differences in daily MVPA between WD and WED, and during school hours. Both models controlled for age and school.

Results: A total of 828 adolecents (56.1% girls, mean=14.8±1.0yrs) provided 2,960 (WD=2,388), WED=572) valid days of data. Boys accumulated more daily MVPA during WED [52.8 min (95%CI: 48.0, 57.6)] compared to WD [50.0 min (95%CI: 47.6, 52.3), however this difference was not statistically significant. Girls accumulated more MVPA during WD [30.0 min (95%CI: 28.9, 31.1)] compared to WED [26.6 min (95%CI: 23.4, 29.9)]. During school hours boys accumulated more MVPA [26.4 min (95%CI: 25.0, 27.7)] compared to girls [16.0 min (95%CI: 15.3, 16.7)]. Estimates of MVPA varied significantly from school to school (range=16.3, 29.9 min).

Conclusions: Findings for girls, but not for boys, were consistent with the SDH. Even though the schools have the same curriculum and routine, it appears that girls and boys accumulated differing amounts of MVPA within and between the schools. Future studies in low-to-middle-income countries should explore the segmented school day to better understand this setting.





## Physical activity and mental health in older adults: A systematic review and meta-analysis

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<sup>1</sup>Hong Kong Baptist University, Hong Kong, China

Ageing (SIG)

Purpose: The benefits of physical activity (PA) on mental health (MH) of older adults are widely recognized. The purpose of this study is to apply systematic review and meta-analysis to identify the relationship between PA and MH as well as further examine the effectiveness of PA that enhanced MH in older adults.

Methods: A systematic literature searching was conducted in five databases before July 2018. Independent title/abstract and full-text screening were undertaken. Inclusion criteria were articles available in full text, human species, journal articles, correlational studies or experimental studies, English as publication language, and subjects aged 65 years and above. Three reviewers independently screened the searching results and performed data extraction and risk of bias assessment. Information were extracted on characteristics of participants, intervention type, intervention duration and frequency, length of follow-up, improvement of mental wellbeing and reduction of mental disorders and mental health problems, and also the relationship between physical activity and mental health. Standardized mean differences (d) for experimental studies and correlations (r) between PA and mental health were tested for effect sizes using a random-effects model.

Results/findings: Seventy out of 5881 articles were retained for data extraction, among which 36 were correlation studies while 34 were intervention studies. A random-effect meta-analysis of 41 tests was conducted on 7 correlation studies and 26 intervention studies. The meta-analytic effects were statistically significant in correlation studies between PA and MH problems (r=-0.22, p<.001). Statistically significant effects were also found in the intervention studies on reducing MH problems (Cohen's d = -0.43, p<.001) and enhancing mental well-being (Cohen's d = 0.85, p<.01).

Conclusions: The current meta-analytic review confirmed the relationship between PA and MH as well as the effects of PA on MH in older adults. The findings provide a useful information for enhancing the future design of experimental and correlational studies in relation to physical activity and mental health. Keywords: physical activity, mental health, older adults, systematic review, meta-analysis





# Quality of life, eating behaviors, chronic nutrition impact symptoms, and unmet supportive care needs in head and neck cancer survivors: a qualitative study

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### Cancer prevention and management (SIG)

Purpose: Head and neck cancer (HNC) survivors may face an array of nutrition impact symptoms (NIS) including dysphagia, xerostomia, taste alterations and difficulty chewing that occur as a result of tumor location and treatment with radiation. Few qualitative studies have assessed the chronic impact of NIS on everyday life. The aim of this study was to obtain a comprehensive understanding of quality of life outcomes, eating behaviors and supportive care needs associated with chronic NIS burden among HNC survivors.

Methods: Between March 2018 and May 2019, semi-structured, face-to-face interviews were conducted among 31 HNC survivors who were 6 months to 9 years post-radiation. An interview guide was utilized to consider themes developed based on a review of the literature and the researchers' clinical experience with the HNC population. There were probes within the interview for participants to raise unanticipated issues and flexibility to follow such leads. A single researcher conducted the interviews to maintain consistency in data collection. Interviews lasted approximately 1 hour and were audio recorded. All interview transcripts were professionally transcribed verbatim and checked for accuracy to ensure a complete account of participants' responses. Two researchers independently reviewed all transcripts to identify themes using code-based thematic qualitative content analysis.

Results: Survivors described behavioral and social restrictions on daily living caused by chronic NIS. Despite these restrictions, survivors had adapted to NIS and reported an overall high mentality and enjoyment of life. Coping considerations included adapting to a new normal, learning to manage NIS, and ambivalence towards NIS and quality of life outcomes. Preferences for patient care included more therapy/support groups and being involved in the treatment plan.

Conclusion: Chronic NIS have substantial effects on the everyday lives of HNC survivors. Health care professionals should address the presence of chronic NIS with HNC survivors in follow-up visits and maximize physical, psychological, social and behavioral aspects of nutrition and well-being.





## Dietary habits, physical activity and sedentary behaviour of children of working mothers: a systematic review.

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### Children and families (SIG)

Purpose: Globally, the trend of women's employment is rising and this increase draws attention to the complex relationship between maternal employment and children's wellbeing. The aim of the study is to review the relationships between maternal employment and the indicators of health behaviour of children and adolescents (6 to 18 years)—dietary intake, physical activity, and sedentary behaviour.

Methods: A systematic review, was conducted. Searches were made of Scopus, PubMed, Science Direct, JSTOR, Google scholar and relevant websites. Peer-reviewed journal articles, conference papers, theses at masters/doctoral level in English were included; studies focused on obesity or overweight and people less than 6 or more than 18 years old were excluded.

Results: 14309 screened articles yielded 37 eligible papers, which showed associations between maternal employment and at least one domain of dietary pattern, physical activity and/or sedentary behavior. Among these, 29 were from high-income countries, 6 from upper-middle-income and 2 from lower-income. Studies included were observational (cross-sectional and cohort) (51.35%), longitudinal (45.95%) and qualitative (2.7%). Data were collected using self-reported surveys, interview and objective devices, such as accelerometers. Nationally representative samples were used in 33.4% of studies. Dietary pattern was assessed in 29 samples, physical activity in 23 and sedentary behaviour in 21. The relationship of maternal employment with dietary pattern and physical activity were found inconsistent and influenced by many factors such as age of children, socioeconomic status, and family correlates. Screen time, the most commonly measured domain of sedentary behaviour (90.48%) in this review, was positively associated with maternal employment in 11 samples. Meta-analysis was not possible due to heterogeneity of analysis.

Conclusions: The review suggested some evidence that dietary intake and physical activity of children and adolescents of employed mothers are different compared with unemployed mothers. Findings also suggest a greater prevalence of sedentary behaviour of children of working mothers. More studies need to find how to support employed mothers to promote the health of their children.

Keywords: Maternal employment, children, dietary pattern, physical activity, and sedentary behaviour.





## Differences in shopping behaviors among food insecure and food secure families

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### Children and families (SIG)

There are 6.5 million children in food insecure (FI) households in the United States (U.S.). Few studies have examined the differences in food shopping behaviors of low-income populations by food security status. Therefore, it is not well known whether the low-income food insecure families shop differently from those who are low-income but food secure (FS). Exploring the shopping patterns and behaviors of low-income and FI households may offer insight into the essentially unchanged prevalence of food insecure children. The purpose of this study was to investigate and describe the fruit and vegetable (F&V) shopping patterns and behavior of low-income families who are reportedly food insecure vs. those who are food secure. Cross-sectional data was collected using validated parentreported surveys among parents of children enrolled across a convenience sample of schools serving predominantly low-income families (>75% children on free/reduced lunch program) in Houston, Dallas, Austin, New York City, Washington, D.C., and Southwest Florida in the fall semester of 2018 (n=88 schools, 4664 parents). Multilevel regression analysis was used to determine differences in F&V shopping behaviors by food security status. Responding parents were primarily mothers (93%), and Hispanic (85%). The majority (66%) of participants were food insecure. Over 80% of the participants reported shopping for F&V at the large grocery stores. Those who were FI were 12% less likely to shop for F&V at large chain grocery stores as compared to those who were FS (p=0.000). Food insecure households were significantly less likely to shop for F&V at warehouse club stores or discount superstores as compared to those who were FS (p=0.001). FI households were 18% more likely to shop at convenience stores as compared to those who were FS (p<0.01). Interestingly, >75% of participants reported never purchasing F&V from local convenience stores. Finally, those who were FI were 32% more likely to receive F&V from a food bank or pantry as compared to those who were FS (p<0.001).





"To be faster and stronger and live longer:" a concurrent mixed methods study to explore students' perceptions of their role as advocates and leaders for obesity prevention

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Children and families (SIG)

Purpose: Children and adolescents have influential voices among their peer groups; thus, obesity-focused youth advocacy programs has the potential to broadly address pediatric obesity, particularly among socially disadvantaged children. This convergent, mixed methods study sought to understand how students attending low- and middle-income schools perceive their skills as advocates and leaders, as well as how they communicate about health with their peers.

Methods: Surveys and brief semi-structured interviews were completed by elementary and middle school students in 21 low- and middle-income schools participating in an obesity prevention study. Surveys included a 17-item Youth Advocacy for Obesity Prevention scale (YAOP; Likert-type response set, range: 0-68, Cronbach's alpha=0.82) assessing five constructs: self-efficacy for advocacy, perceived sociopolitical control, assertiveness, participatory competence, and health advocacy history. Multi-level modeling, accounting for school-level clustering, assessed associations between youth advocacy sum score and gender, school type, race, and BMI z-score. In interviews, students defined what "being healthy" means to them and described how they could convince their peers to be healthier. Interviews were inductively coded for emerging themes related to persuasive messaging.

Results/findings: Survey participants (n=289) were 67.8% female, 61.2% elementary, 52.7% African American, 16.1% Hispanic/Latino. Of these, a randomly selected half (n=131, 45.3%) completed interviews. Mean YAOP score was 41.3 (SD=0.67). Females reported higher scores than males (b=-0.19, SE=0.09, p=0.032), and elementary students had higher scores than middle school students (b=0.24, SE=0.09, p=0.015). No differences were identified by race or BMI z-score. Of the five constructs, students scored lowest on advocacy history and highest on participatory competence. Emerging themes for students' persuasive messaging for peers included providing: general advice (e.g., eat healthy, be active), specific strategies (e.g., eat vegetables with every meal), and short-term (e.g., fitness, sports performance) and long-term (longevity, lack of illness) outcomes of being healthy.

Conclusions: Findings suggest that students in low- and middle-income schools perceive having skills for obesityrelated health advocacy and provide insight on students' communication strategies related to health behavior. Future studies should seek to enhance these skills via training curricula, particularly for males and older students, and assess the potential impact of advocacy training on pediatric obesity outcomes.





## Do children's physical activity associate with their parents'?

#### Miss Ming Yu Claudia Wong<sup>1</sup>

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Children and families (SIG)

#### Purpose:

Parental support, parental modelling and parental gender were the most documented parental factors associating with children's physical activity (PA) level. However, whether physically active children would associate with higher PA level and less sedentary behaviour (SB) of their parents were not examined; thus this investigation was being the purpose of this study.

#### Method:

This is a cross-sectional study using self-report questionnaires. Sixty families, parents with their children in average age of 5.23 years were recruited through convenience sampling. The Chinese version of IPAQ and PAQ-C were used to evaluate the PA levels, while the Chinese version of ASAQ-CH and ASBQ were used to measure the SBs of the parents and the children, respectively. The Pearson Correlation and regression analysis were applied to identify the associations of PA levels and SBs between children and their parents.

#### Results:

The results showed no significant correlation between children and their parents on PA levels. However, the scatter plot showed a horizontal line distribution between children's and parents' PA. This represented parents' PA level remains at the same level within the increasing PA of children. Yet, a separate regression analysis found that son-parent showed his total PA significantly predict parents' total PA level ( $\beta$ =.356, p=.039), while daughter-parent showed her total PA only significantly predict parents' moderate PA ( $\beta$ =.42, p=.033). Moreover, domain-specific sedentary behaviour outcomes revealed that children's SB for hobbies was positively correlated with parents' SB for reading (r=.264, p=0.04), while children playing computer games was negatively correlated with parents' SB for transportation(r=.470, p<0.001).

#### Conclusion:

Generally, active children would not associate with their parents' PA. Instead, they might further increase parents' SB. However, the study outcomes indicated a gender diversity on influencing parents' behaviour. Therefore, further investigation through a qualitative study can be done to explore the reasons behind.





## How has kids' physical activity previously been measured in Australia? And what questions could we use in the future?

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### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

#### Purpose:

Better data is needed to more accurately determine children's and adolescents' physical activity participation. In the past, a considerable number of diverse questions have been used to measure participation levels, creating difficulties when trying to compare and combine data. Currently, Australia does not have a standardised set of survey questions. Using a consistent measurement approach would result in more comparable data and a clearer picture of how active children really are.

#### Methods:

A systematic search was conducted to identify all the datasets consisting of data on youth participation in physical activity and sedentary behaviour within Australia. The survey questions used to measure participation within these datasets were extracted and systematically classified into the various activity domains (overall physical activity, sport, active play, active transport, physical education, exercise, and screen and non-screen-time) using a specifically designed taxonomy. A Delphi panel ranked each question based on their alignment with national guidelines, their coverage and their validity and reliability.

#### Results:

Over 500 questions have previously been used to measure children's and adolescents' physical activity and sedentary behaviour within Australia over the past 70 years. To form a recommended set of questions a concentric approach was adopted, with one central recommended question for each activity domain, followed by a series of other possible questions. The ideal question selected is comparable with a large volume of historical data, have established reliability and validity, and allows us to assess compliance with guidelines.

#### Conclusion:

Greater clarity of physical activity measurement within Australia has long been desired. These recommendations will hopefully result in more consistent and comparable data being collected, and therefore more accurate measurement of how active our youth are.





# Oncology Registered Dietitians' knowledge, attitudes and practices related to food insecurity among cancer patients: a qualitative study

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### Cancer prevention and management (SIG)

Purpose: Food insecurity (FI) is associated with negative health outcomes, including poor quality of life (QOL) and chronic diseases like cardiovascular disease and diabetes. The association between FI and cancer is largely unknown. No comprehensive practice guidelines or consensus criteria currently exist regarding screening for and addressing FI in oncology clinics. Registered Dietitian Nutritionists (RDNs) are on the front lines of nutritional care provided to patients across the cancer continuum, but it is unknown if and how oncology RDNs address FI with their patients. The purpose of this study was to assess oncology RDNs' knowledge, attitudes and practices related to FI among cancer patients.

Methods: Semi-structured interviews were conducted with 41 oncology RDNs working at various cancer centers across the U.S. and recruited through the Oncology Nutrition Dietetics Practice Group of the Academy of Nutrition and Dietetics. Interviews were conducted by telephone using Microsoft Lync and recorded using the audio software program, Audacity®. Interviews lasted an average of 60 minutes and were conducted by a research specialist trained according to the Ecocultural Family Interview protocol. The interviews were coded by research specialists using a semantic approach to thematic analysis. Data were analyzed using Dedoose.

Results: Findings revealed that oncology RDNs are generally aware of the term "food insecurity" and can accurately define it. RDNs believe that FI is a problem for many of their patients and that cancer patients are more likely to be negatively affected by FI compared to healthy adults. RDNs identified potential adverse consequences of FI for cancer outcomes such as poor nutritional status, QOL and tolerance to treatment. Few RDNs reported they regularly ask patients about their ability to afford necessary food. The vast majority of RDNs had not heard of or used a validated assessment tool to identify food insecure cancer patients.

Conclusions: Most oncology RDNs are knowledgeable about FI and are concerned about the potential negative impact on cancer outcomes. However, most do not use a validated assessment tool to identify cancer patients who may be food insecure. These findings can inform intervention work focused on screening for and addressing FI in oncology settings.





## Physical activity and sleep are inconsistently related in healthy children: A systematic review and meta-analysis

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### Children and families (SIG)

Objective: Physical activity is considered an effective method to improve sleep quality in adolescents and adults. However, there is mixed evidence among children. Our objectives were to investigate this association in children and to examine potential moderating variables.

Methods: Eight databases were systematically searched, and we included all study designs with a sample of healthy children ages 3-13 years-old. We identified 47 studies for meta-analysis.

Results: Overall, we found little association between physical activity and sleep (r = .02, 95% confidence interval = -.03 to .07). There was a high amount of heterogeneity in the overall model (I2 = 93%). However, none of the examined variables significantly moderated the overall effect, including age, gender, study design, risk of bias, study quality, measurement methodology, study direction, and publication year. Exploratory analyses showed some weak, but statistically significant associations for vigorous physical activity with sleep (r = .09, 95% CI = .01 to .17, I2 = 66.3%), specifically sleep duration (r = .07, 95% CI = .00 to .14, I2 = 41.1%)

Conclusion: High heterogeneity and the lack of experimental research suggests our findings should be interpreted with caution. The current evidence, however, shows little support for an association between physical activity and sleep in children.





# A Qualitative Study of Food Insecure Individuals' Experiences in the United States and Recommendations for Measurement

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

#### Purpose:

Addressing food insecurity is critical in any efforts to reduce health disparities. The current widely held definitions of food security are holistic and nuanced, but measurement has not been. Measures such as the United States Department of Agriculture's Household Food Security Survey Module (HFSSM) focus on food access and economic aspects of food insecurity, but do not fully consider the social, physical, health, and behavioral dimensions. The purpose of this study is to explore a diverse sample of food-insecure individuals in the US to understand their experiences and barriers related to food insecurity, as well as their perceptions of common experience-based measures of food insecurity (e.g., HFSSM).

#### Methods:

Qualitative data collection will occur from January-March, 2020. We will interview a low-income racially/ethnically diverse sample of food insecure individuals (n=15-20) to explore their food insecurity experiences, conceptualizations of food insecurity, and perceptions of current tools and recommendations for improvement. The interviews will be completed in-person, will last approximately 60-minutes, be audio recorded with permission (or detailed notes will be taken), and verbatim transcription of audio will be completed. The qualitative approach will incorporate thematic analysis utilizing Creswell's "lean coding" technique.

#### Expected Findings and Conclusions:

In our previous qualitative work with food insecure populations, interviewees identified the utility of social capital in securing food ("Basically it's like every end of the month is when we run out. And I call around and see if I can go to somebody's house to eat..."), use of food pantries for emergency food supplies (and even chronic reliance), and prioritized certain food groups, such as meat (leading to limited dietary variety). These are examples of aspects of the food insecurity experience that are not currently captured in the HFSSM. The findings of this study, combined with other research activities being conducted as part of the larger project (e.g., literature scan, expert working group, and psychometric assessments) will help contribute to better understanding food insecurity measurement from the perspectives of those most affected in the US and results may be extrapolated and tested in other countries.





## Communities Of Practices for Healthy Lifestyle (the COP4HL project)

#### Miss Danielle Nørager Johansen<sup>1, 2, 3</sup>, Mr. Thomas Skovgaard<sup>1, 2, 3</sup>

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Ageing (SIG)

#### Purpose

COP4HL is an Erasmus+ funded project aiming at promoting healthy aging through interventions in the everyday environment of selected population groups. The cornerstone of the project is the development of national Communities Of Practices (COP's) designed via collaborative processes involving a wide range of stakeholders. The aging population is a global issue vastly increasing due to declining fertility rates (in some parts of the world)

and increased life expectancy. There is a need to think and act differently prospectively to meet this challenge and ensure healthy, active aging.

For this reason, the Danish COP aims at developing and qualifying educational modules targeting university and vocational students - so they are even better prepared to implement and innovate training for senior citizens.

#### Method

The project is based on a Participatory/Citizen Science approach where diversity in terms of different stakeholders is an important driver for the project outcomes.

In the Danish COP, seniors, municipalities, a fitness franchise focusing on training for seniors, students, and the coordinating university collaborate to create an Active Ageing Trainer (AAT) module focusing on active, healthy aging for senior citizens aged 65 and above. This has been done through interviews, questionnaires, workshops, and meetings, as well as two rounds of piloting the initially developed module.

#### Results/Findings

The AAT-module focuses on students' abilities to deliver high-quality fitness interventions to older individuals and groups. During the module, students are introduced to newest evidence and guidelines on physical activity and aging. Changes in neuromuscular function and particularly the emerging evidence regarding loss of muscle power, strength, and mass (sarcopenia) as we grow older are key areas in the module - and different strategies to postpone those issues are taught.

#### Conclusion

After finalizing the second module pilot in September 2019, next step is accrediting the module within the Europe Active system.

As from the fall of 2020, university students will be able to attend the ATT-module as part of their studies in sports science and health, whilst non-university students like physiotherapists, personal trainers, etc. will be able to purchase the module provided by the fitness franchise.





# Predictors of Classroom Teachers' Intentions to Provide Physical Activity in the Classroom

<u>Dr. Lindsey Turner</u><sup>1</sup>, Dr. Peter Boedecker<sup>1</sup>, Mr. Blake Densley<sup>1, 2</sup>, Dr. Hannah Calvert<sup>1</sup> <sup>1</sup>Boise State University, Boise, United States, <sup>2</sup>College of Idaho, Caldwell, United States

Implementation and scalability (SIG)

PURPOSE: Providing opportunities for elementary school-aged children to be physically active during the school day is important for obesity prevention and overall health. Classroom physical activity (CPA) has been shown to be effective for increasing student PA, but it is not widely practiced among teachers. This study examined teachers' perspectives about CPA – including environmental, organizational, and personal factors - and their intention to provide CPA to their students.

METHODS: Teacher attitudes and beliefs about CPA, including beliefs about environmental supports or barriers and personal competence or skills, were assessed through a survey of all classroom teachers (n=165) at 10 public elementary schools. The survey included eleven scales, including 1) perceived educational benefits (3 items, alpha = .86); 2) perceived hassles (6 items, alpha = .77); 3) perceived competence (3 items, alpha = .94); 4) perceived autonomy (3 items, alpha = .83); 5) perceived autonomy support (6 items, alpha = .95); 6) principal support for CPA (1 item); 7) perceived norms (1 item); 8) organizational climate, which included two subscales, collegial behavior (6 items; alpha = .79) and restrictive behavior (4 items; alpha = .78); 9) openness to educational innovation (4 items, alpha = .74); 10) compatibility with instructional practices (4 items, alpha = .78); and 11) mindset (7 items, alpha = .72). Responses were made on 6 point Likert-type scales (strongly disagree to strongly agree). Hierarchical linear modeling was used to examine how the constructs predicted teachers' intention to provide CPA to students, accounting for the nesting of teachers within schools.

RESULTS: Model results indicated that three of the eleven constructs significantly predicted teacher intention to provide CPA; perceived competence (B = .259, p <.001), autonomy (B = .143, p=.026) and hassles (B = .129, p = .047).

CONCLUSION: Competence, or teachers' belief that they could provide CPA to students, was the strongest predictor of their intent to provide CPA. However, feeling autonomous to implement CPA and perceiving fewer barriers to providing CPA also predicted intention. Addressing all of these factors through professional development could be effective for increasing teachers' use of CPA.





# How did health districts bring about healthier food environments in their hospitals? A large-scale case study in New South Wales (NSW), Australia

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Implementation and scalability (SIG)

Purpose:

This qualitative study investigated the experiences of NSW Local Health District (LHD) staff involved in implementation of a food environment policy – the Healthy Food and Drink in NSW Health Facilities for Staff and Visitors Framework (Framework) – developed by the NSW Ministry of Health. Evaluation of this ongoing, large-scale policy implementation to improve the food and drink offerings for staff and visitors in NSW health facilities adds significant evidence about how to successfully implement large-scale food environment policies in environments other than schools.

This presentation focuses on answering these research questions:

- 1. To what extent have processes at the LHDs, and materials, tools and support from the Ministry, aided the implementation of the Framework?
- 2. How and why did Framework implementation work or not work?

#### Methods:

Nine LHDs previously randomly selected for a related evaluation study were selected and two LHDs were added to improve representativeness (11 of 17 LHDs). Through a scoping and mapping exercise, key stakeholders involved in implementation were identified. Consenting interviewees from stakeholder groups in each LHD participated in either an individual or small group interview. Three large group interviews with Implementation Committees were also conducted. Two interviewers conducted all 75 interviews. Interviews were audio-recorded, transcribed, coded and thematically analysed in NVivo 11.

#### Findings:

The Framework premise to improve food environments was accepted by all stakeholders. Chief Executives of LHDs accepted responsibility for and drove the changes. They directed staff with relevant roles and skills to implement the Framework and these implementation leads, mostly health promotion staff, worked with dietitians and property managers to engage local retailers and work with them to implement the required changes. Initial retailer concerns were largely overcome with local and Ministry support and resources. The removal of sugar-sweetened drinks was a short-term win which encouraged ongoing implementation. Auditing and reporting drove retailer engagement with the Framework food and drink practices.

#### Conclusions:

Large-scale implementation of a policy to improve food environments in hospitals required senior executive commitment, skilled implementers, resources, auditing and reporting, and willing retailers.





## Effectiveness of resistance training on resilience in Hong Kong Chinese older adults: Study protocol for a randomized controlled trial

#### Dr. Chun-Qing Zhang<sup>1</sup>, Prof. Pak-Kwong Chung<sup>1</sup>, Dr. Yanan Zhao<sup>2</sup>

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Ageing (SIG)

Background: Resilience is the process of adapting well in the face of adversity, trauma, tragedy, threats or significant sources of stress. Despite previous research suggesting that physical activity is an important factor of resilience, no existing interventions incorporating physical activity to build resilience among older adults. Strength training has potential benefits that could contribute to the development of resilience among older people.

Purpose: The current study aims to examine the effectiveness of resistance training on resilience among Chinese older adults in Hong Kong adopting a randomized controlled trial design.

Design: This study will apply a three-group, triple blinded (participants, coaches, and data collectors will not be informed of the main purpose of the study), randomized controlled trial (RCT) to examine the effectiveness of the interventions on resilience, functional fitness, and health-related quality of life immediately after a 16-week intervention, as well as the residual effects 12 weeks after completion of the interventions. The CONSORT procedure will be followed. The three groups will be resistance training group, Tai Chi Group, and control group. Power analysis indicates that a sample size of 40 participants per group (totally 160 for 3 groups) will be required in the current study.

Data analysis: The primary outcomes (resilience scores) will be analyzed using an intention-to-treat (ITT) approach. To determine the intervention effect sizes, a two-way repeated measure analysis of variance (ANOVA) will be applied to determine the changes of each outcome parameter among the three time points (i.e., pretest, posttest, and follow-up test).





# Barriers and facilitators to the implementation of evidence-based lifestyle management in polycystic ovary syndrome: endocrinologists' perspectives

Ms. Lucinda Blackshaw, <u>Associate Professor Lisa Moran</u>, Associate Professor Jacqueline Boyle, Associate Professor Tracy Robinson, Dr. Siew Lim

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### Implementation and scalability (SIG)

Background: Polycystic ovary syndrome (PCOS) is a common condition with reproductive, metabolic and psychological manifestations which are exacerbated by obesity. The 2018 International Evidence-based Guideline for the Assessment and Management of PCOS recommends lifestyle management as first-line treatment to improve symptoms and long-term health risk. However, systemic and individual barriers to lifestyle management implementation exist for women with PCOS and the different health professionals involved in caring for women with PCOS. Endocrinologists' barriers and facilitators to the implementation of lifestyle management in PCOS have not previously been explored.

Method: Utilising a qualitative descriptive approach we gathered the perspectives of 11 Australian endocrinologists who saw women with PCOS from three patient subgroups (rural n=2, culturally and linguistically diverse n=6 and general population n=5). Semi-structured interviews were audio-recorded and transcribed verbatim. Analysis was conducted on NVIVO 12 Plus software using a reflexive thematic analysis approach.

Results: Endocrinologists had a comprehensive knowledge of the role of lifestyle in PCOS, considered it integral to PCOS management, discussed it with all women with PCOS and considered it to be addressed well in the guidelines. Reported systemic barriers to the implementation of lifestyle management included a lack of specific advice for PCOS, the poor fit between lifestyle management and specialist care, a lack of access to allied health and other lifestyle management services and training gaps in lifestyle management and PCOS. Individual practitioner barriers included sense of futility with lifestyle management, perceived poor patient motivation and adherence and a perceived patient sense of helplessness. Systemic facilitators included a team care approach utilising allied health referral through chronic disease management plans and credible sources of information. Individual facilitators included provision of tailored advice.

Conclusions: Endocrinologists experienced a number of systemic and individual barriers to the implementation of lifestyle management in PCOS both specific to their circumstances and consistent with findings in general practice and the general population. These barriers must be addressed and current facilitatory practices strengthened in order to optimise health outcomes for women with PCOS. Development and trial of novel, co-designed models of care should incorporate these findings for best practice in PCOS lifestyle management.





## Exploring the impact of a physical activity intervention on the health and wellbeing of young people outside mainstream education: A mixed methods study.

#### Ms. Louisa Horner

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#### **Children and families (SIG)**

Purpose: The purpose of this study was to explore the impact of a seven-month physical activity intervention on health-related quality of life (HRQoL) and wellbeing of young people attending a Pupil Referral Unit (PRU).

Methods: HRQoL was measured using the KIDSCREEN-52 questionnaire. Semi-structured interviews were used to evaluate the staff (Group interview) and participants' (individual interviews) experiences of, and attitudes to, the intervention using the '5C's': competence, confidence, connection, caring and character of positive youth development through sport (PYD) as the framework. Participants 14-16-years (n = 16) were recruited from one school-based PRU via purposive-convenience sampling. One-way repeated ANOVA's, or non-parametric equivalents, were used to test for differences in HRQoL pre- post-intervention and 6-9 month follow up. Findings from the interviews were analysed using template analysis using the 5C's as a priori themes.

Results/findings: There was a trend towards positive changes in all HRQoL dimensions from pre-intervention to the follow up point, but only two dimensions reached statistical significance (Feelings P = .038, d = 1.11; and Bullying P = .03, d = .95). There were minor reductions pre to post-intervention in the dimensions of: Emotion, About Yourself, Free Time, School and Learning, and Family and Home Life. Findings from the interviews indicated that both the young people and PRU staff could identify improvements in all 5C's as well as the development of additional life skills. Connection received the most attention with pupils, and staff, placing greatest emphasis on their ability to develop relationships with others.

Conclusion: This research provides preliminary evidence to suggest that sport and physical activity can be used by staff in PRU's to improve HRQoL and wellbeing for a vulnerable population facing poor health and educational outcomes. It can also increase confidence in young people and provide a means of improving relationships between young people and PRU staff.





## Prevalence and sociodemographic correlates of meeting the 24-Hour Movement Guidelines among school-aged students from low- and middle- income families in China's rural areas

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### Socio-economic inequalities (SIG)

Purposes: Due to socioeconomic disparities in movement behaviors (MBs) among school-aged students, improving MBs in students from low- and middle- income families (LMIFs) in rural areas is important, which is an imperative part of promoting all children and adolescents active and healthy. This study examined the prevalence of meeting the 24-hour movement guidelines and its sociodemographic correlates among Chinese school-aged students from LMIFs in rural areas.

Methods: Using a multi-stage sampling, nationally representative school-aged students in rural areas in China were recruited in November 2017. The Health-Behavior School-aged Children questionnaire (HBSC) was used to collect participants' information on moderate to vigorous physical activity (MVPA), screen time (ST), sleep duration (SLP). Meeting the 24-hour movement guidelines was defined as having more than 1 hour of MVPA, less than 2 hours of ST and more than 8 hours of SLP per day. The questionnaire also collected sociodemographic information, including sex, grade group (low, middle, high), race (Han, minority), family income (low, middle), parental education (low, high). Weight status (non-overweight and obesity, overweight and obesity, determined by WHO reference) was measured by portable device. Generalized linear model(s) was used to explore the predictors of MBs.

Results: Of all 35,372 participants, the prevalence of meeting the MVPA, ST, SLP and 24-hour movement guidelines was 9.5%, 63.1%, 43.8%, 3.7%, respectively. Only grade group was correlated with meeting the 24-hour movement guidelines (OR for low-grade group = 12.1, OR for middle-grade group = 3.3). The correlates of meeting the single MVPA, ST or SLP guideline were varied (e.g., MVPA: boys, younger students; ST: students with Han race and higher parental education level; SLP: boys, younger students, non-overweigh and obese participants).

Conclusions: The prevalence of meeting the 24-hour movement guideline among Chinese school-aged students in rural areas was low. Different factors should be considered for effective interventions of MVPA, ST and SLP. High-grade students were interventional priority for better MBs. School-aged students who are socially disadvantaged should be an interventional priority.





## Why are hospitalised older people sedentary? A grounded theory study exploring knowledge and attitudes towards sedentary behaviour and physical activity in hospitalised older patients

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Ageing (SIG)

#### Abstract

Older adults spend up to 99% of their time in hospital sitting or lying (sedentary) with very little physical activity (PA). This contributes to a longer length of hospital stay and poor outcomes such as worsening frailty. Very little is known about the perspectives of hospitalised older patients about sedentary behaviour (SB) and physical activity (PA). Exploring consumer perspectives assists the co-design and development of strategies to reduce SB and improve PA in hospital.

#### Aims

The aims of this study of older inpatients are to explore their:

- Knowledge of and attitudes to SB and PA;
- Willingness to change their SB and increase PA;
- Views as to what would be required to help them change their SB and improve PA

#### Methods

Semi-structured interviews were conducted with 23 patients aged 65 years and older on an orthopaedic and a geriatric medicine ward at The Queen Elizabeth Hospital. Data collection and analysis was conducted in accordance with grounded theory methodology.

#### Results

Our substantive theory based on participant's descriptions is that the hospital, its systems and processes are the reasons for SB among older people. Older patients are unfamiliar with the term sedentary behaviour. They described SB as being physically and mentally inactive and PA in terms of ADLs and other activities specific to older people. They are somewhat aware that being sedentary is detrimental to their physical and or mental health. Older people reported they were willing to move more if they felt safe and supported. The main categories (themes) from this study are lay conceptualisation of SB and PA, intend to be active, beyond their control, lack of empowerment and negative consequences.

#### Discussion/Conclusion

Older people have some understanding of the harmful effects of SB and are willing to undertake PA but would like to feel safe and supported. The main findings in this study are that older people intend to keep active during hospital





admission and SB in hospital has a negative effect on the mental health of hospitalised older people. Older people need to be empowered to break SB and increase PA during hospital admission.





# What does physical activity research on children look like? An Australian perspective

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Children and families (SIG)

Purpose: Numerous studies have collected data on Australian children's physical activity (PA). However, many of these studies are now underutilised and current participation rates are often determined by only a small proportion of the research which is undertaken. Difficulties also arise when attempting to make comparisons between different groups, geographical areas and time due to the methodological inconsistencies.

Methods: An audit of Australian PA research was conducted on youth aged 0-18 years focusing on overall PA participation, active transport, sport, school-based PA, active play and sedentary behaviours. Online databases and grey literature were searched and a set of metadata was developed to assist with data extraction.

Results: The systematic search yielded 22,283 records, of which 1002 articles were screened at full-text. Along with a grey literature search, over 200 datasets were identified. The coverage of these datasets spans 1951 till today, and consists of data from over 350,000 children. These datasets were financially supported mainly by government and non-government organisations, and mainly conducted through a University. Despite technological advances, the majority of research still utilised surveys and questionnaires to measure physical activity.

Conclusion: Data on PA participation in Australian children are extensive but suffer from inconsistencies. An understanding of what research has previously been conducted helps to shape future research. Utilising more consistent methodological approaches to collect data would allow for better harmonisation and a clearer picture of youth physical activity levels.





# Do nutrition professionals have the tools to implement and evaluate effective nutrition programs?

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### Implementation and scalability (SIG)

Purpose: Nutrition professionals are often at the front line in the development, implementation, and scaling of preventive interventions to support healthy behaviors. Thus, it is important to assess whether these individuals have the tools necessary to facilitate effective interventions. The purpose of this study was to assess the knowledge and application of concepts from prevention and implementation science in nutrition professionals in the United States.

Methods: Attendees of a session about prevention science at a large national nutrition conference in the United States were asked anonymously about their knowledge and application of prevention and implementation science.

Results: Approximately 110 attendees answered polling questions during the conference session. Of the respondents, 65% of participants have implemented either evidence-based or evidence informed programs, yet 22% of participants do not evaluate programs, and 83% of participants had not heard of prevention science, implementation science, logic models, or seen these concepts in practice.

Conclusions: The effective implementation and evaluation of prevention programs is essential to support the development of healthy behaviors. To encourage the implementation and evaluation of effective programs, the following three areas are suggested for the nutrition field: additional training for nutrition professionals, the inclusion of technical assistance in the implementation of prevention programs, and encouraging interdisciplinary teams in program implementation and evaluation. Based on responses from attendees, additional training for nutrition professionals is necessary to support the development, dissemination, and scaling of evidence based programs to develop healthy behaviors and reduce the risk of chronic disease. Additionally, in the development of prevention programs, technical assistance may be helpful to provide training for professionals who are implementing programs. Lastly, interdisciplinary teams including prevention scientists and public health professionals could help to support effective nutrition interventions.





## Implementation of blended and combined exercise and nutrition programs for older adults: perspective of allied health professionals in the Amsterdam metropolitan region.

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### Implementation and scalability (SIG)

Purpose: Interprofessional collaboration and adaptation of e-health are necessary to implement innovative exercise and nutrition interventions in health practice. The aims of this qualitative study were 1) determine the relevant factors related to successful interprofessional collaboration, and 2) determine the relevant factors for implementation and susceptibility of our blended interventions in older adults, by allied health professionals in the Amsterdam metropolitan region.

Methods: This explorative qualitative study was the next step in implementation, subsequent to the VITAMIN RCT. In total 45 physiotherapy and 27 dietician practices were selected for recruitment. We combined fourteen semistructured interviews with dieticians with two focus-groups of mixed exercise- and physiotherapists. After each focus-group and interview the two researchers evaluated and discussed the statements, factors and common believes in relation to the research questions. Transcripts were analyzed with MAXQDA software, and open, axial and selective coding was adapted by two independent researchers. A third researcher was available if consensus could not be reached.

Results: In current practice interprofessional collaboration is not common, mainly due to lacking knowledge about the other profession. Location is a facilitator, as well is previous experience. External factors as higher financial compensation to implement interprofessional work meetings were defined as possible facilitator to collaboration. The professionals defined a shared electronic patient database as necessity to interprofessional collaboration, especially due to the privacy regulations. Main encouraging factors related to blended interventions were timesaving consults, ability to reach immobile older adults, and cost saving healthcare. Main barrier was lacking e-health literacy of older adults.

Conclusions: This study shows that the exercise and nutrition professionals have a positive attitude towards future implementation of these types of blended and combined interventions for older adults. Furthermore, interprofessional collaboration is a point of attention in our regional allied healthcare system. Several external factors related to implementation, like financial compensation, make the adaptation of combined interventions with e-health for older adults challenging.





## Relation of perceived barriers and physical activity levels in Brazilian older adults

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Ageing (SIG)

Despite the well-known benefits of physical activity, there is still a great amount of the population leading a sedentary lifestyle. The causes may be explained by the barriers perceived to physical activity, so the determination of these may be an important tool for the increase of a population's physical activity level (PAL).

PURPOSE: To analyze the association between perceived barriers and PAL in older adults.

METHODS: This was a descriptive cross-sectional study conducted within the elderly population living in three neighborhoods of the urban area of a medium-sized city of southern Brazil. The PAL was evaluated with the IPAQ (transport and leisure domains) and the perceived barriers with the instrument proposed by Reichert et al. (2007) validated for the study population. The chi-square test was used to analyze the associations between perceived barriers and PAL.

RESULTS: 52.7% of the studied population was classified as physically active, 37.18% as insufficiently active and 10.25% as physically inactive. The barrier perceived the most among the insufficiently active elderly was having an injury or illness that interferes in physical activity (58.62%) and among the physically inactive, feeling lazy and tired (62.5%). Physically inactive and insufficiently active older adults reported a greater number of barriers in greater frequencies and similar perceived barriers (having an injury or illness that interferes in physical activity, feeling lazy and tired, and lack of companionship). In the analysis of the difference in the perception of barriers between the groups stratified by PAL, a statistically significant difference (p < 0.05) was found in the barriers "feeling old for practicing physical activity" (p = 0.034) and "having an injury or illness that interferes in physical activity" (p = 0.004).

CONCLUSIONS: The findings of this study showed the impact that the perception of barriers exerts on PAL, showing that the higher the number of perceived barriers, the lower tends to the PAL of the older adults. Health professionals working with this population should be aware of intervention possibilities that may reduce or minimize the negative effects of perceived barriers on PAL.





## Factors associated with the implementation of a physical activity program in Australian elementary schools: An application of the Ecological Framework for Understanding Effective Implementation

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### Implementation and scalability (SIG)

PURPOSE: School-based physical activity programs improve student health and academic performance. However, real world implementation of such programs by classroom teachers is low. The purpose of this study was to examine the association between factors at organizational (school capacity), provider (teacher characteristics) and innovation-level (attributes of the program and quality of support systems) and teacher implementation of Bluearth Foundation's Active Schools program.

METHODS: Data were collected from classroom teachers who had been involved in the program between 2015-2017. Measures were used to assess school climate, teacher characteristics, quality of support systems, and attributes of the program using online questionnaires. Univariate associations were assessed by entering each predictor variable as a fixed effect in a linear mixed effect model. Next, all predictor variables with a significant univariate association (p<0.05) were entered as fixed effects into a single mixed effects model and backwards deletion was conducted to delete all predictor variables until only variables significant at p<0.05 remained in the model.

RESULTS: 76 (47%) teachers responded;83% were female. In the univariate analysis, school capacity (teacher climate, p=.028; environmental influence, p=.031), teacher characteristics (self-efficacy, p=.001; attitudes, p=.020, belief in behavioral benefits, p=.045); attributes of the program (observability of benefits, p=.010) and quality of support systems (hands-on training, p=.027) were positively associated with implementation. In multivariate analysis, only self-efficacy was independently associated with implementation.

CONCLUSIONS: Factors at multiple levels influence implementation of holistic movement programs and the school context needs to be considered in the design of implementation strategies. Improving the implementation of movement programs requires multidisciplinary teams, with insights from organizational psychology, education administration, and individual behavior change. Strategies that enhance school movement culture, teacher attitudes, self-efficacy and beliefs about the benefits of programs on student behavior, hands on training and tools to facilitate teacher observation of program benefits are likely to increase implementation.





# Evaluating the effectiveness of physical activity and nutrition resources in Out of School Hours Care

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Children and families (SIG)

Purpose:

Out of School Hours Care (OSHC) services are important settings to promote healthy eating and physical activity among children. In 2018-2019 the NSW Ministry of Health Eat Smart Play Smart (ESPS) resource was disseminated to OSHC services across NSW, Australia to support the services with promoting positive healthy eating and physical activity behaviours. The aim of this study was to evaluate the access, use and effectiveness of existing resources in OSHC services. This is the first study in Australia of its kind and the findings may improve the reach of existing resources and inform the development of future interventions.

Methods:

All OSHC services in urban, regional and rural areas of NSW (approximately 1,744 services) were invited to complete a purposefully designed online survey. The survey included questions about access, use and effectiveness of resources, specifically the ESPS resources to promote healthy eating and physical activity behaviours. Data were analysed using descriptive statistics.

Results:

Survey responses were received from 80 OSHC services in NSW as of December 2019. Preliminary results indicate that 74% of respondents utilised the ESPS resource. Of the 26% who had not used the resource, 55% indicated it was because they never received a copy. Of the services who received the ESPS resource, 76% indicated the resource contributed to their service's ability to meet the Australian National Quality Standards. Sections ranked most useful included afternoon tea recipes and menu planning. Educational materials (63%), support with encouraging child participation in healthy eating activities (35%) and professional learning (31%) were identified as areas in need of additional support to promote healthy eating behaviours. Similarly, educational materials (70%) and professional learning (66%) were identified as areas in need of additional support to promote physical activity behaviours. Suggested improvements included offering ESPS content in different formats (31%) and restructuring and simplifying the ESPS resource (28%).

Conclusion:

This evaluation provides valuable insights into existing resources and will inform future interventions for OSHC staff to improve knowledge and practices in the promotion of positive healthy eating and physical activity behaviours among attending children.





# A 1-day acceptance and commitment therapy workshop leads to reductions in emotional eating in adults

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### Implementation and scalability (SIG)

Purpose Emotional eating has been defined as the tendency to overeat in response to negative emotions and is a symptom of emotion dysregulation. Interventions for emotional eating have been developed based on acceptance and commitment therapy (ACT). However, these interventions only address emotional eating in the context of weight loss programs and are therefore not available in a weight neutral context.

Methods The present study aimed to test the feasibility and acceptability of a 1-day ACT workshop that taught skills to reduce emotional eating, without promoting weight loss. The workshop was delivered in a single day and aimed to reduce emotional eating by improving values clarification and commitment, acceptance, and mindfulness. Follow-ups were conducted at 2 weeks and 3 months post-intervention.

Results Results suggest feasibility and acceptability of the 1-day workshop; participants described appreciating the brevity of the program and its applicability to their everyday lives. Improvements in emotional eating were found at 2 weeks (t(31) = 5.80, p < 0.001) and 3 months (t(29) = 6.96, p < 0.001). A repeated measures MANOVA revealed a significant main effect of time (F(14, 96) = 4.98, p < 0.001, partial  $\eta$ 2 = 0.421), with follow-up ANOVAs indicating that this effect held for all variables.

Conclusions The results from this study can be used to inform a larger-scale randomized controlled trial to determine the efficacy of the program in a larger sample and eventually disseminate it in other real-world settings.





## Quantitative process evaluation of the healthy summer learners program

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### Implementation and scalability (SIG)

Purpose: The purpose of this study was to examine the implementation dose and fidelity of the Healthy Summer Learners (HSL) program, one of the first interventions to simultaneously target summer slides in both weight status and academic learning.

Methods: HSL operated in two low-income elementary schools four days per week for six weeks (i.e. 24 days) during the summers of 2018 and 2019. The program was operated by teachers who worked at each school and was designed to deliver 3.25 hours of reading/writing instruction, three hours of physical activity (PA) opportunities, nutrition education, and a healthy breakfast, lunch, and snack, daily. Trained research assistants assessed the dose and fidelity of the program using checklists and observation forms on three randomly chosen days each summer. Student attendance records were provided by program staff.

Results: A total of59 children were enrolled across both summers with 31% attending 10 or fewer days, 22% attending 11 to 19 days and 47% attending 20 days or more. The average days attended was higher in 2018 than in 2019 (17 v. 13). Of the intended 195 minutes of academic content, an average of 114 (SD=49) and 86 (SD=56) minutes were observed in 2018 and 2019, respectively. Of the intended 180 minutes of PA an average of 154 (SD=10) and 131 (SD=50) minutes were observed in 2018 and 2019, respectively. All meals and snacks served met the USDA nutritional guidelines. Nutrition education was observed on each of the observation days in 2018 and none of the observation days in 2019.

Conclusions: Overall, HSL was implemented with varying fidelity. The first summer of implementation was more consistent with the intended dose of PA and academic time. Children also attended the program more frequently in 2018. These findings will be discussed in relation to the main outcomes and qualitative process evaluation findings from the HSL evaluation.





# Investigating the Differences in Motor Competence Across Levels of Neighbourhood Deprivation in School Children

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### Socio-economic inequalities (SIG)

Purpose: The aim of this study was to investigate deprivation differences in motor competence in school children.

Methods: National data were captured on 4,491 children (49.1% boys; aged 11.4±0.6 years) as part of the Dragon Challenge (DC) assessment implementation across 4 regions in Wales, between November 2014 and 2016. Motor competence was measured using the DC which involves nine tasks, completed in a continuous circuit within a timed trial. Tasks require the application of different combinations of fundamental, combined and complex motor skills. Participants were scored on their technical quality, performance outcomes, and time. A total DC score was calculated, with a larger score displaying higher motor competence. Participants' home postcodes or lower/middle super output areas (if home postcodes were missing) were used to calculate Welsh Index of Multiple Deprivation (WIMD; 2014) scores and WIMD quintiles (1=most deprived). A two-way ANCOVA investigated the effect of sex and WIMD quintiles on motor competence, adjusting for age and ethnicity.

Results: There was a significant interaction between WIMD quintiles and sex on DC Score, while controlling for age and ethnicity (F(4,3627)=2.485, p=0.042). WIMD quintile was significant in girls (F(4,3627)=5.402, p<0.001) and boys (F(4,3627)=8.361, p<0.001). For girls, quintile 1 had a significantly lower adjusted mean DC score (31.00) than quintile 2 (1.83, CI 0.13 to 3.53; p=0.03), quintile 4 (2.57, CI 0.90 to 4.24; p<0.001), and quintile 5 (2.07, CI 0.26 to 3.87; p=0.01). For boys, adjusted mean DC score was significantly lower in quintile 1 (31.65) compare to quintile 3 (1.86, CI 0.24 to 3.48; p=0.01) and quintile 5 (3.46, CI 1.69 to 5.24; p<0.001); in quintile 2 (32.44) compared to quintile 5 (2.67, CI 0.85 to 4.50; p<0.001); and in quintile 4 (33.22) compared to quintile 5 (1.88, CI 0.05 to 3.71; p=0.04). No other significant differences in DC score between quintiles were found.

Conclusion: The present study was one of the first large-scale studies to investigate differences in motor competence by sex and levels of deprivation. Overall, results showed that national inequalities exist and focused services are warranted, particularly for those living in the most deprived neighbourhoods.





# Parental acceptability, feasibility, appropriateness and adoption of an m-health intervention to improve the nutritional quality of school lunchboxes

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### Implementation and scalability (SIG)

Purpose: To assess parental acceptability, appropriateness, feasibility and adoption of an m-health intervention to improve the nutritional quality of school lunchboxes.

Methods: A cluster randomised controlled trial was conducted in 32 primary schools throughout New South Wales, Australia. Primary schools were randomised to either a six month multi-component lunchbox intervention (SWAP IT) which included 10 weekly lunchbox messages sent directly to parents via a school mobile communication app (Skoolbag), provision of resources (water bottle, ice brick, parent booklet) and school nutrition guidelines, or to a control arm. Implementation outcomes were measured to assess the extent to which our intervention was implemented and inform future scale-up efforts. Acceptability, appropriateness, feasibility and adoption were assessed at follow up in all consenting parents from intervention schools, via a computer assisted telephone interview (CATI). Validated scales were used to measure acceptability (Acceptability of Intervention Measure), appropriateness (Intervention Appropriateness Measure) and feasibility (Feasibility of Intervention Measure). Adoption was measured via parental report of a change in lunchbox packing behaviour.

Results: Of parents who consented to participate in the CATI (n=769), 326 (42%) parents have completed the CATI (currently ongoing). The majority of parents reported downloading the Skoolbag app (81%), with 57% of parents opening four or more lunchbox messages. For acceptability, preliminary findings have shown that the majority of parents found the program appealing (91%), approved (96%), and liked SWAP IT (96%). SWAP IT was considered appropriate with parents agreeing that SWAP IT was fitting (97%), applicable (95%) and suitable (92%) and seemed like a good idea (97%). For feasibility, parents also agreed that SWAP IT was easy to use (97%), possible (97%) and implementable (92%). In regards to adoption, over 63% of parents reported that SWAP IT changed what they packed in the lunchbox. Finalised results from the CATI (completed by the end of 2019) and overall scores of validated measures will be presented.

Conclusion: Overall, SWAP IT was adopted by the majority of parents and was considered to be feasible, appropriate and acceptable.





# The suitability of community health workers as "agents of change" for physical activity promotion

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### Socio-economic inequalities (SIG)

Objective: New strategies are needed to address modifiable NCD risk factors in low-to-middle-income countries, whilst not burdening the already-strained health care system. One possible solution is the role of the community health worker (CHW) in physical activity promotion at a primary health care level. Therefore, the aim of this research was to assess health status as well as current knowledge, attitudes and practices of CHWs regarding physical activity.

Methods: This observational study assessed the health profiles in 81 CHWs and physical activity knowledge through a self-administered survey in 159 CHWs.

Results: The CHWs (52% female; 37.9±smn;9.3 years) had a mean BMI of 29.7 (±smn;7.5kg/m2), with 74.1% being overweight or obese. Thirty two percent had hypertension and 9% were pre-hypertensive. The mean glucose levels were 5.7 (±smn;2.1mmol/l) and cholesterol was 4.8 (±smn;0.8mmol/l). Sixty-nine percent stated that they were familiar with the PA public health guidelines, and yet 19.7% believed that only vigorous PA is beneficial for health, whilst 45.9% did not know how to measure intensity. The majority (96.6%) believed that physical activity promotion is part of their job, however 22.4% felt they did not have sufficient knowledge to advice their community on PA, and only 15.9% reported having any formal training on PA.

Conclusion: There is a strong case for the task shifting of physical activity pre-participation screening, risk stratification and physical activity counselling to the role of the CHWs, however there are some initial issues that need to be addressed. Firstly, CHWs in South Africa appear to be as susceptible as their communities when it comes to prevalence of overweight and obesity as well as associated NCD risk factors, calling into question their ability to act as role models for health education. Furthermore, there appears to be some crucial gaps in PA knowledge and a lack of training which may hinder their physical activity counselling efficacy. Community health workers present a unique and important opportunity to safely improve physical activity levels in LMICs, however they need to be empowered through adequate training, as well as addressing their own behavioural change challenges.





## Psychological mechanisms involved in the effect of social media food marketing on adolescents' food-related attitudes and dietary behaviours: A theoretical framework.

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### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Traditional food marketing channels (e.g. television and print media) predominantly advertise energy dense nutrient poor foods and beverages. In adolescents, traditional food marketing has the effect of enhancing attitudes, preferences and increasing intake of marketed foods, with adverse effects on adolescent dietary behaviours. With adolescents being the most digitally-driven segment of the population, social media is increasingly used as a communication channel for food marketing targeting adolescents. Compared with traditional food marketing channels, social media offers food marketers opportunities for more implicit persuasion marketing techniques. However, no research to date has established a theoretical framework describing the psychological mechanisms that moderate and mediate the effect of social media food marketing (SMFM) cues on adolescents' food-related attitudes and dietary behaviours.

Methods: A draft theoretical framework was developed based on existing marketing frameworks, empirical research from literature and social cognitive theories. Subsequently, 10 Australian and European experts in the field of marketing, adolescent health, psychology, behavioural sciences and communication sciences provided their vision on the draft theoretical framework during 45-minute interviews, after which the framework was further adjusted and verified.

Results: The developed SMFM theoretical framework describes the proposed psychological moderators and mediators involved in the effect of SMFM on adolescents' food-related attitudes and dietary behaviours. It proposes that several cognitive, emotional and social mediators play a role in adolescents' processing of SMFM cues. More specifically, the engaging and implicit nature of SMFM, combined with adolescents' developing cognitive abilities mainly triggers heuristic or automatic pathways. This lowers adolescents' active perception of marketing messages, while activating affect-based (i.e. emotional or social) processes, ultimately impacting their food-related attitudes and dietary behaviours. Several moderators, i.e. message or individual factors, are proposed to influence this relationship.

Conclusions: This SMFM theoretical framework can be used as a tool that provides guidance for future research on the effects of social media food marketing in adolescents, with the ultimate purpose of helping adolescents identify and resist SMFM of energy dense nutrient poor foods. Empiric validation is warranted to confirm the processes described in the SMFM framework.





# Development of food selectivity and autism from childhood to early adolescence: The chicken-or-egg dilemma

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### Children and families (SIG)

Purpose: Food selectivity (i.e., 'picky' or 'fussy' eating) may contribute to compromised nutrition and poor growth in childhood. Children with Autism Spectrum Disorder (ASD) tend to be at a higher risk of food selectivity; affecting up to 90% of children with the neurodevelopmental condition. ASD is increasing globally and currently affects one in every 60 children. Yet the clinical cut-off for ASD diagnosis under-represents children with subclinical ASD traits and girls, who are underdiagnosed. How ASD traits and food selectivity develop is poorly understood because the current evidence favours case-control study designs or only includes samples of children with diagnosed ASD. These studies fail to consider the full continuum of ASD traits in the population and assume food selectivity to be an expression of ASD, therefore providing unreliable evidence into the direction of effects. However, some evidence suggests that food selectivity during infancy and toddlerhood (e.g. late acceptance of solids during weaning and slow eating) may precede or exacerbate the expression of ASD traits. Large epidemiological studies with repeated measurements are needed to know 'what came first', food selectivity or ASD traits? This study aims to establish the direction of longitudinal pathways between ASD traits and food selectivity from infancy to early adolescence.

Methods: This study comprises of a secondary data analysis from Generation R, a birth cohort of N=7968 children born in Rotterdam. Food selectivity and ASD traits are measured in parallel at five time-points (1.5, 3, 5, 10 and 13 years old) using the parent-reported Child Behavior Checklist. Cross-lagged models will be used to examine the directionality of the food selectivity - ASD traits association across child development.

Results: Results are forthcoming.

Conclusions: Evidence derived from this study will guide behavioural interventions relating to the management and prevention of food selectivity and/or ASD traits. Such interventions are likely to contribute to the reduction of food selectivity, nutrient deficiencies and attendant health consequences, and potentially the expression of ASD traits. An enhanced understanding of the aetiological pathways can facilitate the development of a front-line screening tool for paediatric clinicians to identify feeding difficulties or ASD traits in the population.




# Investigation and research on the dietary nutrition of youth volleyball players

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: With the improvement of world sports competition level, the importance of athletes' diet nutrition becomes more and more prominent. In order to better understand the nutritional status of young athletes and provide a favorable basis for the improvement of dietary nutrition of young athletes in competitive sports in the future, this paper conducts a dietary survey on Shanghai youth women volleyball players.

Methods: 16 players of Shanghai youth women's volleyball team were selected, aged 14.9±1.9 years, with a height of 178±4.8cm and a weight of 65.3±5.2kg. (1) Dietary survey method -- food weighing method was adopted. During the survey period, the consumption of all kinds of food and the amount of remaining food in each meal (including all food consumed except dinner, such as various fruits, drinks, snacks, etc.) were accurately weighed and recorded in detail. (2) Dietary review method: during the dietary survey period, ask and accurately record the weight of all snacks and fruits eaten by athletes after dinner, and try to keep the food packaging as a reference.

Results: Female athletes were found to have insufficient total calories, too little breakfast, too much dinner, and too much extra meals. The proportion of carbohydrate intake is too low, which is related to the fact that athletes do not know the role of sugar in sports training. It is necessary to strengthen the intake of sugar-rich food such as staple food of athletes, so as to avoid the effect of insufficient sugar storage on sports ability and training effect. Less VA and VB1; Calcium intake is low and zinc intake is low.

Conclusions :(1) To strengthen athletes' understanding and learning of nutrition knowledge, let them know the importance of dietary nutrition, learn how to choose food according to their body's needs. (2) Strengthen the sports nutrition training for canteen staff . (3) The coach should not only be strict in training, but also give more guidance in dietary nutrition, so as to timely and reasonably urge the athletes to make scientific and reasonable choices of various foods during meals.





# Characteristics of early adopting schools and teachers of a scaled up physical activity intervention

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#### Implementation and scalability (SIG)

Purpose: Organisational factors such as implementation climate, readiness and culture of the school may influence the decision for schools to adopt interventions, especially where coordinated action is required among teaching staff for implementation. Further, certain characteristics of interventions are theorised to predict the decision to adopt. We aimed to identify intervention characteristics that supported teachers' and schools' decision to adopt Transform-Us! in the first year following the project launch.

Methods: Transform-Us! is a school-based program to increase physical activity and reduce sedentary time freely available to all primary schools in Victoria, Australia (n=1,786). To calculate reach, adopting schools and teachers were recorded via the program website (teachers could register independently of their school). To understand conditions leading to adoption, school leaders and teachers completed a voluntary pre-training online survey upon registration focusing on intervention characteristics, organisational readiness and climate.

Results: 181 schools (Catholic 19.5%, Government 78.1%, Independent 2.4%) and 293 teachers adopted Transform-Us! in the first 12 months from inner regional (15.9%), major cities (73.2%), outer regional (8.5%), and remote areas (2.4%). Government school representation was 12% higher than the state average which coincided with underrepresentation in independent schools. Additionally, schools from inner regional areas were underrepresented by 16% compared to the state average. Of the adopting teachers, 43% did so independently of their school leadership. Teacher surveys (n=136) indicated teachers are already using active breaks (74.6%) and delivering active lessons (68.7%), with 93.9% confident in their ability to break up prolonged classroom sitting. School leaders reported (n=37) 85.5% of adopting schools had school level physical activity policies, 56.7% agreed physical activity is a top priority for their school and 75% of schools received funding for physical activity in the last year, and 77.8% reported Physical Education classes being taught by a specialist.

Conclusions: This study outlines the importance of teacher competence and confidence alongside school culture on reach and adoption rates across a state-wide intervention undergoing scale-up across Victorian schools. Understanding who and why schools, school leaders and teachers adopt programs helps tailor future dissemination activities.





# Systematic Review and Meta-Analyses: Motor Skill Interventions to Improve Fine Motor Development in Children Aged Birth to 6 Years

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

The objective of this study was to systematically review the evidence of motor skill intervention programs on typically developing children's fine motor development aged birth to six years.

Methods: Six electronic databases were searched with no date restrictions. Inclusion criteria were any school-, community- or home-based intervention targeting the development of fine motor skills of children aged birth to six years; randomized controlled trails (RCT) using quasi-experimental, experimental or single group pre-post designs with a minimum sample size of 15 participants per group; and statistical analyses of fine motor skill development at both pre- and post-intervention or addressing the intervention effects on fine motor skill development. Data were extracted on design, participants, intervention components, methodological quality and efficacy.

Results: Twenty-five of the total 31 studies reported positive intervention effects on fine motor skills. The metaanalyses included 19 studies and revealed moderate effect sizes of motor skill programs on fine motor, visual motor and manual dexterity outcomes. There were substantial differences between intervention settings, facilitators, length and content with most studies implemented in school settings and facilitated by teachers.

Conclusion: Fine motor skill development in the early years is an extensive upcoming field of interest for many international researchers. This review paper presents evidence on the positive effects of intervention programs that aim to enhance fine motor skills for young children. The findings are promising, but need to be interpreted with caution due to the high risk of bias in many of the studies.





# The Rating Scale of Physical Activity Intensity for Preschoolers in China

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#### Children and families (SIG)

Prupose:The research intends to design a scientific, reasonable and universally applicable physical activity (PA) intensity rating scale for Chinese preschoolers, so as to effectively help teachers in kindergartens and parents to understand the PA intensity for children, and master the skills to reasonably arrange PA curriculum.

Methods:A group of 158 children and the other group of 27 children were selected from a kindergarten in Beijing. Children first wore the Polar Team 2 heart rate meter and the RT3 triaxial accelerometer, and then were tracked during indoor and outdoor activities. Researchers used the PA intensity rating scale to record students' data prior to employing SPSS22.0 to analyze the data and verify the reliability, validity and rationality of the scale.

Result/findings:From the conversion of text and graphs, the use of criterion validity test (average heart rate: r = 0.468, P < 0.01; Counts, r = 0.472, P < 0.01), and adding three physical indicators, i.e., breathing, sweating and complexion, to the second draft of the scale according to teachers' feedback, eventually, the intensity is divided into 6 levels. After testing, the correlation coefficient among raters using the second draft scale was 0.626 (P < 0.05), which indicates the reliability of the scale. Additionally, the Spearman correlation coefficient between the evaluation results and heart rate was 0.593 (P < 0.01), and there were significant differences among groups of different heart rate level (P < 0.05). This implies the scale form has good criterion validity and discriminant validity. Therefore, the scale form was finalized, with three main intensity scales, namely, 1-2, 3-4, and 5-6, respectively corresponding to the lower, medium and higher PA intensity.

Conclusions:The graph-based PA intensity scale form for Chinese preschoolers developed in this research is a rating scale for teachers with 6 options. It distinguishes the intensity of different PA played by children, help Chinese kindergarten teachers understand the PA intensity at any time, and enable them to arrange PA courses for children reasonably.





# Thirst for health: The association between low-income primary students' water consumption and nutrition and physical activity behaviors, knowledge, and attitudes

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#### Children and families (SIG)

Purpose: Very few studies have examined frequency of water consumption or factors related to water consumption in children despite findings that indicate that increased water consumption has been shown to be linked to decreased body weight and obesity prevention in children. Understanding young people's water consumption behaviors and how they relate to other nutrition and screen-time behaviors, knowledge, and attitudes.

Methods: This is a secondary data analysis of a study on coordinated school wellness (Arizona Department of Education Team Nutrition) with 9 low-income schools with students ages 9-13 (mean age= $10.4\pm0.8$ ; 50.5% female) in the state of Arizona in April and May of 2019. Students (n=507) completed the Kids' Activity and Nutrition Questionnaire, which assesses dietary intake—including water intake, screen time behaviors, knowledge of dietary recommendations, and healthy food preferences. Mutually adjusted mixed model linear regressions were used to test the association between times of water intake and nutrition and screen-time behaviors, knowledge, and attitudes, adjusting for student sex and age and the clustering of children within schools.

Results: Students reported consuming water in the past day a mean of 5.2±2.6 times. Self-reported consumption of water was not related to sex or age (p>0.1). Water was positively associated with fruit ( $\beta$ =0.30; 95% CI=0.13,0.47), vegetable( $\beta$ =0.21; 95% CI=0.03, 0.40), and diary intake( $\beta$ =0.49; 95% CI=0.29, 0.70), but not sugar-sweetened beverage intake( $\beta$ =0.03; 95% CI=-0.17, 0.23), TV-watching ( $\beta$ =-0.03; 95% CI=-0.16, 0.09)or other screen use ( $\beta$ =0.03; 95% CI=-0.07, 0.14). In terms of knowledge of recommendations for children around whole grains, fruits and vegetables, dairy, and physical activity, students' water consumption was statistically significantly related to only recommendations for fruits and vegetables (p=0.006). Finally, in assessing students' preferences for healthy dietary intake and physical activity, water consumption was related to higher preferences for vegetables (p<0.001) and for physical activity (p=0.025).

Conclusions: Water intake is associated with some but not all positive dietary behaviors, knowledge, and diet and physical activity preferences. More research is needed to examine water intake as a positive health behavior.





# Residential environment and walking behavior in Hong Kong older adults – A longitudinal study

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#### Ageing (SIG)

Purpose: Longitudinal study linking physical environment, and social environment to walking is sparse. This study therefore aimed to examine the change of associations between physical environment, social environment, and walking among older adults in a 3-year time period [(Time1 (2016), Time 2 (2017), and Time 3 (2018)].

Methods: Participants (N = 1067 older adults) aged  $\geq$  65 yrs., with no diagnosed cognitive impairment and competent to walk were recruited from both 1) elderly centers of 18 Districts in Hong Kong (HK); and 2) randomly selected in the HK household database. Participant's both perceived and objective physical environment and perceived social environments were assessed. Their walking behaviors were objectively measured using accelerometers (total step per day).

Results: After data management, there were 483 older adults [ $\geq$ 75 yrs (51.1%), and female (83.4%)] included in the final data analysis.In neighborhood level, longitudinal structural equation modeling (SEM) was used to assess the associations among the dependent variable (total step per day) and associated constructs [Social environment (i.e., perceived social cohesion) and objective environment from Geographical Information System (i.e., connectivity, density and land use mix)] in a 3-year time period. Results showed that social environment (i.e., perceived social cohesion) and objective environment significantly predicted total step per day among older adults in Time 2 and Time3.

In individual level, same data analysis was used to assess the associations among the same dependent variable and another set of associated constructs [Social environment (i.e., Companionship, Encouragement, and Role model) and subjective environment (i.e., physical environment facilitators and physical environment barriers)] in a same time period. Social environment (i.e., Companionship, Encouragement, and Role model) and subjective physical environment (i.e., physical environment facilitators and physical environment barriers) were significant predictors of total step per day among older adults in Time 2 and Time 3.

Conclusions: This longitudinal study further demonstrated cause-effect relationships of our studied constructs and lay the groundwork for developing future walking intervention. Policy-makers and walking intervention designers should develop strategies to enhance both physical and social environments in order to promote older adult's walking.

Keywords: physical activity, elders, neighborhood





# Facilitators and barriers for clinicians to implement exercise = medicine in routine clinical care

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#### Implementation and scalability (SIG)

#### Purpose

The prescription of exercise in clinical care has been advocated worldwide through the 'exercise is medicine' (E=M) paradigm. The knowing-doing implementation gap of E=M, however, still exists at the level of clinicians. This means that despite clinicians know that prescribing active lifestyle as a treatment option will stimulate their patients to adopt a more physically active lifestyle, resulting in improved health, fitness and quality of life at the patient level, they do not provide tailored active lifestyle referral in routine clinical care. In this study, barriers and facilitators that clinicians experience regarding the implementation of E=M in routine clinical care are studied.

#### Methods

Semi-structured interviews were conducted with clinicians working in 4 departments of 2 university medical centers in the Netherlands. The development of the interview guide was guided by the framework for innovation within health care organizations of Fleuren et al (2014).

#### Results

Factors that were perceived as facilitators and barriers by clinicians to implement Exercises = Medicine in routine clinical care could be categorized in six main themes. These included: (1) factors related to the level of the clinicians, (2) factors related to the level of the department, (3) factors related to a broader context (hospital, society etc...), (4) factors associated with the patient, (5) practical factors, (6) factors related to referral options. Most determinants that were reported were related to the theme 'factors related to the level of the clinicians'.

#### Conclusion

Within this study we identified key factors that currently hamper the implementation of E=M in Dutch routine care. The results will be used to guide implementation strategies towards more effective implementation of E=M into routine clinical care, and will feed into a blue print for the implementation of E=M in other hospitals.





# Is walking to school enough to prevent childhood obesity?

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#### Socio-economic inequalities (SIG)

Purpose: This study examined the extent to which active school commuting and a range of 'bottom-end' health behaviours explain the increased risk of overweight/obesity among 11-year-old children living in the most deprived neighbourhoods in England.

Methods: Subjects consisted of 7262 (3637 boys) 11-year-old English children. Children were classified as normal weight or overweight/obese. School commute mode (active/passive) and health behaviours were parent-reported. Health behaviour scores below the mean of the lower half of the distribution were classified as 'bottom-end' on this indicator. Neighbourhood deprivation was defined using the 2004 English Indices of Multiple Deprivation. Odds ratios (ORs) for being overweight/obese according to neighbourhood deprivation were estimated. A range of bottom-end health behaviours were explored to assess if they attenuated associations between neighbourhood deprivation and overweight/obesity.

Results: Children living in the most deprived neighbourhoods in England were most likely to be overweight/obese, commute to and from school actively and participate in all bottom-end health behaviours compared to children living in the least deprived neighbourhoods. Adjusting for significant bottom-end health behaviours reduced the OR for overweight/obese to 1.44 (95% CI 1.23 to 1.69) in the highest neighbourhood deprivation group compared to the lowest.

Conclusion: Higher rates of overweight/obesity among children living in the most deprived neighbourhoods in England is not fully explained by participation in unhealthy behaviours. Active school commuting alone is unlikely to be enough to prevent and reduce inequalities in childhood overweight/obesity in England.





# The differential effects of viewing social media food preparation videos of sweet snacks versus fruits and fruits and vegetables on adolescents' appetite

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#### Children and families (SIG)

Purpose: There is a link between exposure to food content through the food media environment and eating behaviors. Social media culinary videos constitute one of many food media platforms that expose audiences to food content. We conducted two studies to (i). Analyze the nutritional content of social media culinary videos focusing on BuzzFeed's Tasty and to (ii). Investigate the effects of exposure to BuzzFeed's Tasty videos on adolescents' hunger, intentions to eat and food choice behavior.

Methods: Quantitative cross-sectional content analyses were used to evaluate the nutritional content of 165 recipes from BuzzFeed's Tasty using Nubel meal planning software. The United States Department of Agriculture school lunch guidelines were used to evaluate the nutritional content of the recipes. For the experiment, a pre-test post-test experimental study was conducted on middle school children (N =126), mean age 13.88, SD =1.20. The participants were exposed to 4 minute 17 seconds of Tasty videos demonstrating either the preparation of sweet snacks (n =50) or fruits and vegetables (n =76). The measures were hunger, intentions to eat and cook the foods portrayed and food choice behaviour.

Results: The content analysis showed that a significant proportion contained high amounts of total fat 69% ( $\chi$ 2=13.96, p<.001), saturated fatty acids 74% ( $\chi$ 2= 19.09, p<.001). The guidelines recommend that the foods must be trans-fat free however 71% ( $\chi$ 2=15.17, p<.001) of the recipes contained trans fats. The experiments showed that, the effects of exposure to Tasty on intentions to eat and prepare vegetables and sweet snacks were statistically significant F(1,166) =8.11, p =005,  $\eta$ 2 =.047 andF(1,166) =9.287, p =.003,  $\eta$ 2 =.053, respectively. Exposure to sweet snacks also had an indirect effect on food choice behaviour mediated by intentions to eat sweet snacks.

In conclusion, Buzzfeed's Tasty recipes fall short of the recommendations for healthy diets and have short term effects on intentions to eat. Further research is warranted to determine the effects of long term, repetitive exposure.





# How do participants differ from non-participants in an online physical activity intervention -with or without support from a physical therapist- for breast and prostate cancer survivors (The PABLO trial)?

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#### Cancer prevention and management (SIG)

PURPOSE The aim of this study is to identify characteristics that differentiate between cancer survivors who did or did not participate in the PABLO trial, in which an online intervention to enhance levels physical activity (PA) - with or without additional support from a physical therapist -, is compared to usual care.

METHODS Breast and prostate cancer survivors who had completed primary curative treatment 3-36 months earlier were invited to participate in PABLO. All participants, and non-participants who were willing to do so, completed an online questionnaire assessing socio-demographics (age, sex, educational level, smoking and alcohol use), factors related to PA-behaviour (perceived benefits and barriers, social support, attitudes, self-efficacy), fatigue (Multidimensional Fatigue Inventory), mood (Profile Of Mood States) and health-related quality of life (HRQOL, Short Form 36 Health Survey). We compared baseline data between participants and non-participants, using an independent Students' t-test for continuous variables and the chi-square statistic for categorical variables.

RESULTS One hundred forty-one survivors (response rate: 11%) participated in the trial. Of the responding nonparticipants, 153 (47% of the non participants, 12% of the invited survivors) filled out the questionnaire. Sociodemographic variables did not differ between participants and non-participants, except that participants were less likely to consume alcohol (17% versus 27%, p = 0.048). Participants reported a significantly lower self-efficacy (on a 10 point Likert scale, mean = 4.9 versus 5.9, p < 0.01) and more perceived barriers to PA (mean = 2.1 versus 1.7, p < 0.01). Participants had reported significantly more Role limitations due to physical health (mean = 59.3 versus 67.8, p < 0.01) and General fatigue (mean = 58.3 versus 69.1, p < 0.01). No significant differences were found for perceivedbenefits, social support or attitudes towards PA. No significant differences were observed for specific dimensions of fatigue or mood.

CONCLUSIONS PABLO trial participants had a higher need for support in becoming or staying physically active and experienced more role limitations due to physical health, which suggests that the trial included relatively vulnerable survivors, who are likely to benefit from the intervention.





# The level of agreement between objectively determined body compositions versus perceived body image outcomes in 6 to 8 years old South African children: BC – IT study

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: To assess the level of agreement between body size self-perception and actual body fatness determined by body mass index (BMI) and deuterium dilution methods in South African 6 to 8 years olds.

Methods: A cross-sectional study design was followed with a total of 202 children, boys (n=83; 41.1%) and girls (n=119: 58.9%) aged 6 to 8 years. To measure the level of agreement between subjective (silhouettes) and objective body size outcome measures, the children's silhouette choices were compared to their measured BMI, and fatness determined by Deuterium Dilution method (DDM). The WHO BMI-for-age classification was used to classify children as underweight, normal, overweight and obese.

Results: Out of 202 children, 32.2%, 55.1%, 8.8% and 2.4% perceived their body size as underweight, normal, overweight and obese, respectively. Based on the BMI measured outcomes, 18.9%, 72.8%, 6.9% and 1.5% were classified as underweight/thinness, normal, overweight and obese, respectively. The outcomes of DDM on the other hand showed that, 8.9%, 65.3%, 16.3% and 9.4% were underweight, normal weight, overweight and obese, respectively. In summary 23.3% of children who were not underweight thought they were, whereas, 10.2%, 7.8% and 7% children who were normal, overweight and obese did not know they were. The applications of the Silhouettes' and BMI resulted in either overestimation or underestimation in the three body weight categories. Overall, the kappa levels of agreements were small (<0.20), therefore the level of agreement for DDM with perception and BMI was poor. The agreements between body fatness measured by DDM and BMI, respectively, with perceptions were very low (Kendall tau; 0.16 and 0.23; p<0.001).

Conclusions: It can be concluded that when using silhouettes, children either overestimated being underweight or underestimated being normal weight, overweight and obese when compared to their actual measured weight status using DDM. There is also generally, poor to fair levels of agreement between body size perception outcomes, BMI and DDM outcomes in 6 to 8 years old South African school going children. As such, children and their parents should cautiously be made aware of the child's actual weight status and referred for appropriate interventions.





# Relationship quality impacts improvement in physical function in response to a couples-based exercise intervention in older adults

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#### Ageing (SIG)

Physical activity (PA) guidelines for older adults (OAs) recommend multicomponent PA including aerobic, musclestrengthening, and balance modes. Meeting the PA guidelines for OAs can preserve physical function (PFx), preventing physical disability and loss of independence. Unfortunately, the great majority of OAs fail to meet PA guidelines, due in large part to poor adherence to the muscle-strengthening and balance components. One untapped resource that may promote health behaviors, including PA, are close relationship partners. However, a paucity of research exists exploring the utility of the romantic partner to enhance multicomponent PA program adherence and effectiveness, especially for OAs who have the most to gain from multicomponent PA to maintain PFx. Purpose: This study aimed to examine the association of relationship quality (RQ) with the changes in PA behavior and PFx in response to a supervised 9-week PA program (muscle-strengthening, flexibility, balance training) combined with a PA behavioral change intervention (unsupervised; aerobic PA) in older adult couples.

Methods: Heterosexual couples who were romantically involved and cohabitating [n=9 dyads (18 individuals); 69.4+4.9 yo] were assessed at baseline and post-intervention for PFx via 6-Minute Walk Test (WALK), Timed Up and Go (UPGO), Transfer Task (TRANSFER), and the Community Balance and Mobility Scale (CBMS); PA via Community Healthy Activities Model Program for Seniors (CHAMPS) questionnaire; and relationship quality (RQ) via the Couple Satisfaction Index-32.

Results: Paired samples t-tests revealed improvements in WALK, UPGO, TRANSFER, and CBMS (all P<0.05) and an average decline in both PA and RQ (both P<0.05). Bivariate correlational analysis indicated that baseline RQ was not related to change in any measure of PFx (all P>0.05). However, improvement in RQ was related to better performance in both UPGO and TRANSFER (r= -0.68 and -0.54, respectively, both P<0.05).

Conclusions: Our results suggest that whereas initial RQ may not influence multicomponent PA intervention effects on PA and PFx in OA couples, changes in RQ during a program may be an important influential factor. Research exploring the utility of the romantic partner as a change agent for multicomponent PA behavior change and maintenance in older adults is warranted.





# Social cognitive correlates of moderate-vigorous physical activity and energy expenditure among Indonesian middle-aged and older adults

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Ageing (SIG)

#### Purpose:

Physical activity (PA) in middle-aged and older adults is critically important to improve quality of life. Thus, PA promotion in this age group should be a public health imperative. Identification of PA influences is required to inform the design of effective PA programs. Little is known about correlates of moderate and vigorous PA (MVPA) and energy expenditure (EE) among Indonesian middle-aged and older adults. This study aimed to identify social cognitive correlates of MVPA and EE in this population.

#### Method:

This is a cross-sectional study involving 118 adults (age 61.7±8.3 year, female 72%) recruited from an integrated service post in Indonesia. Participants completed a self-administered questionnaire on self-efficacy in PA engagement and in overcoming PA barriers, outcome expectations of PA (physical, social, and self-evaluative), self-regulation (goal setting and planning), and friends and family social supports. MVPA and EE were calculated from an interview administered Standford 7-day Physical Activity Recall. Bivariate correlations and stepwise multiple regressions (adjusted for sex and age) were conducted.

#### Results

All social cognitive measures correlated moderately with MVPA (r=0.52-0.76) and weakly with EE (r=0.08-0.37). A model that included all social cognitive measures, except for self-efficacy in PA engagement and outcome expectations in physical and social aspects explained 80.9% of MVPA. Self-efficacy in overcoming PA barriers had the highest standardized coefficient ( $\beta$ = 0.33,p<0.001), followed by friend participation and family reward (each with  $\beta$ = 0.20,p<0.001), exercise planning and goal-setting (each with  $\beta$ =0.16,p<0.01), self-evaluative outcome expectations ( $\beta$ = 0.11, p<0.05) and family participation ( $\beta$ =0.10,p<0.05). A model which included exercise goal setting and family participation (each with  $\beta$ =0.19,p<0.05) explained 26.6% of EE.

#### Conclusion

Self-efficacy in overcoming PA barriers, self-evaluative outcome expectations, self-regulation and social support are significant MVPA correlates, while EE is explained by goal setting and family support. Therefore, those aspects should be considered when designing PA interventions in this population.





# Development and pilot evaluation of a food agency based cooking intervention at a community health center

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#### Implementation and scalability (SIG)

Objective: Better cooking skills may improve food security by improving management of existing resources, ability to budget and plan meals, and capacity to cook healthy meals from inexpensive ingredients. In this research partnership with a federally-qualified health center in Detroit, Michigan, we collaboratively piloted a new cooking skills intervention, based on a Food Agency approach, with the goal of improving diet quality and food security.

Methods: We conducted focus groups (two Spanish, two English) with CHASS patients (N=38) to inform development of the classes. Based on focus group results and input from the steering committee, we then developed and piloted four cooking classes that were conducted in English and Spanish (separately) in the teaching kitchen at the health center (N=30, two more classes are planned for six total classes). We assessed changes in cooking confidence and other related outcomes using surveys pre- and post- class. We also conducted interviews (N=12) with class participants 2-4 months after the classes to understand their experience and satisfaction with the class and whether/how they used the concepts taught in their day-to-day lives.

Results: CHASS patients identified barriers to cooking, including trade-offs between quality and cost of food in local stores, difficulty satisfying preferences of family members, and lack of time and interest. Many participants self-identified as "good cooks" but lacked confidence preparing unfamiliar foods. Classes focused on vegetarian cooking, anti-inflammatory cooking, and seasonal cooking. Preliminary results indicate that participants improved confidence in: cooking (p=0.05), assembling and cooking a healthy meal without a recipe (p=0.05), experimenting with new ingredients (p=0.001), and knowing how to make use of food before it goes bad (p=0.03). In post class interviews participants identified that they enjoyed the social interaction and the hands-on participation in the classes, and that they used the recipes and ingredients at home.

Conclusions: Participatory, hands on cooking interventions based on Food Agency may be an effective way to engage low-income patients in community health clinics and to empower healthy behavior change.





# Tackling metabolic syndrome in a regional area of Australia

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Ageing (SIG)

Purpose: To determine impact of a 6-month home-based behaviour change intervention aiming to reduce the risk of chronic disease by determining changes in metabolic syndrome status and cardiovascular (CVD) risk score.

Methods: A randomised controlled trial of regional adults in the coastal town of Albany in the Great Southern region of Western Australia. Participants (n = 401) were aged 50-69 years and classified with or at risk of metabolic syndrome and randomly assigned to intervention (n = 201) or control (n = 200) group. The 6-month intervention incorporated goal setting, self-monitoring and feedback and motivational interviewing.

Results: Significant improvements in metabolic syndrome status and cardiovascular disease risk score (-0.82) were observed for the intervention group relative to control group from baseline to post-test.

Conclusion: This home-based physical activity and nutrition intervention reduced participants' risk of experiencing a CVD event in the next 5 years by 1%. Incorporating such prevention orientated approaches in primary care might assist in reducing the burden of long-term chronic diseases.





# Safe & seated or active & engaged? Evaluation of an exercise program for older adults in the residential aged care environment.

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#### Ageing (SIG)

Purpose: There are clear physical activity guidelines for older adults, however there is often little attempt to support older adults living in residential aged care to achieve these guidelines. When older adults enter residential aged-care (RAC), there is often a misconception that their physical function will follow a rapid trajectory of decline, and that for people with cognitive decline, there is a perception that they are unable to participate in, or benefit from, exercise. Providing avenues to maintain functionality for people living in RAC is one of the roles of allied health professionals, such as Accredited Exercise Physiologists (AEPs). AEPs may be of value in the RAC, to help maintain functionality and promote well-being, through the implementation of exercise programs.

Methods: This research evaluated the impact of a targeted, individually-specific, 12-week AEP-led exercise intervention for people living in a secure unit. Data were collected pre-and-post intervention to assess physical function (GENEActiv accelerometers, 5-repetition sit-to-stand, timed-up-and-go, two-minute walk, handgrip). Correlations and repeated measures ANOVA were performed to analyse the data.

Results: 59 residents participated in the study. There was evidence for maintenance of function for intervention participants, with significant (p<0.05) interaction ( $\eta$ 2=0.13) and main effect ( $\eta$ 2=0.26) for the handgrip strength test, and significant interaction for the timed-up-and-go (p <0.05,  $\eta$ 2 = 0.19). There was evidence of a dose effect (p<0.05) for one-to-one individual sessions and the timed-up-and-go change scores (r=-0.40) and two-minute walk change scores (r=0.46).

Conclusion: Residents living with functional and cognitive decline in the RAC environment can be perceived to be unable to participate in, or benefit from, exercise. This evaluation has demonstrated that participation in a 12-week AEP-led exercise program can support maintenance of function. This provides scope for implementation of AEP-led exercise programs in the RAC environment, as a means of maintaining function and avoiding the trajectory of decline older adults are expected to follow on entry to RAC.





# Feeling young, eating well, staying healthy? The impact of subjective age and food-related life on senior citizens' perceived health

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Ageing (SIG)

#### Purpose:

Feeling younger than chronological age has been shown to impact health outcomes positively. But how chronological and subjective aging are linked with food consumption and satisfaction with food-related life is not well researched. The present study examined these links, with the objective of exploring the impact of selected psychological and behavioral relations with senior citizens' perception of being in good health.

#### Methods:

Self-sufficient senior citizens living independently were recruited for an online survey by a research agency. Participants were 499 seniors aged 55-90 (Mage 68.5 years), 47.3% women, 68.9% married/cohabiting, 13.6% single and 16.8% were divorced or widowed. The questionnaire included items on common food related practices, meal regularity and intake of age appropriate supplements (vitamin D), a scale on satisfaction with food-related life (SWFL), items measuring the general tendency to worry, a scale measuring subjective aging (referring to FEEL-, LOOK-, DO- and INTEREST-Age), perception of personal health status, height and weight (BMI), and appetite, as well as common socio-demographic characteristics. Multiple regressions were conducted with subjective health as dependent variable.

#### Results:

The subjective age of respondents was lower on average than their chronological age, and this gap increased with chronological age: A total of 48.9%/41.1%/33.8%/16.4% of respondents in their fifties/sixties/seventies/eighties were aligned with their chronological age, whereas 42%/53.7%/65.6%/83.6% of respondents felt approx. one decade younger than their chronological age.

Perception of health was related to chronological and subjective age respectively in opposite directions; while increasing age had a positive association with perception of health, subjective perception had a negative impact, i.e., if one feels old, the perception of being in good health decreases. General tendency to worry, BMI and limited resources for food shopping were negatively linked with health perception, whereas being satisfied with food related life was positively linked with perception of health.

#### Conclusions:

Feeling young(er) while aging appears to contribute to the perception of being at good health, but further studies of the antecedents and consequences, including nutrition-related behaviors, of a "positive" outlook on aging is lacking.





# The role of physical complaints, motivation and affect to predict daily physical activity in older adults: A time-based Ecological Momentary Assessment (EMA) study

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#### Ageing (SIG)

PURPOSE: A lifestyle with sufficient physical activity (PA) contributes to healthy ageing. Nonetheless, older adults (65+) are the most inactive age group in our population. Current behavior change interventions are often tailored to participants' baseline characteristics and needs. However, within these tailored interventions, behavioral determinants are assumed to be relatively stable over time, while in reality determinants are dynamic and change regularly over time and contexts. The COM-B framework incorporates these dynamics by stating that behaviors are affected by psychological and physical capabilities, physical and social opportunities and volitional and automatic motivations. These three factors can change over time and contexts. Before future interventions can incorporate these dynamics, one needs to determine how motivations, capabilities and opportunities vary throughout the day and are related to daily PA. Consequently, the study aims are (1) to examine how older adults' physical complaints (physical capability), affect (psychological capability) and motivation to be active vary throughout the day and (2) how these factors can predict daily PA levels.

METHODS/RESULTS: Data are collected in 60 older adults in Flanders, Belgium. Participants are recruited through convenience sampling. All participants fill in a questionnaire assessing socio-demographics and overall health (PROMIS Health Profile), and wear an accelerometer (Axivity AX3) for seven consecutive days to objectively assess PA. Furthermore, during these seven days participants receive questions regarding positive and negative affect (PANAS), motivation and physical complaints using a time-based EMA methodology. Each day, the same questions are asked at six random moments between 9AM and 10PM using a smartphone-based questionnaire (SEMA3 application). Three-level (moments within days within participants) regression analyses will be conducted in R. Data collection is ongoing and will be finished in March 2020. Results will be presented at ISBNPA2020.

CONCLUSIONS: This is one of the first studies examining the time- and context-dependency of determinants of PA in older adults using a time-based EMA methodology. The results will provide important insights into how future interventions can take into account dynamic determinants and how the research field can evolve towards Just-In-Time Adaptive Interventions (JITAIs) in older adults.





# Evaluating implementation outcomes for physical activity interventions integrated in routine cancer care: A systematic review

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#### Cancer prevention and management (SIG)

Purpose: Physical activity (PA) interventions are efficacious in ameliorating many common side-effects of cancer, however PA is not a routine part of cancer treatment. Efficacy studies focus on demonstrating the clinical benefits to patients, whilst, implementation outcomes may be more important when seeking to change practice. The purpose of this systematic review was to identify those outcomes that are evaluated when PA interventions are implemented within routine cancer care practices.

Methods: The systematic review was conducted in accordance with the PRISMA statement. We searched Medline, CINAHL, Web of Science, PsycInfo, SportsDiscus, Scopus and Cochrane Central Registry of Controlled Trials using terms for PA, cancer and implementation. We also manually searched the Moving through Cancer website, which was developed alongside the new ACSM cancer guidelines to connect people to cancer-specific PA opportunities. Study inclusion criteria were: 1) PA implemented as adjunctive therapy within the cancer care continuum from diagnosis to curative intent or care, and 2) reporting at least one implementation outcome. Proctor's Implementation Outcomes Framework was used to define the implementation outcomes and guide data extraction and synthesis.

Results: The results suggest we have limited understanding of PA implementation for cancer care. From an initial search yielding 4441 hits, 37 articles met the inclusion criteria. Most studies explored the patient-level outcome of appropriateness (defined as whether the PA program improved the side effects of cancer). Few studies explored organisational-level sustainability or penetration (reach) outcomes. An important finding of this review is that many PA interventions established a co-ordination role that supported program optimisation and integration. The role appears critical to PA intervention success in cancer settings yet is not extensively studied or well-articulated.

Conclusions: There is significant scope to expand the implementation outcomes evaluated in PA interventions to improve health outcomes for people living with cancer. This includes evaluating existing programs (for example, those identified at Moving through Cancer) and focusing on opportunities to examine the coordinator role. This shift would support efforts to better integrate PA interventions in routine cancer care.





# A Mixed Methods Process Evaluation of the Implementation of the JUMP-in Intervention on Dietary Habits of Children

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#### Implementation and scalability (SIG)

Purpose. To stimulate healthy dietary habits among primary school-aged children (4-12 yrs), the City of Amsterdam integrated a dietary component as part of the Amsterdam Healthy Weight Programme (AHWP). Via a process evaluation we aimed to distil barriers and facilitating factors of the 'JUMP-in' healthy dietary school policy's adoption, implementation and continuation, incorporating the perspectives of all stakeholders involved.

Methods. A mixed methods approach was used. Ten primary schools from socioeconomically disadvantaged neighbourhoods in Amsterdam where JUMP-in was implemented for one or two years, were included. Our data collection consisted of (1) interviews with involved health promotion professionals, school principals, school project coordinators and teachers, (2) focus group discussions with parents and children, and (3) document analyses, e.g. from the structured implementation logs of the involved health promotion professionals. We explored perceptions of health care professionals, school principals, school project coordinators, teachers, parents and children to be able to compare different views on facilitating and hampering factors (triangulation). Descriptive statistics were obtained for quantitative questions and qualitative data was analysed via content analysis.

Results. The main facilitating factors for the implementation process of JUMP-in intervention on dietary habits were high parental support, the potential for tailoring the programme, a socio-political environment in favour of healthy eating, one school employee in charge of implementation, high teachers' perceived self-efficacy, knowledgeability and clarity regarding the school's healthy dietary policies. On the other hand, main barriers were identified as: parents that do not support dietary policies, teachers who do not perceive implementing the programme as a priority in light of the regular curriculum, and parents who perceive the programme as insufficiently tailored to their cultural dietary habits.

Conclusion. In general we found a positive attitude towards and satisfaction with the JUMP-in programme. However, dissonance between programme elements (e.g. the potential to tailor the programme in some cases compromises clarity of programme guidelines) as well as between different stakeholders (e.g. guidelines were perceived clear among school principals or coordinators, whereas for some teachers guidelines were not clear) hamper successful long-term implementation of the programme.





# Effects of exercise in the physical health of breast cancer women undergoing hormone therapy – A systematic review and meta-analysis

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#### Cancer prevention and management (SIG)

Purpose: Hormone therapy has a lot of consequences to breast cancer women, and literature suggests that exercise is important, but the effects in the physical health of breast cancer women undergoing hormone therapy it yet not clears in the literature. The objective of this systematic review was to investigate the effects of exercise in the physical health of breast cancer women undergoing hormone therapy.

Methods: The five electronics databasesPubMed, Web of Science, Cinahl Database, Cochrane Library for Clinical Trials and Lilacswere searched by two authors using the "Breast Neoplasms"[Mesh] and "Tamoxifen"[Mesh] and "Aromatase Inhibitors"[Mesh] and "Exercise"[Mesh] in April of 2019. Randomized and non-randomized clinical trials that investigate the effects of exercise in breast cancer women undergoing hormone therapy were included. The physical effects investigated were cardiorespiratory fitness, pain, bone mineral density, grip strength, and body fat percentage. The risk of bias was accessed by Downs and Black Scale. Pooled effects were reported as standardized mean differences (SMDs) and 95% confidence intervals (CIs) using a random-effects model.

Results: 13 studies were included in the systematic review and 11 in the meta-analysis. Different modalities of exercise were investigated as aerobic, resistance, concurrent, walking and yoga in 555 breast cancer women aged 58.5 (6.3) years old undergoing hormone therapy using tamoxifen or aromatase inhibitors. Seven studies included a control group and asked them to maintain their usual activity routine during the study or allocate them to a waitlist control. The exercise intervention was from eight to 48 weeks, with the frequency of 2x week to 5x week, from 15 minutes to 100 minutes per session, in a light to moderate intensity of 50% to 80% of the HRmax. Significant effects were found for cardiorespiratory fitness (MD 0.370; IC95% 0.111; 0.629; p=0.005; I2 = 93%) and pain (MD -0.554; IC95% -1.107; -0.002; p=0.049; I2=80%). No significant effects were observed for bone mineral density, grip strength, and body fat percentage.

Conclusions: Aerobic, resistance and walking exercise were found to be beneficial for breast cancer women undergoing hormone therapy in cardiorespiratory fitness and pain and should be recommended to these women. (PROSPERO CRD42018099367)





# Design and evaluation of nanofoods based on-hydroxy-methylbutyrate as agents to avoiding muscle mass deterioration from ageing or sedentary behaviour

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#### Ageing (SIG)

The use of functional foods whose bioactive compounds have beneficial effects on health has been an essential tool for improving nutritional status as well as for preventing or controlling diseases. One of the processes that occur most frequently in the different stages of life and through many pathological states is the loss of muscle mass. That can be caused either by a protein hypercatabolism derived from a pathological process/ aggression (wasting), as in the case of chronic degenerative diseases, because of muscular demand for high exercise intensity or sedentary behaviour, or even naturally and gradually as in ageing (sarcopenia). Consumption of bioactive compounds such as b-hydroxy-b-methylbutyrate (HMB) can help to reduce the loss of muscle mass. HMB has been proposed to decrease atrogenes activation by modifying the muscle protein replacement (Baptista et al., 2013). However oral administration can reduce its action due to gastric, enzymatic and absorption processes, which leads to a lower percentage of active compound or metabolite that reaches its tissue target. To solve this problem, emergent technological designs have shown to be an excellent alternative. Therefore, this study aims to design a nanocompound based on layered double hydroxides with b-hydroxy-b-methylbutyrate (LDHs-HMB) that will function as carrier to target tissue to avoid the reduction of muscle mass loss. The LDHs-HMB will be synthesised. To perform functionalization of the compound, LDHs-HMB was evaluated for precipitation method, ion exchange and reconstruction. Physicochemical analysis of nanomaterials was made by X-ray diffraction (XRD), infrared analysis (IR), differential scanning calorimetry (SEMS) and thermogravimetric analysis (TGA), with differential scanning calorimetry (DSC). LDH's hybrid compounds were successfully synthesised by the co-precipitation method and characterised by powder X-ray diffraction and XPS analysis. In the next month, lethal dose 50 and a biological assay will be done to elucidate the effect of oral consumption. This work illustrates the characterisation of a novel organic-inorganic hybrid nanocomposites based on LDH's, b-hydroxy-b-methyl butyrate (HMB) and type I collagen.





# Daily physical activity and computer productivity improvements associated with active computer workstations.

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#### Implementation and scalability (SIG)

Purpose: The purpose of this study is to identify differences in computer usability, discomfort and physical activity levels for individuals utilizing stand biased, sit stand and traditional workstations.

Method: Participants were recruited from a university population of administrative personnel. Based on their workstation type, individuals were assigned to one of three groups (Stand biased, Sit stand or Traditional). Researchers utilized RSIGuard® Ergonomic Software to collect active computing time, mouse clicks, total mouse distance, keyboard errors, and words per day. Based on these variables an error rate was calculated. Data were collected for 10 working days for each participant. Participants were asked to complete a questionnaire that identified workstation components ie. footrests and complete the Nordic Musculoskeletal Questionnaire. ActivPAL® sensors were used to collect data on activity levels, sit to stand changes and METs for each individual for three work-days. Anova was used to evaluate continuous data and the Scheffe test was used to determine which groups showed statistically significant differences.

Results: Participants who utilized a stand-biased workstation had statistically more time standing and less time sitting at work than those who used a traditional workstation. Additionally the energy expenditure (METs/h) was statistically different for the stand biased and tradition workstation groups. However, time walking and step count were not significantly different between the any of the three groups. Computer utilization variables showed a statistical difference in the word count and mouse double clicks between the three groups but no difference in error rate or active computer minutes. There was no statistical difference for individuals reporting discomfort within each group for the neck, upper back, shoulder, wrist/hand, hips, knees or ankles/feet.

Conclusion: Individuals who utilize a stand-biased workstation expend more energy and spend more time standing and less time sitting than their traditional workstation counterparts. Additionally, utilization of a stand biased workstation appears to be associated with an increase in productivity with little to no change in the percentage of individuals reporting discomfort when compared to traditional counterparts.





# Innovative Methods of Vascular Health Assessment in Children: Perspectives and Current Evidence from Field Studies

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Children and families (SIG)

Purpose: This paper discusses some innovative methods of vascular function assessment in children. Data will be presented from several studies carried out in different countries in children (from ages 6-16 years) in which non-invasive vascular function measurements were assessed together with the risk of cardio-metabolic syndrome.

Methodology: These methods are currently being used in several ongoing projects. These assessments are particularly innovative in that they can be carried out non-invasively. These include assessments of endothelial health via flow mediated dilatation (FMD), assessment of arterial stiffness using pulse Wave velocity (PWV) and microvascular assessments by studying changes in the retinal microvasculature. In addition to the vascular function assessments, hemodynamic variables such as heart rate and heart rate variability data will also be presented and discussed

Results: The talk will discuss the advantages and disadvantages of each of these measurements and identify the potential challenges that arise from the usage of these methods in the field.

Conclusions: Vascular function measurements are simple and non-invasive and can be easily carried out in children. Quality assurance as well as the need for careful training of the operators are, however, particularly important aspects that must be considered when planning such experiments.

Keywords: Flow mediated dilation, Pulse wave velocity, retinal microvasculature, Children's health.





# The relative association between mother-child and father-child physical activity and dietary intake: a cross-sectional study

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#### Children and families (SIG)

Purpose: There is a lack of studies on parent-child physical activity and dietary intake that have included both parents. Therefore, the relative contribution of mothers' and fathers' physical activity and dietary intake related to that of their child remains unclear. The aim of this study was to assess the associations between mother-child and father-child moderate-to-vigorous physical activity (MVPA) and dietary intake, and to assess if the sex of the child and parents level of involvement in daily child care moderate these associations.

Methods: A cross-sectional analysis of data obtained from the Amsterdam Born Children and their Development study was conducted. The present study included 2167 mother-child pairs and 1954 father-child pairs for MVPA, and 2384 mother-child pairs and 2147 father-child pairs for dietary intake. MVPA was measured in METs/week for children and in minutes/week for parents. A total dietary intake score (DIS) was measured for participants average daily intake of fruits, vegetables, snacks and sugar-sweetened beverages (SSBs), using a self-report questionnaire. Linear regression analyses were used to assess the relationship between parent-child MVPA and DIS, separately for mothers and fathers, in four hierarchical models. In the second model of each analysis, correction was made for the other parent' physical activity and/or dietary intake to examine the relative predictive value of each parent.

Results: A significant association between mother-child MVPA was found ( $\beta$ =0.013; 95%CI:0.006;0.021,p<.001). The association between father-child MVPA was only significant for fathers with a high level of child care involvement ( $\beta$ =0.014;95%CI:0.004;0.023, p<.01). A significant association was also found between mother-child DIS ( $\beta$ =0.254; 95%CI: 0.192;0.316), p<.001), and between father-child DIS, with a stronger association between father-son ( $\beta$ =0.234;95%CI:0.169;0.298,p<.001) compared to father-daughter ( $\beta$ =0.114;95%CI:0.047;0.181, p<.01).

Conclusions: Both parents contribute relatively to each other to the child' MVPA and DIS with sex-specific effects. Therefore, this present study highlight the importance of including both parents in studies to child' physical activity and dietary intake. Further investigation to parents involvement in daily child care is required.





# Adiposity mediates the association between gross motor development and physical activity in 6- to 7-year-old children

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Children and families (SIG)

Purpose: This study aims to examine the association between the age of achieving six gross motor milestones and physical activity during childhood, and whether these associations are mediated by adiposity.

Methods: We gathered data from 217 children ( $6.9 \pm 0.3$  yrs) born weighing more than 1.5 kg, who participated in the baseline assessment of our four-year follow-up study. Adiposity was assessed as the percentage of fat (%fat) measured by dual-energy X-ray absorptiometry. Physical activity was measured using a triaxial accelerometer (Active style Pro HJA-350IT). Time (min/day) spent in moderate-to-vigorous physical activity (MVPA time) was used for analysis. The age at which children achieved the following motor milestones was obtained from the Maternal and Child Health Handbook records: holding head up (n = 121), sitting (n = 94), crawling (n = 146), standing supported (n = 144), walking supported (n = 116), and walking unsupported (n = 174). Potential confounders such as maternal age and pre-pregnancy body mass index, gestational age, and birth weight were also obtained from the Handbook records.

Results/findings: The mean  $\pm$  SD MVPA time was 81.7  $\pm$  22.5 min/day. The age of crawling or standing supported was negatively correlated with MVPA time (P < 0.05) and positively with %fat (P < 0.01), whereas MVPA time was negatively associated with %fat (P < 0.001), after controlling for gender and age. Multiple linear regression analysis revealed that a later age of crawling or standing supported was associated with decreased MVPA time (P < 0.05) and increased %fat (P < 0.001) even after adjusting for gender, age, accelerometer wear time, and the confounders. When %fat was introduced as a covariate in the model predicting MVPA time, the association between the age of crawling or standing supported, while %fat was significantly associated with MVPA time (P < 0.01).

Conclusions: Our results indicate that infants who crawled or stood at a later age spent less MVPA time during childhood; however, this association is mediated by adiposity. Strategies to prevent physical inactivity in these infants should focus on optimising their body composition.





# Relationships among resilience, physical activity, and mental health of older adults: A path analysis

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Ageing (SIG)

Purpose: Physical activity has been recognized as an important determinant of mental health among older adults. The current study aimed to test a model in which physical activity was hypothesized to influence mental health in path mediated by resilience.

Methods: Cross-sectional data were collected from a sample of 293 Chinese older adults (60 males, 233 females) with the age range from 65 to 95 years (M=76.58, SD=7.02) in eight community senior centres located in three districts in Hong Kong. Correlation analyses were performed to assess the associations between physical activity, resilience and mental health variables. Path analysis was employed to examine the mediation effects of resilience from physical activity to mental health.

Results: Building on the three path models, it was found that significant mediation effects of resilience on the relations from physical activity to depression ( $\beta = -.54$ , p = .002), from physical activity to loneliness ( $\beta = -.25$ , p = .005), as well as from physical activity to psychological well-being ( $\beta = .37$ , p = .008). In sum, this study demonstrated that resilience mediated relationship from physical activity to mental health among older adults.

Conclusions: Findings of the current study suggested that older adults who were more physically active reported greater psychological well-being and less mental health problems, and the effects were mediated by resilience.





# How Can Low-Income Czech Families Achieve a Nutritionally Adequate Diet that is Optimised for Cultural Acceptability?

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#### Socio-economic inequalities (SIG)

Background: Czech nutrition recommendations prioritize health aspects without considering affordability. Low socio-economic groups have the highest risk of nutrition-related noncommunicable diseases and cost has been identified as an obstacle to achieve a healthy diet, making the implementation of affordability into dietary guidelines necessary. The aim of this study was to develop a food basket (FB) for a low income Czech family of four that is nutritionally adequate, health-promoting and culturally acceptable at an affordable price.

Methods: Linear programming optimisation was used to ascertain that the FB covered the recommended nutrient intakes from the Czech Nutrition Society and from the World Health Organization (WHO). Cost of the FB was calculated on the basis of more than 3900 prices of 330 foods. Within a given cost constraint, all FBs were optimized for the highest possible similarity to the reported food group intake according to the most recent Czech National Food Consumption survey, which was used as a proxy for cultural acceptability.

Results: The optimised FB affordable at a daily food budget for a Czech family on minimum wage (CZK 177,  $\sim \in 6.8$ ) contained 76 foods and had an average relative deviation of 10% per food category from reported intake. The main deviations were: 72% less sweets and confectionery; 66% less salt; 52% less meat; 50% less milk products; 8% less potatoes; and 484% more milk; 69% more oils and fats; 20% more cereals; and 6% more vegetables.

Conclusions: The optimised FB can help to guide the development of food-based dietary guidelines for low income households in Czech Republic.





# Exploring the usability of a Tailor-made Perceptual-Motor Development Program after training of teachers in remote and adverse living areas: Lessons learn't

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Socio-economic inequalities (SIG)

Purpose. High percentages of at-risk perceptual-motor development are reported among children growing up in disadvantaged communities. Therefore, the purpose is to investigate the usability of a Tailor-made Perceptual-Motor Development Program to overcome developmental delays in low SES communities.

Methods. The study was conducted in the rural Vaalharts region of the Northern Cape Province in South Africa. Preschool children between 3 and 5 years (n=43) were recruited from one primary school, and divided into an intervention (n=25) and control group (n=18). The teachers delivered a Tailor-made PMO program for 16 weeks, once a week, after receiving necessary training by means of a workshop from the researchers. A two group, pre-, post- and retention-test research design was followed and participant were measured with the MABC-2 test battery. A Mixed methods approach was followed to analyse the data including T-testing and repeated measures over time ANOVA with a post-hoc Bonferonni correction. Furthermore, monthly site-monitoring visits were conducted followed by discussions with the teachers regarding any challenges with a focus group reflection regarding the teacher's experiences in conducting the program at the end.

Results. Limited intervention effects (p>0.05) were found after the program delivery. Although teacher buy-in was found, many challenges were experienced, mainly due to knowledge and educational barriers of the teachers. Themes that emerged included feelings of an overload of information, complex lesson plans to implement and pedagogical barriers, both on an organizational and implementation level.

Conclusion. Findings from this study suggest that focusing on identifying and establishing only key behaviours of program delivery are important during training while it is also important to assess the competencies of teachers in these areas during training. In addition, frequent and ongoing support during the intervention period are essential to improve program delivery and to offer optimal developmental support. These modifications can improve the delivery of tailor-made programs as a first step in empowering teachers to deliver such programs.

Keywords: Developing countries; early child development, gross motor; school readiness; low income settings, perceptual-motor development, intervention, teachers; training; South Africa





# The Our Outdoors Well-Being Survey

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: The purpose of this study was to initiate psychometric testing of the Our Outdoors Well-being Survey. The Our Outdoors Project engages citizens to characterize their public outdoor spaces with an overall goal of increasing physical activity and positive well-being through transparency, advocacy and participatory evaluation. The survey was designed to capture individuals' momentary experiences of well-being in outdoor locations and to allow for scale-up to measure population-based changes in utilization of outdoor space using a citizen science mHealth app.

Methods: An initial item pool of 15 likert-type survey items was generated by reviewing existing well-being measures and item content, previous research on which specific aspect of health and well-being are thought to be influenced by the environment, and feedback from stakeholder groups. Self-report data were collected from three locations that varied in urbanicity; the total sample was n=137 adults. Participants completed the survey (paper or online) while using the space and reported on environmental attributes (e.g., noise). To evaluate the presence of a latent structure items were subjected to an exploratory factor analysis using Principal Axis Factoring and Varimax rotation. Once factors were identified, indices were created by averaging the items. To evaluate discriminate and convergent validity descriptive statistics were used to characterize the association between each of the indices and the participants' perception of five outdoor space attributes: crime, noise, distance from traffic, beauty, and pleasant surroundings.

Results/Findings: The data were suitable for Factor Analysis (Bartlett's Test of Sphericity p < .001; KMO = .892). A two-factor solution was identified, with the first factor - positive wellbeing ( $\alpha$ =.93) in outdoor space - accounting for 42.26% of the variance and the second factor- negative wellbeing ( $\alpha$ =.88) in outdoor space - accounting for 22.21%. Bivariate correlations were observed in the expected directions. For example, positive well-being was positively associated with pleasant surroundings (r=.498, p<.001) negatively correlated with noise (r=-.220, p<.001).

Conclusions: The survey demonstrated promising psychometric qualities and warrants further evaluation. Short surveys such as these can offer quick and robust means of assessment of psychological well-being in outdoors spaces, a key factor in studies of physical activity and health.





# Low Physical Activity is Associated with Body Image Dissatisfaction and Chronic Disease Risk Profiles in Urban Populations: Results from a Household Survey in Botswana

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

#### Purpose:

This study examined variations in physical activity (PA), body image dissatisfaction and chronic disease risks factors across socioeconomic households in major urban centers in Botswana, within a nutrition transition framework. We hypothesized that participants from middle-to-high income households will have lower PA, higher BMI, higher body image dissatisfaction and increased risk for chronic diseases compared to those from low income households. Declines in PA and the nutrition transition have important implications for obesity and incidence of chronic diseases in sub-Saharan Africa. Yet significant evidence gaps on these relationships persist. We considered a household survey as a novel approach to examining these relationships and narrowing of the evidence gaps.

#### Methods:

Participants were 728 adults (Female, n = 66.2%), aged 18 to 90 years (M = 33.4; SD = 13.28), from low (62.6%), medium (15.7%) and high (21.7%) income households in three major urban areas in Botswana. A stratified cluster random sampling design was used, with neighborhood income as the stratifying unit. One adult from each household completed a socio-demographic questionnaire, the International Physical Activity Questionnaire, and a body image questionnaire. Weight and height were measured using a portable digital scale and a stadiometer. Various descriptive statistics, ANOVA and regression models were used to test for the hypothesized relationships.

#### Results:

Participants from high income households had significantly higher BMI, higher incidence of diabetes and higher cholesterol than those from low and middle income households (p<.001). Time spent in moderate PA dropped with an increase in income (p<.001). Only 35.4% of the participants reported doing moderate to vigorous PA over the past seven days. Females had significantly lower PA, higher BMI, higher body image dissatisfaction and higher risks for chronic disease than males (p<.001). Being younger, female and having a higher BMI were significantly associated with higher body image dissatisfaction and higher risk for chronic disease (p<.001).

#### Conclusions:

These findings confirm that declines in PA and a nutrition transition have important implications for health outcomes in Botswana and developing countries. The study highlights the potential of household surveys to increasing our understanding of these relationships and the need for community based interventions.





# Community networks in a child obesity prevention intervention: A crossjurisdiction analysis from The Children's Healthy Living Program

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#### Implementation and scalability (SIG)

PURPOSE: Community networks with strong partnerships and relationships are better situated for implementing community-based interventions. However, the literature is not clear on how relationships and networks develop when implementing complex interventions. To address this gap, an innovative approach to Social Network Analysis (SNA) was used to examine relationships in the multilevel Children's Healthy Living (CHL) intervention to reduce child obesity. The purpose of this study is to understand how community networks evolved as CHL staff implemented intervention activities.

METHODS: CHL was a multilevel, multisite cluster randomized controlled trial. The intervention was conducted in nine communities within five jurisdictions in the US Affiliated Pacific from 2013 to 2015. Intervention activities were coded in six-month "blocks" over the two-year intervention to investigate how community networks changed. Coded data were used to create network maps for four time intervals. Evolution of social networks were examined through visualizing maps that were compared to look for relationship patterns among community implementers. Descriptive statistics of the number of nodes and edges present in the maps were reported along with the calculations of graph density and the average weighted degree.

RESULTS: Community network density increased over time with maximum number of ties possible for the network (graph density = 1.0) was realized 12 months into the intervention and the average weighted degree (number of activities implemented by community network) increased nine-fold from the beginning to the end of the intervention. Schools, community-based groups, and large organizations were primary implementers with 269, 244 and 240 activities implemented, respectively. A pattern of interaction between the three primary implementers emerged at the 12 month time-period and continued to develop during the following two time-periods.

CONCLUSIONS: Social network mapping provided a way to visualize and understand community connections. Findings highlight the need to have sufficient time to develop and build relationships among school, non-profit, and large organizational partners, especially those that can leverage new resources for the community, to reduce young child obesity. Exploring interactions between community implementers are needed to identify key points that can be leveraged to sustain community action.





# Associations of physical activity with health-related quality of life among Australian breast cancer survivors with low levels of physical activity.

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#### Cancer prevention and management (SIG)

#### Purpose

To a survivor of breast cancer, health-related quality of life is fundamental. Undertaking a greater level of physical activity can improve quality of life but many breast cancer survivors do not meet recommended levels of physical activity. This study examines the relationship between objectively assessed physical activity and health-related quality of life among survivors of breast cancer with low levels of physical activity and how any relationship is changed by breast cancer-specific concerns, fatigue interference, and self-efficacy.

#### Methods

The physical activity of 17 physically inactive, post-treatment breast cancer survivors were assessed over seven days using accelerometry. Demographic and clinically relevant information, health-related quality of life, breast cancer-specific concerns, anaemia symptom concerns, fatigue interference, and self-efficacy for physical activity was assessed. Following simple linear regression of physical activity and health-related quality of life, multivariate regression models that included breast cancer-specific concerns, anaemia symptom concerns, fatigue, or self-efficacy for physical activity were tested.

#### Results

The Functional Assessment of Cancer Therapy – General (F(1, 15)=4.785, p<.05) and the subscale of functional wellbeing (F(1,15)=6.163, p<.05) significantly predict moderate physical activity among breast cancer survivors with low levels of physical activity. Functional Assessment of Cancer Therapy – General explains 24.2% of the variance in moderate physical activity and the subscale of functional well-being explains 29.1% of the variance.

#### Conclusions

Objectively assessed physical activity is positively associated with health-related quality of life among survivors of breast cancer with low levels of physical activity. However, breast cancer-specific concerns, fatigue interference, and self-efficacy do not appear to be associated with physical activity among this population.





# A scoping review of accelerometer-measured physical activity among toddlers

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: To survey literature that defines/validates accelerometer-based physical activity measures (validation papers) and reports accelerometer-based physical activity levels among toddlers (assessment papers).

Methods: The search strategies were developed by the authors including a professional librarian. The key search terms included toddlers, accelerometers, and physical activity. The eligibility criteria were: English language articles published, included samples of children aged 12 to 35 months, and used accelerometers to recognize physical activity. To be eligible as a validation paper, true physical activity behavior data had to be compared with concurrent accelerometer data. To be eligible as an assessment paper, physical activity measures during at least all waking hours had to be reported.

Results: We identified seven original research papers as validation papers and 14 original research papers (with 11 independent samples) as assessment papers. Of the seven validation papers, five used ActiGraph accelerometers and six papers placed accelerometers on the hip. To recognize physical activity, five papers used an accelerometer count cut-point approach, and the remaining two used a machine learning approach. The suggested ActiGraph accelerometer cut-points varied across the papers. In the 11 assessment studies, six used ActiGraph, four used Actical, and one used Axitivity. Among them, seven placed accelerometers on the hip, two did so on the wrist, and the remaining two did so on the ankle. Various definitions for moderate- to vigorous-intensity physical activity (MVPA) were used across the assessment studies, reporting MVPA in a range of 4 to 58 minutes/day. The major limitations noted for toddler PA assessment included no consensus on accelerometer data processing rules (e.g., definitions of non-wear time, valid day, and activity intensity/type) and a lack of methodological means to differentiate toddlers' unique passive movement, caregiver-carrying, from child-initiated movements.

Conclusions: This scoping review summarizes the nature and extent of toddler physical activity research literature. Despite the critical need for accurate toddler physical activity assessment, there is no consensus on accelerometer data processing methods, making it difficult to advance the field. Future research should focus on methodologies for toddler physical activity assessment that account for toddlers' unique behavioral patterns.





# Comparison of the acute effects of yoga vs combined aerobic and resistance exercise on adolescents' cognition and stress: A randomized controlled trial

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#### Children and families (SIG)

Purpose: To compare the acute effects of yoga to combined aerobic and resistance exercise on cognition and stress in healthy adolescents in a secondary school. We hypothesized both exercise groups would experience improvements relative to the control group, but effects would be significantly greater for yoga. This is one of the first studies to compare the effects of a single session of yoga to exercise in a non-clinical sample of adolescents in an ecologically valid setting.

Methods: Participants were 55 secondary school students (15.6 ±0.5 years), who were randomized at the class level to one of three conditions: a non-exercise attention-matched control (CON); combined aerobic and resistance exercise (ARE); or yoga (YOG). The YOG and ARE groups engaged in a 30-minute session of yoga and combined aerobic and resistance exercise, respectively. The CON group received a 40-minute lesson on nutrition. Measures of selective attention (d2 test of attention), stress (visual analogue scale), and arousal (felt arousal scale) were used pre and post intervention. Generalized linear mixed models were used to examine adjusted differences between groups.

Results: YOG outperformed ARE in selective attention processing speed (28.6 [95% CI = 2.34, 54.85]; p <0.05; d = 0.71). Also, there was a significant effect on stress favoring YOG over ARE (-22.2 [95% CI = -31.87, -12.44]; p <0.001; d = 1.52) and CON (-20.7 [95% CI = -30.28, -11.07]; p <0.001; d = 1.42). There was a significant group-by-time effect for arousal, favoring YOG over ARE (-1.3 [95% CI = -2.13, -0.44]; p = 0.002; d = 0.93) and CON (-1.1 [95% CI = -1.97, -0.29]; p = 0.007; d = 0.80).

Conclusions: These findings suggest a single bout of yoga may improve cognition and stress to a greater extent than combined aerobic and resistance exercise. Yoga may be an efficacious exercise modality for improving selective attention and alleviating stress in the school environment.





# Intestinal microbiota in infants according to their type of feeding

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### Children and families (SIG)

The 2012 National Health and Nutrition Survey declared a low prevalence of exclusive breastfeeding in Mexico as a public health problem. Only 14.1% of Mexican women breastfeed exclusively as recommended by the World Health Organization. The use of human milk substitutes or milk formula has become a common practice due to diverse factors such as the insertion of women into working life and the lack of breastfeeding promotion. Substitutes and milk formula influence the colonisation of the intestinal microbiota, which has been associated with obesity at late stages. Feeding practices of pregnant woman could have an impact on their nutritional status. However, in the Mexican population, the type of substitutes and milk formula has not been correlated with the intestinal microbiota. This study aims to associate microbiota whit infant formulas that prevail in Mexican childhood. Forty-nine women 18-35 years old, vaginal canal birth, whose infants were in a regular weigh for gestational age from Gynecology and Obstetrics Unit of the Occidental General Hospital (Guadalajara, Mexico) were included. Fecal samples were collected once a month for six months. Enumeration of lactic acid bacteria and enterobacteria group was done. Anthropometric parameters (weight and body length) and breastfeeding monitoring were analysed for six months. 93.9% were housewives with high school education. Low adherence to breastfeeding was observed. After 15 days there was a loss percentage of 53.1%, at first month 57.1%, second month 61.2%, third 59.2%, fourth 65.3%, fifth 71.4% and the sixth month 73.5%. In the first months, lactic acid enumeration was higher in infants with breastfeeding. Enterobactericeae enumeration was higher in infants with milk formula and mixed feeding. Lactobacillus paracasei spp. and Leuconostoc lactic were identified as the predominant bacteria in the newborn. In the last months, L. plantarum, L. pentosus, L. crispatus, and L. delbueckii were identified in all kind of feeding. Adherence to breastfeeding is low, despite hospital policies and information about the advantages of breastfeeding. Infants with breastfeeding have a lower enumeration of Enterobactericeae, which has been related to gastrointestinal and endocrinal disorders.




## Delivering employer-based walking challenges in a low physical activityengaged community on the U.S.-Mexico border.

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Implementation and scalability (SIG)

#### Purpose

Obesity-related cancers and other chronic diseases are a major modern public health concern. Walking as a form of exercise has been shown to improve health and reduce risk for heart disease, stroke, type 2 diabetes, depression and more (DHHS, 2008). In the wake of smart phone applications and smart watches, local walking challenges engage communities in sustained physical activity through friendly competition and consequently, individuals increase their daily exercise as a lifestyle change.

#### Methods

We host 3 employer-based walking challenges a year: Walk The Walk Team Challenge (WTW), 10,000 Steps for 100 Days (10K for 100), and Step Bootcamp. Each of these challenges consist of different objectives, but have the same aim of increasing individuals' daily physical activity. Enrollment and pre and 2-week post competition step counts were collected and compared for each challenge.

#### Results

These challenges attracted participants from a wide range of employees from universities, the City, the County, utility companies and private employers. WTW had the greatest number of participants with 825 in 2019. Followed by 10,000 steps for 100 Days at 405. Step Bootcamp had the least participants with 73 enrolled, however, this challenge was the most intensive. At baseline, step count varied from 9924 for WTW to 7280 for the Step Bootcamp. Two-week post challenge averages ranged from 13,061 for WTW to 12,632 for the Step Bootcamp. Participants in the Step Bootcamp had a 73.5% increase while the WTW had only a 31.6% increase in average daily steps. Of the 405 participants who started the 10,000 Steps for 100 Days, at week 6, approximately 130 are step in the challenge.

#### Conclusions

We successfully delivered three walking challenges. Enrollment was highest for the team based challenge, however, the greatest step improvement was observed in the Step Bootcamp. Walking challenges can be a low cost and easily implementable wellness resource to employers to increase physical activity.





# "The Intersectorial Prevention Laboratory" (TIPL): Mobilizing partners in prevention initiatives

**Dr. Anders Blædel Gottlieb Hansen<sup>1</sup>**, Dr. Mette Aadahl<sup>1,2</sup>, Prof. Charlotta Pisinger<sup>1,2</sup>, Miss Gül Sakal<sup>3,1</sup>, Dr. Ulla Toft<sup>1,2</sup> <sup>1</sup>Centre for Clinical Research and Prevention, Frederiksberg, Denmark, <sup>2</sup>University of Copenhagen, Copenhagen, Denmark, <sup>3</sup>Steno Diabetes Center Copenhagen, Gentofte, Denmark

Implementation and scalability (SIG)

#### Purpose:

TIPL is an initiative initiated in 2018 by the Danish Regions (an interest organization for the five regions in Denmark) with the aim of strengthening cooperation and cross-sectoral partnerships in public health promotion and prevention. TIPL is situated at Centre for Clinical Research and Prevention, Denmark.

#### Methods:

TIPL is a non-profit public initiative that facilitates different partners and organizations to meet and develop intersectoral partnership projects on prevention and health promotion. Project ideas are required to originate from challenges in public health and clinical practice and an evaluation and implementation design must be embedded for the project to be connected to TIPL.

TIPL offers a bank of resources, consisting of researchers, fundraisers and statisticians providing support with intervention design, data analysis, fundraising, partnership facilitation, mobilizing partners, and guidance in relation to evaluation, implementation and process. Thus, TIPL provides organizational and research support, but are not able to run nor fund projects.

#### Results/findings:

TIPL has received positive responses as an innovative setting for facilitating new projects. TIPL can offer research support and skills that are often difficult for the project owners to obtain. So far, the contribution from TIPL has been on mobilizing and involving partners in new projects, qualification and development of study- and evaluation design and fundraising. Mobilization of partners has been through three inspiration and networking meetings where a broad range of stakeholders have been gathered, ranging from interest organizations, municipalities, regions, GPs, NGOs and the private sector, resulting in the start-up of eight new projects. Foci of these projects are on cooperation across sectors, from hospitals to rehabilitation and smoking cessation programs in the municipalities and on involving NGOs in research projects.

#### Conclusions:

A common denominator for the projects is the facilitating role of TIPL in relation to gathering and mobilizing partners and in contributing to research design with a focus on evaluation, co-creation, and involving stakeholders in intervention design. The innovative potential for TIPL is in facilitating new types of partnerships, pragmatic approaches to evaluation and the development of new solutions, which would otherwise have been absent.





## Change in diet quality over 12 years in the 1946-51 cohort of the Australian longitudinal study on women's health

<u>Dr. Jennifer N. Baldwin<sup>1,2</sup></u>, Ms. Peta Forder<sup>3</sup>, Dr. Rebecca Haslam<sup>1,2</sup>, Dr. Alexis Hure<sup>3,4,5</sup>, Prof. Deborah J. Loxton<sup>3</sup>, Dr. Amanda Patterson<sup>1,2,3</sup>, Prof. Clare E. Collins<sup>1,2</sup>

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Ageing (SIG)

Purpose:

How or whether diet quality changes over time has rarely been reported at a population level. Our aims were to investigate change in diet quality over 12 years in a nationally representative sample of women born in 1946-51, and to identify characteristics of women whose diet quality changed over time.

#### Methods:

The Australian Recommended Food Score (ARFS) was measured in 2001 (n=10,629, mean age 52.1 years) and 2013 (n=9115; n=8161 for both time-points) for the 1946-51 cohort from the Australian Longitudinal Study on Women's Health. Participants were categorised by tertiles of baseline diet quality and also classified as 'diet quality worsened' (ARFS decrease  $\leq$ -4 points, n=2361), 'remained stable' (-3 $\leq$ change in ARFS $\leq$ 3 points, n=3077) or 'improved' (ARFS increase  $\geq$ 4 points, n=2723).

#### Results:

On average, ARFS total and subscale scores remained relatively stable over time (mean [SD] change 0.3 [7.6] points) with some regression to the mean. Women whose diet quality worsened over time were more likely to be highly physically active at baseline compared with women whose diet quality improved (p<0.001). Among women with poor diet quality initially (lowest baseline ARFS tertile, n=2451, mean [SD] baseline ARFS 22.8 [4.5] points), almost half (47%, n=1148) had not improved after 12 years, with women less likely to be in the healthy weight range (41% compared to 44%) and be never-smokers (56% versus 62%, p<0.05) compared with those whose diet improved.

#### Conclusions:

Diet quality remained relatively stable over 12 years' follow-up among mid-aged women. Almost half of those with poor baseline diet quality remained poor over time, emphasizing the need to target high-risk groups for nutrition interventions.





## Fathers and Fussy Eater

<u>Ms. Stephanie Rahill<sup>1</sup></u>, Dr. Aileen Kennedy<sup>1</sup>, Prof. John Kearney<sup>1</sup> <sup>1</sup>Technological University Dublin, Dublin, Ireland

#### Children and families (SIG)

Purpose: Food fussiness refers to the rejection of foods, which can lead to an inadequate consumption of a wide variety of foods. Parents can influence their child's eating behaviours through the environment in which they rear their child. The majority of studies on children's fussy eating have focused on mothers as the primary caregiver, however, recent findings suggest that fathers also have some child feeding responsibilities. With an increase in paternal feeding responsibilities, it is important to establish how this influences a child's development of eating behaviours. Therefore, the aim of this research is to examine the associations between paternal factors and children's fussy eating.

Methods: The study involved cross-sectional data from an Irish sample of fathers, who completed an online survey based on one of their children aged 5-12 years old (n=155). The Feeding Practices and Structure Questionnaire assessed paternal feeding practices. The Child Feeding Questionnaire assessed paternal perceived responsibility, while the Children's Eating Behaviour Questionnaire assessed food fussiness. Associations were firstly assessed using t-tests and correlations followed by multiple linear regressions.

Results: Paternal concerns, perceptions of weight status and feeding responsibilities were not associated with child's level of food fussiness. However, findings from the adjusted model illustrated that family meals was the only structure-related feeding practice inversely associated with food fussiness ( $\beta = -0.29$  [CI 95%: -0.35 - -0.12]), such that fathers, who reported that their child more frequently consumed the same meal as the rest of the family, had a child with lower levels of food fussiness. Persuasive feeding was the only non-responsive feeding practice associated with food fussiness ( $\beta = 0.25$  [CI 95%: 0.06 – 0.34), such that higher paternal reports of persuasive feeding was associated with higher levels of food fussiness.

Conclusion: Findings from this study illustrate the importance of including fathers in studies in relation to child feeding, as their feeding practices influence food fussiness in both a positive and negative manner. In addition, findings suggest that a whole-family approach, not just maternal, is necessary when developing interventions to address issues in relation to child's dietary intake.





# **Poster Session P.2**





## Acute Effect of Virtual Reality Exercise on Heartrate and Mood among College Students with Anxiety Symptomology: A Pilot Study

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e- & mHealth (SIG)

Purpose: Depression and anxiety rate in college students are on the rise, and exercise has been shown to alleviate these symptoms. Virtual reality-based exercise has been an innovative means to motivate individuals to adhere to exercise. This study examined the acute effect of immersive virtual reality (VR) exercise bike on physiological and psychological outcomes in college students with depressive and anxiety symptoms.

Methods: Total of 20 participants (Mage= 20.45, SD=0.76 ;11 females; MBMI=23.33, SD=2.86) participated in the study in 2018. Penn State Worry Questionnaire (PSWQ) and Center for Epidemiologic Studies Depression (CES-D) were used to screen students with either symptomology of depression or anxiety. Participants participated in two 20-minute exercise sessions, each on a separate day: 1) VR bike exercise, and 2) traditional ergometer exercise. Brunel Mood Scale was used for mood assessment immediately before and after both sessions, and heart rate was assessed every 4 minutes during each session.

Results: Average score for PSWQ and CES-D was 52.06 and 16.65, respectively. Repeated two-way (Time and Condition) ANOVA indicated that there was a significant interaction effect on vigor (F (1,19) = 8.79, p < 0.01). Additionally, there were significant Time effect on depression (F (1,19) = 5.81, p < 0.05), tension (F (1,19) = 6.55, p < 0.05), and vigor (F (1,19) = 15.71, p = 0.01). Marginal significance of Time effect on Confusion (F (1,19) = 4.39, p = 0.05) was also shown. Paired t-test indicated that no significant difference on average heartrate between the two conditions.

Conclusions: College students who have moderate-to-high worry can benefit from 20 minutes of bike exercise. Although physiological responses may be comparable between the two exercise modes, VR bike exercise can be more effective in enhancing the positive mood compared to traditional bike exercise.





## Evaluation of public open spaces in Mexico City

<u>Dr. Catalina Medina<sup>1</sup></u>, Miss Maricruz Morales<sup>1</sup>, Miss Claudia Nieto<sup>1</sup>, Dr. Célida Gómez<sup>2</sup>, Dr. Simón Barquera<sup>1</sup> <sup>1</sup>National Institute of Public Health, Mexico City, Mexico, <sup>2</sup>Universidad Iberoamericana, Mexico City, Mexico

#### Policies and environments (SIG)

Urban parks are key settings in the community that can promote healthy lifestyles, however the lack and low maintenance of facilities could reduce participation. Objectives were to identify public open spaces (POS) into public databases, and to evaluate internal and external features of these spaces in Mexico City.

Methodology. POS were those green spaces, grey areas and natural environments, regardless of the size, with recreation purposes, accessible to the general public, mostly free of charge or with low cost (<5 USD). An exhaustive review of the national public geostatistical databases was carried out on the "Digital Map" platform. Previous searches were complemented by performing a visual review on the Roji Guide (a jumbo format that has 31 state plans plus Mexico City). Trained field workers visited and evaluated POS in Mexico City using the Mexican Parks Instrument. This instrument was divided into 5 different themes: geographic and weather characteristics (GWC), physical activity facilities (PAF), support facilities (SF), internal environment (IE), neighborhood surrounding (NS).

Results. A total of 944 POS were mapped and evaluated. The second largest municipality within the city holds only 0.3% of POS. GWC - there are no site maps in 96.5% of the POS. PAF - 85.7% of the parks had tracks within their facilities. SF - 43.1% of the POS are unattractive, public security police were identified in 16.5% POS, 9.5% of these spaces have bathrooms. IE - 98.9% of them do not have a medical service, only 4% of the POS have drinking fountains and 13.4% of the these have food sales inside. NS - 59% of these spaces have at least one nearby public transportation station, most POS are surrounded by residential units, advertising of food and beverages around were found in 3.6% of the POS.

Conclusion. In order to increase participation, local and federal government should identify some strategies to improve these spaces in Mexico City.





# Health behavior correlates of intuitive eating in a community-based sample of men and women

<u>Dr. Vivienne Hazzard</u><sup>1</sup>, Ms. Laura Hooper<sup>2</sup>, Dr. Nicole Larson<sup>2</sup>, Dr. Marla Eisenberg<sup>2</sup>, Dr. Dianne Neumark-Sztainer<sup>2</sup> <sup>1</sup>Sanford Research, Fargo, United States, <sup>2</sup>University of Minnesota, Minneapolis, United States

Disease prevention and management

Purpose: Intuitive eating (i.e., eating according to internal hunger and satiety cues) is associated with better psychological well-being and lower body mass index, but relatively little is known about its behavioral correlates. The purpose of this study was to examine how intuitive eating is associated with health behaviors aligned with those Tribole & Resch suggest may cultivate attunement to internal cues (i.e., eating breakfast daily, yoga practice, and adequate sleep) and disrupt attunement to internal cues (i.e., self-weighing, dieting, and unhealthy weight control behaviors [UWCBs]).

Methods: Cross-sectional data from 765 men and 1,009 women (mean age = 31.1 years) who participated in Project EAT-IV (Eating and Activity in Teens and Young Adults) were used for the present study. Intuitive eating was assessed via seven items (e.g., "I trust my body to tell me when to stop eating") adapted from the Intuitive Eating Scale (IES) and IES-2, with responses recorded on a 4-point Likert-type agreement scale (McDonald's omega = .85 in both men and women). Responses were averaged, and participants who, on average, agreed with all seven items were classified as intuitive eaters. Logistic regression was used to generate sex-stratified, demographics-adjusted prevalence estimates of each health behavior.

Results: At EAT-IV, 41.5% of men and 43.2% of women were classified as intuitive eaters. Among men, intuitive eaters were less likely than non-intuitive eaters to report past-year dieting (29.7% vs. 57.5%, p < .001) and UWCBs (29.0% vs. 47.3%, p < .001). Among women, intuitive eaters were more likely than non-intuitive eaters to eat breakfast daily (46.4% vs. 36.0%, p = .003) and to get at least seven hours of sleep per night on average (90.6% vs. 85.3%, p = .03), and intuitive eaters were less likely than non-intuitive eaters to report past-year dieting (59.9% vs. 74.7%, p < .001) and UWCBs (51.9% vs. 62.2%, p = .004). No associations were observed for regular yoga practice or frequent self-weighing among either sex.

Conclusions: Results suggest a cluster of modifiable health behaviors that may influence attunement to internal cues, though longitudinal research is needed to elucidate temporality of these relationships.





# Development of an app-based assessment tool for childcare physical activity environments and practices

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<sup>1</sup>Coburg University of Applied Sciences and Arts, Coburg, Germany

Early care and education (SIG)

#### Purpose

Childcare centers are settings with a huge impact on children's health and health behavior and should therefore be encouraged to implement policies and practices to promote physical activity. The project "QueB 2 – developing quality with and through physical activity" aims at exploring how stakeholders can be involved to identify childcare centers with need for action. For this purpose, an app-based quick assessment tool is developed.

#### Methods

First, stakeholders working with childcare centers (consultants and supervisors) were identified and invited to take part in group discussions about the following questions: Which role does physical activity play in your daily work? Which issues concerning physical activity arise in the childcare centers you work with? How can you identify childcare centers' need for action concerning physical activity? What support do you need for that? Second, a first draft of a quick assessment checklist building on scientific evidence and existing frameworks was

second, a first draft of a quick assessment checklist building on scientific evidence and existing frameworks was created and sent to stakeholders for feedback. In the third step, the quick assessment tool is developed as a web app and tested by stakeholders.

#### Results

Physical activity plays only a small role in the work of childcare consultants and supervisors. However, they consider it an important issue for childcare centers and see the added value of an app-based assessment tool giving it a stronger weighting. The tool should be simple and suitable for use in counseling to give a first impulse to childcare centers with small expenditure and without consequences. The assessment should be combined with information material and an invitation to activities like workshops or trainings for childcare center staff.

#### Conclusions

Stakeholders can be involved to sensitize childcare centers to the issue of physical activity environments and practices with the help of an app-based quick assessment tool.





## Users' perception of a smartphone app to promote physical activity through active transportation: a qualitative study within the Smart City Active Mobile Phone Intervention (SCAMPI)

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### e-&mHealth (SIG)

Purpose: Globally, physical inactivity is identified as one of the highest risk factors for morbidity and mortality. Promotion of active transportation (AT) is a viable option for many to increase their daily physical activity (PA). The development of mHealth interventions broadens the opportunity to reach larger populations in order to promote AT. The Smart City Active Mobile Phone Intervention (SCAMPI) study is a randomized controlled trial evaluating the use of a smartphone application (app) promoting AT to increase participants' PA. This qualitative study examines the acceptance and usability of the SCAMPI app from a participant perspective.

Methods: Seventeen participants (13 women; age range 25-61 years), living in the county of Stockholm, who had completed the 3-month intervention (behavior change program delivered through an app) in the SCAMPI randomized controlled trial during 2018 agreed to participate in a semi-structured telephone-based interview. These 17 participants were representative of the whole intervention group (n=127) considering baseline characteristics such as age, sex and area of residence. The interviews were audio recorded, transcribed verbatim and analyzed with an inductive qualitative content analysis.

Results: The analysis resulted in two themes. The first theme "The main motivators: monitoring and messages" highlighted that monitoring AT and being able to set up weekly goals in the app were perceived as the main motivators to use more AT. The second theme "Acceptable although refinement is appropriate" showed that the app was accepted and encouraged many participants to use more AT. Nevertheless, there were functions in the app that needed to be modified. For instance, although the automatized tracking of travel behavior was appreciated, it was reported to be time consuming and unreliable at times.

Conclusions: This study contributes with novel knowledge about healthy adults' experiences of using an app for promoting AT. The results show that the app was well-accepted and that self- monitoring and goal-setting were the main motivators to use more AT. The automatized tracking of AT was appreciated; however, it was also reported to be energy- and time consuming when it failed to work. Thus, this feature should be improved in future research.





## SnackAR - An educational game app integrating nutrition and mathematics

<u>Dr. Tamara Bucher</u><sup>1</sup>, Ms. Berit Follong<sup>1</sup>, Ms. Pauline Verhoeven<sup>1</sup>, Mr. Mitchell Burley<sup>1</sup>, Dr. Elena Prieto-Rodriguez<sup>1</sup>, Dr. Andrew Miller<sup>1</sup>, Prof. Clare Collins<sup>1</sup>, Dr. Shamus Smith<sup>1</sup> <sup>1</sup>The University of Newcastle, Callaghan, Australia

#### e-&mHealth (SIG)

Purpose: Poor eating patterns and larger portion sizes contributing to increased energy intake and excessive weight gain. Children and adults have difficulties in estimating food volumes and portion sizes and understanding food labels and kilojoule content. These tasks require basic mathematical skills. At the same time, worldwide interest and achievement in mathematics has declined in school-age children. This is partly due to the perceived misalignment with the school curriculum. Technology, gamification and real-life contexts can help make volume-learning fun and schools play a key role in promoting healthy lifestyles and healthy eating for children. This study aimed to develop and pilot-test a technology to embed aspects of the 'Health and Physical Education' syllabus within Mathematics to enhance learning experiences.

Methods: Our interdisciplinary team of Computer Scientists, Nutrition and Mathematics Education experts used codesign principles to develop an evidence-based tool to integrate mathematics and nutrition education. Primary school teacher surveys (N=101) and testing and interviews with children (N=14, age M=9.3, SD=0.8 years) and their parents (N=13 parents) informed the design of an augmented reality-based game application for food portion size and volume and unit learning that is aligned with the Australian curriculum was informed by

Results: Teachers expressed positive beliefs and interest in using digital games for teaching volume and capacity measurement. About 33% already used digital games, with 55% not currently using, but wanting to use them. SnackAR is an app, which displays a variety of virtual foods, and teaches children to estimate food portions using several different unit types, e.g. weight in grams, volume in milliliters, volume in cm3 and energy in kilojoules. The preliminary testing of the app indicates that 13 out of 14 children liked the application. Overall, the children perceived the estimations as challenging and further technological improvements relating to provision of feedback could be helpful.

Conclusions: Stakeholders reported that integration of a digital game to integrate nutrition and mathematics teaching is acceptable. However, usability and effectiveness of the prototype technology need to be tested in a randomised controlled trial to assess potential value of integration of the tool into the primary school curriculum.





# Perceptions of Meat Reducers and Implications for Social Norm-based Interventions to Reduce Meat Consumption.

Miss Vibhuti Patel<sup>1, 2</sup>, Dr. Nicola Buckland<sup>1</sup>, Prof. Helen Kennedy<sup>1</sup>

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#### Motivation and behavior change (SIG)

Background & Purpose: Current levels of meat intake are detrimental to human and planetary health. As such, effective strategies to reduce meat intake in favour of more sustainable protein sources are needed. Social normbased messages, which detail that most people have reduced their meat intake, may be promising in promoting meat reduction, given the effectiveness of social-norm based messages in promoting healthy dietary changes (Cruwys et al., 2015). To be effective, social-norm based messages need to refer to a desirable and aspirational norm-referent group (e.g. Berger & Rand, 2008). Currently it is unclear how people who have reduced their meat (meat reducers) are perceived. For the first time, this research examined the perceptions of meat reducers compared to vegetarians and habitual meat consumers (pre-registered on OSF).

Methods: Two online surveys were used. Survey 1 used a free association task, whereby 366 UK-based participants (M: 42.6  $\pm$  14.5 years; 47% male) listed the thoughts they most associated with meat reducers. Participants also rated the valence (positivity or negativity, 3-point scale) of these associations. Survey 2 used an experimental between-subjects design to assess participants' [n = 420 (university students n = 206; university staff n = 214), M: 30.8  $\pm$  12.14 years; 26% male] personality trait impressions of a hypothetical person described as either a meat reducer, vegetarian, or habitual meat consumer.

Results: Survey 1: The most common and important traits people associated with meat reducers were healthy, ecofriendly, conscious, animal lovers, and thoughtful. Analysis of variance on the valence scores showed that meat reducers were perceived significantly more positively compared to habitual meat consumers (p<.001,  $\eta p2=.153$ ). Survey 2: Meat reducers were rated as significantly more environmentally friendly, animal loving, health conscious, intelligent, and open-minded compared to habitual meat consumers (p<.05). No other trait ratings (e.g. likeability, attractiveness) significantly differed between meat reducers and habitual meat eaters.

Conclusions: Results from these two studies confirm that meat-reducers are perceived positively amongst UK adults. These innovative findings will inform the development of social norm-based interventions to reduce meat intake.





# Reducing early childhood obesity at the county-level: Impacts of efforts to improve nutrition and physical activity in Los Angeles (LA) County, California

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#### Policies and environments (SIG)

Purpose: Early childhood obesity is of great concern given its links to adverse health outcomes, social marginalization, and discrimination (Reilly & Kelly, 2010). Accordingly, there has been an increase in national and regional efforts to address early childhood obesity. In LA County, a leading public grant-making and child advocacy organization funded a diverse portfolio of investments to reduce early childhood obesity (RECO). RECO adopted a wide variety of strategies (education, media campaigns, financial incentives, changes to the built environment, policy changes) primarily targeting nutrition and physical activity as a means to reducing early childhood obesity. This study examines the county-level impacts of RECO on early childhood obesity and overweight in LA County.

Methods: Given the unique characteristics of LA County, particularly its size and diversity, it is difficult to identify appropriate comparison counties in order to estimate county-level impacts. To address this challenge, this study uses the innovative synthetic comparison group method (Abadie, 2010), which relies on a pool of "donor" counties in southern California and weights them to create a "synthetic" county that is similar to LA County prior to RECO. Our analysis then compares LA County and the synthetic county after RECO to test for a county-level impact. We use overweight (BMIs > 85th percentile) and obesity (BMIs > 95th percentile) data for children aged 2-5 from Southern California Kaiser Permanente.

Results: Examining early childhood overweight and obesity rates over time in LA County reveals that rates were lower after RECO compared to before. After accounting for what might have happened in the absence of RECO by introducing the synthetic comparison group, we find a significant county-level impact of RECO on early childhood overweight and obesity: full implementation of RECO across LA County would significantly reduce early childhood overweight by almost 5 percentage points (Impact Estimate = -4.88, p<.001) and obesity by 1.5 percentage points (Impact Estimate = -1.52, p<.05) in LA County compared to the synthetic comparison county.

Conclusions: These findings demonstrate the potential utility of a diverse set of nutrition and physical activity strategies to reduce early childhood obesity at the county-level.





# Adherence to a Movement Practice: Exploring the Lived Experience of Yoga, Gym Use, and Pro-Health Habits

#### Ms. Wendy Reynolds<sup>1</sup>

<sup>1</sup>AUT University, Auckland, New Zealand

Motivation and behavior change (SIG)

#### Purpose

A primarily qualitative phenomenological doctoral study was designed to explore the topic of exercise adherence through the lens of the lived experience of a consistent movement practice. Movement practitioners (yoga n= 40; gym use n=8) self-selected as having a regular practice that they considered to be their primary modality of movement.

#### Methods

A unique feature of the study is that the research protocol does not specify a yoga or gym 'intervention', but instead collates data on participants' practice tenure, frequency, duration, intensity, and types of yoga practice / gym use (including a home practice), i.e. a lived or 'real world' experience of practice. Self-regulation within the context of health habits is explored via an online survey tool incorporating self-efficacy (with respect to diet and physical activity), overall activity levels (in addition to participants' primary movement practice) and a measure of interoceptive awareness to compare the internal felt landscape of yoga versus gym practitioners. The inclusion of heart rate variability (HRV) as a quantitative objective biomarker provides a gauge of allostatic (stress) load and an opportunity to consider how a movement practice may support pro-health habits mediated by HRV. Interpretative phenomenological analysis will uncover interview themes, to be triangulated against survey responses.

#### Findings

Data analysis is currently underway and due for completion by end April 2020. The aim is to present preliminary findings at the Conference, which would be the first public presentation.

#### Conclusions

The innovative research design aims to broaden the conversation, particularly within the yoga literature, beyond the traditional interventional approach considering yoga for specific clinical conditions, to an exploration of a yoga practice as experienced by practitioners. The use of HRV may offer insight regarding parasympathetic dominance and self-regulation (as it relates to health behavior). The wider lens, of adherence to a movement practice, hopes to uncover the experience of committed practitioners in order to better understand pro-health habits (exercise adherence and healthy lifestyle choices) and concepts that may be applied in behavior change research and public health.





# Associations between light-intensity physical activity and obesity among children and adolescents

**Dr. Meijing An<sup>1</sup>**, Ms. Xinyue Cui<sup>2</sup>, Prof. Jun Ma<sup>1</sup>, Prof. Patrick Lau<sup>3</sup>, <u>Associate Professor Tianjiao Chen<sup>1</sup></u> <sup>1</sup>Institute of Child and Adolescent Health, School of Public Health, Peking University, Beijing, China, <sup>2</sup>Center for Medical Device Evaluation, CFDA, Beijing, China, <sup>3</sup>Department of Sport & Physical Education, Faculty of Social Sciences, Hong Kong Baptist University, Hong Kong, China

#### Policies and environments (SIG)

Purpose: Evidence to support the effectiveness of moderate-to-vigorous-intensity physical activity (MVPA) on weight management is well established in the literature. However, few studies have examined the relationship between light-intensity physical activity (LPA) and obesity. This study intends to examine the relationship between LPA and central and general obesity among children and adolescents.

Methods: In 2013, a cross-sectional study was conducted with 19,848 children and adolescents between the ages of 6 and 18 from seven provinces in China. Height, weight, and waist circumference were measured objectively. The time of LPA and MVPA over the preceding seven days were collected using the questionnaire modified according to short last 7-day self-administered International Physical Activity Questionnaire. The Chi-square test and logistic regression analysis were conducted.

Results: After controlling for covariates, children and adolescents who were active in LPA had a lower risk for central obesity (OR = 0.885, 95% CI: 0.797–0.982, P = 0.022) and a marginally lower risk for general obesity (OR = 0.924, 95% CI: 0.843–1.014, P = 0.095) compared with those who were inactive in LPA independent of MVPA. Children and adolescents with inactive MVPA showed a lower risk for central obesity or a marginally lower risk for general obesity if they were active in LPA compared with those who were inactive in either LPA or MVPA (OR = 0.843, 95% CI: 0.728–0.976, P=0.022, for central obesity; OR = 0.893, 95% CI: 0.784–1.107, P=0.087, for general obesity).

Conclusions: PA independent of MVPA is inversely associated with obesity among children and adolescents. Participating in active LPA may exert an important role in the prevention of adiposity, especially for those who are inactive in MVPA, which deserves further investigation and calls for formulating the recommendation time for LPA. Future longitudinal research that will focus on the effects of LPA on adiposity is required to verify this finding.





## Assessment of nutrition environments in the rural Lower Mississippi Delta region of the United States

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#### Policies and environments (SIG)

Purpose: To better understand the persistently low diet quality of pregnant women and their children who participated in a lifestyle intervention, the study participants' local food environments were measured. This is the first comprehensive assessment of food environments in the rural Lower Mississippi Delta Region of the United States.

Methods: Food environments of 5 towns in which participants resided were measured using the Nutrition Environment Measures Survey for grocery stores, convenience stores, full service restaurants, and fast food restaurants. General linear models were used to test for ratio score differences among food outlet classes and subclasses. Spatial analysis was used to explore geographic clusters of food outlets and to compute distances between study participants' residence and the closest food outlet by class.

Results: Of the 266 food outlets identified, 11 (4%), 86 (32%), 50 (19%), and 119 (45%) were classified as grocery stores, convenience stores, full service restaurants, and fast food restaurants, respectively. Nutrition Environment Measures Survey mean total ratio scores among the 4 classes of food outlets were significantly different from one another except for convenience stores and full service restaurants. On average, 54%, 21%, 16%, and 8% of maximum points possible was achieved by grocery stores, full service restaurants, convenience stores, and fast food restaurants, respectively. Seventy-five percent, 50%, and 54% of study participants lived in or adjacent to a convenience store cluster, full service restaurant cluster, and fast food cluster, respectively. On average, study participants lived closer to convenience stores and fast food restaurants (0.4 and 0.5 miles, respectively) than grocery stores and full service restaurants (1.6 and 1.1 miles, respectively).

Conclusions: Food outlets in the 5 Lower Mississippi Delta towns scored low on nutrition environment measures associated with healthful eating and characteristics of food deserts and food swamps were prevalent in the towns. Behavioral interventions designed to affect positive changes in dietary habits of rural residents are needed; however, prior assessment of nutrition environments is necessary to first ascertain if environmental supports that facilitate healthful eating are present.





# Community-level impacts of nutrition and physical activity strategies to reduce early childhood obesity

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### Policies and environments (SIG)

Purpose: Obesity often begins early in life, with many children entering school already overweight or obese. Accordingly, a leading grant-maker funded multiple grants aimed at reducing early childhood obesity (RECO) in Los Angeles County, California. RECO adopted a wide variety of innovative strategies (nutrition education, media campaigns, financial incentives, changes to physical activity environments, policy changes), focusing on low-income communities. Over 1,000 activities took place in different communities and at different times over six years (2011-2017). This study capitalizes on variations in strategy, timing, and location of the RECO activities and has two goals 1) describe the RECO strategies used to target early child obesity in communities across Los Angeles County and 2) assess the community-level impact of these strategies, individually and combined.

Methods: The study team gathered data on RECO activities and their timing and location through review of documents and interviews with organizations implementing RECO activities. Activities were then categorized into four obesity reduction strategies based on those identified by the Centers for Disease Control and Prevention (CDC). Census-tract level child obesity data (n=1,223 census tracts) were aggregated from the Public Health Foundation Enterprises (PHFE) Women Infants and Children (WIC) administrative data. A Comparative Interrupted Time Series analysis approach was used, comparing trends in outcomes before and after a specific RECO activity was implemented within a community, as well as trends across other communities in Los Angeles County not affected by the activity.

Results: Descriptive analyses demonstrated that RECO activities adopted all four strategies; the strategy of supporting healthy food and beverages was used across the most census tracts. Impact analyses revealed that RECO as a whole significantly reduced early childhood obesity rates by .59 percentage points in communities where RECO activities occurred. RECO activities that encouraged breastfeeding and those that encouraged communities to organize for change significantly reduced early childhood obesity, but impacts of the different strategies were not significantly different from each other. There were also greater impacts on reducing early childhood obesity in majority non-white communities.

Conclusions: The findings have implications for the community-level effectiveness of different strategies to address early childhood obesity.





## Health and nutrition knowledge: a qualitative study with US adolescents

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#### Policies and environments (SIG)

Background: Public health food guidance could help shape adolescent dietary behaviors. However, food and nutrition-related terms are likely inconsistently defined and understood among adolescents. Investigating these concepts among adolescents may elucidate how best to communicate them.

Objective: Assess how adolescents define terms commonly used in the health and nutrition field. Methods: This was a qualitative study conducted with 21 adolescents (12.05±1.32 years old, 57.1% male) from Houston, USA. Telephone interviews were conducted in a private office. Semi-structured questions and prompts were developed by the research team and content was informed by a literature review and the Dietary Guidelines for Americans. Script questions were pre-tested with five staff members from the research center and revisions were made as necessary. The script was divided into: demographics, terms, description of someone (un) healthy, and ratings. Interviews were digitally recorded and transcribed verbatim. Hybrid thematic analysis was used to code and analyze data by three independent trained qualitative researchers. Findings: Adolescents defined "healthy" in terms of wellness-type behaviors related to diet, physical activity, and body weight. Adolescents' ratings of their personal health varied from "not healthy or unhealthy" to "healthy" just based on their diet and physical activity behaviors. Examples of healthy individuals were specific persons (e.g., parents) or someone engaged in a particular profession (e.g., athlete) or being active. Examples of unhealthy individuals included specific persons (e.g., siblings) or someone engaged in unhealthy lifestyle behaviors (e.g., unhealthy diet and physical activity). Most adolescents reported that healthy individuals should eat a healthy diet and be active. Few mentioned adequate sleep or weight status. Clear descriptions for healthy and unhealthy foods were provided, while energy-dense, nutrient-dense, and processed foods adolescents struggled to define. Fast-foods and junk-foods were identified with non-health benefits, except for being convenient and tasty. Natural and organic foods were used as interchangeable terms with health benefits.

Conclusion: Adolescents have a limited understanding of common health and nutrition-related terms. National dietary guidelines should use terms that are easily understood by adolescents. More comprehensive research is needed in this regard.





# Assessing the feasibility of Stand Up for Health - A programme designed to reduce sedentary behaviour in contact centres

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#### Motivation and behavior change (SIG)

Purpose: Sedentary behaviour has been linked to reduced mental and physical health, as well as lower job satisfaction and productivity. Contact centres have been identified as workplaces with high levels of sedentary behaviour, and it is reported that one in four members of staff regularly experience musculoskeletal problems. Stand Up for Health (SUH) is a workplace intervention developed based on the socio-ecological model to target sedentary behaviour in contact centres. The NIHR funded study has the following aims-

Aim 1: Test the acceptability and feasibility of implementing the Stand Up for Health intervention in contact centres Aim 2: Assess the feasibility of using a cluster randomised controlled trial study design

Aim 3: Scope the feasibility of a future health economic evaluation of Stand Up for Health

Method: This feasibility study uses a cluster randomised stepped wedge design to assess data collection methods and procure preliminary estimates of effectiveness for the following:

Primary outcome: Sedentary time in workplace, objectively measured using activPALs.

Secondary outcomes: Total sedentary behaviour, physical activity, mental wellbeing, work engagement and musculoskeletal health.

A process evaluation will be conducted to understand views and experiences of the SUH intervention activities, and implementation processes with a view to refining the theories of change.

Results: 11 contact centres from across the UK have been recruited and randomised. Intervention delivery has commenced in 5 centres consisting of the following elements to target the levels of the socio-ecological model:

- i. Workshops conducted at each centre to introduce equipment and activities, and also serve as a forum to elicit staff preferences and suggestions to reduce sedentary behaviour.
- ii. The SUH project team works with each contact centre to develop an action plan and theory of action, to create change at organisational, environmental, group and individual levels.

Conclusion: Contact centres present a complex work and research environment given the lack of autonomy among employees, shift patterns, and environmental and infrastructural constraints. This study will provide learnings on the implementation and acceptability of a novel, non-prescriptive programme to reduce work-place sedentary behaviour, and aid future implementation at a larger scale.





# Barriers faced by childcare educators in influencing feeding practices of young children

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#### Early care and education (SIG)

#### Purpose:

Childhood is a critical time for growth and development, with eating habits and food preferences influenced by their environments. Two-thirds of Australian children (1-4 years) attend childcare with long day care (LDC) used most frequently and for the longest period. Child food intakes in LDC have been shown to be inconsistent with dietary recommendations and increased exposure to childcare associated with adiposity. LDC is therefore an important environment for public health intervention to prevent childhood obesity.

#### Methods:

A cross sectional qualitative study of newly graduating childcare educators across two campuses in Geelong and Melbourne, Victoria. Online surveys collected demographic data. Focus group discussions used photo elicitation to explore participant knowledge, attitudes and practices of the Childcare Food & Activity Practices Questionnaire (Gubbels et al 2015).

#### Results:

Respecting child choice was considered important with pre-served versus self-served meals debated as preferred methods to facilitate self-regulation. Participants felt their role was to monitor types and amounts of foods offered, with children determining how much to consume. Self-regulation was challenged by childcare food monitoring procedures. Picky eating and emotional behaviours elicited personal beliefs and practices of coercion and pressure to eat. Role modelling was understood as important however often restricted by childcare policy. Participants described a gap between learnt knowledge and observed practice.

#### Conclusions:

Childcare educators agree they are influential in the health of children. Knowledge learnt appears to be shifting towards healthy feeding practices, however application is often challenged by childcare policy and procdure. Australian childcare is a regulated industry, therefore existing policy and procedures could be strengthened to support healthy feeding practices of young children.





# Protocol for a randomised controlled trial to lower occupation-related sedentary behaviour in South African office workers

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#### Motivation and behavior change (SIG)

Objective: Office workers spend most of their workday being sedentary and this increases the risk of cardiometabolic diseases. Sedentary behaviour can be accumulated during and outside of occupation-related domains. The aim of this study is to determine the effectiveness of sit-stand desks and healthy messages on interrupting sitting time whilst at work in order to improve the cardiometabolic health profiles of office-bound workers.

Methods: We will conduct a randomised controlled trial with post-intervention focus groups. Participants will be recruited at an information management company in Johannesburg, South Africa and randomly assigned to one of two groups, a sit-stand group ( $n \ge 30$ ) or a control group (n = 30) for comparison. Both groups will be followed for 12 months in total. The intervention for the sit-stand group will include the introduction of a collapsible wooden desk stand placed on top of the participants' existing workstation, with healthy messages sent weekly to the participants to motivate a change in sedentary behaviour.

Results/findings: All participants will be screened and assessed at baseline, 3-, 6- and 12-months for behavioural (diet, physical activity, smoking/vaping, alcohol consumption), anthropometric (waist and body mass index), cardiometabolic disease risk and sleep parameters. Focus groups will take place post-intervention to determine the perceptions of participants towards using interventions to reduce sitting time during work hours.

Conclusion: There is an urgent need to address sedentary behaviour in the workplace. The findings from this study have the potential to inform future work-based interventions in office bound workers, and is particularly important in sub-Saharan African and other low- and middle-income regions where evidence is extremely limited.





# Perceptions and priorities of stakeholders towards a digital platform supporting health behaviour change in cardiovascular disease

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### e-&mHealth (SIG)

Purpose: Evidence suggests that digital health interventions are effective self-management solutions for addressing health behaviour change (BC) in cardiovascular disease (CVD) prevention, such as increased physical activity (PA). However, a proliferation of disparate digital health interventions are currently available to people living with CVD. We propose an innovative digital health platform structure, offering a variety of existing, evidence-based interventions to users based on their individual needs and preferences. This may be a more sustainable approach to health BC for those who are self-managing a complex long-term condition. This paper aims to better understand the perceptions of key stakeholders towards the proposed platform and identify the development considerations they may prioritise based on their experiences of CVD management.

Methods: A qualitative research design and triangulation of data collection methods were used to generate data. Data collection included focus group discussions, semi-structured interviews and guided conversations. Participants were people with a diagnosis of CVD (n=16) and relevant healthcare professionals (n=7). A thematic analysis was conducted to explore patterns and themes within the various participant contributions.

Results: Findings indicate that the proposed platform would be a beneficial solution for certain groups whose health BC is not currently supported by discrete solutions. Both participant groups perceive the digital health platform as more trustworthy than accessing multiple interventions through unsupported digital repositories. Healthcare professionals agree that they would endorse an evidence-based platform which had been rigorously developed and evaluated. CVD participants would prioritise a decision support tool to guide them through the platform, as they perceive an unstructured approach as overly complex. Both participant groups perceive selective data sharing to be a useful method for gaining support with health BC goals from certain self-selected individuals (e.g. spouse).

Conclusions: Improving health behaviour is a complex and life-long endeavour in CVD self-management. These findings suggest that an innovative digital health platform would offer a flexible and comprehensive solution for health BC to a wider and more diverse population. This paper makes a significant contribution to the rationale for developing an innovative digital health platform.





## The application of behaviour change theories and techniques in dietetic practice: a systematic review of randomised controlled trials

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#### Motivation and behavior change (SIG)

Purpose: Theories and models of behaviour change can provide the theoretical underpinning for effective health interventions. The extent of their application in contemporary dietetic interventions has not been explored. This systematic review aimed to synthesise the evidence on the use of behaviour change theories and techniques in interventions delivered by dietitians in Primary Health Care (PHC) settings.

Methods: Medline, Cumulative Index to Nursing and Allied Health, PsycINFO, Embase, and Cochrane databases were searched for English language, randomised controlled trials up to August 2019. The review followed PRISMA guidelines and included studies of adults ( $\geq$  18 years) who received face-to-face nutrition care delivered by a dietitian in PHC settings. The interventions had to be underpinned by recognised behaviour change theories. Comparison groups received usual, minimal or no care. Interventions delivered in hospitals or via telephone only were excluded. Screening was conducted independently in duplicate and data were extracted regarding study population, intervention design, behaviour change technique content, primary outcome measures such as measurable changes in health behaviours or health outcomes, and their key findings. The quality of each study was assessed using the Cochrane Risk of Bias tool.

Results: Nineteen studies met the eligibility criteria, representing 5172 adults. Social cognitive theory was the behaviour change theory most commonly applied in interventions (n=15) with 11 of those studies having significant intervention effects. The trans-theoretical model, health belief model, self-determination theory, and ecological model were also identified within the included studies to underpin intervention design. Goal setting, problem-solving, social support, and self-monitoring were the most commonly reported techniques (n=15; n=14; n=11; n=11 respectively). Studies had a high or unclear risk of bias (n=10; n=9 respectively).

Conclusions: The extensive range of health conditions seen by dietitians, alongside the complexities of behaviour change, highlight the importance of embedding theory-based interventions in dietetic care. The explicit reporting of theories and techniques in published studies is strongly recommended. Findings from this review should inform future PHC practice and research.





## Proof of concept of the Goldilocks principle in Childcare workers

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#### Motivation and behavior change (SIG)

#### Purpose

Childcare workers show a high prevalence of high BMI and low cardiorespiratory fitness, thus facing increased risk of health problems. According to childcare curricula, the preschool teachers should encourage children to be more physically active, given the importance of physical activity for children. Childcare workers should therefore act as role models by actively participating in playful physical activities together with the children. However, no studies have investigated if these activities, primarily aiming at the children, also increase physical activity of childcare workers to an extent that improves their cardiorespiratory fitness (i.e. intensities above 60 % of heart rate reserve (HRR)).Therefore, this study investigates if designed playful physical activities (Goldilocks activities) elicit physical activity of sufficient intensity to increase cardiorespiratory fitness in childcare workers.

#### Method

Goldilocks activities were designed on basis of studies investigating facilitators for physical activity in day care, and pilot trials conducted in Danish kindergartens. These pilot trials revealed several important contextual factors influencing whether the childcare workers' heart rate did, indeed, rise to more than 60 % HRR during playing activities with the children, as measured by heart rate monitors and accelerometers.

#### Results

Results from pilot trials indicate that regular pedagogical playing activities performed for 10-15 minutes by children and childcare workers do not lead to significant time (i.e. more than 1 min) at HRR >60 % in the workers. In contrast, the designated Goldilocks activities (i.e. performed for 10-15 minutes) resulted in 3-5 minutes at HRR >60 %. Hence, if childcare workers perform 3-4 Goldilocks activities daily, they could get sufficient time in high intensity physical activity to improve their cardiorespiratory fitness as a natural part of work. We will verify these pilot results in a proof of concept study among 30 childcare workers, and present results at the conference.

#### Conclusion

If designated Goldilocks activities engaging both children and childcare workers in physical activity induce sufficient time at high intensities to improve the childcare workers' cardiorespiratory fitness, the concept could have a large potential for increasing health among childcare workers, thus supporting sustainable work in this occupational sector.





## Sedentary behavior in traditional office employees vs. remote workers

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#### Policies and environments (SIG)

Purpose: Advancement of technology has allowed employees to shift from working in a traditional office space to working in their residence. However, the long-term effects of transitioning the workforce from maintained and regulated offices to a home environment are unknown. This purpose of this exploratory study was to assess the baseline differences in sedentary behaviors in home office workers and those in a traditional office setting.

Method: This longitudinal cohort study took place from March – June 2019 in Central Texas, United States. Traditional office workers were recruited from a university population of administrative personnel. Members of the community who worked from their residence full-time were recruited to represent the remote working cohort. Participants were asked to wear an activPAL accelerometer to collect total time sitting/lying, time standing, step count, energy expenditure, and sit-to-stand transitions for five consecutive days during their work week. A repeated measures ANOVA was performed to compare the traditional office and home office cohort during traditional working hours (9:00 am- 5:00 pm) and the 24-hour day.

Results: The daily totals of time sitting/lying, standing, and stepping were not statistically different between the home office and traditional office environment. Energy expenditure of traditional office employees and individuals working from home was not statistically significant. When the data was restricted to traditional working hours, time sitting/lying, standing, and stepping in the traditional office environment and the home office did not significantly differ between traditional office workers and home office employees. Total step count and total energy expenditure also did not statistically differ and neither group met recommendations for daily movement.

Conclusion: This study suggests that with the transition of the work environment from commercial office buildings to private residences, it is important to continue to encourage physical activity for computer-based workers regardless of their physical location. Ergonomists and employers should be sure to design for movement and ergonomics. It is mutually beneficial for companies to educate their workers on the benefits of reducing sedentary behaviors and providing resources and equipment to encourage this throughout the workday.





## Associations of coffee and other beverages with academic performance in university students

Ms. Sara Jumabhoy<sup>1</sup>, <u>Prof. Jeffery Sobal<sup>1</sup></u> <sup>1</sup>Cornell university, Ithaca, United States

Other

Purpose: Caffeinated beverages are often consumed to enhance mental performance. Previous studies examined associations of academic performance with single types of caffeinated beverages or combined several types of caffeinated beverages to represent total caffeine intake. This investigation is innovative in studying types of beverages separately in relationship to academic performance among university students.

Methods: A cross-sectional design administered a pilot-tested online questionnaire to undergraduate student volunteers at one medium sized U.S. university to obtain an availability sample of 252 responses. Measures were self-reported and included coffee consumption, use of other caffeinated beverages (tea, energy drinks, and soft drinks), reported grade point average (GPA), and reasons for coffee consumption. Analyses used descriptive, bivariate, and multivariate statistics.

Results/findings: One-fourth of students reported they did not drink coffee, and 75% reported drinking coffee, 74% tea, 5% energy drinks, and 3% soft drinks. The association between amount of coffee use and GPA was curvilinear and not statistically significant. The most important reasons for coffee drinking were to keep awake during the day, liking the taste, waking up in the morning, helping to focus, pep up during the day, daily routine, and keeping awake at night. Significant associations between tea drinking and GPA were positive, and associations of energy drinks and soft drinks with GPA were negative.

Conclusions: Congruent with most prior studies, coffee consumption was not associated with academic grades, while energy drink use was negatively related to academic grades. With little prior research, positive associations of tea and grades and negative associations of soft drinks and grades were unexpected. Most, but not all, of the reasons for coffee use were related to remaining awake and alert. A variety of student subcultures may use caffeinated beverages differently, with coffee drinking subcultures offering a mainstream strategy for staying awake, tea drinking subcultures emphasizing both tea use and strong academic performance, and energy and soft drink consuming subcultures reacting to poor grades by increasing caffeinated beverage use. Behavioral nutritionists may use these and related findings to educate students about the mixed associations between coffee and other caffeinated beverages and academic performance.





## Facilitators and barriers to change regarding the excessive consumption of salt in the diet of a target population of Costa Rica.

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<sup>1</sup>Costa Rican Institute for Research and Teaching in Nutrition and Health, Cartago, Costa Rica

#### Motivation and behavior change (SIG)

Purpose: To identify facilitators and barriers to change sodium intake in the diet of a target population in Costa Rica to guide the development of a social marketing plan.

Methodology: The primary audience selected was mothers with one school-age child, in charge of purchasing and/or preparing food at home. The secondary audience was school age children. The behavior selected was the reduction of the use of discretionary salt and commercial condiments when cooking at home and their consumption at the table. The Social Ecological and Transtheoretical Models of Change guided the formative research. Data collection included 8 semi-structured interviews and 4 focus groups aimed at the primary segment in 4 communities in the metropolitan area of Costa Rica. Data were systematized into categories and analyzed to identify the 4P's of social marketing. Ethical approval was received.

Results: Mothers (n=49, mean 36 years, married or live as a couple, with secondary to university level education, SE medium and low, average 2 children school age) consider preparing foods for their family as a way to show love and protection. Homemade food has a high status and is associated with "healthy food". Benefits: healthier family members, lower risk of high blood pressure and looking better physically. Barriers: taste and preference of family members for saltier foods, linked to tradition; decrease in excessive salt use is not well accepted rationally, except when associated with feelings; commercial condiments (with hidden salt) are cheap, easy to use and considered typical. Report eating at restaurants once or twice biweekly, usually fast-food that is seen as an award. When grocery shopping purchases are planned, made quickly, no time to read labels. Participants report greater confidence if the spokesperson is from the health and education field. Behavioral changes are based on external motivators. Promotions are associated with convenience. The channels used and trusted are television, Facebook and WhatsApp.

Conclusion: Mothers play a vital role in the household decision-making around food. Strategies for reducing salt intake are sentimental (love and protection) and from a rational point of view (risk and prevention of diseases)





# Feasibility of the AusMed diet program: Translating the Mediterranean Diet for Older Australians

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#### e- & mHealth (SIG)

#### Purpose:

To test the feasibility of a Mediterranean diet (MEDI) program developed specifically for older Australians (AusMed). This novel program includes tailored eHealth support with foods and recipes modified for the population while maintaining the integrity of a traditional MEDI.

#### Methods:

Phase 1: A process evaluation was conducted with a group of older Australians (n = 17, mean age 71.2 ± 4.2 years). Consumer research groups were presented with AusMed materials in three sections: 1. Education materials; 2. Program support materials; 3. Cooking demonstration/tasting and surveyed for opinion after each section. Semi-structured interviews (n = 6) were performed and thematically analysed using n-Vivo to identify barriers/enablers to adherence. Program materials were then modified according to results.

Phase 2: 2-week feasibility trial (n = 15). A dietitian delivered a group counselling session, provided program materials and food hampers prior to commencement of the trial. Text message support using the COM-B model was delivered throughout. Outcome was measured by validated 14-point Mediterranean diet score, food and support acceptability surveys.

#### Results/findings:

Phase 1; Quantitative feedback: All participants (100%) agreed their knowledge of MEDI had improved and they were confident they could adhere to AusMed; support materials were acceptable, the majority preferring booklet format (70%) and group delivery (58%). Themes emerging from qualitative analysis; 1. Barriers (program complexity, perceived cost and food preferences); 2. Provision of additional behavioural support and 3. Simplification and individualisation of materials.

Phase 2; Trial participants were found to have increased their adherence from a mean score of  $5.4 \pm 2.4$  (considered low adherence), to a mean score of  $9.6 \pm 2.0$ , (considered moderate to high adherence). All participants reported food satisfaction, confidence to continue with the dietary change and that eHealth support was acceptable and assisted in adherence.

#### Conclusions:

Health benefits from dietary change take time to accrue. Tailoring interventions and including eHealth support can improve adherence. A sample of Australians significantly improved their adherence to MEDI and found both the foods and eHealth support were beneficial. Larger intervention studies over a longer period are needed to confirm long-term adherence and associated health benefits in an Australian setting.





# Understanding the needs of end-users for "Nutrition and Diet" mHealth apps: A Preliminary-Analysis

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#### e-&mHealth (SIG)

#### Purpose

We sought to explore the perspectives of end-users on the features, current use and acceptance of "Nutrition and Diet" mHealth apps. Almost 43% of the world's population now owns a smartphone and the number of nutrition apps is growing.

#### Methods

A multidisciplinary team of AI experts, computer scientists, dietitian-nutritionists, physicians, pharmacists and psychologists designed and setup the survey. Before its release, it has been pilot-tested by 21 end-users. The feedback was reviewed and the survey was finalised - resulting in a 19-item questionnaire translated into six languages: EN, DE, FR, ES, IT, EL. This has been disseminated through conferences, patient associations and social media.

#### Results

End-users (n=1000) from 31 countries and 5 continents (731 women, 262 men, 7 neither) with a mean age of 28.7 (SD: 9.8) have so far completed the survey. More than half of the participants (58.6%) have used a "Nutrition and Diet" app. The primary criteria for selecting such and app were to be free of charge, user-friendly and validated. It should also produce automatic results of caloric and macronutrient content (i.e. food type and/or the portion size are estimated by the system without any contribution by the user). An app is less likely to be selected if it wrongly estimates portion size, calories or nutrient content. Moreover, other important limitations include the use of a database that comprises non-local foods, and which may omit major foods. It seems that it is easier for the participants to select criteria for preference, rather than barriers, as expressed by the percentage of the selected "no opinion" responses on these questions (11% and 27%, respectively). Furthermore, on a scale of 1-5 (1: completely insignificant, 5: completely significant), end-users indicated that shared history records and also the possibility of sharing data with other apps (e.g. fitness apps) are completely unimportant for them.

#### Conclusion

To the best of our knowledge, this is the broadest survey of end-users on the subject of "Nutrition and Diet" apps. Understanding the needs of end-users will benefit both the research on innovative tools used for dietary assessment, as well as behavioural change research.





## Inclusion of children with special educational needs and disabilities in physical education: A systematic review and meta-analysis of teachers' attitudes

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Other

Purpose: Since the publication of the Salamanca Statement in 1994, there has been calls for greater inclusion of children with special educational needs and disabilities (SEND) in physical education (PE). The purpose of this study is to explore the extent to which PE teachers have positive, negative, or neutral attitudes towards the inclusion of SEND children.

Methods: A systematic review and a meta-analysis of published studies was conducted. Quantitative studies were sourced from electronic databases and were included in the systematic review if they were written in English, peer reviewed, and published between the 1975-2018. Studies were included in the meta-analysis if they used a validated questionnaire, and reported the mean and the standard deviation of the questionnaire items, and the sample size.

Results: The search yielded 1835 records, of which 28 met the inclusion criteria. Of 25 articles that used a validated questionnaire, 15 were eligible for the inclusion in a meta-analysis to assess the extent to which teachers held positive or negative attitudes towards including SEND children in PE. The pooled meta-analytic mean was positive, but small, and there was a large amount of heterogeneity in attitudes across studies. Subgroup analysis of differences in attitudes between males and females were unclear. Academic preparation and in-service attendance of professional courses, as well as previous experience working with SEND pupils, were positively associated with teachers' attitudes. Age was mostly negatively associated with attitudes towards inclusion of SEND children. Further post-hoc analysis revealed substantial differences in teacher attitudes comparing studies dated before and after the publication of the Salamanca Statement. The effect of years of teaching experience on teachers' attitudes was mixed, and differences between males and females in respect of these attitudes were unclear.

Conclusion: This systematic review highlights that, although there is still a great deal of variability, there have also been positive changes in teachers' attitudes towards including SEND children in PE lessons over the past four decades. Further research is clearly needed to assess more rigorously the factors affecting, not only teacher present attitudes, but also attitudinal formation over time.





# Self-perceptions as predictors of sustained participation in physical education among adolescents

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#### Disease prevention and management

Purpose: Perceptions of one's physical self – a sub-domain of global self-concept – are particularly important when considering physical activity engagement, in that individuals who feel more positively about their physical appearance are more likely to engage in physical activity behaviour for purposes of self-enhancement. The association between self-perceptions and physical activity has focused almost exclusively on sport and leisure-time physical activity, precluding an understanding of the high school physical education (PE) context. This is despite the dramatic declines in PE participation that are reported once PE is made optional after Grade 9 in Canadian high schools. As such, the purpose of this research was to examine the influence of self-perceptions (i.e., physical appearance, global self-concept) in Grade 9 on sustained (i.e., participation status when optional) in PE among high school students in Grades 10 and 11.

Methods: The present sample was drawn from the longitudinal COMPASS study and consisted of a 3-year linked sample of students in Canadian secondary schools (n = 867) in Grades 9, 10, and 11 (Years 2016-2018). Self-reported measures included physical appearance perceptions and global self-concept at each year, and optional participation in PE class assessed in Grades 10 and 11. Longitudinal regression models were used to test the effects of self-perceptions (i.e., physical appearance, global self-concept) on the likelihood of physical education class participation in grades 10 and 11, adjusting for grade 9 race/ethnicity and school area median household income.

Results: As hypothesized, adolescents with positive evaluations of their physical appearance in Grade 9 ("True": OR = 1.10, 95% CI: 0.95-1.27; "Mostly True": OR = 1.14, 95% CI: 1.01-1.30) were more likely to remain in PE class, compared to those with negative evaluations of their physical appearance.

Conclusion: Adolescents that perceived their physical appearance more negatively while enrolled in PE were more likely to disengage from PE participation once no longer mandatory. This preliminary data suggests that future institutional efforts should focus on creating positive opportunities for promoting positive self-concept in Grade 9, in order to keep adolescents engaged in PE throughout high school.





# Review, reflection and prospect of China's policies on adolescent physical health in China since 1979

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#### Policies and environments (SIG)

Background: Over the 40 years since the reform and opening-up, China's policies on adolescent physical health have undergone four stages: adjustment and recovery (1979-1986), perfection and standardization (1987-1996), reform and deepening (1997-2006), top-level design and collaborative innovation (2007-2017), and besides, the policies have been upgraded and perfected along with the development of the times. Nevertheless, test data on Chinese students' physical health suggest that teenagers' physical health is still confronted with a grim situation.

Methods: This paper collects and sorts out the policies and regulations on adolescent physical health from January 1, 1979, to December 31, 2018. Sources include the China Sports Yearbook 1979-2016, the Compilation of Sports Laws and Regulations of the People's Republic of China: 1989-1992, the Compilation of Sports Laws and Regulations of the People's Republic of China: 1993-1996, the Compilation of Sports Laws and Regulations of the People's Republic of China: 1993-1996, the Compilation of Sports Laws and Regulations of the People's Republic of China: 1993-1996, the Compilation of Sports Laws and Regulations of the People's Republic of China: 1993-1996, the Compilation of Sports Laws and Regulations of the People's Republic of China: 2009-2014, the Ten Years of Chinese Sports Legal System: 1995-2005, etc. Meanwhile, this paper makes use of the database of China Law and Regulations Network to search and supplement relevant policy documents.

Findings: the inherent limitations of policies result in target deviation, value displacement and effect deviation; poor policy execution mechanism results in poor coordination, insufficient motivation and ineffective supervision; the selfishness of the target group results in insufficient policy identification, deviation from the direction and low effectiveness; the change of examination-oriented education system and modern lifestyle leads to a weak environment for policy execution. To further perfect the policies associated with the physical health of Chinese teenagers, it is urgent to enhance the effectiveness of policy execution.

Conclusions: It is necessary to set up a strategic committee on the physical health of Chinese teenagers to plan the policy system for the physical health of teenagers as a whole; it is required to create a cross-border, linked and efficient policy execution mechanism and expand policy execution resources; it is essential to enhance the target group's policy identification and improve the policy execution environment.





## Sitting at work and adiposity in office and non-office settings

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Policies and environments (SIG)

#### Purpose

Findings on relationships between sitting time at work and cardio-metabolic risk are mixed. We examined associations of occupational sitting time with adiposity measures for workers in office and non-office settings.

#### Methods

Data were from 6146 full-time workers in the 2014–15 Australian National Health Survey, categorised into those who mostly sit in office settings (office sitters, n=2705), who mostly sit in non-office settings (non-office sitters, n=523) and who mostly stand, walk or engage in physical labour at work ('others', n=2918) based on occupation group and predominant work activity. Linear regression models examined associations of measured waist circumference and body mass index (BMI) with self-reported time spent sitting at work for each of the three groups, who were further stratified by gender and physical activity level.

#### Results

Longer sitting time at work was associated with greater waist circumference in office sitters: one additional hour/day of associated with 0.40 cm greater waist circumference sitting was (95%CI: 0.03, 0.78; p=0.037). However, the relationship was not significant for non-office sitters nor for 'others'. Gender-specific analyses among office sitters found significant sitting-time associations with waist circumference in men but not in women. Stratified analyses also found significant associations in those with <150 min/week of leisure-time physical activity but not in sufficiently active office sitters. For BMI, no significant associations were found for any groups.

#### Conclusions

We found differential associations of workplace sitting with waist circumference across work settings. Occupational sitting was detrimentally associated with waist circumference in office workers (particularly men and those with insufficient leisure-time physical activity) but not in non-office workers. Possible explanations include different ways sitting time is accumulated during work hours between subgroups who may differ in job autonomy and in physical and social work environments. Further research is needed to better understand how associations of workplace sitting with adiposity may be related to differences in occupation and workplace contexts and why occupational sitting can be associated with abdominal adiposity but not with BMI.





# Relative Perceptions of Physical Activity: Is meeting social standards associated with mental health?

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Other

Purpose: Participation in physical activity (PA) is shown to play a role in predicting a variety of mental health outcomes, including lower levels of anxiety and depression, and improved mental wellbeing. While objective participation in PA is beneficial, some literature suggests individual's perception of their engagement in a socially-valued health behavior– relative to others – can independently influence health outcomes. Relative self-perceptions are driven largely by social influence and tend to draw on comparisons to similar reference groups, whereby individuals may have more adaptive psychological function when they perceive themselves to be attaining social standards. Despite theoretical assertions, limited examination on how relative perceptions of PA – beyond the effects of actual PA engagement – may relate to mental. As such, the present study explored the relationship between relative perceptions of PA status and indices of mental health.

Methods: Participants (n = 374, Mage -= 60% between 18 - 24, SD = 1.83) completed a cross-sectional survey. In addition to demographics and a purpose-built item evaluating relative perceptions of PA status; the Godin Leisure-Time Exercise Questionnaire, Centre for Epidemiologic Studies Depression Scale, State-Trait Anxiety Inventory, (STAI) and Warwick-Edinburgh Mental Well-being Scale were administered. A one-way between-subjects MANCOVA was conducted to examine the effect of relative perceptions of PA status on depression, anxiety, and mental wellbeing while controlling for reported PA levels.

Results/Findings: In the overall model, depressive symptoms, trait anxiety symptoms, and wellbeing were significantly related to relative perceptions of PA status (F(24, 986.70) = 1.582, p = .038, Wilks'  $\Lambda$  = .896, partial  $\eta$ 2 = .036). Significant main effects were found for depressive symptoms (F (8, 342) = 3.08, p = .002 partial  $\eta$ 2 = .067), trait anxiety symptoms (F (8, 342) = 2.85, p = .004 partial  $\eta$ 2 = .063), and mental wellbeing (F (8, 342) = 2.90, p = .004 partial  $\eta$ 2 = .064), when controlling for reported PA levels.

Conclusion: Preliminary findings suggest an individual's perceptions of PA status relative to others has a significant effect on their mental health – beyond the actual levels of PA engagement. Utilizing a social comparison framework may provide further understanding into PA and mental health.





# Comparing apples and oranges; examination of varying approaches for development of food insecurity measures across the United States and Australia

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Other

Purpose: Research in behavioral physical activity and nutrition is occurring in countries across the globe, often in parallel tracks, yet collaboration between nations is encouraged. This presentation will elucidate the experiences of researchers from Gretchen Swanson Center for Nutrition in the United States (US) and Deakin University in Australian (AU) as they work together to develop an international food insecurity measurement tool. Specifically, we will address formative stages of this partnership, including similarities and differences among approaches.

Methods: Development of common metrics related to food insecurity and pilot testing are occurring in 2020 and will be presented at a later date. The focus of this presentation will be on the observations of the US and AU research teams during the formative phases of building an international research collaboration.

Results: The formative phases of this project have presented a unique "natural experiment" and opportunity to discern variation as well as congruence of approaches related to food insecurity research methodology and institutional processes. To date, distinctions in funding allocation and contracts, ethics requirements, sampling, recruitment, data collection, and data safety and management have been identified as details that require further exploration when compared to traditional single country collaborations. In addition, we found that the US and AU researchers generally conceptualize and develop food insecurity measurement tools in different ways. For example, identifying constructs and how these are operationalized have country-specific needs (e.g., sociodemographics such as race/ethnicity are measured and emphasized differently).

Conclusions: International (multi-institute and transdisciplinary) collaboration is often encouraged, but the variation in research methodology and project management may present issues that need to be overcome for optimal results. Considerations for processes to establish and maintain effective international collaborations among researchers from similar nations (e.g., developed, English-speaking countries) will be detailed for further dissemination.





# Physical activity and passive pastimes as risk markers for obesity in Grade 7 learners: NW-CHILD study

#### Dr. Barry Gerber, Prof. Anita Pienaar

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#### Motivation and behavior change (SIG)

Purpose: Physical inactivity and increased sedentary time in children are often linked to health risks like overweight and obesity. Limited information is available regarding this health risk behaviour and body composition of South African children during later childhood. Therefore, the purpose is to assess the relationship between body composition and low physical activity levels and also between body composition and sedentary behaviour in Grade 7 learners living in the Northwest Province of South Africa.

Methods: This study formed part of the NW-CHILD longitudinal study. Grade 7 learners (N=587, mean age 12.92±0.42, boys=302, girls=282, white=151, black=433, children from low (N=346) and high socio-economic schools (N=238) that were part of the 2016 measurements participated in the study. Fat percentage and BMI was used as body composition characteristics. PA levels were assessed with the PA Questionnaire for Children (PAQ-C) and sedentary behaviour by means of the Sedentary Behaviour Questionnaire. Descriptive and a non-parametric Spearman Rank Order Correlations we used (Statistica for Windows). Relationships were considered practically significant by applying the following cut-off values: 0.1 (small), 0.3 (medium) and 0.5 (large) were received.

Results/Findings: A percentage of 18.01% overweight and obesity were found in the group. A small percentage (10.79%) of the group was low active, while 58.56% were moderately active. Small relationships were established between BMI and fat percentage and physical activity which were influenced by race, gender and socio-economic status. Total sedentary time also showed small, although higher correlations with fat percentage compared to with BMI, which was influenced by television viewing hours, travelling time and by other sedentary technologies. High socio-economic status (SES) and girls showed the highest negative influence on the relationship between sedentary behaviour during the week and weekend.

Conclusion: South Africa is not excluded from the risks of increased sedentary behaviour and decreased physical activity and the relationship of these behaviours with increasing obesity. Health practitioners such as Kinderkineticists are therefore important to assist children to receive adequate opportunities to be physically active.




# Environmental, social and structural constraints for health behaviour: Perceptions of young urban black women during the preconception period - A Healthy Life Trajectories Initiative (HeLTI)

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#### Disease prevention and management

Purpose: Obesity and non-communicable disease are rapidly increasing in sub-Saharan Africa. Prevention efforts are critical, particularly for women preconception to maximise intergenerational effects. We sought to examine perceptions of health, and everyday factors that influence nutrition, exercise, and other health behaviours.

Methods: Young nulliparous women aged 18-24 years recruited using snowball sampling. Four focus groups each with 6-10 participants were conducted in Urban Soweto, South Africa, using semi-structured interview guides . to understand health behaviours of young women during the preconception period, and barriers and facilitators to these behaviours. Following inductive thematic analysis, data were further interpreted within the theoretical framework of the Behaviour Change Wheel (BCW).

Results: The findings suggest that, in this urban African township, young women understand the importance of a healthy diet and physical activity but lack knowledge on the impact of overweight and obesity on health and disease. The data suggest an obesogenic environment where structural, and social factors strongly influence young women's health choices, and limit their capacity for behaviour change.

Conclusions: Interventions to improve young women's diet, physical activity and health must recognise: (i) the home and social contexts as a source of both role models and barriers to change; (ii) the current normalisation of obesity; and (iii) contextual issues of safety and violence within the community. Better understanding young women who strive to overcome these barriers to health in the community could be hugely beneficial.





# Trends in the nutritional quality of fast food burger restaurant menu items in the US from 2012-2016

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### Policies and environments (SIG)

Objective: Fast-food restaurants have received some positive attention in recent years for introducing healthier menu items. However, fast food remains generally high in calories, fat, sugar and salt, and the extent to which the nutrition profile of fast-food restaurant menus has changed in advance of national menu labeling in the US is unknown.

Methods: We use data from 2,472 food items on the menus of 14 top-earning burger fast-food chain restaurants in the US, available from 2012-2016. Data were obtained from the MenuStat project and analyzed in 2019. The Nutrient Profile Index (NPI) scores were estimated and used to categorize foods as healthy ( $\geq 64/100$ ). Generalized linear models were used to examine mean NPI scores and the proportion of "healthy" menu items among items offered in all years (2012-2016) and items offered in 2012 only compared to items newly introduced in subsequent years.

Results: Overall, less than 20% of menu items were classified as healthy with no change from 2012-2016 (p=0.91). Mean NPI score was relatively constant across the study period among all food items ( $\approx$ 50 points, p=0.59) and among children's menu items ( $\approx$ 56 points, p=0.73). The only notable change in NPI score or in proportion of healthy items was in the direction of menu items becoming less healthy. NPI scores for appetizers and sides newly introduced in 2015 were 13.69 points lower than appetizers and sides on the menu in 2012 only (p<0.001) and appetizers and sides introduced in 2016 were 9.13 points lower than 2012 items (p=0.02).

Conclusions: Top burger fast-food restaurants have not improved the nutritional profile of the items on their menus overall, among core menu items, among newly introduced items, or on children's menus. To make positive changes, restaurants will have to make larger changes to the nutritional composition of the foods they offer.





# Apalachee high school sleep education campaign: Factors influencing teenage sleep

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Motivation and behavior change (SIG)

Purpose: The purpose of this study was to inform the development of a sleep education campaign to improve sleep duration and quality among high school students.

Methods: Twelve focus groups were conducted in a peri-urban high school in central north Georgia with students, parents/primary caregivers, and teachers and counselors to discuss the barriers and facilitators to teenage sleep duration and quality. Students were identified through systematic sampling using the school's listserv to identify every 4th student for each grade level for a total of 50 students across 8 focus groups. Convenience sampling was used to invite caregivers through email and 17 caregivers participated across 2 focus groups. The high school principal identified school personnel to ensure representation across grade levels for a total of 12 participants across 2 focus groups. Questionnaires were completed by all of the participants prior to beginning the focus group discussion to obtain information about demographics, sleep knowledge and behavior, and typical student sleep patterns. Focus group discussions covered topics related to identifying barriers and facilitators of sleep, including: school activities, interpersonal conflict, homework, technology, work, napping, and stress.

Results/Findings: Demographics of focus groups participants mimicked the distribution of the entire school's existing demographics. Questionnaire results indicate that approximately half of students are getting  $\leq 6$  hours of sleep on a typical school night (50%) and are using some form of technology to fall asleep (54%). Slightly more than 50% of caregivers perceived that their child (student) received  $\leq 6$  hours of sleep on a typical school night. Almost 70% of school personnel perceived that students received  $\leq 6$  hours of sleep on a typical school night. Thematic analysis of the focus group sessions is currently underway and will be completed in early 2020.

Conclusions: Preliminary data indicates that more than half of the students in this school lack sufficient sleep and that technology plays a role in the sleep routine for most students. Further analysis of the qualitative data will provide insights into the school-based strategies most likely to have a positive impact high school students' sleep duration and quality.





# Physically Active Black women with Cardiometabolic Conditions: Associations between Physical Activity Characteristics, Health and Fitness

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Disease prevention and management

Purpose: Physical inactivity may contribute to disparities in physical activity (PA) behavior and health among Black women. Achieving PA benefits requires long-term engagement. Leveraging behavioral and cognitive aspects of individuals who regularly perform PA may provide an understanding of maintenance-specific determinants of PA, among this group. This study examined associations between PA characteristics (dose, maintenance, and intensity) and (1) health condition prevalence, and (2) perceptions of health and fitness.

Methods: Black women with health conditions currently maintaining PA (persistent behavior >6 months) completed a web-based survey and self-reported leisure-time PA dose (amount per week), PA maintenance ( $\leq 2$  years vs. >2 years), PA intensity (perceived PA effort per session assessed by the Borg scale), existing health conditions (i.e., obesity, diabetes, high blood pressure (HBP), high cholesterol, polycystic ovarian syndrome, and cancer), and perceived health and fitness. Associations between PA characteristics, health conditions, and self-rated health and fitness were examined with multinomial logistic regression analyses, controlling forage, income, education, body mass index, and intensity.

Results: Of the 103 participants, 72.8% reported having  $\leq$ 3 conditions (27.2% with  $\geq$ 2 conditions); 43.7% reported having HBP and 37.9% reported having obesity. PA dose was not associated with any outcomes. PA maintenance was associated with having obesity (adjusted relative risk (RR) [95% confidence interval]: 0.35 [0.14 - 0.89], p=0.03). PA intensity was associated with HBP (adjusted RR 0.70, 95% CI: 0.53 - 0.92, p=0.01) and having  $\geq$ 2 conditions (adjusted RR 0.72, 95% CI: 0.54 - 0.95, p=0.02). PA characteristics were not associated with perceived health and fitness.

Conclusions: A better understanding of the factors associated with PA maintenance among Black women has implications for reversing the cycle of physical inactivity and health disparities among Black women. Our findings suggest that strategies focusing on promoting consistent PA behavior and a high degree of effort per session may be more beneficial and efficacious than the amount of PA performed each week for Black women living with chronic health conditions. Future studies are needed to explore these associations further.





# Development of esports in Hong Kong: A study protocol

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#### Policies and environments (SIG)

#### Purpose:

The Esports market is a fast-growing industry worldwide, including in Hong Kong. Newzoo, the global leader in Esports, games, and mobile intelligence in 2017 estimated the Esports' economy would have a year-on-year growth of 41.3%. Responding to the rapid development of Esports, the Hong Kong Policy Address of 2017/18 described Esports as "a new sector with economic development potential". While reviewing Esports related literature, only a few studies in Hong Kong were open to the public. Existing study gaps were identified, including unrepresentative sampling, not theory-based, not in individual perspective (i.e. determinant of participating in Esports), and not data-driven. The current study aims to collect data on the participation in, recognition of, as well as attitude towards Esports in secondary school and university students as well as the general public.

#### Method:

This study will adopt the mixed-methods sequential explanatory design, consisting of two distinct phases: qualitative study followed by a quantitative study. Regarding the determinants of students participating in Esports, a pilot qualitative study through interview will first be conducted. This interview data together with the Theory of Planned Behaviour (TPB; Ajzen,1991) the construct will be used to develop the instruments of the quantitative study. The TPB construct includes the elements of behaviour, intention to participate, attitude, subjective norms and perceived behavioural control. The determinants will be revealed through Structural Equation Modelling, in which approximately 1600 sample size is required. Senior form secondary schools students will be invited using stratified random sampling according to the 18 districts, and the university students will be recruited randomly from the 8 Government-funded universities. Moreover, a tele-survey with a sample size of 1551, targeting Hong Kong Chinese general public aged 15 or above, will be used to examine the public's understanding of Esports. The survey items include but not limited to their understanding, perception and attitude towards the governance structure and development of Esports.

#### Conclusion:

The results of this study will help identify the determinants of students' participation in Esports. It will also identify the possible health problems induced by intensive participation in Esports and recommend measures, supporting system, and policy for regulating its development among students in Hong Kong.





# Economic evaluation of an affordable technology-based physical activity intervention to improve physical activity levels and mobility outcomes in rehabilitation units

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### e-&mHealth (SIG)

Purpose: The Activity and MObility UsiNg Technology (AMOUNT) rehabilitation trial was the first pragmatic randomised trial to investigate the effects of exercise using affordable technology to increase physical activity and mobility of patients admitted to hospital rehabilitation units. The trial found that performance-based mobility assessed with the Short Physical Performance Battery (SPPB) (0-3 continuous score) was significantly better in the intervention group than the control group (mean between-group change score 0.2 points; 95% CI 0.1 to 0.3; p= 0.006) over the 6 month trial period. However, the cost-effectiveness of this program is yet to be determined. The aim of this study is to investigate the trial-based cost-effectiveness and cost-utility of the physical activity intervention investigated in the AMOUNT trial.

Methods: This is a cost-effectiveness and cost utility analysis conducted alongside the AMOUNT trial, in which a total of 300 people receiving inpatient rehabilitation were randomised to the physical activity (technology enhanced mobility and physical activity plus usual care, n=149) and usual care control group (n=151). A health and community care funder perspective was used. Data were collected on health (from hospital records) and community service use (from calendars), using local or national costs as appropriate. The costs of intervention delivery were also calculated from trial records. All data is available, and we are finalising data analysis, which was specified a priori. Using the mean costs and the mean health outcomes in each trial arm, the incremental cost per 1) additional person achieving an improvement greater than the median SPPB change score, 2) QALY gained of the intervention group compared with control group at 6 months will be calculated. Bootstrapping will be used to estimate a distribution around costs and health outcomes, and to calculate the confidence intervals around the incremental cost-effectiveness ratios. Robustness of the results will be assessed through sensitivity analyses.

Results: The mean cost of the intervention was AUD 1,892 per patient, including costs associated with training, equipment and staff time. Full results will be available for presentation at the conference.

Conclusions: This study will contribute to the scarce cost-effectiveness evidence on physical activity interventions for people with mobility impairments.





# The PAC App: Uptake and adoption of a national physical activity tracking app

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### e-&mHealth (SIG)

Purpose: ParticipACTION is a national, physical activity (PA) social marketing organization. In February 2019, it launched a mobile PA app (PAC app) interlinked with a community challenge (CC) to find Canada's most active community (June 2019). The app syncs to phone health apps and commercially available PA tracking devices. With content and features informed by the behaviour change wheel it guides users in increasing PA. The CC facilitates opportunities for PA through participation in community events. Communities compete to track the most PA over 3 weeks using the app. The purpose of this study is to examine uptake and adoption of the PAC app in its first six months and examine if the CC increased app uptake and adoption.

Methods: A naturalistic observational study design was employed over the first 6 months of the app's existence to determine uptake and adoption. User engagement metrics were recorded through the app analytics. Descriptive analyses were conducted.

Results: In the first 6 months, 117,765 users downloaded the app and 74,540 participants completed onboarding (self-reported PA). App users were  $46.7\pm12.8$  years old and 80% female. An average of  $\sim 2,869$  users completed onboarding each week. Average user engagement, defined as opening the app at least once, was  $\sim 9,551$  users/week. Of these users, an average of 8,447 users/week have device-recorded PA data recording a total 18.8 $\pm 6.3$  min of MVPA/day and 128.2 $\pm 40.3$  min/week of MVPA during the 6 months. App use increased with the launch of the CC but was not sustained. Onboarding peaked the week before the CC at 12,018 users/week and engagement peaked during the first week of the CC at 20,775 users who recorded 20.0 min of MVPA/day and 140.5 min/week. App engagement declined by 37% in the week following the challenge and returned to pre-CC levels by 3-weeks post-CC.

Conclusions: This 6-month natural observation of the PAC app revealed significant reach and uptake of the app; however, long-term engagement was not sustained. Community challenges may increase app uptake and engagement, though user retention requires further investigation. The PAC app is continually evolving, and ongoing evaluation will identify improvements in user engagement and retention.





# A systematic review of interventions to improve the dietary intake, physical activity and weight status of children attending family day care services

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### Early care and education (SIG)

Purpose: Healthy eating and physical activity interventions in early childhood education and care settings have the potential to reduce the prevalence of childhood obesity and its associated short and long-term health conditions. Research in this area has largely focussed on centre-based services, however, there is an emerging body of literature in family day care. The aim of this study was to i) identify and synthesise findings from interventions to improve the dietary intake, physical activity and weight status of children aged 0-6 years attending family day care services; and ii) assess the impact of interventions on family day care environments, intervention cost and adverse outcomes.

Methods: Medline in Process, PsycINFO, ERIC, Embase, CINAHL, CENTRAL and Scopus databases were searched March 2019. Studies were included if they i) evaluated an intervention to improve the diet, physical activity and/or weight of children aged 0-6 years; ii) were delivered in family day care services; iii) targeted child diet, physical activity and/or weight and; iv) used a parallel control group design. Screening, data extraction and risk of bias was undertaken by two reviewers with disagreements resolved by a third reviewer.

Results/findings: In total, 8,977 titles were retrieved, and 199 full-texts reviewed. No studies met the inclusion criteria for the primary outcome, however two studies reporting on the secondary outcome of family day care environments were included. The four year community-wide obesity prevention program, and the 12-month train-the-trainer program both reported statistically significant improvements in the healthy eating and physical activity environments of family day care, compared to cross-sectional state average control groups. Neither study reported intervention costs or adverse outcomes. Two ongoing studies measuring outcomes at child levels were also identified.

Conclusions: Findings indicate that healthy eating and physical activity interventions can be effective in improving family day care environments. Few existing studies were eligible for inclusion, highlighting a need for high quality, controlled trials to identify effective strategies to improve children's diet, activity and weight in this setting. Future intervention research reporting child dietary intake, physical activity and weight status is required to assess impact on children's health behaviours.





# Muscle-strengthening exercise and depressive symptom severity among a nationally representative sample of 23,635 German adults

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Other

Purpose: There is strong evidence that physical activity is associated with lower likelihood of depression. However, most existing studies have investigated aerobic physical activity (e.g. walking/running), with few population studies examining the association between muscle-strengthening exercise (push ups, using weight machines) with depression. The aim of this study is to examine associations between weekly frequency of muscle-strengthening exercise and depressive symptoms among a representative sample of German adults.

Methods: Cross-sectional analyses were conducted on the 2014 German Health Update, a population-based crosssectional health interview survey conducted by the German Federal Ministry of Health. Previously validated questionnaires were used to assess muscle-strengthening exercise (European Health Interview Survey Physical Activity Questionnaire) and depression symptom severity (eight-item Personal Health Questionnaire Depression Scale). Generalized linear models with Poisson regression with a robust error variance were used to assess prevalence ratios of depression symptom severity (mild, moderate, moderately severe/severe) across weekly muscle-strengthening exercise frequency (None [reference]; 1, 2, 3-4 and  $\geq$ 5 times/week), adjusting for potential cofounders (e.g. age, sex, socioeconomic status, self-rated health, smoking, hazardous alcohol consumption, aerobic exercise).

Results: Data were available on 23,635 adults ( $\geq$ 18 years)(response rate = 27.6%). When compared with those reporting no muscle-strengthening exercise, for all levels of depressive symptom severity, there were reduced adjusted prevalence ratios (APR) across all muscle-strengthening exercise frequencies. Compared to the higher muscle-strengthening exercise frequency groups (3- $\geq$ 5 times/week), the prevalence ratios (APR range: 0.53-0.85) were similar among lower frequency groups (1-2 times/week) (APR range: 0.46-0.85). All associations remained after adjustment for sociodemographic, lifestyle characteristics and aerobic physical activity.

Conclusion: Among a large sample of German adults, muscle-strengthening exercise was associated with a lower likelihood of depressive symptoms severity. Although longitudinal studies are needed to better understand the direction of associations, our preliminary epidemiological evidence suggests that small-to-moderate increases in muscle-strengthening exercise at the population-level are likely to positively contribute to reducing of the significant public health burden of depression.





# The Effect Text Messaging Interventions on Promoting Physical Activity: A Systematic Review of Randomised Controlled Trials

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e- & mHealth (SIG)

Background: Cardiovascular disease (CVD) is the leading cause of mortality worldwide, with physical inactivity being a modifiable risk factor for CVDs. Mobile health (mHealth) interventions have been shown to be cost-effective and successful in modifying behaviours of individuals in previous studies.

Aim: This study aims to assess the efficacy of adding text message interventions to activity tracker use on physical activity (PA) levels.

Methods: Using PRISMA guidelines, 4 electronic databases (MEDLINE, the Cochrane Central Register of Controlled Trials, EMBASE and PSYCINFO) were searched from their inception to June 2018. The Australian New Zealand Trial Registry and Google Scholar were also searched. Relevant studies with text message interventions focusing on promoting physical activity were identified. Two reviewers independently screened studies, data was extracted by one reviewer and cross-checked by a second reviewer. Trial quality was assessed by one reviewer.

Results: Of 96 records screened, only 4 randomised controlled trials were found to be eligible. Out of 4 studies, only 1 study demonstrated that daily text messaging in addition to self-monitoring of objectively measured step counts significantly increased physical activity levels. There was an overall decrease in step counts over the course of the studies in both control and intervention groups, the intervention groups experienced less of a decrease in step counts.

Conclusion: This review found that mobile phone text messaging might have a role in promoting physical activities. Future mHealth trials should aim to have larger sample sizes, longer study durations and collect similar data points in standardised units to provide robust evidence.





# Adherence to Pregnancy-Related Guidelines—Expectation vs. Reality—Results From The Canadian Electronic Maternal Health Survey.

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### Early care and education (SIG)

Purpose: Adhering to pregnancy-related guidelines can lead to better health outcomes for both mother and their offspring. Presently, adherence to physical activity (PA) and gestational weight gain guidelines throughout pregnancy requires further investigation. The purpose of this study was to examine the PA behaviours and weight gain patterns during pregnancy related to guideline adherence using a sample of Canadian women from the validated Electronic Maternal (EMat) Health Survey.

Methods: Using the 2019 Canadian Physical Activity Guideline (CPAG), PA guideline adherence was defined by intensity ( $\geq 2x$  high,  $\geq 3x$  medium, or  $\geq 4x$  low) and by frequency ( $\geq 3$  times/week), respectively. Adherence to IOM guidelines was based on pre-pregnancy body mass index (BMI) category (underweight, normal weight, overweight, and obese class) and whether gestational weight gained was within the recommended range. Multiple logistic regression analyses were conducted using IBM SPSS ver. 24. For both CPAG and IOM guidelines, adherence was the dichotomous outcome (met, unmet) for the logistic regression analyses, wherein statistical significance was defined at  $p \geq 0.05$ . Covariates deemed statistically significant at  $p \geq 0.1$  during univariate analysis were included in the regression model.

Results: A total of 1,046 new mothers with a singleton pregnancy in the last five years were included. Women who perceived themselves as overweight before pregnancy were 30% less likely to meet the 2019 CPAG by intensity (OR = 0.70, 95% CI = 0.51 - 0.95), by frequency of exercise (OR = 0.70, 95% CI = 0.52 - 0.94), and less likely to meet IOM guidelines (OR = 0.69, 95% CI = 0.50 - 0.95) relative to women who considered their weight category to be normal pre-pregnancy. Also, women who perceived themselves as obese before pregnancy were 46% less likely to meet the CPAG by frequency of exercise (OR = 0.30 - 0.99), relative to women with normal pre-pregnancy weight. Overall, nearly 75% of women failed to meet both sets of pregnancy-related guidelines.

Conclusion: The results of PA behaviours and weight gain patterns from the EMat survey suggest that most new mothers are unable to meet both sets of pregnancy-related guidelines.





# Using pre-service training in nutrition and health as an opportunity to improve the knowledge and attitudes related to weight amongst health educators and professionals

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<sup>1</sup>The University of Sydney, Camperdown, Australia

Other

#### Purpose

Health and obesity related knowledge possessed by health professionals during higher education is known to influence their professional practice and treatment of individuals under their care. This includes pre-service dietitians, doctors, school educators and allied health professionals whose roles involve health and nutrition education on a daily basis.

Amongst this group of professionals, nutrition knowledge has been shown to be lower than professional practice requires and weight related attitudes are negatively skewed towards individuals are at a higher weight. Common perceptions of overweight and obese individuals are that they are lazy, unmotivated, have poor hygiene and low intelligence and are responsible for their weight due to a lack of willpower and poor food selection. Without appropriate levels of knowledge or skewed attitudes, the professional practice and accuracy of health education provided risks being affected.

Whilst previous research has measured and treated nutrition knowledge and weight-based attitudes amongst preservice health educators, an intervention targeting both factors simultaneously had not been completed. The study presented addressed this gap through the design and implementation of a higher education based intervention that aimed to increase nutrition knowledge and decrease negative weight based opinions.

### Methods

Spanning 12 weeks, the intervention was embedded in lectures and tutorials of an elective offered to higher education students (n=111) and enrolments included health, non-health and education related degrees. The intervention was based on theoretical frameworks including Health At Every Size and Fitness not Fatness that take a holistic approach to health education. Baseline and post-test measures of nutrition knowledge and weight bias were conducted to determine the effectiveness of the intervention.

### Results

A series of t-tests on baseline and post-intervention scores revealed that nutrition knowledge increased by 8% (p<.05), the degree of weight bias decreased by 9 points (p<.05) and degree of fat stereotyping decreased by 33% (p>.05).

### Conclusions

These results indicate that the design and implementation of the intervention were moderately successful. Applications of this intervention design extend for use in specific groups of health educators or professionals like dietitians if content is contextualised and tailored to each group's specific learning and professional practice needs.





# Objective neighborhood crime moderates an mHealth physical activity intervention in the US

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Motivation and behavior change (SIG)

Purpose: Neighborhood crime is a potential barrier to increasing physical activity (PA). Few studies designed to increase PA have examined the relationship between participants' neighborhood crime rates and the success of the intervention.

Methods: Insufficiently-active adults were recruited from Phoenix, Arizona, USA neighborhoods stratified by four types (high vs. low walkability x high vs. low SES). Participants (n=337, 63.2% female, aged 18-60) were then randomized into a 2 (immediate vs. delayed financial reward) x 2 (adaptive vs. static goal setting) factorial design to promote PA over 1 year. Self-reported walking for transportation and leisure in the last week were measured using the International Physical Activity Questionnaire (IPAQ) at baseline, 6, and 12 months. Objective crime incidents (N=139,154) including violent (murder and nonnegligent homicide, rape, robbery, aggravated assault) and property (burglary, vehicle theft, larceny and arson) were measured using police incident report data from the year prior to randomization date. Crimes were geocoded and total crime rates estimated within 1km of participant households using GIS-calculated street network buffers. Crime rates were z-scored for the region.

Negative binomial hurdle models examined the effects of crime and the intervention on self-reported walking after adjusting for baseline activity, SES, and neighborhood walkability. Two submodels were estimated: a logistic regression examining likelihood of reporting any walking (versus none), and a zero-truncated negative binomial regression estimating total number of non-zero minutes walked. Transportation and leisure walking were analyzed separately.

Results/findings: Overall, both leisure and transportation walking increased over the course of the intervention. A significant 3-way interaction was observed across reward type, goal type, and total crime for the leisure walking count model (p=.02), with intervention effects on PA moderated by crime level. There were no significant 2- or 3- way interactions for transportation walking. Block-level SES independently predicted transportation walking minutes in the count model.

Conclusions: Total crime rate moderated the effects of reward and goal type for walking for leisure, but not transportation. The complex interplay between crime and intervention components on leisure walking will be discussed.





# How completely are school-based physical activity interventions described in research reports?

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Other

Purpose: Incomplete descriptions of interventions are a barrier to evidence use and are a common problem in reports of randomised controlled trials, but no study has investigated the extent of this in public health physical activity interventions. This study aimed to evaluate the completeness of the descriptions of school-based physical activity interventions in a representative sample of research articles.

Methods: We searched PubMed from May 2012 to May 2017 to identify studies investigating the effects of population-level physical activity interventions in school settings. We included experimental and quasi-experimental studies where the physical activity intervention was compared to a control intervention. The completeness of intervention description for both groups was investigated using the Template for Intervention Description and Replication for Public Health and Policy (TIDieR-PHP) checklist, a 11-item checklist aimed to provide guidance on complete intervention reporting.

Results: Our search yielded 589 articles, with a total of 68 articles included after full-text assessment. Overall the level of intervention description was low. For intervention groups, only 4 articles (6%) reported all 11 items in the TIDieR-PHP checklist, and 12 (18%) articles did not describe at least half of the items. Reporting was worse for control groups, no article reported all items and 51 (75%) articles described less than half of the 11 items in the TIDieR-PHP checklist. The least frequently reported items were "Materials (description of any materials used in the intervention)", "Unplanned variation" and "How well (fidelity and adherence)". The most commonly reported items across articles were "Brief name" and "Why (rationale of the intervention)".

Conclusions: Descriptions of interventions in articles investigating school-based physical activity programs are typically incomplete. Insufficient intervention information hinders replication and is a source of research waste. Authors and journals should provide complete descriptions of interventions, so research users such as policy-makers and other decision makers are well equipped to reliably translate effective interventions to other settings. Better reporting of physical activity interventions will contribute to reducing the current research-to-practice gap, where only a minority of useful and effective interventions move from research to practice.





# Planning for active office intervention in Thailand: university employees' survey and in-depth interview

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Motivation and behavior change (SIG)

#### Purpose:

Decreasing sedentary behavior (SB) in the workplace is an important objective of health promotion. In Thailand, SB is a novel issue and lack of studying. This study aimed to explore office workers' knowledge, attitude, barriers, and strategies to develop an intervention to reduce occupational sitting time in university employees.

#### Methods:

A Mixed-methods approach was used, 48 non-academic office workers were recruited and surveyed. The Past-day Adults Sedentary Time-University (PAST-U) and workplace Sitting Break (SITBRQ) questionnaire were used to measure SB level, sitting bout, frequency, and duration of sitting interrupted in 1 hour and whole working hours SB break. An in-depth interview was used to recognize potential multi-component SB intervention strategies and barriers. Workplace environmental factors was also observed.

### Results:

Participants were females (n=26) and males (n = 13), aged  $44 \pm 10$  years, worked for five days a week. Participants spend the common of their days in SB (66.6%), especially in the workplace, SB accounted for 77.87% of work-hours (8h). Most participants had 2-hour sitting-bout, 2-time breaks from work in 1 hour and 5 mins of light physical activity, 3-5-time breaks from work a day, and had 10-19 mins of physical activity during working hours. The interview indicated that interventions for reducing sitting time in workplace at organization level should include administrators' policies for supporting and providing facilities, a campaign message to modify organizational culture, behavior, and environment related with SB. At individual level, SB interventions should enhance individual's knowledge, motivation, tools, and peer support. This workplace lack of physical and material environments supported to reducing SB in the work setting.

### Conclusion:

Office workers spent most of their time in SB. An intervention should include policy statements to change culture, behavior, and environment. Office workers should be enhanced knowledge and behavioral change strategies to reducing SB in workplace.





# Utilizing fidelity to assess the effectiveness of a comprehensive professional development model on undergraduate students teaching food literacy

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Other

Purpose: To determine if undergraduate student participation in a comprehensive professional development model (CPDM) during a cross-age teaching internship results in the delivery of experiential food literacy education with adequate fidelity

Methods: Undergraduate students (n=15) from two universities attended a three-day workshop on learnercentered, experiential education and inquiry-based facilitation strategies. Undergraduates engaged in experiential professional development by observing and facilitating lessons from the learner-centered curriculum Teens CAN: Comprehensive Food Literacy in Cooking, Agriculture, and Nutrition. Throughout the training, undergraduate students engaged in reflective practice. Additionally, they were trained to collect lesson fidelity observations. Based on previous research, 80% fidelity to lesson procedures was considered adequate to achieve intended student outcomes. Upon completion of the training, undergraduates began teaching Teens CAN to adolescents through afterschool programs in underserved communities. Two undergraduates co-facilitated each lesson and five observed and recorded lesson fidelity using structured observation sheets. Fidelity scores were calculated for each lesson and lesson components. Scores were converted to percentages for the average overall delivery. Inter-rater reliability was assessed to determine the level of consensus between observers.

Results: Seven of 12 lessons from Teens CAN have been implemented thus far. Preliminary results indicate that fidelity for all lesson components exceeded the 80% threshold associated with measurable student outcomes. Additionally, preliminary results indicate that average fidelity of lesson implementation was 96%. Furthermore, the five lesson observers had high agreement with an inter-rater reliability of 0.94.

Conclusions: These findings suggest that the CPDM may be effective in preparing undergraduate students to deliver learner-centered lessons with high fidelity. The strong inter-rater reliability also suggests that there is consistent understanding between undergraduate students on what is required to successfully implement the lessons. Development of a CPDM for undergraduate students that results in lesson fidelity exceeding 80% has the potential to broaden the reach of health-focused programming delivered by agencies with limited staff working in underserved communities. Future assessments include self-efficacy for teaching cooking, nutrition, and agriculture and self-perceived improvements in efficacy over time.





# International approaches to regulatory governance of population nutrition: a review of the evidence from food policies

#### Dr. Yandisa Ngqangashe, Prof. Sharon Friel<sup>1</sup>

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### Policies and environments (SIG)

Purpose: Creating healthier food environments through cross-cutting food policies is one of many ways premature mortality from diet-related non-communicable disease can be reduced. There is an increasing number of studies evaluating the outcomes of food policies, but there is paucity of research on the regulatory attributes of these policies and how these affect policy outcomes. Our study seeks to systematically examine the governance arrangements in formulating and implementing food reformulation, food taxation, food labelling, and food marketing policies.

Methods: Drawing on principles of agenda setting and regulatory theory, we are conducting a systematic review literature on regulatory attributes of food policies with regards to how these food policies come about, the regulatory approaches and governance processes used in formulating and implementing these policies. After the review, we will use qualitative comparative analysis (QCA) to establish associations between these regulatory attributes and food policy outcomes.

Preliminary results: The actors that are emerging as drivers of food policies are consumer groups, public health interests groups, the food industry, government departments and opposition political parties. The actors use multiple strategies to push the policies forward, these strategies include scientific evidence, framing, litigation and lobbying. In the nutrition labelling, taxation and reformulation policy cases we have already reviewed, we observed a command and control regulatory approach whereby the government sets the standards, monitors and enforces compliance while the regulatory approach to the food marketing policies was a co-regulatory arrangement, whereby the government legislated a statutory body to monitor the food and advertising industries' food marketing codes.

Conclusion: More food policy attributes will emerge as we continue with our review. These will be used to create a typology of food policies that work.

Key words: food policies, environment, regulation, governance, population, nutrition





# College students' physical activity levels and situational motivation between dance-based active video games and aerobic dance

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Motivation and behavior change (SIG)

Purpose: The prevalence of physical inactivity remains high worldwide. Lack of motivation has been examined as one of the most cited reasons for not exercising. To better develop effective physical activity (PA) programs among young adults, the present study examined the effects of dance-based active video games (AVG) on Chinese college students' PA and situational motivation as the comparison with traditional aerobic exercise.

Method: Forty participants (33 female, Meanage = 21.6 years old, Standard Deviation = 2.1) completed two separate 20-minute exercise sessions with a 10-minute interval on the same day: (1) Xbox 360 Kinect Just Dance AVG session; and (2) traditional instructor-led aerobic dance. Participants' PA (sedentary, light PA [LPA] and moderate-to-vigorous PA[MVPA]) were measured by the ActiGraph GT9X Link accelerometers, and their situational motivation (SM) was assessed via the established Situational Motivation Scale following each session. This 16-item survey included four constructs: intrinsic motivation, identified motivation, external regulation, and amotivation. The dependent t-test was used to detect mean differences for all outcomes between the two sessions, with the significance level being set at p < 0.05.

Results: Dependent t-test indicated significant differences on participants' percent of time in LPA (t = -2.27, p = 0.03, Cohen's d = 0.31) and intrinsic motivation (t = -2.90, p = 0.01, Cohen's d = 0.44). Specifically, participants spent more time in LPA (M = 0.34, SD = 0.13) and had higher levels of intrinsic motivation (M = 5.69, SD = 0.99) in AVG session compared to aerobic dance session(M = 0.38, SD = 0.13; M = 6.08, SD = 0.75). There were no significant differences on other outcomes.

Conclusion: Although findings indicated participants in dance-based AVG had similar MVPA compared with aerobic dance, higher percentage of time spending in LPA and greater intrinsic motivation were observed during the AVG session. This suggests that AVG can be a motivational tool for promoting light intensity of PA and may facilitate the adherence to PA among Chinese college students.



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# Understanding the physical and psychological wellbeing of family Carers of serving men and women and Veterans.

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Other

Purpose: Carers often put their own needs behind the needs of those they care for; they also tend not to seek assistance for their own physical and psychological health concerns. This can place Carers at increased risk of illness and mental health issues. This mixed method study aimed to understand how habitual activity and health behaviours of Carers of Veterans related to Carers' physical and psychological well-being.

Methods: Participants (n=28) completed a six-minute walk test and surveys related to physical activity (IPAQ-SF) and psychological well-being (resilience, mental health continuum, psychological distress). Participants wore a GENEActiv accelerometer for seven days, to collect data on movement behaviour and sleep. Twenty-two Carers participated in a face-to-face interview, to examine barriers to Carers attending to their own physical and psychological well-being needs, as a means of contextualising the quantitative data. Descriptive statistics were produced and correlational analysis performed for quantitative data (IBM SPSS v25). Interview transcripts were uploaded to NVivo (QSR v12) and analysed, using a thematic analysis approach, to understand participants' experiences.

Results: Forty percent of Carers met physical activity guidelines. There were significant relationships between fitness and resilience (r=0.610, p=0.007), and MVPA and resilience (r=0.494, p=0.037). Carers who had higher scores for resilience were also fitter and did more PA. Carers with evidence of psychological distress slept more than Carers without psychological distress (r=0.525, p=0.025). Carers had higher psychological distress and lower fitness compared to population norms. Qualitative findings indicated that Carers did not always know where to find support to enable them to undertake their caring role and meet their own physical and psychological well-being needs.

Conclusions: Findings suggest a need for accessible and multi-faceted support services for Carers of Veterans, that target physical and psychological well-being. Translating these findings into meaningful interventions and strategies for Carers is the next step in this process. Programs designed to increase physical activity, build resilience, and reduce psychological distress may be beneficial for Carers, and should be developed, implemented, and evaluated within this population.





# Physical activity and sedentary time among youth in structured settings: A systematic review and meta-analysis

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Othe

Purpose: Youth should accumulate at least 30 minutes of daily recommended 60 minutes of moderate-to-vigorous physical activity (MVPA) during school hours. The purpose of this study is to conduct a systematic review and metaanalysis of the amount of time youth spend physically active and sedentary during different structured settings (Prospero number: 42018111804).

Methods: Observational and experimental/quasi-experimental studies (baseline data only) with full-text available, written in English and published in a peer-reviewed journal were included for analysis. Studies reporting objectively measured physical activity (light, moderate, or vigorous physical activity) and/or time spent sedentary (SED) during structured settings among youth (0 to 18 years) were eligible.

Results: A total of 190 studies (childcare n=62; school n=92; afterschool program n=14; summer camp n=4; and sport program n=18) from 30 countries (47.9% United States), representing 74,073 youth (3 to 16 years) were included. A High degree of heterogeneity was observed across the studies due to differences in study design, sample size and the protocol used to measure PA and SED. The meta-analyses revealed, on average, youth spend 248.3 min (68%) in SED and 31.5min (8.6%) in MVPA during childcare hours, and 220.5 min (60.1%) in SED and 27.8 min in MVPA at school. Youth attained proportionally higher levels of MVPA in afterschool programs (19.4%; 21.5 min), sport programs (31.4%; 16.7 min), and summer camps (13.4%; 56.2 min) when compared to school and childcare. Increased SED was observed as youth age (40min/h at age 3 to 55 min/h at age 5) in childcare and during school (32min/h at age 6 to 45 min/h at age 15), while MVPA did not decrease with age in both settings.

Conclusions: MVPA accumulated during childcare and schools hours seemed closed to the recommendation, despite high proportion of SED. Afterschool, summer camp and sport programs are important settings that can contribute to daily PA. Ensuring youth have access to these structured settings may be an important step forward for public health.





# Factors associated with treatment response and non-response in a lifestyle intervention for children and adolescents who are obese

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Motivation and behavior change (SIG)

Purpose: The present study aimed to determine the factors related to treatment response and BMI z-score change as a result of a lifestyle modification program for obese children and adolescents.

Methods: A total of 242 subjects participated in the Intervention for Children and Adolescent obesity via Activity and Nutrition (ICAAN) study. Participants were split into three groups according to the degree of BMI z-score change after 6- and 18-months to investigate short- and long-term treatment response. Participants with zBMI increase were defined as non-responders, those with zBMI decrease  $\geq 0$  to <0.25 as moderate responders, and participants with zBMI decrease above 0.25 as high responders. One-way ANOVA and chi-square test were performed for continuous and categorical variables, respectively.

Results: According to univariate comparison after 6 months, children (<11 years) were more likely to respond to the intervention than adolescents ( $\geq$ 11 years) (p=.005), and mothers of non-responders had higher levels of depression (p<.001) and psychosocial stress (p=.001) compared with moderate responders. Also, non-responders had a higher level of total calorie (p=.013) and fat intake (p=.003). High responders had higher AST (p=.008), and ALT (p=.004) levels compared with non-responders. Meanwhile, adolescents (p=.035) and participants with Tanner stage  $\geq$ 2 (p=.003) were more likely to be non-responders after 18 months. Also, moderate responders had higher levels of AST (p=.023), ALT (p=.036), FBS (p=.021) at baseline compared with non-responders. Early BMI z-score changes at 3 (p<.001), 6 (p=.001), and 12 months (p=.001) were related to longer-term treatment response after 18 months.

Conclusion: Participants who are younger and have a lower level of liver functioning may respond better to a shortand long-term lifestyle modification treatment. Also, initial BMI z-score change may be an early indication of treatment response. The results may help identifying patients who are less likely to be successful in lifestyle intervention.





# Do associations of sex, age and education with transport and leisure-time physical activity differ across 17 cities in 12 countries?

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### Motivation and behavior change (SIG)

Purpose: Leisure-time and transport activity domains are studied most often because they are considered more amenable to intervention, but to date evidence on these domains is limited. The aim of the present study was to examine patterns of socio-demographic correlates of adults' leisure-time and transport physical activity and how these associations varied across 17 cities in 12 countries.

Methods: Participants (N=13,745) aged 18-66 years in the IPEN Adult study and with complete data on sociodemographic and self-reported physical activity characteristics were included. Participants reported frequency and duration of leisure-time and transport activities in the last 7 days using the self-administered International Physical Activity Questionnaire-Long Form. Six physical activity outcomes were examined in relation with age, education, and sex, and analyses explored variations by city and curvilinear associations.

Results: Sex had the most consistent results, with five of six physical activity outcomes showing females were less active than males. Age had the most complex associations with self-report transport and leisure-time physical activity. Compared to older people, younger adults were less likely to engage in transport physical activity, but among those who did, younger people were likely to engage in more active minutes. Curvilinear associations were found between age and all three leisure-time physical activity outcomes, with the youngest and the oldest being more active. Positive associations with education were found for leisure-time physical activity only. There were significant interactions of city with sex and education for multiple physical activity outcomes.

Conclusions: Although socio-demographic correlates of physical activity are widely studied, the present results provide new information. City-specific findings suggest there will be value in conducting more detailed case studies.





The curvilinear associations of age with leisure-time physical activity as well assignificant interactions of leisuretime activity with sex and education should be further investigated. The findings of lower leisure-time physical activity among females as well as people with low education suggest that greater and continued efforts in physical activity policies and programs tailored to these high-risk groups are needed internationally.





# Impact of food taxes on purchasing of close substitute foods: Analysis of a large randomized experiment in a virtual supermarket

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### Policies and environments (SIG)

Purpose: To investigate the extent to which food taxes lead to changes in demand of food substitutes (e.g., from unhealthier to healthier alternatives within food-groups). Additionally, we aimed to investigate substitutions from name-brand to home-brand alternatives and differential effects by household income level.

Methods: Data from a virtual supermarket experiment were used, wherein 1,038 adults completed at least one of five weekly grocery shops, with 4,259 observations in total. Each shopping occasion was randomly allocated to control or one or more pricing options. Food groups were constructed by classifying products within food categories (e.g., grains and snacks) into low, medium or high sugar, sodium or saturated fat content (e.g., low sugar snacks, medium sugar snacks and high sugar snacks) based on recommendations. Outcome measures included the change in food purchases within food-groups due to changes in own or close substitutes' price, measured as a price elasticity of demand for the full sample and by income groups. Analyses were conducted using the Almost Ideal Demand System model.

Results: Preliminary results show that as prices increased, demand for the taxed products declined (albeit with greater declines among the foods with low/medium levels of unhealthy nutrients compared to those with high levels). Cross-price elasticities within food-groups consisted of mainly complementary effects, but also some substitution effects. For example, a 10% increase in price of high sugar snacks was associated with a 1% and 10% decrease in purchases of low and high sugar snacks and a 2% increase in purchases of medium sugar snacks. Also, if the price of name-brand beverages increased by 10%, purchases of home-brand beverages fell by 1% and vice versa. Price elasticities were only slightly higher for low-income compared to high-income participants.

Conclusion: Contrary to our hypothesis, price increases on foods high in unhealthy nutrients mostly did not lead to substitutions with healthier foods. Given the relatively low own-price elasticities of food-groups high in unhealthy nutrients, policies involving relatively high taxes and broad base taxes would be needed to decrease overall unhealthy food purchases and consumption.





# Physical activity and sedentary behaviour in people with myasthenia gravis

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Other

Purpose: Despite improvements in the medical management of myasthenia gravis (MG) in recent years, patients continue to report poor health and wellbeing outcomes such as high levels of fatigue, reduced quality of life, walking limitation and altered balance. Physical activity has been shown to be associated with these outcomes in other clinical populations, however there has been limited research in adults with MG. Therefore, the primary aim of this study was to describe physical activity and sedentary behaviour in adults with MG and the secondary aim was to explore associations between these behaviours and fatigue, quality of life, balance confidence and walking limitation.

Methods: A self-report online survey was used to assess physical activity, sedentary behaviour, fatigue, quality of life, balance confidence and walking limitation in adults aged 18-80 years with MG with stable self-reported symptoms. Analyses included descriptive statistics and multiple linear regression models.

Results: Respondents included 85 adults with MG ( $48\pm15.5$  years; 74.1 % female) with 96.5% generalized MG and 3.5% ocular MG. Most participants (n=53, 62.4%) reported sufficient physical activity ( $\geq$ 500 METminutes.wk-1), however participants also reported an average of 9 h/day of sedentary behaviour (mean  $8.9\pm3.5$ ). Meeting physical activity guidelines ( $\geq$ 500 METminutes.wk-1) was significantly (p<0.05) associated with reduced fatigue (R2=0.196, B=-17.65, 95% CI 45.22, 99.32), increased quality of life (R2=0.330, B=-8.83, 95% CI -11.88, -5.79), reduced walking limitation (R2=0.305, B=-11.06, 95% CI -15.54, -6.57) and increased balance confidence (R2=0.304, B=20.70, 95% CI 12.28, 29.12). No significant associations were found for sedentary behaviour. When patterns of physical activity and sedentary behaviour were combined, greater fatigue (R2=0.213), lower quality of life (R2=0.364), increased walking limitation (R2=0.341) and lower balance confidence (R2=0.279) was observed in patients who met physical activity guidelines and had lower sedentary time (<10 h/day) (p<0.05).

Conclusions: Physical activity and sedentary behaviour is associated with favorable health and wellbeing outcomes in adults with MG. Findings highlight that physical activity and sedentary behaviour may be possible intervention targets, however longitudinal and intervention studies are needed to determine causality.





# Hombres Saludables: Promoting physical activity in Latino men with a tailored e-health intervention

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### e- & mHealth (SIG)

Introduction: Latino men in the U.S. are disproportionately affected by health conditions related to low physical activity (PA) levels. Engaging in regular PA can reduce risk of chronic diseases and yield many health benefits; yet, few Latino men (24%) meet national PA guidelines. Moreover, there is a paucity of PA interventions developed for Latino men. Our prior formative research with Latino men suggested that technology-based interventions may be ideal for helping to increase PA. Thus, we engaged 38 Latino men in focus groups to adapt an evidence-based Internet PA intervention that was originally developed for Latinas. This presentation will describe the resulting Hombres Saludables PA intervention and baseline participant characteristics.

Methods: Hombres Saludables is an ongoing 6-month Spanish language individually-tailored web- and text-message PA intervention for Latino men. Participants are randomized to the PA intervention arm or wellness control arm. The PA intervention includes: two check-in phone calls, an interactive website with PA tracking, goal setting and individually tailored PA content; automated SMS text messages, a pedometer, a six-month gym membership and access to a private Facebook group. PA is assessed via ActiGraph GT3X+ accelerometer and the 7-Day Physical Activity Recall at baseline and 6-months. Participants also complete pre and post questionnaires (e.g., self-efficacy, decisional balance, social and environmental PA determinants).

Results: Participants are Latino men (N= 43), mean age 38.5 years (SD=12.57), who are mostly employed full or parttime (72.1%). Participants' educational levels are > college graduate (44.2%), some college (20.9%), and < high school degree (20.9%). More than half (55.9%) are married or living with a partner. At baseline, median accelerometer measured MVPA in 10-minute bouts was 13 min/week (IQR= 0-57) and self-reported MVPA median was 0 min/week (IQR= 0-45). This presentation will also report baseline values for participants' personal, social and environmental PA determinants.

Conclusions: Hombres Saludables uses an innovative, interactive web and text-message based intervention for improving PA among Latino men, an underserved population at risk. If the intervention proves feasible and efficacious, we will refine and evaluate it in a larger randomized trial.





# Who's meeting who: an analysis of ministers' diaries and interest group meetings

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### Policies and environments (SIG)

Purpose: Limited progress in nutrition policy action is often blamed on the close relationships the food industry has with health policy decision-makers. This analysis sought to examine this belief through the analysis of health ministers' and other key ministers' diaries.

Method: Six years' of diary entries were downloaded from fourteen different ministers' diaries in two states in Australia. A coding framework was developed based on initial data. It classified interest groups into four broad categories: advocacy, business, university or general business, as well as the professional focus of the organisation meeting with the minister, for example, bank, food company, cancer organisation. In addition, any meeting topics related to nutrition policy were identified. The coding framework was applied to the diary entries (n = 23,790). A descriptive analysis was then undertaken.

Results: Analysis of health ministers' diaries found that the food industry had limited documented interaction with the two state health ministers; however they had a much higher level of interaction with other more senior ministers. For health ministers, medical associations, private hospitals and health services, and sporting associations (rugby league associations) had the most interactions. Poor representation was seen on nutrition issues, and there was an apparent lack of nutrition advocates interacting with the health and other ministers.

Conclusion and recommendations: There are opportunities for nutrition advocates to increase their level of interaction with state ministers. This could include building alliances with medical associations, as they are in a powerful position, to advocate directly to health ministers. It could also involve targeting other, more senior ministers. Ministers' diaries can provide valuable insights into who is meeting officially with ministers. However, there are also limitations with this type of dataset.





# The impact of the devaluation of the Surinamese Dollar (2015 – 2016) on food intake in Suriname

#### Miss Gerani Cheuk A Lam

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### Policies and environments (SIG)

Objective: A currency devaluation influences food prices and populations' diet, especially in developing countries and within poorer households, resulting in the consumption of cheaper, and therefore often lower quality diets. Reduced consumption of high-quality foods restrains the protective health benefits of these foods towards the incidence of NCDs, and increases the risk of micro- and macronutrient deficiencies among populations that are already subject to food and nutrition insecurity. Despite global evidence of higher food prices directly affecting populations' health status, and as such possibly jeopardizing economic performance and rural development, there has been no research conducted on the effect of rising food prices on food intake in Suriname yet. As such, the objective of this study was to assemble primary food consumption data, with respect to pre-and post-devaluation food intake patterns of Surinamese households. This with the goal to report changes in post-devaluation dietary intake, in order to better comprehend the future implications for health, facilitating evidence-based policy development and nutrition intervention planning.

Results: Higher food prices resulted in low, - middle - and high-income groups increasing the expenditures on food (p < 0.01). Reductions in the proportion of households' significantly lowering the post-devaluation intake of high-quality foods, such as fruits, vegetables, lean meat and fatty fish were observed (p < 0.01). Furthermore, changes in the intake of low-quality foods were witnessed as well, with proportions of households significantly reducing the intake of discretionary foods and terminating eating out-of-home (p < 0.01).

Conclusion: The fall of the Surinamese currency, in combination with country's dependency on imported foods, increased local food prices and with salaries remaining the same, resulted in both lower- and higher- income households increasing their food expenditures. Post-devaluation changes in regular dietary pattern and food intake enrolled, with a significant reduction in the consumption of high-quality foods being noticed, especially within lower-economic households. On the one hand, significant proportions of Surinamese households possess a decreased probability of consuming healthy diets. On the other hand, households with also a significant reduction in the intake of low-quality foods might encounter a beneficial health impact if already coping with overweight and related non-communicable diseases.

Keywords: Food price rises, nutrition, Food consumption, LMIC





# Going beyond the trial: Making the most of outcomes and process data in the preparation of the implementation of a home-based cardiac rehabilitation programme (REACH-HF) for people living with heart failure.

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### Disease prevention and management

Purpose: REACH-HF is an effective and cost-effective home-based rehabilitation programme for people with heart failure and their caregivers. This 12-week programme is delivered at home with facilitation from a specifically trained healthcare professional, via a paper-based Heart Failure manual, resource for caregivers, and progress tracker. In addition, patients receive a CD with instructions for relaxation techniques and a DVD with chair-based exercise videos. In preparation for the wider roll-out of REACH-HF in the UK's National Health Service, this project aimed to identify key targets for optimisation of the delivery of, and engagement with, the intervention.

Methods: A mixed-methods synthesis was conducted using the findings from the feasibility study, multi-site randomised controlled trial, and process evaluation to identify key areas for optimisation in relation to the determinants in the REACH-HF logic model. The intervention development group, a patient advisory group workshop, and a facilitator telephone consultation discussed, added to, and prioritised the identified targets. In discussion with the patient advisory group and REACH-HF facilitator's, potential practical refinements targeting these areas were generated.

Results: Key areas for optimisation included: (a) self-monitoring of symptoms and progress, (b) the exercise programmes and general physical activity, (c) the personalised approach to facilitation, (d) engaging the caregivers, and (e) ending of the facilitated intervention and ongoing use of self-management strategies. This resulted in changes in the intervention materials including: (a) clearer information and instructions for self-monitoring of symptoms, (b) a restructured progress tracker with detailed instructions and examples of use, and (c) an additional section in the manual about ongoing self-management. In addition, changes were made to the facilitator training. These included: (a) a revised training manual detailing the facilitation process with scenarios, tips, and good practice examples, (b) a detailed procedure on how to identify the patient's starting level for their chosen exercise programme, and (c) audio snippets of good practice face-to-face and telephone consultations.

Conclusion: This project showcases how learnings from trials can be used beyond providing evidence for effectiveness. Making the most of available data helps refine and prepare interventions in the transition from research to practice. Enhancing the likelihood of successful implementation.





# Wellness policy writing and implementation: Differences between rural and urban schools

#### Dr. Lacey McCormack<sup>1</sup>, Dr. Jessica Meendering<sup>1</sup>, Dr. Marlene Schwartz<sup>2</sup>

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### Policies and environments (SIG)

Purpose: To determine how rural and urban schools differ in their school wellness policy writing and implementation. Results can inform large-scale interventions addressing the rural/urban obesity disparity.

Methods: Schools from eight states participated in this cross-sectional study during the 2016-2017 academic year. Written district wellness policies were assessed for strength and comprehensiveness using the Wellness School Assessment Tool (WellSAT). Schools from within participating districts had key informant interviews to assess wellness policy implementation using the Wellness School Assessment Tool Interview (WellSAT-I). Regression analyses were used to examine the relationship between wellness policy writing and implementation and rural/urban location while controlling for percent of non-white students and percent free and reduced price lunch within schools. Ultimately, 95 schools were included in analyses.

Results: The majority of schools (n=63) were elementary and enrollment among all schools ranged from 40 to 1,916 students. Approximately half of all students were non-white and over 60% received free or reduced lunch. Of the 95 total schools, 62 were located in city or suburban areas (65%). A number of rural/urban differences were seen in both the written quality scores and implementation of each item examined. Of the 56 written items examined, approximately 70% (n=39) differed. There were differing items in each of the five WellSAT sections, and of the 37 items that differed, approximately one-third (n=13) were higher (better) scores among rural schools. Of the 56 implementation items examined, approximately 50% (n=29) differed. There were differing items in each of the five WellSAT-I sections, and of the 29 items that differed, only 4 items were scored higher (better) among rural schools.

Conclusions: A striking number of differences in the writing and implementation of school wellness policies exist between rural and urban schools, with rural schools generally having worse scores. Written policy quality could be improved in both settings by using a standard template that includes all federally required information plus best practices. Supports for implementation should be explored, focusing on potential differences between rural and urban schools.





# Perceptions of Walking versus Cycling to School among New Zealand Adolescents Living in Rural Settlements

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#### Other

Purpose: The prevalence of adolescents meeting physical activity guidelines is low internationally. Although active transport to school is a potential way to increase adolescents' daily physical activity, the proportion of adolescents travelling to school by car has increased in many countries in recent decades. Walking and cycling to school have been extensively studied in urban settings, whereas rural information is sparse. This study compared perceptions of walking and cycling to school among adolescents living  $\leq 4.8$  km from school in rural New Zealand.

Methods: Adolescents (n=71; 54.9% female; 15.5±1.5 years) residing in rural areas (population <1000) and attending one of 11 secondary schools in the Otago region, New Zealand, completed an online survey about their school travel and perceptions of walking and cycling to school. Distance to school was calculated using Geographic Information Systems shortest network path analysis.

Results: Overall, 68% of rural adolescents actively travelled to school, with 63% walking and 13% cycling. Compared to cycling, a greater proportion of adolescents perceived walking to school as an opportunity to socialise (59% vs 25%; p<.001) with more peer (71% vs 30%) and parental (74% vs 38%) support and role-modelling, greater availability of footpaths versus cycle paths (79% vs 32%), and greater desire (53% vs 24%) and intention (66% vs 13%) to walk to school (all p<.001). Over three-quarters of adolescents were confident they could walk or cycle to school. More than 90% of adolescents perceived walking and cycling to school as safe and reported that their parents held the same belief. Trip duration, distance, and cold/wet weather were perceived as more common barriers for walking than for cycling to school. Over two-thirds of adolescents reported that cycle-friendly uniforms would encourage cycling to school more often.

Conclusions: Compared to cycling, walking to school was more common, the preferred mode, and perceived by adolescents as having greater social and infrastructural support. Findings suggest that environments with adequate infrastructure and social support appear to encourage walking to school. Thus, mode-specific approaches may be required to encourage active school travel among rural adolescents, with special attention on the social and built environments related to cycling.





# The associations of physical activity and sedentary behaviors with mental health and sleep quality in Chinese young adults

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Disease prevention and management

Purpose: To investigate the associations of physical activity and sedentary behaviors with psychological status and sleep quality in Chinese university students.

Methods: Participants 214 (aged  $19.0 \pm 1.1$  years, 46.3% women) were college students recruited from a university in Shanghai, China. Physical activity was objectively measured using hip-mounted accelerometry monitors (Actigraph GT3X+ and wGT3X-BT, Pensacola, FL, USA). Time spent on screen use and smartphone use was used as indicators of sedentary behaviors, which was surveyed by a questionnaire. The Self-rating anxiety scale (SAS) and the Self-rating depression scale (SDS) were used to measure anxiety and depressive status, respectively. Sleep quality was assessed by Pittsburgh sleep quality index (PSQI). Linear regression modelling was conducted to assess the association of physical activity and sedentary behaviors with psychological and sleep variables.

Results: Female students accumulated more time spent on light physical activity (LPA) (157.2±37.7 vs. 131.1±48.0 mins, P < 0.05) and moderate-to-vigorous physical activity (MVPA, 49.6±22.3 vs. 38.6±17.0 mins, P < 0.05), and had higher total PA (326.9±119.6 vs. 271.7±114.8 CPM, P < 0.05) than males. After adjustment for wear time of accelerometers, age and gender, physical activity variables were not associated with psychological and sleep variables. However, longer time spent on smartphone use was associated worse scores on depression (P < 0.05), anxiety (P < 0.05) and sleep quality (P < 0.05).

Conclusion: Smartphone use was associated worse scores on depression, anxiety and sleep quality. Therefore, interventions targeting university students should be developed to reduce sedentary behaviors, especially smartphone use.





# It starts with a conversation: upskilling health professionals in Healthy Conversation Skills (HCS) to support behaviour change.

<u>Dr. Jenna Hollis<sup>1, 2, 3, 4, 5</u>, Dr. Lesley MacDonald-Wicks<sup>3, 5, 6</sup>, Ms. Mandy Hunter<sup>7</sup>, Prof. Maralyn Foureur<sup>8</sup>, Dr. Kirsty Seward<sup>6</sup>, Prof. Clare Collins<sup>3,5,6</sup>, Ms. Lucy Kocanda<sup>2, 5, 9</sup>, Ms. Belinda Tully<sup>1</sup>, Associate Professor Wendy Lawrence<sup>10</sup>, Dr. Tracy Schumacher<sup>5,9</sup></u></sup>

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### Motivation and behavior change (SIG)

Purpose: Changing people's behaviour by advice-giving and instruction, as typically used in traditional healthcare consultations, is usually ineffective.Healthy Conversation Skills (HCS) training adopts an empowerment approach in order to enhance health professionals' communication skills for having conversations to engage and motivate people to make behaviour changes. These include eating more healthily and increasing physical activity levels. This study aimed to assess changes in health professionals' i) competence in using 'open discovery questions' (a key HCS communication skill), and ii) barriers and facilitators to having behaviour change conversations, post-HCS training.

Methods: HCS training (2 x 4 hour interactive group sessions; 10-18 trainees/session) was conducted in October-November 2019. The training was reviewed for cultural safety and acceptability for Aboriginal staff and people. Pre (T1) and post (T2) training surveys collected data on demographics, and changes in competence and confidence (the latter reported on a 10-point Likert scale, where 10 = highest confidence) in having behaviour change conversations. The Theoretical Domains Framework (TDF) was used to examine changes in barriers and facilitators to having these conversations, specifically the domains: skills, social/professional role/identity, belief about capabilities, belief about consequences, intentions, goals, memory/attention/decision process, and behaviour regulation. Data were summarised using descriptive statistics and tested for equality using two-sided Wilcoxon signed rank tests.

Results: 45 participants completed the training (98% women; 18% Aboriginal and Torres Strait Islander Origin), including 33 health professionals employed within the local health district and/or 11 University lecturers/researchers. Competence in using 'open discovery questions' increased post-training (T1=41 responses; T2=167 responses, p<0.001), as did participants' confidence ratings for having behaviour change conversations (T1=6.0 median (4.6-7.7 interquartile range); T2=8.1(7.0-8.9), p<0.001), including with Aboriginal clients (T1=5.0(3.2-6.5); T2=7.6(6.5-8.3), p<0.001). The training improved the TDF domains: skills (T1=4.3(3.3-5.3); T2=6.0(5.7-6.7), p<0.001), belief about capabilities (T1=5.0(4.0-6.0); T2=6.0(5.3-6.0), p<0.001), intentions (T1=5.3(4.1-6.5); T2=6.5(5.8-7.0), p<0.001) and goals (T1=4.3(3.7-5.0); T2=5.3(5.0-5.7), p<0.001).

Conclusion: HCS training increased health professionals' competence in using HCS, and their confidence in having behaviour change conversations. Wider implementation of HCS training may be a capacity-building strategy to support health professionals to use person-centred approaches to behaviour change to improve population health.





# Physical activity and screen time guidelines in outside school hours care: A scoping review

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Early care and education (SIG)

#### Purpose:

Most children are not doing enough physical activity and have excessive screen time. The outside school hours periods offer discretionary time use, and the activities children do in these times have an important influence on whether they meet or fail daily activity recommendations. Millions of school children globally attend outside school hours childcare, though in many jurisdictions their physical activity and screen time in this setting goes ungoverned. This review aimed to identify all published guidelines for physical activity and screen time in outside school hours care from around the world, to determine the level of physical activity and screen time recommended, and the methods used to create the guidelines.

#### Methods:

A prospectively registered scoping review was conducted (Medline, Emcare, Embase, Scopus, ERIC, Sportsdiscus, TROVE, ProQuest, UpToDate, NICE, SIGN and Google). Results were screened independently by two reviewers following the PRISMA-ScR guidelines, and data were synthesised narratively.

#### Results/findings:

269 documents were identified, of which 25 were reviewed in full-text, and nine included. Eight originated from the USA and one from Canada. The US guidelines consisted of both national (n=2) and regional (n=6) documents. All the guidelines focused predominantly on the after school care period (n=9) with only one of the guidelines also incorporating the before school care period. Seven of the nine included guidelines had both physical activity and screen time recommendations, whilst two guidelines had only physical activity guidelines. The guidelines varied considerably in the amount of recommended physical activity and/or screen time (for physical activity: duration/intensity/bouts; for screen time: duration/quality of content). Taken together, guidelines recommended between 30 and 60 minutes of MVPA and less than 30 to 60 minutes of recreational screen time per after school care session. All guidelines were developed by expert/stakeholder panels, though none used rigorous guideline development methods, such as GRADE or GIN-McMaster Checklist.

#### Conclusions:

Guidelines for children's activity behaviours in outside school hours settings have focused primarily on physical activity and the after school period. All published guidelines to date emanate from North America. Guidelines using recognised, rigorous guideline development methods and for other world regions are warranted.





# Community leadership readiness is associated with reductions in childhood overweight and obesity over time in low income areas: Evaluation of South Australia's Obesity Prevention and Lifestyle initiative

<u>Associate Professor Margaret Cargo<sup>1</sup></u>, Dr. Iordan Kostadinov<sup>2</sup>, Associate Professor Theo Niyonsenga<sup>1</sup>, Dr. Suzanne Carroll<sup>1</sup>, Dr. Michelle Jones<sup>3</sup>, Prof. Mark Daniel<sup>1</sup>

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### Policies and environments (SIG)

Purpose: Community leadership readiness (CLR) has been identified as a community-level contextual factor influencing the success of community-based obesity interventions; however, measures of CLR have not been assessed in relation to community-level obesity outcomes. This study evaluated: (a) the impact of baseline CLR and change in CLR on weight change over time in 4-5-year-old children; and (b) whether the impact of CLR on children's weight change varied according to area-level SES.

Methods South Australia's community-based childhood Obesity Prevention and Lifestyle program (OPAL) was implemented in 20 communities. Each community received 5 years of intervention. OPAL was evaluated using a quasi-experimental design. This presentation reports on the intervention condition only. CLR was assessed across 168 suburbs in the 20 intervention communities. Using a validated online CLR survey, four stakeholders from each community rated each suburb within their community on a 9-point scale for CLR at baseline and follow-up. Annual community prevalence of overweight/obesity was based on BMI derived from measured height and weight for 4-5-year-old pre-school children. BMI data were obtained from an administrative dataset with addresses geocoded and assigned to suburbs nested in communities. Area-level SES measures, sourced from the ABS 2011 Census, included the proportion of residents with a bachelor's degree or higher and median household income. Data were analyzed using multilevel binomial regression models.

Results: Mean CLR scores were 3.34 (SD 0.81) and 5.19 (SD 1.23) at baseline and follow-up, respectively, with a mean change of 1.85 (SD 0.89). Baseline CLR was related to baseline overweight/obesity (Beta=0.0444, 95%CI 0.0158 to 0.0729) and over time predicted reductions in overweight/ obesity prevalence (Beta=-0.0087, 95%CI - 0.0150 to -0.0025). Change in CLR was associated with reductions in overweight/obesity over time (Beta=-0.0128, 95%CI -0.0182 to -0.0074). These relationships varied by area-level SES and were only associated with reductions in overweight/ obesity amongst communities with low SES at baseline.

Conclusions: The impact of CLR on weight change over time was modified by area-level SES. Local leadership may be more important in lower SES areas, potentially for leveraging resources to reach families living in more impoverished conditions, to promote and support physical activity and healthy eating activities.





# Health professionals' perspectives on telehealth for childhood obesity treatment: a focus group study

<u>Ms. Li Kheng Chai<sup>1,2,3,4</sup></u>, Prof. Clare Collins<sup>1,2</sup>, Dr. Chris May<sup>1</sup>, Dr. Amy Ashman<sup>1,2</sup>, Associate Professor Tracy Burrows<sup>1,2</sup> <sup>1</sup>University of Newcastle, Callaghan, Australia, <sup>2</sup>Priority Research Centre in Physical Activity and Nutrition, Callaghan, Australia, <sup>3</sup>Children's Hospital Queensland and Health Service, Brisbane, Australia, <sup>4</sup>Queensland University of Technology, Brisbane, Australia

### e-&mHealth (SIG)

Purpose: Innovative and effective child weight management interventions are needed to address the rising global prevalence of obesity. Web-based technology may enhance intervention by overcoming barriers including transportation, time or costs associated with attending clinic appointments. Given health services in rural areas might be harder to access than in urban areas, this study aimed to identify the perspectives of health professionals in rural New South Wales, Australia on the use of telehealth for childhood obesity treatment.

Methods: Four focus groups were conducted covering discussion topics including: i) current state of child weight management services, ii) the use of telehealth or technology-based interventions for childhood obesity, iii) barriers and enablers to parents and clinicians using telehealth, and iv) the implementation of telehealth in clinical settings and its benefits and/or disadvantages. Recordings of focus group discussions were transcribed verbatim. Data were interpreted using thematic analysis.

Results: Overall, 21 health professionals (n=18 female, n=3 male; n=10 dietitians, n=5 physiotherapists, n=3 paediatricians, n=2 occupational therapists, n=1 clinical nurse consultant in paediatrics) practiced in Tamworth or Armidale participated in the focus groups. When asked about how useful a technology-based childhood obesity program would be for families in the rural region, the group mean score was 8.1 out of 10 (n=18) with 67% (n=12) rated 8 or higher (i.e. useful to extremely useful). Health professionals felt that telehealth could be offered as an alternative to in-person consultations and were generally confident with using technology. However, they felt the need for additional training and troubleshooting support especially when the system breaks down. Perceived benefits to health service was increase in clinic efficiency by decreasing clinicians' travel time to clients' home and rural sites while increasing clinicians' capacity to provide more appointments.

Conclusions: In conclusion, the sample of health professionals in this study believed that families will benefit positively from a technology-based childhood obesity program. Findings from this study further supports the implementation of an online technology-based lifestyle program targeting families with children in need of weight management interventions in health service settings.




# How does children's time-use in physical activity, sedentary behaviour and sleep change across the transition from primary to secondary school? A systematic review.

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#### Motivation and behavior change (SIG)

Purpose: The transition from primary to secondary school is a critical period in children's development due to its potential influence on health behaviours and wellbeing. Previous research has documented an increase in sedentary behaviour (SB) over the school transition; however, little is known about the accompanying changes in physical activity (PA) and sleep, which when combined are the behaviours that make up 24-hour movement patterns. This study aimed to systematically review and summarise evidence on individual and collective changes in PA, SB and sleep across the school transition.

Methods: This systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines and was registered with the International Prospective Register of Systematic Reviews (CRD42018095573). Six electronic databases were searched from January 1990-May 2019. Eligible criteria included longitudinal studies reporting time spent in PA, SB and/or sleep, with baseline assessments conducted during the last two years of primary school and at least one follow-up during the first two years of secondary school. For studies reporting only SB outcomes, this review considered those published from November 2015 onwards to update a previous systematic review. A narrative synthesis was performed with a focus on the significance and direction of change to evaluate evidence on behavioural changes.

Results: Six articles reporting changes in PA (n=5) or PA and SB concurrently (n=1) were included in the review. Most articles (n=4/6) had a high risk of bias. There was evidence of a decrease in daily PA and for specific time periods (i.e., in-school, after-school and leisure time) over the school transition. A concurrent increase was observed in SB. No studies were identified that assessed changes in sleep, or all three movement behaviours concurrently.

Conclusions: Current evidence suggests the need for targeted period-specific intervention strategies to prevent a decrease in PA over the school transition. Further research is warranted to explore the changes in the 24-hour composition of all three movement behaviours and associated factors to inform future behavioural interventions during this critical developmental period.





# Intercultural Education through Physical Activity, Coaching and Training (the EDU-PACT project)

#### Miss Danielle Nørager Johansen<sup>1, 2, 3</sup>, Mr. Thomas Skovgaard<sup>1, 2, 3</sup>

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Purpose Research into intercultural education indicates that:

1) Many teachers and coaches don't have sufficient professional competencies to perform intercultural education through sports;

2) Initial teacher and trainer education (pre-service) and continuing professional development (in-service) neither provides them with the necessary knowledge nor covers practices, skills, competencies, and appropriate models of the everyday reality in classrooms and training sessions, respectively, due to a lack of consistent guidelines and didactical concepts.

EDU-PACT is an Erasmus+ funded project aiming at improving the quality of pre-service and in-service education strengthening the professional profile of both sports-related teaching, professions preparing teachers, and coaches for inclusive intercultural education in and through Physical Activity (PA) and sports.

Methods A rapid evidence analysis was conducted to scope the scientific literature and obtain knowledge about the field. The analysis formed the basis for a need-analysis template to be fulfilled by each participating project partner to identify existing knowledge and wishes related to intercultural learning through PA and sport - from an academic perspective, PE teacher perspective and sports coach perspective. This information was obtained by interviews and/or focus groups with relevant stakeholders.

Findings from each partner were put together in a combined needs-analysis and those findings formed the basis of the development of a module related to intercultural learning containing of four module units.

Results/findings

Initial outlines of each module unit are presented below:

Unit 1: "Understanding yourself" related to Self-Confidence, Self-Awareness, and Adaptability.

Unit 2: "Understanding others" related to Communication, Cooperation, Leadership, Respect, Tolerance, and Empathy.

Unit 3:"Planning and delivering sessions" related to Critical Thinking, Decision Making, Problem Solving, Organizing, and Managing.

Unit 4:"Reflection and evaluation" related to Teaching, Reflecting, Monitoring, Reviewing Intercultural Learning Approaches and Strategies.

Conclusion The module and module units will be available as an online tool to be used in various settings - however, primarily targeting PE teaches and sports coaches. For PE teachers or sports coaches working with children and youth with diverse ethnical backgrounds, the module and module units can help improve intercultural education through PA and sports.





# The use of Short Message Service (SMS) to improve self-care in type 2 diabetes patients: Integrative review

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#### e-&mHealth (SIG)

Purpose: To synthesize and analyze the available evidences in the scientific literature on the effects of the use of Short Message Service (SMS) in self-care promotion in type 2 diabetes mellitus (T2DM). The guiding question of the study is: is there evidence in the literature that sending SMS to T2DM patients improves self-care practices?

Methods: This is an integrative review that compiled studies published between 2007 and 2017, following 6 main steps: elaboration of the guiding question; carrying out the literature search; categorization of studies; evaluation of studies included in the work; interpretation of results; and synthesis of the review. The terms used in the search were: "diabetes mellitus", "text messaging", "mobile application", "self-care", and their variations according to the Medical Subject Headings and the Descriptors in Health Science (DeCs). In addition, the DeCs terms were also searched in Portuguese and Spanish languages. The search strategy was applied to the following databases: CINAHL, Cochrane Library, Scopus, Web of Science, Nursing database, Virtual Campus of Public Health, Collection of Information Sources of the Brazilian Unified Health System, Regional Health Coordination South, IBECS, LILACS and PubMed. The results obtained were independently reviewed by two authors.

Results: 739 articles were identified, of which 23 were classified as eligible. The main themes included in the content of the messages were: medications (n=15); self-monitoring of glucose levels (n=9); motivation (n=9); education (n=7); diet (n=7); physical exercise (n=6); and foot care (n=3). Positive results were reported from the studies as improvement in glycosylated hemoglobin levels, greater compliance with medications, improved self-care practices, increased knowledge about diabetes, and better foot care. It was observed in the review that in order to achieve statistical relevant results, the ideal duration of interventions with SMS is from 8 to 12 months.





# Use of Health Impact Assessment (HIA) to inform public trail use decisions that improve health and well-being of nearby communities

#### Dr. Sally M. Davis<sup>1</sup>, Dr. Richard L. Kozoll<sup>2</sup>, Dr. Theresa H. Cruz<sup>1</sup>

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#### Policies and environments (SIG)

Purpose: We discuss how we successfully performed a Health Impact Assessment (HIA) to inform the decisions of public land managers as they designed a re-route of the Continental Divide National Scenic Trail (CDT). The HIA was used to assess the effects of trail placement and construction on health, economic development and social capital in a nearby rural, tri-ethnic, under-resourced community, and it provided an important model for public land managers.

Methods: Researchers gathered data from public health and recreation literature and surveys of potential users of the CDT regarding preferences for trail location, trail design and trailhead access. Extrapolation of these data provided projections of future use and consequent improved health, economic benefit and social capital in the community. A report was prepared for agency and public review, and its findings were subsequently integrated with the US National Environmental Policy Act (NEPA) environmental assessment (EA), required before construction of new trails on public lands in the United States.

Results/findings: The HIA findings indicated that more people would use the trail if access was closer to town and trailhead amenities such as parking were included. Findings also identified aspects of trail design that would maximize use by local people and visitors. Two federal public land agencies, the United States Forest Service and Bureau of Land Management included findings from the report in their EA. A portion of the re-route was recently completed and celebrated with a two-day event on National Public Lands Day. Local residents, visitors and dignitaries joined in the celebration by taking a walk on the new section of the CDT through a scenic forest environment. HIA findings also influenced planning by the nearby village, in its role as a CDT Gateway Community, to participate in a statewide initiative to promote outdoor recreation and tourism.

Conclusions: HIA can be successfully integrated into the policy and decision-making process for trails on public lands, thereby providing positive effect on health, economic development and social capital in nearby communities.





# Rehabilitation as a site for building capability for physical activity engagement in the context of a long-term condition

#### Prof. Nicola Kayes<sup>1</sup>, Ms. Christine Cummins<sup>1</sup>

<sup>1</sup>Centre for Person Centred Research, Auckland University of Technology, Auckland, New Zealand

#### Disease prevention and management

Purpose: Physical activity may be fundamental for people to live well with a long-term condition. However, research consistently reports physical activity engagement for people living with the chronic, disabling consequences of illness remains low. While exercise-based rehabilitation is routinely offered in the acute or sub-acute phase of illness, the focus is on managing the immediate impact of acute illness events or symptom management versus building capability for longer term physical activity engagement. In this presentation, we synthesise evidence from a series of qualitative studies exploring experiences of physical activity engagement in the context of a long-term condition to critically consider the potential for a greater focus on physical activity for health and well-being in routine rehabilitation practice.

Methods: We drew on Qualitative Descriptive methodology to carry out a secondary analysis of semi-structured interview data from a purposive sample of people with Stroke (n=5), Multiple Sclerosis (MS; n=5) and Cancer Survivors (n=10). Interviews explored participant experiences of physical activity engagement. Participants were diverse in terms of time since diagnosis, gender, clinical course (Multiple Sclerosis), and type (Cancer). Data were analysed using conventional content analysis.

Findings: Participants highlighted physical activity is important for managing symptoms and treatment-related side effects, preventing recurrence, establishing a sense of normality, mental health and social engagement. However, navigating physical activity was complex in the context of the residual and ongoing impacts of their condition. They expressed concerns about safety, risk of harm, injury or exacerbation, fatigue, and uncertain illness trajectory. These concerns co-existed with broader existential threats around body image, perceived capability, and the meanings ascribed to physical activity. Participants reported limited (or no) access to targeted and tailored advice to navigate these complexities.

Conclusion: Navigating physical activity in the context of a long-term condition is complex and requires active management, tailored to experience and context. Rehabilitation has potential as a site for building capability for managing the inherent complexities. However, a shift away from medicalised notions of exercise as treatment, to a focus on optimising what happens at the point of care for longer term health and well-being may be critical to realising this potential.





# Associations between sleep and physical activity with physical and mental health on a U.S university campus

<u>Mr. Bryce Daniels<sup>1, 2</sup></u>, Dr. Kaitlyn Gallagher<sup>1, 2</sup>, Dr. Michelle Gray<sup>1, 2</sup>, Dr. Erin Howie<sup>1, 2</sup> <sup>1</sup>University of Arkansas, Fayetteville, United States, <sup>2</sup>Exercise Science Research Center, Fayetteville, United States

Other

Purpose: The purpose of the study was to evaluate associations between critical health behaviors (sleep and physical activity) with self-reported health (physical and mental) of students, faculty, and staff of a U.S. university campus. This study provides a needs assessment to better understand a college campus's health behaviors and health status. Being a workplace for faculty and staff plus a place where young adults establish lifetime health behaviors, a higher education environment presents an important opportunity for intervening on negative health behaviors.

Methods: The study utilized a cross-sectional design. Participants were included if they were current students, faculty, or staff at the University of Arkansas in Fayetteville and could complete the questionnaires in English. The measures utilized included the Pittsburg Sleep Quality Index (PSQI), International Physical Activity Questionnaire-long (IPAQ), and SF-12 self-reported health (mental and physical). Regression, adjusted for sex and age with  $\alpha = .05$ , was used to evaluate the associations between physical activity and sleep with physical and mental health outcomes.

Results: 311 participants (32.1 years, SD 14.0; 46.2 female) completed all measures. The median score (25th-75th percentiles) of the PSQI was 5 (3, 7) and 53.3% were considered "poor" sleepers. From the IPAQ, the following medians (25th-75th percentiles) were found: vigorous activity (MET-min/week): 480 (0, 1,440), moderate activity (MET-min/week): 870 (300, 2025), walking (MET-min/week): 1,014 (462, 2,772). PSQI score was negatively associated with self-reported mental health (-1.4, 95%CI [-1.7, -1.1], p<.001), but had no association with physical health. Vigorous activity was positively associated with physical health score (.0002 MET-min/week, 95%CI [.00001, .0004], p=.035) while moderate activity (p=.542) and walking (p=.244) were not. No physical activity measures were statistically associated with mental health.

Discussion: The majority of campus participants had poor self-reported sleep. The current needs assessment found negative associations between sleep and mental health and vigorous physical activity with physical health, but these associations need confirmation with objective sleep and physical activity measures. Innovative interventions to improve sleep quality and perform more vigorous activity may improve mental and physical health on a college campus, and both sleep and physical activity behaviors should be targets of future studies.





# Use of intense sweeteners in New Zealand packaged food and beverage products: 2013 to 2019

Miss Rachel Nunn<sup>1</sup>, Prof. Cliona Ni Mhurchu<sup>2</sup>, Dr. Helen Eyles<sup>2</sup>, <u>Dr. Leanne Young<sup>2</sup></u>

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#### Policies and environments (SIG)

#### Purpose

Consuming food and beverages low in added sugar is widely recommended as part of a healthy eating pattern. Consumer demand for lower sugar products has increased, as has the number and variety of products containing intense sweeteners as a replacement for sugars. The objectives of this study were to 1) determine the prevalence of intense sweeteners in packaged foods and beverages available for purchase in New Zealand supermarkets; 2) determine the main types of intense sweeteners used; and 3) examine if the prevalence and type of intense sweeteners in packaged supermarket products changed between 2013 and 2019.

#### Methods

This study used Nutritrack, an annually updated database of all packaged food and beverage products available in four major supermarkets in New Zealand (approximately 15 000 products per year). Descriptive analyses were used to explore the prevalence and type of intense sweeteners overall and by food category, in 2013 and 2019. Permitted sweeteners were classified according to the Food Standards Australia New Zealand and US Food and Drug Administration standards. The difference in prevalence between 2013 and 2019 was analysed and changes in the types of sweeteners described.

#### Results

There are 12 intense sweeteners permitted for use in New Zealand and seven permitted in the USA. Full findings will be presented for the first time at the ISBNPA conference in 2020.

#### Conclusions

Results will identify if there have been changes over time in the prevalence and type of intense sweeteners in the New Zealand food supply and will inform a larger investigation into ingredients used in the reformulation of packaged food products.





# Associations between the practice of relaxation activities and diet quality: exploring the mediating roles of eating behaviour traits and self-determined regulation of eating behaviours in the PREDISE study

<u>Ms. Julia Lévy-Ndejuru<sup>1,2</sup></u>, Prof. Simone Lemieux<sup>1,2</sup>, Ms. Élise Carbonneau<sup>1,2</sup>, Ms. Raphaëlle Jacob<sup>1,2,3</sup>, Prof. Catherine Bégin<sup>1,4</sup>, Prof. Sophie Desroches<sup>1,2</sup>, Prof. Véronique Provencher<sup>1,2</sup>

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#### Motivation and behavior change (SIG)

Purpose: While practicing relaxation activities may be positively related to better diet quality, its association with eating behaviours is unclear. This study aims to explore whether eating behaviour traits and self-determined regulation of eating behaviours mediate the association between the practice of relaxation activities and diet quality, in a sample of French-speaking adults (Québec, Canada).

Methods: A total of 418 women and 482 men, aged between 18 and 65 years and recruited as part of the PREDISE study, were considered in the analyses. Participants had to report whether they practice one or more relaxation activities (e.g., yoga or meditation). Healthy Eating Index (HEI) was calculated from three web-based 24h dietary recalls. Intuitive Eating Scale, where Body-Food Choice Congruence subscale (BFCC) refers to the tendency to choose nutritious foods while respecting well-being and preferences, and Regulation of Eating Behaviour Scale, where the Self-Determination Index (SDI) indicates a more autonomous eating behaviour regulation style as opposed to controlled, were completed through online questionnaires. T-tests were conducted to compare individuals who currently engage in relaxation activities (practitioners) to those who do not (non-practitioners). Multiple regression analyses were performed to test the mediational model (PROCESS macro version 3.3). Analyses are adjusted for sociodemographic covariables.

Results: Overall, 88 women and 43 men were practitioners, and they had a higher HEI score than non-practitioners (62.9±13.0 vs. 55.6±14.3; p=0.0002). Parallel mediation models showed significant indirect effects of practitioner status on HEI score through BFCC ( $\beta$  = 1.51, SE = 0.40, 95% CI:2.35, 0.81) and SDI ( $\beta$  = 1.55, SE = .38, 95% CI: 2.35, 0.86). The direct effect was not significant ( $\beta$  = 1.0, SE = 1.28, p = 0.4372, 95% CI: 3.52, -1.52).

Conclusions: These findings suggest that the current practice of relaxation activities is associated with a better diet quality, which can be explained by practitioners' higher intuitive eating skills and more self-determined regulation of eating behaviours. Further studies should investigate potential impacts of relaxation activities on the development and maintenance of positive eating habits. (Funded by CIHR)





# A web-based intervention to improve child intake of fruit and vegetables in childcare

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#### Early care and education (SIG)

Background: As dietary behaviours developed during childhood track into adulthood, interventions to improve child nutrition within the early childhood education and care setting are recommended. Web-based modalities represent a promising means of supporting the delivery of ECEC-based healthy eating interventions at scale. The primary aim of this study is to examine the impact of a web-based intervention together with health promotion officer support on child dietary intake of fruit and vegetable serves in childcare. Secondary aims are to examine the impact on centre implementation of recommended healthy eating policies and practices

Methods: A cluster randomised controlled trial employing an effectiveness-implementation type-II hybrid design will be conducted with 22 ECEC centres within New South Wales, Australia. Centres allocated to the intervention group will receive access to a web-based program (incorporating audit and feedback, developing a formal implementation blueprint and educational materials) together with health promotion officer support (via an educational outreach visit, ongoing consultation and local technical assistance, identification of centre champion) to implement healthy eating practices to improve child diet in care. The primary outcome of the study is the mean serves of fruit and vegetables consumed by children whilst in care at six months follow-up, assessed through the measurement of 440 children's lunchboxes. Secondary outcomes include the mean serves of fruit and vegetables packed within lunchboxes and centre's healthy eating environments assessed via direct observations. Child and centre-level outcomes will be analysed using linear regression models.

Results: Development of the web-based program, including selection of behaviour change techniques and implementation strategies employed via the web-based program to address ECEC barriers will be presented. Twenty-two centres have completed baseline data collection. Baseline child dietary intake of fruit and vegetable serves during care will also be presented.

Conclusions: This is the first randomised controlled trial to examine the impact of a web-based intervention on child dietary intake in care. Results of the study will strengthen the evidence-base regarding the impact of healthy eating practices on child diet in care. The web-based modality provides a novel approach for population-wide implementation support to centres given their potential reach and consistency with existing infrastructure.





# Changes in Physical activity and Neighborhood environment by torrential rain

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#### Policies and environments (SIG)

[BACKGROUND] Natural disasters have changed our lifestyles for long-term. As the neighborhood environments associated with the levels of habitual physical activity, the inactivity caused by the natural disasters increases the risk of the physical deconditions. It remains unclear that the effects of the natural disasters on the habitual physical activity. The purpose of the present investigation was to examine the changes in physical activity levels and the neighborhood environment walkability associated with the torrential rain.

[METHODS] The participants of the present investigation were 857 individuals (322 Men and 535 Women, aged 67.6±10.6 years old), and were recruited from the area damaged by the torrential rain in 2018. All subjects completed a questioner including about the physical activity levels and the neighborhood environment walkability before-, after, and effects of the torrential rain. The physical activity levels were evaluated based on the duration and frequency. The neighborhood environment walkability was assessed by eleven questions (basic + recommended) from the International Physical Activity Questionnaire Environmental Module (IPAQ-E).

[RESULTS] Two percent of total subjects answered that the physical activity decreased compared with that before the torrential rain. The subjects who broken their house had significantly lower physical activity compared with the subjects not broken their house (p<0.05). The physical activity environmental did not differ significantly among two measurements points.

[DISCUSSION] The results of the present investigation demonstrated that the effects of the torrential rain on the habitual physical activity would be not significant where the neighborhood environment did not change, and the damages for housing was significant contributor for the decreases in physical activity.





# The Price Is Right: Prevalence of promotions on breakfast cereals in a large supermarket chain in New Zealand

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Policies and environments (SIG)

#### Purpose:

Supermarkets are a key food environment for improving population's diet. 87% of New Zealanders purchase groceries from supermarkets weekly, and pricing and other promotional strategies are used by retailers to influence shoppers' choices. Our aim was to examine the frequency of promotions on breakfast cereals over a 12-week period and determine whether healthier or less healthy products were promoted more frequently at a major food retailer in New Zealand.

#### Methods:

Weekly cross-sectional surveys of 198 breakfast cereals and drinks were conducted for 12 weeks in six Auckland supermarket stores. Data collected included on-shelf regular and discounted price, features in weekly mailers, instore product promotional displays, and type of promotional strategy used. Product was considered promoted if it was promoted in at least one of the six stores. The weekly frequency of promotions and an estimate of the resulting price reductions were calculated. Product nutritional composition (energy, sugar, sodium and fibre) and overall Health Star Rating were used to determine the healthiness of promoted versus non-promoted breakfast items.

#### Results/findings:

During the study period, 56.1% to 71.7% of breakfast items were promoted through at least one strategy each week. Of these, 3.0% to 16.7% were simultaneously promoted via on-shelf promotions, in-store extra promotional displays, and weekly mailers. The weekly frequencies of promotions were 53.0% to 71.2% for on-shelf promotions, 3.0% to 19.2% for weekly mailers, and 20.2% to 29.3% for in-store extra promotional displays. Price reduction was used in 25.8% to 46.5% of on-shelf promotions, and cost savings relative to the regular price ranged from 2% to 54%. Generally, the healthiness of the promoted and non-promoted breakfast foods was comparable, with promoted products having slightly higher mean Health Star Rating for weekly mailers (4.1 versus 3.9) and in-store extra promotional displays (4.0 versus 3.9), with no difference for on-shelf promotions (3.9).

#### Conclusion

Promotions are a frequently used strategy to influence shopper product selection but the healthiness of promoted versus non-promoted items does not vary greatly. Marketing strategies focused on healthier products only could be an important means to improve the healthiness of supermarket food purchases and thus population diets and health.





# Pie in the sky: Exploring the links between apartment living and food practices

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#### Policies and environments (SIG)

Purpose: More Australians than ever are living in apartments (currently 2.3 million) and this is a key response to housing Australia's growing urban population. Apartments are often much smaller than traditional detached houses, and the shift to apartment living brings lifestyle changes for many occupants. Many of the health implications of living in apartments remain under-investigated. Specifically, while food practices (the purchasing, preparation and consumption of food as well as broader factors such as meal planning, cooking skills, and socialising) play a vital role in the overall well-being of the population, the interrelations between apartment living and food practices remains unknown. We sought to explore apartment living and its influence on food practices.

Methods: We conducted a pilot study in 2019 to explore how apartment living influences food practices in Melbourne, Australia using photo-elicited qualitative interviews (Deakin University Human Ethics Advisory Group approval HEAG HEAG-H 118\_2019). Four suburbs within 8km of the CBD were selected and these neighbourhoods represented a mix of both high and low socioeconomic status (SES) areas. Random addresses within these neighbourhoods were mailed invites and subsequently 12 participants were chosen for interviews. Basic thematic analysis was undertaken on the interview transcripts.

Results: Preliminary evidence suggests that the higher levels of commercialisation in areas where apartments are located may make it easier to access food of all types. When purchasing food for home, restrictions on the amount and type of groceries that were purchase were evident. These included the inability to carry or transport items, limited storage space within the apartment, and restrictions of what they could cook. This latter point was due to the size of the preparation space, ability to own (due to storage) particularly cooking equipment, and issues related to both ventilation and internal smoke alarms.

Conclusion: With apartment living becoming more prevalent in Australian cities, it is timely to observe the potential impact of this shift on food practices. Food practices play a vital role in the well-being of the population but there is limited guidance about the ways apartments should be designed to encourage healthier food practices.





# Weight status (BMI) and weight-related goals in defining portion sizes and reported consumption of sweet and savoury energy-dense foods

**Prof. Liisa Lähteenmäki<sup>1</sup>**, Ms. Susanne Hansen<sup>1</sup>, Ms. Ingrid Laukeland Djupegot<sup>2</sup> <sup>1</sup>*Aarhus University, Aarhus, Denmark,* <sup>2</sup>*University of Stavanger, Stavanger, Norway* 

#### Motivation and behavior change (SIG)

Portion sizes, especially in energy-dense foods have been associated with contributing to weight increase. Energydense foods differ in their role in diet and in addition to portion size the frequency of consumption is crucial to the energy consumed. The objective was to study whether individuals differ in their use patterns of sweet and savoury foods (candy and crisps) related to their current weight status (BMI) and weight-related goals.

Survey (n=905; age 18-65 years) was conducted among randomly selected Danish participants. Weight status as BMI was based on reported weight and height. Weight-related goal was asked with a question on whether respondents tried to lose weight, actively maintain their weight, or did not pay attention to weight. Candy and crisp consumption was measured with a eight-category scale containing pictures of candy/crisps in different amounts for respondents to choose from as normal consumption and the amount they would like to eat. In addition, they reported their use frequency of candy and crisps on a frequency scale that could be transformed into times per week of consumption.

The portion of candy and crisps eaten normally and desired amount to eat did not differ according to weight status (BMI). Those trying to maintain their weight (54% having normal BMI) reported significantly lower portion sizes as what they eat or would like to eat compared to those who do not pay attention to weight and those who try to lose weight. They also had lower reported weekly consumption of candy, whereas consumption did not differ according to weight status. However, in crisps there were no differences between weight goals in reported normal or desired portion size, use frequency or weekly consumption of crisps.

Weight maintainers are an interesting group of individuals as they vary in their BMI and many have never been overweight. They seem to better adjust their portion size rather than consumption frequency when eating sweets, but they do not differ in the use of crisps. Better understanding of this group and how it restrains its eating provides valuable information to factors that be used to promote weight management.





# The effect of exercise-induced fatigue on the technical skill performance of subelite female soccer players

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Othe

Purpose: To evaluate the effect of aerobic and anaerobic fatigue on the technical skill performance of sub-elite female soccer players, and determine the aerobic and anaerobic fitness characteristics of sub-elite female soccer players.

Methods: Forty-eight female soccer players participated in the study. Players completed the Loughborough Soccer Passing Test (LSPT) before and directly following the execution of the repeated sprint ability (RSA) test on day 1. On day 2, players completed the LSPT before and directly following the execution of the Yo-Yo Intermittent Recovery Level 1 (Yo-Yo IR1) test. Maximal heart rate and blood lactate concentration were obtained following the fatiguing exercises.

Results: Players covered a mean distance of 560 m in the Yo-Yo IR1 and 614 m in the RSA test. Maximal heart rate values of 190 bpm and 186 bpm were recorded following the aerobic and anaerobic tests respectively. A decline in the LSPT was found in terms of passing, penalty and total time following both fatiguing exercises, and displayed small to moderate effect sizes. A significant (p<0.001) increase in penalty time (32.6%) and total performance time (10.1%) was recorded following the Yo-Yo IR1. Penalty time (20.4%) and total performance time (8.5%) also increased following the RSA test.

Conclusions: Physical fatigue has a detrimental effect on short-passing ability, with aerobic fatigue influencing passing accuracy more than anaerobic fatigue, resulting in a larger decline in technical skill performance. These results suggest that the fatigue-related decline in technical performance seems to be related to the fitness level of a player.





# Training opportunities in healthy eating and physical activity for staff of out of school hours care programs in NSW, Australia

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#### Early care and education (SIG)

Purpose: Childcare programs, including out of school hours care (OSHC), are a fast-growing setting in Australia which can provide healthy foods and opportunities for physical activity to children. Yet, relatively little is known about what occurs in these settings.

Methods: Data were collected during the afterschool period from 77 OSHC programs, on two non-consecutive weekdays (32 affiliated with an organisation, 37 independent programs and 8 attached to a long day care program). Structured interviews were conducted with program directors about healthy eating and physical activity practices and policies. Foods and beverages offered to children were observed and categorised into food groups aligned with the Australian Dietary Guidelines. Staff behaviour and program activities were recorded using the Systems for Observing Staff Promotion of Physical Activity and Nutrition. Associations between service type, healthy eating and physical activity behaviours were explored using parametric and nonparametric tests.

Results: More than 50% of OSHC programs sampled reported having no nutrition or physical activity training. OSHC services associated with an organisation provided vegetables more frequently (p=0.036) and a greater variety (p=0.012) of vegetables to children. Programs affiliated with an organisations had the highest proportion of structured games (p=.081) yet played more elimination games (p=0.019) than independent and long day care services.

Conclusion: There is a need for further OSHC staff training in healthy eating and physical activity best practice behaviours in NSW.





# Living with diabetes

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Disease prevention and management

#### Background:

Rapid socio-economic transitions along with genetic vulnerability have led to an upsurge in diabetes epidemic among Indians living in urban as well as rural areas. The aim of the study is to explore the lived-experiences of individuals with diabetes from different social, cultural and contextual backgrounds.

#### Methods:

A qualitative study was conducted with 35 individuals (13 women and 12 men), above the age of 40, who have been living with Type 2 Diabetes for at least 6 months. The participants were interviewed at a multi-disciplinary clinic in India, using purposive sampling technique. Semi-structured interviews were conducted. The data was analysed using thematic analysis with the constant comparative method.

#### Results:

Several themes emerged in the data including acceptance of diabetes as "a part of my life" and "a challenge given by God" in contrast to "I want it to go away". The disease was perceived as "a silent killer that weakens everything" and "it is never cured". Cognitive adaptations such as "it's a common disease" "I feel better with the changes" were seen. Behaviour related themes related to diet and exercise were also observed.

#### Conclusion and implications:

Findings highlight cultural and gender differences in diabetes perception and management, along with challenges influenced by social and contextual factors. Understanding these lived-experiences in diabetes care can aid in developing more personalized interventions.





# The feasibility and preliminary efficacy of an eHealth lifestyle program in women with recent gestational diabetes mellitus

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#### e-&mHealth (SIG)

Purpose: Self-administered eHealth interventions provide a potential low-cost solution for reducing diabetes risk by targeting lifestyle behaviours. Our aim was to evaluate the feasibility and preliminary efficacy of the Body Balance Beyond eHealth intervention in women with recent gestational diabetes mellitus (GDM).

Methods: Overweight/obese women with a diagnosis of GDM in the previous 24-months were randomised into one of three groups: High Personalisation (access to Body Balance Beyond healthy lifestyle website plus individual video coaching with a dietitian and exercise physiologist, and personalised text message support), Low Personalisation (website only), and waitlist control. A process evaluation was conducted at 3-months and 6-months. Primary outcome (weight) and secondary outcomes (HbA1c, cholesterol, diet quality, moderate-vigorous physical activity level) were analysed at baseline, 3-months and 6-months using linear mixed models (intention-to-treat).

Results/findings: Forty-two women (mean age  $33.5\pm4.0$  years, BMI  $32.4\pm4.3$  kg/m2) were randomised, of which 29 (69%) completed the 6-month assessment. Retention rates at 6-months were 80% for the High Personalisation group, 54% for the Low Personalisation group and 71% for the Waitlist control (Reasons: pregnant, n=2; personal/work commitments, n=4; placed on weight-loss diet, n=1; resources not useful, n=1; uncontactable, n=5). The majority (91%) of women in both intervention groups accessed the Body Balance Beyond website in the first 3 months, which fell to 57% at 6 months. The website provided useful information about lifestyle factors for 65-95% of women, while 25-30% found it motivating. Most women (85-92%) in the High Personalisation group felt the video coaching increased their confidence and helped achieve goals, while only 8-31% felt this way about the text messages. Overall satisfaction rates with the program were higher at 3-months (85% satisfied) than 6-months (62%). No significant group by time interactions were observed for any outcome, with the exception of HDL cholesterol where a difference was observed favouring the control group (p=0.028).

Conclusions: Retaining women with a recent diagnosis of GDM is challenging. The Body Balance Beyond website combined with video coaching appears to be acceptable and useful for women with previous GDM. Further analysis of the program's efficacy on diabetes risk reduction in a larger study is underway.





# The Contribution of Physical Education to Physical Activity within a Comprehensive School Health Promotion Program

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#### Policies and environments (SIG)

Purpose: Physical inactivity in the United States remains a concern among public health organizations, leading to legislation that requires schools to develop comprehensive wellness policies for children's health promotion. Given pressure exerted on schools to create and maintain environments conducive to children's physical activity (PA), it is prudent to understand how schools promote movement through physical education (PE) and the school day, and the degree to which this subject plays a role in shaping children's health behavior. The purpose of this study was to understand how PE contributes to the overall PA that children receive in a school recognized for health promotion.

Methods: A case study was conducted with a school in the United States that received recognition from a national health and wellness organization for health and wellness. To examine the contribution of PE to overall PA levels, students in grades 4-8 (ages 9-14; N=105) wore ActiGraph wGT3X+ accelerometers over seven days to capture habitual behaviors. Data were analyzed using ActiLife software and grouped into low, moderate, and high activity levels based on a tertile split for daily PA. Data were analyzed on an aggregate scale (i.e. average for seven-day wear period) before being segmented into PE, school day, and daily PA. A 2-way ANOVA (sex\*activity level) was conducted to determine the ratio of physical activity accumulated in physical education to school and overall daily physical activity.

Results: Analyses revealed a non-significant interaction between sex and activity level to predict contribution of PE to school MVPA F(2, 99) = .284, p=.753. One-way ANOVA analyses revealed significant differences in the amount of MVPA attained in PE F(2, 102) = 9.948, p=.000, school F(2, 102) = 57.818, p=.000, and over the entire day F(2, 102) = 149.684, p=.000 between low, moderate, and high activity groups, respectively. Highly active participants obtained almost twice as much PA during PE as low active participants.

Conclusions: PE contributes significantly to children's school day and overall PA, especially for those who are least active. Policies that increase the frequency of PE in schools may help to bridge the gap in activity inequality in the United States.





# Children's healthy and unhealthy beverage availability, purchase and consumption: A wearable camera study

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Policies and environments (SIG)

#### Purpose

Children's sugar-sweetened beverages (SSBs) consumption presents significant risks for obesity, type 2 diabetes and dental health. But there is a lack of objective data on beverages in children's overall environments. This study aimed to determine the nature and extent of children's beverage availability, purchase and consumption, throughout their days, using wearable cameras for data collection.

#### Method

Data were sourced from 'Kids'Cam NZ', a study in which randomly-selected New Zealand children (n=168; 11-14y, mean 12.6y) wore cameras for four days (Thursday-Sunday), automatically taking a photo every 7s. Using content analysis, Thursday and Saturday images (n=700,201) were systematically analysed.

#### Results

On average, 18.9 (95% CI 16.8, 21.4) drinks/day were available to the children (n=158), of which 7.5 (95% CI 5.8, 9.7; 39.7%) were non-core drinks, including 6.4 (95% CI 5.0, 8.3; 33.9%) SSBs. At school and home, core drinks (water, unflavoured milk) were the most available. In all other locations in which children spent time (e.g., recreation venues and food retail outlets) non-core drinks dominated, at rates 1.5-5 times that of core drinks availability. Almost all drinks (n=17; 10.8%) the children purchased were non-core. On average, children (n=111; 70.3%) consumed a drink 2.6 (95% CI 2.1, 3.1) times/day, including one (95% CI 0.7, 1.3) SSB.

#### Conclusion

At school and home core drinks predominated. SSBs were available to most children in all locations in which they spent time, and dominated their drinks purchases and consumption. SSBs appear to be a typical feature of children's everyday environments, almost certainly making it difficult for children's beverage intakes to align with guidelines. The findings support calls for governments to urgently enact the SSB-related actions in the WHO Commission's Ending Childhood Obesity implementation plan and, in turn, improve child health.





# Social media's reaction to the latest version of Canada's Food Guide (2019)

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#### Policies and environments (SIG)

Purpose: The release of an updated Canadian Food Guide (CFG) in January 2019 was a big departure from previous versions which shifted the focus from food groups and servings to a visual plate with messaging around increasing plant-based proteins, choosing water as the beverage of choice, and whole grains. This study aimed to investigate how traditional media framed the release of CFG and how audiences reacted to its release on social media.

Methods: Titles of news articles, Facebook comments, and tweets from Twitter were collected using Meltwater and manual data collection. Leximancer software conducted conceptual extraction and relational analyses on written words and visual text, which involved mapping of relationships among the themes. Human coding was completed to contextualize the content, in which nine prominent frames (food guide, impact, health, plant-focussed, who will use?, Canadian culture, food, meat, and dairy) were identified.

Results: News headlines highlighted CFG release (with changes) and alluded to potential impacts (on industry). Analysis of Facebook comments revealed that the most commonly discussed frames were health, food, plant-focussed, and meat, while the majority of the tweets were in direct reference to CFG being released, oftentimes with a link to another webpage, and discussed the overlap between health and food.

Conclusion: The analysis revealed how frames emerged from social network users that shifted the discussion away from CFG release and impact (e.g., industry) to the influence of health and food and a plant-focussed vs. meat debate. As evidenced by the framing on social media, people are aware of the link between food and health, yet misinformation abounds.





# "Fit communities" - associations between the built environment and healthrelated fitness in adults

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#### Policies and environments (SIG)

Purpose: There are many health benefits of regular physical activity. Notably, regular physical activity can improve physical fitness. Higher levels of physical fitness is protective against chronic disease. Accumulating evidence suggests the neighborhood built environment is important for supporting physical activity and health however, few studies have investigated the contribution of the neighborhood built environment to fitness levels. Our study investigated the associations between objectively-measured and self-reported neighborhood walkability and perceived health-related fitness (cardiorespiratory, muscular strength, and flexibility) in adults.

Methods: In August (summer) of 2018, a random cross-sectional sample of 592 adults from established neighborhoods in Calgary (Canada) completed an online questionnaire. During the online questionnaire, participants reported their perceived cardiorespiratory fitness (CRF), muscular strength (MS), flexibility, moderate-to-vigorous physical activity (MVPA), strength training, health, and sociodemographic characteristics. The questionnaire also captured participant's perceptions of their neighborhood's walkability (Physical Activity Neighborhood Environment Scale; PANES) and the physical activity supportiveness of neighborhood parks (Park Perceptions Index; PPI). Using 6-digit residential postal codes, participant's households were linked to an objective measure of walkability (Walk Score®). Multivariable linear regression models estimated adjusted unstandardized beta (b) for the associations between each Walk Score®, PANES, and PPI and perceived CRF, MS, and flexibility. Models were adjusted for age, sex, ethnicity, education, household income, dog ownership, access to a motor vehicle, tobacco use, frequency of MVPA, and frequency of strength training.

Results: The average (SD) age of participants was 46.0 (14.7) years and 67.2% were female. Participants, on average, participated in at least 30-minutes of MVPA on 3.4 (2.1) days/week and undertook strength training 2.0 (1.8) days/week. On a scale from 0 (low fitness) to 100 (high fitness) participants, on average, reported moderate CRF (65.2), MS (64.9), and flexibility (62.3).

Adjusting for covariates, Walk Score<sup>®</sup> was not associated with any fitness outcomes. Adjusting for covariates, the PANES was positively associated (p<.05) with CRF (b=6.47), MS (b=5.15), flexibility (b=7.01) and the PPI was positively associated (p<.05) with CRF (b=3.75) and flexibility (b=4.62) but not MS.

Conclusions: Our novel findings suggest the neighborhood built environment may be important for supporting higher health-related fitness levels in adults.





# Is receiving body-related comments related to exercise motivations and unhealthy weight control behaviors? A cross section study among Chinese young women

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#### Motivation and behavior change (SIG)

Purposes. It is common in Chinese culture to give body-related comments (BRC) to family and friends as a sign of showing care. The current study explored whether such comments are related to appearance-related motivation to exercise and using unhealthy weight control behaviors among Chinese young women.

Methods. College female students (N=236) at a comprehensive university in Southwest China filled an online survey. The frequency of receiving BRC was measured by three questions: "How often do [family members/romantic others/friends] make comments to you about your body weight and/or body shape?" Appearance-based exercise motivation was measured by asking participants whether they exercised to lose weight/gain weight/lose fat/gain muscle. Unhealthy weight control behaviors were measured by identifying whether they used ten unhealthy methods to lose/control weight in the past month. Regression analyses and t-test were used for data analyses.

Results. Approximately one-third of participants reported receiving BRC a few times a month and 16.3% a few times a week from friends. A quarter of participants receiving comments from parents a few times a month and 10.7% receiving a few times a week. Regression analyses showed that, controlling for BMI (M=19.8, SD=2.45), receiving BRC from romantic others and friends predicted exercise motivation to lose weight, b=.23, p<.05, b=.27, p<.01, respectively; Receiving BRC from romantic others and friends predicted exercise motivation to lose fat,b=.19, b =.20, both Ps<.05. Compared to those without unhealthy weight control behaviors, those "ate very little" received more BRC from romantic others (p<.05). Those used "dieting" received more BRC from parents and romantic others (Ps<.05).

Conclusions. Although Chinese college women are generally slim, they received frequent BRC from their social context. Receiving BRC is related to exercise motivations to lose weight and fat and more unhealthy weight control behaviors. Colleges and universities should implement comprehensive education programs to help Chinese college women and their parents, romantic others, and peers to recognize the impact of BRC.





# Positive and negative educators' feeding practices and mealtime environments in the Family Day Care setting

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#### Early care and education (SIG)

Purpose: Educators' feeding practices can impact children's eating behaviours and dietary intake. Family Day Care (FDC) services care for children in small, intimate environments, where mealtimes can be challenging for the sole educator responsible for preparing and feeding up to four young children of different ages and abilities. This research examined the mealtime environments and educators' feeding practices in FDC services.

Methods: Twenty-six full-day observations in FDC services were conducted using the Environment Policy Assessment and Observation tools in two Local Health Districts. Seventeen best practice items for mealtime environments and educator feeding practices were coded "yes" or "no" when observed during each mealtime. SPSS was used to calculate descriptive statistics.

Results/findings: Seventy-seven meal occasions were observed (22 morning teas, 26 lunches, 25 afternoon teas and 4 additional meals). On average, children spent 71 minutes in mealtimes at FDC. Over half the educators (15 out of 26) spoke English as their second language. The following positive educator feeding practices were observed at every mealtime: seventeen educators sat with children, ten educators encouraged children to eat healthy foods while allowing them to make their own choices and only four led or encouraged pleasant conversation. No educators were observed to role model eating healthy foods or praise children for eating healthy foods at every observed mealtime. The following negative educator feeding practices were not observed at any mealtimes: pressuring children to eat (24 out of 26), requiring a child to sit at the table until they have finished the meal (25 out of 26), television on (21 out of 26), educator using a screen device (19 out of 26) and spoon feeding a child (who was able to feed themselves) to get them to eat (12 out of 26).

Conclusions: Most educators avoided the use of negative feeding practices, apart from spoon-feeding children. Conversely, many educators were not observed using positive feeding practices at every mealtime. Future interventions should target mealtimes as a pedagogical opportunity for developing key life skills and healthy eating behaviors through positive feeding practices and enjoyable mealtimes.





# Investigating the sleep quality in children with ASD using objective and subjective measurements

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Other

Purpose: To investigate the sleep quality in children with ASD using subjective and objective measurements

Methods: A total of 156 subjects (mean age = 10.05; SD = 1.08) were recruited in this matched case-control study. This group comprised 78 ASD cases and an equal number of matched controls by age in year (8-12), gender and BMI (±5%). Cases were defined as those diagnosed with ASD by physicians based on the Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM-5, American Psychiatric Association, 2016) and were recruited from five local special schools for intelligence disability in Hong Kong. Subjects with one or more comorbid psychiatric disorders, complex neurological disorders (e.g., epilepsy, phenylketonuria, fragile X syndrome, tuberous sclerosis), or taking drugs that might affect sleep (e.g. melatonin supplements, anti-depressants), were excluded from the study. Control was defined as the one who did not have previous medical history of ASD and was selected for each ASD subject by matching age, gender and BMI.

Results/findings: Results showed that children with ASD had a shorter sleep duration, reduced sleep efficiency, longer sleep onset latency and wake after sleep onset than children with TD (ps <.05).

Conclusions: The present study was the first large scale study investigating the sleep quality in children with ASD in Asia region using objective and subjective sleep assessments. It is concluded that children with ASD have poor sleep quality than children with TD as shown by both types of measurements.





# Prevalence of non-communicable disease risk factors among primary schoolchildren in disadvantaged communities in Nelson Mandela Bay, South Africa

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#### Disease prevention and management

#### Purpose

Schools in South Africa, particularly those situated in disadvantaged communities, face various challenges and are subsequently not conducive to promoting a healthy and active lifestyle. One of the aims of this study therefore was to assess the incidence of non-communicable disease risk factors among grade 4 to 6 children (ages 8 to 13 years) in government primary schools situated within disadvantaged communities.

#### Method

A cross-sectional survey was conducted in eight randomly selected primary schools in Nelson Mandela Bay. In total 973 schoolchildren participated in the study. The study measured anthropometric variables (height, weight, waist circumference), body composition (body mass index), blood pressure, HbA1c, total cholesterol, grip strength, cardiorespiratory fitness (20-m shuttle run), and objectively measured physical activity by means of accelerometery.

#### Results/findings

Results indicated that 14% of the sample presented with elevated blood pressure  $\geq$  90th percentile. In respect of hypercholesterolemia, 14% presented with borderline high values and 3% presented with high values. The hyperglycaemia test categorised 8% as prediabetic and 0.1% as diabetic. Waist circumference measurements identified 6% of girls and 4% of boys as high risk and for BMI, 25% were classified as overweight/obese. In respect of estimated VO2max, 47% of children were categorised with very low to low fitness levels while only 40% had high to very high fitness levels. More than half of the children (52%) did not meet the requirement of 60 minutes of moderate-to-vigorous physical activity per day.

#### Conclusions

In conclusion, a prevalence of cardiovascular disease risk factors was identified. Concerning numbers of children also presented with low cardiorespiratory fitness and sedentary behaviour. Regular monitoring of cardiovascular disease risk factors is essential to identify children at risk. This study contributes to other evidence-based data that could assist in raising public attention and justifying the need for further engagement in health-promoting policies and primary prevention programmes among the most vulnerable groups within South Africa.





# Perceived barriers and facilitators to fruit and vegetable consumption in a persistently impoverished and highly obese rural community

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#### Disease prevention and management

Purpose: In the United States (U.S.), 1 in 3 adults are obese. Obesity rates are even higher in rural communities, compounded by poor dietary choices, specifically with few adults meeting recommended daily fruit and vegetable (FV) intakes. These health disparities are amplified for residents of rural Appalachian communities in the eastern U.S. due to limited resources, which are exacerbated by geographic isolation and low socioeconomic status. Therefore, the purpose of this qualitative research is to understand perceived barriers and facilitators influencing FV intakes in rural Appalachia. A better understanding of what impedes health-promoting behaviors will provide guidance for policy, systems, and environmental (PSE) changes to decrease obesity prevalence in these communities.

Methods: Five focus groups were conducted among community leaders and residents (n=34) in one highly obese (>40%) rural Appalachian community in the eastern U.S. Focus groups ranged from 53-76 minutes with 4-11 participants per session and 24% (n=8) reporting an annual household income <\$20,000. A semi-structured moderator guide was developed to examine barriers and facilitators to FV intakes of individuals and the community. The focus group discussions were digitally recorded and transcribed verbatim before thematic content analysis was performed using a grounded theory approach.

Results: Consensus among participants indicated lack of access and Appalachian cultural norms as major community-level barriers to FV intakes. The majority of participants reported lack of nutrition-related knowledge and high prices as individual-level barriers to FV consumption. For individuals, facilitators centered on freshness of produce, primarily offered through small family gardens and preserved for the off-season. Social support was recognized as a key facilitator for consumption of FV for the community.

Conclusions: Understanding cultural context for health behavior in rural Appalachia is vital to successfully implement relevant PSE changes to decrease obesity in these communities. Overcoming barriers, coupled with PSE changes, may encourage increased FV intakes among rural populations at an increased risk of high obesity. Further research is warranted to integrate food access initiatives with nutrition education in order to appropriately address community needs that cultivate healthier lifestyles.





# Barriers and facilitators of physical activity across the school to university transition

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#### Policies and environments (SIG)

Purpose: Physical activity levels decline as students transition from high school to university. This is coupled with an increased prevalence of mental health concerns in student populations, which could be attenuated by regular physical activity. Universities represent a unique setting to promote physical activity and have potential to reach a high proportion of students. This research aimed to explore the experiences of students as they transitioned from high school to university and to identify barriers and facilitators to physical activity during this period.

Methods: Focus groups and individual interviews were held with inactive first year students and university stakeholders, including lecturers, health promotion staff, mental health practitioners, disability officers, and physical activity practitioners (n = 30). Focus groups and interviews were audio recorded and transcribed. Transcriptions were coded qualitatively using thematic analysis. Codes were grouped together to form themes and sub-themes.

Results: The school to university transition was identified as a major life event for young people requiring adjustment to a new environment and culture, often away from family and friends. Students were largely positive about their experiences of the transition, however most students felt that coming to university had negatively impacted their physical activity levels and other health behaviours. A range of barriers and facilitators to physical activity at the individual, social, community and environmental level were identified. Students with mental health issues, disabilities, from low income backgrounds, and from ethnic minority groups were identified as being particularly at risk of physical activity declines. Potential strategies to address the barriers and build on physical activity facilitators were proposed.

Conclusions: The findings highlight the complex and unique experiences of students as they transition to university and the need to develop interventions that support students to maintain positive health behaviours during this period. Services and environments that are inclusive and accessible were identified as central to enabling physical activity, with an identified need for strategies that effectively target students at greater risk of physical inactivity.





# Content of critical nutrients declared on labels of processed foods sold in supermarkets between 2018-2019 in Costa Rica

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#### Policies and environments (SIG)

Purpose: Nutrition labelling has been suggested as one tool to curb the rise in diet-related non-communicable diseases (NCD). In Costa Rica, nutrition labelling is not mandatory and therefore the nutritional composition of packaged foods is little known. This study a) analyzed the content of critical nutrients for NCD (sodium, saturated fat and sugars) declared on labels of processed foods sold in Costa Rican supermarkets between 2018-2019, and b) compared those contents to United Kingdom Traffic Light labelling (UK-TLL) nutrient profiling system.

Methods: Data (n=6,842) were collected in three supermarkets with different socioeconomic levels in great metropolitan area during 2018-2019. The Food Label Information Program for Latin America (FLIP-LAC) was used for data collection and capture. FLIP-LAC is a smartphone-based technology and methodology developed at The University of Toronto. Foods and non-alcoholic beverages available at grocery supermarkets were collected and classified into 23 major food categories. Data included nutrient declarations and ingredients list. Analyses were conducted for 10 categories (n=5,353) identified as critical due their contribution to diets in the Costa Rican population. Contents of sodium, saturated fat and sugars (mean±DS) were calculated and compared to the UK-TLL thresholds.

Results: 70% (n=3,752) of the products declared sodium, 64% (n=3,436) saturated fat and 55% (n=2,943) sugars. Categories with the highest and lowest sodium content (mg per 100g/ml±DS) were Sauces and Condiments ( $3463\pm7483$ ) and Beverages ( $25\pm61$ ), respectively. Categories with the highest and lowest saturated fat content (g per 100g/ml±DS) were Sugars and Sweets ( $12\pm9.6$ ) and Beverages ( $0.7\pm2.5$ ), respectively, while categories with the highest and lowest sugar content (g per 100g/ml±DS) were Sugars and Sweets ( $12\pm9.6$ ) and Beverages ( $0.7\pm2.5$ ), respectively, while categories with the highest and lowest sugar content (g per 100g/ml±DS) were Sugars and Sweets ( $50\pm31.7$ ) and Soups ( $2.7\pm3.9$ ), respectively. Fifty-three percent of products had a low sodium content (i.e., green), 39% a median (i.e., yellow) and 8% high (i.e., red). With respect to saturated fat content, 34% of products were classified as green, 20% were yellow and 37% were red. Most products (50%) were classified as red in terms of their content of sugar, 37% were green and 26% were yellow.

Conclusion: Mandatory regulation of nutrition labeling is urgently needed in Costa Rica to supports public policies in favor of healthier food environments.





# Associations between individual long-term diet from childhood to adulthood and cardiometabolic outcomes: a systematic review

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#### Disease prevention and management

Purpose: Exploring diet-disease associations based on long-term diet exposure across the lifespan is a promising and comparatively under-utilised approach. This systematic literature review aims to evaluate the current evidence on associations between individual long-term diet, from childhood to adulthood, and cardiometabolic outcomes.

Methods: The review protocol was developed according to PRISMA guidelines. Seven journal databases were searched; eligible papers included original analyses of cohort studies of healthy populations, in journal articles published in English at any date. The exposure of interest was long-term diet based on repeated, quantitative measures from childhood to adulthood and spanning five or more years. Outcomes of interest were cardiovascular disease, obesity, type 2 diabetes and related clinical risk measures.

Results: Out of 7,725 papers screened, 37 eligible articles were identified representing nine cohorts across six countries. The review synthesises findings from over 150,000 subjects, ranging from 3-18 years in childhood and 19-90 years in adulthood, with individuals' diets re-measured across 6 to 60-year periods. The most common diet exposures were intakes of macronutrients, fruit, vegetables and sugar-sweetened beverages, diet quality scores and breakfast consumption habits. The most common outcomes were weight-related measures, blood pressure and serum lipids. Persistent high or increasing values for fruit intake, vegetable intake, breakfast consumption and diet quality scores were generally associated with favourable cardiometabolic outcomes compared to persistent low or decreasing values. Persistent high or increasing values for sugar-sweetened beverage intake were generally associated with unfavourable outcomes.

Conclusions: Dietary intake and behaviours at both childhood and adulthood are associated with cardiometabolic outcomes. The findings from this review will help clarify the importance of diet throughout life stages and provide insights for how and when diet is promoted from a public health perspective.





# Co-development of physical activity, screen time and sleep from childhood to adolescence: an eight-year study

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#### Other

Purpose: Canada was the first to adopt comprehensive 24-hour movement guidelines that include recommendations for physical activity, screen time and sleep to promote health benefits. No studies have investigated the concurrent development of these behaviours in North American youth. The objectives were to assess adherence to the Canadian 24-hour movement guidelines for children and youth and identify joint trajectories of moderate-to-vigorous physical activity (MVPA), screen time and sleep from childhood to adolescence.

Methods: Nine hundred and thirty eight participants of the MATCH study self-reported their MVPA, screen time and sleep duration over 8 years. MVPA and screen time were measured three times per year (24 cycles), and sleep was measured once per year (8 cycles). Guideline adherence was dichotomised as meeting the recommendations for each specific health behaviour or not. Multi-group trajectory modeling was used to identify unique trajectories of behavioural co-development. Analyses were stratified by sex.

Results: Between 10% and 39% of youth did not meet any recommendation at the various cycles of data collection. More than half of youth met one or two recommendation, and less than 5% of participants met all three recommendations at a study cycle throughout the 8 years of follow-up. Four different trajectories of behavioural co-development were identified for boys and for girls: a complier (good adherence to the guidelines; 12% boys and 9% girls), a decliner (decreasing adherence to the guidelines; 23% boys and 18% girls) and a non-complier group (low adherence to the guidelines; 42% boys and 42% girls) were identified. In boys, a physical activity-complier group (high MVPA-low screen time; 23%) was identified, whereas in girls a screen-complier group (moderate screen time-low MVPA; 30%) was identified.

Conclusions: There is a need to recognise that variations from general trends of decreasing MVPA, increasing screen time and decreasing sleep exist. Specifically, we found that although it is uncommon for youth to adhere to the Canadian 24-hour movement guidelines, some youth displayed a high likelihood of attaining one or multiple of the behavioural recommendations. Further, patterns of adherence to the guidelines can differ across different sub-groups of youth.





# Combating health disparities in access to care for obesity treatment

#### Prof. Phillip Brantley<sup>1</sup>

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#### Disease prevention and management

Purpose: Louisiana is currently one of the US leaders in the prevalence of obesity. Health disparities have been prominent in access to obesity treatment, particularly bariatric surgery. One of the State's largest insurers, the Office of Group Benefits (OGB), partnered with Pennington Biomedical Research Center (PBRC) to examine the feasibility and potential financial and health benefits of providing treatment to its adult members with severe obesity (HEADS UP study). The proposed poster will examine the level of participation in HEADS UP by eligible African American and Caucasian members OGB.

Methods: HEADS UP is an observational study. The initial contact with OGB members (approximately 250,000) occurred through a letter explaining the program, basic inclusion/exclusion criteria, and how to navigate the screening process. Eligible participants were directed to a website for further screening and those who met this second level of eligibility attended on-site screening and evaluation for treatment.

Results: A total of 6,800 interested OGB members contacted the study website. A total of 2,730 met the project eligibility requirements and visited PBRC for on-site screening and evaluation for the treatment of their choice of surgical (1,114 requested) or nonsurgical, intensive medical intervention-IMI (1,616 requested). The HEADS UP program completed its 5 year initial contract on June 30, 2016. It provided bariatric surgery treatment for obesity (gastric banding, gastric bypass of gastric sleeve) to 490 severely obese adults and nonsurgical weight management treatment (liquid diet, lifestyle modification) to 922 severely obese adults. Weight loss was successful in the surgical group which averaged over 30% of baseline weight lost and in the non-surgical treatment program which averaged 6.3% of baseline weight lost or about 16 pounds). HEADS UP has a very unique and diverse group of participants, with 38.6% of participants African American.

Conclusions: The number of OGB members who expressed an interest in the study was consistent with the estimated number of African American and Caucasian individuals with severe obesity among the membership of OGB. Providing insurance coverage for obesity treatment may help alleviate health disparities in obesity care.





# Mental health outcomes of lifestyle behaviour change interventions targeting men: A systematic review with meta-analysis

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Disease prevention and management

#### Purpose:

Despite rising mental health problems worldwide, engaging men to seek mental health support is challenging. Maleonly lifestyle interventions have shown promise for improving men's physical health, but the overall impact of these programs on psychological outcomes is unclear. This review aimed to evaluate the impact of male-only lifestyle interventions on men's mental health and to identify key intervention features associated with effectiveness.

#### Method:

A systematic literature search with no date restrictions was conducted across four databases. All studies used a randomised design to evaluate the impact of a male-only lifestyle behaviour change intervention on one or more mental health outcomes (e.g., depression). Studies included men with and/or without pre-existing mental health conditions. Risk of bias was assessed using criteria modified from the CONSORT statement and recent reviews. A fixed effects meta-analyses calculated aggregated change effects.

#### Results:

The search returned 15,946 citations. Nine studies were eligible for inclusion, representing 1,427 participants. Eight of the studies tested interventions targeting multiple lifestyle behaviours (e.g., physical activity, diet) and seven studies had weight as the primary outcome. No studies targeted men with pre-existing mental health conditions. Overall, significant group-by-time effects were reported for 7 of 27 (26%) mental health outcomes. Risk of bias was generally low across studies, though only one intervention assessed mental health  $\geq$ 12m after baseline and no studies were specifically powered to detect changes in mental health. In the fixed effects meta-analyses, small-to-medium intervention effects were observed for mental health-related quality of life (d=0.24), self-esteem (d=0.51) and positive affect (d=0.58). Insights into effective study or intervention features were limited due to the low number of heterogeneous studies.

#### Conclusion:

While male-only lifestyle interventions have improved men's mental health in some circumstances, studies that are specifically powered to detect long-term changes are urgently required, particularly in men with pre-existing mental health concerns. These studies will also help to illuminate which intervention components or targeted health behaviours are most important to optimise participant outcomes. This is critical, given men are reluctant to participate in traditional mental health treatments and require tailored solutions to prevent and treat mental health concerns.





# "Sick and tired of being sick and tired": changes in health and well-being of adopters of a Couch-to-5K running app.

#### Dr. Katie Pickering<sup>1</sup>, Dr. Andy Pringle<sup>2</sup>, Prof. Jim McKenna<sup>3</sup>

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#### e-&mHealth (SIG)

Purpose: Free-of-charge commercially available physical activity (PA) apps have the potential to reach widespread population groups. Voluntary engagement with these PA resources has the potential to make expensive professional intervention redundant. However, the enthusiasm associated with mHealth interventions for improving health and well-being remains unclear for commercially available PA-oriented products that are not facilitated by health professionals. Resultantly, the purpose of this research was to investigate whether voluntary adoption of a free-of-charge running app (Couch-to-5K) can produce beneficial health outcomes.

Methods: An anonymous online survey was developed to explore user experiences of, and adherence to, a Couch-to-5K running app. Data was collected over 12 weeks using a combination of open-ended and closed response questions. Data from open-ended questions were analysed thematically to explore experiences of using the app and changes in health and well-being were analysed in SPSS version 22.

Results/Findings:The survey reached 903 adult (females n=718; mean age 42.4; ±SD 9.89 years) Couch-to-5K users. Whilst only 165 (22%) of respondents reported having at least one health condition, 579 (77.2%) reported the app had a positive effect on their health, 184 reported no impact on health and 153 did not respond. Of 754 responses, 313 (41.5%) said that app adoption helped reduce stress. In addition, 521 respondents provided indications of further health advantages using an open-ended response option. Data reduction of these responses revealed improvements across the following themes:

Weight loss Medication reduction Mental Health improvement General well-being improvement Health condition improvement Confidence

Conclusions:Effective management of chronic illness and mental health is a key public health agenda. Participation in Couch-to-5K showed improvements in the health and wellbeing of participants in this study. Adopting Couch-to-5K also seems to be effective for managing stress. Chronic illness and mental health concerns are costly to treat; therefore accessible interventions which alleviate the strain on health services to manage such conditions are important. Understanding the specific components of the Couch-to-5K programme which led to positive health and well-being outcomes is crucial for developing and promoting PA apps for specific population groups and future research should consider this.





# Associations between health status, daytime functioning, sedentary time, physical activity, and body fat percentage among rural Latinas/os: The moderating role of stress

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#### Disease prevention and management

Background: Stress is associated with weight-related health behaviors and obesity, yet it is unclear whether stress influences relationships between health behaviors and obesity. Little is known about which weight-related health behaviors are most strongly related to obesity among rural Latino adults. This study examines the relationship between health behaviors (physical activity, sedentary behavior, daytime dysfunction), perceived health status, and % body fat, and whether stress moderates these relationships, among rural Latino adults.

Methods: 109 Latinas/os (Mage=37.1 years, 89% female, 80.4% completed high school) were recruited from rural counties in South Texas. Accelerometers assessed past week time in moderate-to-vigorous physical activity (MVPA). Participants self-reported time spent on a typical weekday or weekend day engaging in sedentary activities (e.g., watching T.V., browsing social network sites). Responses were summed to create weekday and weekend index scores. Participants self-reported health status [poor to excellent] and past month stress and daytime functioning. Stress and daytime functioning items were summed, respectively. Higher scores indicated better health, greater time sedentary, more daytime dysfunction, and greater stress. Bioelectrical impedance analysis measured % body fat. Hierarchical multiple regression examined relationships between study variables and % body fat and tested for interactions between stress and study variables on % body fat. Analyses controlled for age, sex, and education.

Results: Better health status was associated with lower % body fat ( $\beta$ =-2.00, SE=.74, p=.01). Stress moderated relationships between health status and % body fat ( $\beta$ =-.21, SE=.09, p=.03) and MVPA and % body fat ( $\beta$ =-.03, SE=.02, p=.05). For those with less stress, greater time in MVPA is associated with higher body fat % ( $\beta$ =.23, SE=.01, p=.04). MVPA and % body fat were not associated among individuals experiencing higher stress. For individuals with high stress, poorer health is associated with greater body fat %( $\beta$ =-3.65, SE=1.00, p=.001). Health status and % body fat were not associated among low stress individuals. No other significant associations were found.

Conclusion: Future research should investigate mechanisms through which stress exerts influence on relationships between health status, MVPA, and % body fat and causes of stress among this understudied population to inform design of appropriate interventions.





# Examining Teachers' Personal Physical Activity Behaviors in Relation to Implementation of Classroom Physical Activity

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Early care and education (SIG)

Introduction: The use of classroom physical activity (CPA) is becoming more widespread, as many teachers and administrators recognize the value of providing school-day PA opportunities to their students. However, not all teachers engage in moderate to vigorous PA themselves, which may affect their attitudes toward promoting PA to their students. The purpose of this investigation was to examine teachers' self-reported PA engagement in relation to their perceptions about CPA, the extent of their implementation of a ten-week CPA intervention, and the average PA of their students.

Methods: Participants included 54 teachers across five elementary schools. Teachers attended a training on CPA implementation at the onset of the ten week intervention. During this training, the short form of the International Physical Activity Questionnaire (IPAQ) was administered to assess participant PA levels. The IPAQ scoring protocol was used to calculate metabolic equivalent of task (MET)-minutes per week, which is a single estimate of the frequency and intensity of weekly PA reported by each teacher. Total MET-minutes per week was used as the independent variable in the regression models. Dependent variables included teacher-perceived educational benefits of CPA (measured via baseline survey), total CPA provided throughout the ten week intervention period (reported weekly by each teacher), and average steps over one measurement week for students in each classroom (measured via accelerometer). Multilevel modeling was utilized to account for the nesting of teachers within schools.

Results: MET-minutes of teacher PA calculated from the IPAQ was not associated with teacher perceptions of the benefits of CPA, the number of CPA opportunities they offered to students, or their students' average steps in a given week over the ten week period.

Conclusions: Teachers' reported levels of personal PA were not significantly associated with their perceptions of the educational benefits of CPA for students, the extent to which they provided CPA to students, or how many steps their students took on average, in a given week. It is potentially encouraging that the extent to which a teacher values and promotes CPA to students is not systematically associated with their own PA behavior.





# Active virtual reality induces moderate-to-vigorous physical activity in young adults: a feasibility study

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#### e- & mHealth (SIG)

Purpose: Research shows that active video games are being used to provide additional opportunities for increasing moderate-to vigorous physical activity (MVPA). However, the effect of virtual reality (VR) on MVPA is less understood. VR games can be played either as an active (AVR) or sedentary (SVR) setting, but there are no evidence of the MVPA that AVR is capable of inducing MVPA. We therefore compared the objectively measured MVPA produced by AVR and SVR using hip- and wrist-worn-accelerometers.

Methods: Seventeen young adults (age: 22.1±1.3 years; body mass index: 22.9±3.9 kg×m-1) underwent one AVR session and one SVR session. The AVR game played was Beat Saber (Beat Games®), which required the participants to move their arms holding virtual swords (saber lights) to cut through small blocks and evade larger blocks by crouching and moving side to side during the process. in the SVR session the participant played a game called Thumber (Drool®) using a game controller (Xbox One) connected to a computer. Each game session was preset to last for approximately 20 minutes. Time spent (minutes) in MVPA was calculated using vector magnitude (VM) counts obtained from hip- and wrist- worn accelerometers during the game sessions.

Results: MVPA was significantly higher in the AVR session than in the SVR session, as measured either in the wrist (18.2  $\pm$  1.1 vs. 0.3  $\pm$  0.5; p < 0.001; d = 20.3) or in the hip (4.04  $\pm$  3.97 vs. 0.01  $\pm$  0.01; p = 0.001; d = 1.4). We found also that time spent in MVPA corresponded to 90 % of the active session when measured with wrist accelerometers and 20 % when measured with hip accelerometers.

Conclusions: We are among the first to show that AVRs are capable of inducing MVPA. Additional research with alternatives to increase game engagement in AVR is now warranted. We suggest that a wrist accelerometer is a more sensible choice of instrument comared to a hip accelerometer to detect MVPA in during the VR game play that feasures significant upper body movement.




# Are physical activity, sedentary behavior and performance indicators different by subgroups of German university students?

Other AG 8 Ftan 2019<sup>1</sup>, Dr. Rainer Neumann<sup>1</sup>, <u>Prof. Claudio Nigg<sup>1</sup></u> <sup>1</sup>Karlsruhe Institute of Technology, Karlsruhe, Germany

Motivation and behavior change (SIG)

Purpose: Understanding behavioral health differences informs policy makers' resource allocation. Therefore, we assessed German university students' demographic differences in physical activity (PA), sedentary behavior (SB) and performance indicators.

Methods: Summer academy participants (n=77; 37.7% female; age=21.0, SD=1.6 years; study areas: medicine=28.6%, natural sciences=27.3%, technical studies=14.3%; location: southern Germany [Bavaria/Baden-Württemberg]=46.8, northern Germany [all others]=44.2%;  $\leq$ 4 semesters in university=58.4%) completed questionnaires and motoric tests about their PA, SB, strength, balance, flexibility and biometric indicators.

Results: Descriptives were: Moderate to vigorous PA=49.5, SD=43.1min/day. SB: sitting=7.9, SD=1.9hours/day; leisure screen time=3.0180.4, SD=2.3hours/day. Strength: standing long jump=184.1, SD=36.1cm; hand strength 37.1, SD=9.4kg. Balance: single leg stand 24.6, SD=21.1sec. Flexibility: stand and reach=-4.7, SD=14.1cm. Biometrics: BMI=21.5, SD=2.1kg/m2. ANOVAs revealed 7/40 significant group comparisons (p<.05), however multiple comparison Bonferroni correction revealed only 2/40 significant comparisons (males outperformed females on standing long jump and hand strength; p<.001).

Conclusions: In large part, there were no demographic differences on PA, SB and performance indicators (except strength differences between males and females) in our sample. The participants were homogeneous in that they were all scholars of an academic foundation. However, they did represent a broad range of content areas allowing some confidence in the results' generalizability.

This sample does engage in substantial SB (sitting and leisure screen time). We recommend interventions to decrease SBs and to maintain PA and motoric performance to prevent future onset of chronic diseases in this population. Future studies using a more representative sample are likely to be informative on University students PA, SB and performance indicators.

Ftan 2019 ÅG 8 (alphabetical): Lea Ade, Michael Blank, Alexandra Denk, Lina Fischer, Elisabeth Geller, Anna Gimpel Timo Hagenreiner, Vivian Lucas Keune, Luca Keunecke, Annika Liebich, Katharina Liebig, Daniel Schraffl, Sören Tumeltshammer, Paul Wagner.

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# Impact of PSE strategies on health behaviors in a rural setting: Baseline findings from a prospective cohort study

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### Policies and environments (SIG)

Purpose: Policy, systems, and environmental (PSE) approaches are a growing strategy to reduce obesity in rural communities where health disparities related to poor nutrition and physical inactivity are prominent. These approaches are extensive and multifaceted; therefore, it is challenging to evaluate the impact of PSE strategies due to the complexity of the work. Although many PSE studies employ process evaluations, novel approaches to evaluate health outcomes related to behavior change are needed.

Methods: A prospective cohort study was initiated to evaluate individual behavior change in response to a series of PSE strategies in a rural, Appalachian county in Kentucky (obesity >40%). Validated survey instruments were used to develop a survey assessing dietary practices and active living behaviors. Participants completed a baseline survey and will be re-administered annually for the next four years.

Results/Findings: In fall 2019, residents were invited to participate through social media, flyers, and sampling at community events. Of 177 invited adults, 152 participated (85.9% participation rate), with 65% being women (n=99). Participants' mean age was 54.7 years (Standard Deviation (SD) 15.3; range 22-84), with mean BMI of 34.0 kg/m2 (SD 9.2; range 14.7-69.0), and 67% (n=101) classified as obese. Overall, 43.4% have less than a high school education, 60.4% reported annual household income <\$20,000, and 29.1% of participants conveyed food insecurity. Among participants, 46.7% do not feel they eat as many fruits/vegetables as they need, with 41.4% reporting eight or fewer servings of ruit and 62.5% reporting eight or fewer servings of vegetables (besides potatoes and lettuce) in the past month. For physical activity, 82.8% reported no vigorous-intensity activities within the past week, while 68.4% reported at least 10 minutes of continuous moderate-intensity activity.

Conclusion: Baseline findings reveal there is ample opportunity for outcome improvement. The establishment of this cohort allows for longitudinal assessment of nutrition and physical activity patterns in a rural Appalachian environment. Additionally, it provides a unique opportunity to examine the multitude of impacts on individual-level health behaviors as a result of community-level PSE approaches to reduce obesity.





# Sedentary behaviour interventions and adults with Type 2 Diabetes: A scoping review

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### Disease prevention and management

Purpose: Diabetes is estimated to effect 451 million adults worldwide. Adults with type 2 diabetes (T2D) have high amounts of sedentary behaviour (SB) and accumulate more SB than those without T2D. SB is any waking behavior with a low energy expenditure ( $\leq$  1.5 metabolic equivalents) while in a sitting, reclining, or lying posture. Increasing SB elevates the risk of premature mortality regardless of physical activity and augments cardiometabolic risk factors (CRF). To our knowledge no reviews have investigated (1) if reducing SB can improve CRF in individuals with T2D and (2) whether SB reductions and CRF improvements can be sustained. Hence, we conducted a scoping review to address these two issues.

Methods: Our protocol was developed using the scoping review methodological framework proposed by Arksey & O'malley (2005). Three electronic databases (MEDLINE, PubMed, and SPORTDiscus) were searched using a Boolean search strategy. In addition, reference lists of included studies and review articles were checked manually for more potential suitable articles. The titles and abstracts of articles were reviewed by two independent researchers and the remaining articles were reviewed in full and any disagreements were resolved by discussion with a third researcher. Studies were included if: (1) all participants were adults (18 years) and had been clinically diagnosed with T2D; (2) it included a SB intervention; (3) it included a SB and/or cardiometabolic outcome; (4) were published in English. Observation studies were excluded. Data were extracted, quality was not assessed (consistent with guidelines on scoping review conduct), and results were described using a narrative approach.

Results: A total of 10 studies met the inclusion and exclusion criteria. The included studies provide preliminary evidence that breaking up SB for hours to days can produce significant improvements in CRF and targeting reductions in SB over time (minimum = 12 weeks and maximum = 3 years) can produce significant sustained improvements in SB in adults with T2D.

Conclusions: T2D is a worldwide health burden and pragmatic behavior change interventions are needed. Reducing SB could be a sustainable way to improve CRF in individuals with T2D and warrants investigation.





# Australian primary school principals', teachers' and parents' attitudes and barriers to changing school uniform policies from traditional uniforms to sports uniforms.

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### Policies and environments (SIG)

Purpose: It has been hypothesized that one of the reasons children, particularly girls, may not be active at school is due to the impracticability of their school uniforms. Within Australia most schools require children to wear traditional uniforms, that is, leather shoes with shirts and pants for boys, and a dress, tunic or skirt and shirt with leather shoes and socks or stockings for girls This study aimed to assess Australian primary school principals', teachers' and parents' attitudes to changing school uniform policies which require students' to wear traditional uniforms to allow students to wear sports uniforms every day, and to assess associations between participant characteristics and attitudes to uniform changes. A secondary aim was to identify principals' and teachers' perceived barriers to uniform changes.

Methods: Cross-sectional surveys of principals, teachers and parents of children in grades 2-3 (age 7-10) from 62 primary schools within the Hunter New England region of New South Wales, Australia (October 2017-March 2018). Mixed logistic regression at the school level measured associations between participant demographics and attitude to uniform changes.

Results: Seventy three percent of principals (38/52) reported that their uniform policy only allowed children to wear a sports uniform on sports days. Thirty-eight percent of principals (18/47), 63% of teachers (334/579) and 78% of parents (965/1231) reported that they would support the adoption of a school uniform policy that allowed children to wear a sports uniform every day. The most commonly reported barriers to change were school status and the perception that sports uniforms were not appropriate for formal occasions.

Conclusion: Although the majority of principals were not supportive of a change to sports uniform every day, the majority of teachers and parents were. Given the low prevalence of children, particularly girls, meeting physical activity guidelines and the decline in physical activity as children age allowing students the opportunity to wear more activity friendly uniforms may be worth investigating as an inexpensive and scalable strategy in achieving population level improvements in children's physical activity.





# Co-development of new Australian national guidelines for physical activity and screen time in outside school hours care

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Early care and education (SIG)

### Purpose:

Physical inactivity and excessive screen time in children is a global problem. The outside school hours periods are key time periods where children can accumulate physical activity. Approximately 10% of Australian children attend Out of School Hours Childcare (OSHC) and this is growing. In Australia, OSHC physical activity and screen time practices currently lack formal guidance/policy. This study aimed to engage multidisciplinary stakeholders and end-users to formulate national OSHC physical activity and screen time guidelines.

### Methods:

A 4-round online Delphi survey was conducted (May - December 2019). Australian and international stakeholders were invited, representing academia, education sector, government, health professionals, OSHC staff and parents (n=110). The first round comprised open-ended items exploring themes of physical activity, screen time and sedentary behaviour in the before school care, after school care and vacation care settings. Questions in subsequent rounds were based on stakeholder suggestions from previous rounds and designed to seek consensus for inclusion in national guidelines. Consensus was prospectively set at 80% agreement, and only statements deemed 'critically important' were included. Survey results were combined with findings from two systematic/scoping reviews to inform draft guidelines.

### Results/findings:

Sixty-seven respondents participated (response rate 61%). "Critically important" consensus was reached for 47 statements, including the types of activities available (e.g. free play, playground play and equipment), accessibility to indoor and outdoor play areas, provocations to stimulate physical activity, staff education, incorporating activity guidelines into OSHC practices and balancing physical and sedentary activities. Consensus was achieved immediately for restricting screen time in all OSHC time periods (before and after school and vacation care). The final Delphi round sought feedback on draft Australian guidelines for physical activity and screen time in OSHC.

#### Conclusions:

A consensus approach based on extensive stakeholder engagement was used to develop Australian guidelines for physical activity and screen time in OSHC. It is envisaged these guidelines may be adopted into formal policy in future. Translational research to implement and evaluate the guidelines into OSHC services is warranted.





# Does communication of risk for type 2 diabetes promote change in physical activity behaviours?

### Dr. Susan Williams<sup>1</sup>, Prof. Kate Ames<sup>2</sup>, Prof. Corneel Vandelanotte<sup>1</sup>

<sup>1</sup>Central Queensland University, Physical Activity Research Group, Appleton Institute, North Rockhampton, Australia, <sup>2</sup>Central Queensland University, School of Education and the Arts, Brisbane, Australia

Disease prevention and management

#### Purpose:

Risk communication is recognised as an effective behaviour change technique (BCT) for health behaviours. The online Australian Diabetes Risk Assessment (AUSDRISK) provides individuals with a score based on known risk factors for type 2 diabetes. If a high-risk score (>12) is calculated, a generic text-based message is provided with follow-up advice-to consult a doctor for further testing and improve lifestyle behaviours. Effectiveness of the AUSDRISK as a BCT for health behaviours is unknown. This study examined changes in physical activity behaviours and visits to health professionals after completion of the AUSDRISK.

### Methods:

This two-arm randomised trial consisted of adults over 35 years of age, randomly allocated to receive a tailored video-based or text-based feedback message regarding their score and follow-up advice. Survey data was collected at baseline and one- and three-months follow-up and included socio-demographic characteristics, physical activity behaviours (Active Australia Survey), intention to change and consultations with health professionals. Primary outcomes included change in physical activity and visits to health professionals. Data from both groups were pooled for this secondary analysis that includes descriptive statistics and adjusted logistic regressions.

### Results:

Of 1212 adults screened, 533 were eligible, 477 completed baseline and 249 (Mean age 52.2 ±9.5 years; 78% female) completed follow-up surveys. At baseline, 30.8% were classified sufficiently active, 11% healthy weight (29.7% overweight; 59.4% obese), and 91.2% intended to change activity levels. At three-months, 51% had recorded an increase in physical activity, 46% had consulted their doctor and 39% other health professionals (dietitian/nutritionist (19%); exercise consultant (21%)) and (28% had consulted both). Increased physical activity less likely in those classified obese (OR 0.38, CI 0.16-0.91; p=0.03) and more likely in in those who consulted their doctor (OR 1.84, CI: 1.07-3.15; p=0.03) or an exercise consultant (OR 3.47, CI: 1.67-7.11); p=0.001)

### **Conclusions:**

This study highlights the positive role of risk communication (by text-based or video messages) and the AUSDRISK in promoting health behaviour change in adults with high risk of type 2 diabetes. General Practitioners and exercise consultants play an important role in supporting individuals to maintain change in physical activity over-time, but additional strategies are necessary to support those with obesity.





# Understanding the Role of Teach-Back and Teach-to-Goal Educational Strategies in Improving Comprehension and Engagement in a Technology-Enhanced Diabetes Prevention Intervention

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<sup>1</sup>University of Nebraska Medical Center--College of Public Health, Department of Health Promotion, Omaha, Nebraska, United States, <sup>2</sup>University of Virginia--School of Medicine, Department of Public Health Sciences, Charlottesville, Virginia, United States

### e-&mHealth (SIG)

Purpose: Today, there remains a gap in understanding how well adapted Diabetes Prevention Programs (DPP) work for individuals with low health literacy. Our study evaluated how the use of automated telephone calls to deliver DPP information applying teach-back and teach-to-goal health literacy (HL) techniques might influence overall participant comprehension and engagement in a technology-based DPP.

Methods: A sample of 425 (88.3% of eligible) participants (36.8±6.4 kg/m2, 52.5±12.1 years, 67.3% female) initiated the 22 possible interactive voice response (IVR) telephone lessons as part of this quasi-experimental study. During each lesson participants were provided with reinforcement messages based on how well they comprehended information provided. If needed for those that missed information initially, an additional opportunity to listen to the material and answer review questions was performed. Correct answers received 2 and 1 point, respectively. For an overall comprehension score, all points earned were divided by the number of IVR lesson questions completed. ANOVA, chi-square and multivariate regression modeling was used to test differences of descriptive characteristics and between IVR calls completed, overall comprehension score and health literacy levels.

Results/findings: A total of 425 (LHL-75, 92.6%; HHL-350, 97.0%), 279 (LHL-50, 61.7%; HHL-229, 63.8%), 202 (LHL-44, 54.3%; HHL-158, 43.8%), and 126 (LHL-29, 35.8%; HHL-97, 26.7%) participants completed calls 1, 9, 16 and 22, respectively. While high health literacy (HHL) participants achieved a better overall comprehension score (LHL-16.8±13.1; HHL-16.9±13.3, p<0.01); the initial comprehension gap at call 1 between HHL and LHL disappeared by call 22. Additionally, low health literacy (LHL) participants completed a greater proportion of calls with 38.7% completing all 22 calls vs. 28.9% of HHL (p<0.001). Finally, multiple regression models revealed that the number of IVR calls completed were predicted by comprehension scores and health literacy (F(4, 420)=65.5, p<0.001, R2=0.52).

Conclusions: Regardless of HL levels, overall comprehension rates predicted the number of lessons completed suggesting both HL groups benefited from the additional reinforcement over the length of the intervention, thus reducing knowledge disparities. While our results suggests the potential benefit of using information reinforcement techniques to promote greater program engagement, future studies using experimental designs need to further evaluate these findings.





# Can sodium warnings modify preferences? A case study with bread

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### Policies and environments (SIG)

Purpose: The inclusion of front of pack nutritional warnings has emerged as a potential alternative to empower consumers in selecting healthier food options. The present work was aimed at exploring consumers' reaction towards sodium reduction in the context of the implementation of warnings. The effect of sodium warnings on consumers' expectations, food selection and hedonic perception was assessed using white bread as case study.

Methods: A total of 171 consumers participated in the study that encompassed four parts. Firstly, consumers received two bread samples with different salt content (2.00% and 1.38% salt) and were asked to rate their overall liking and to indicate which sample they preferred under a blind condition. The second task consisted of looking at four bread packages, rating their expected liking and indicating which one they would buy. Packages of bread with 2.00% salt featured the sodium warning while those with 1.38% salt did not. For each salt level, two packages with different graphical design (fictitious brands) were considered. Then, consumers were asked to try the bread they had previously chosen, assess their overall liking and indicate their willingness to buy it again. Finally, data on consumers' socio-demographic profile, attitudes and behaviour related to health and salt consumption was collected.

Results: Salt content significantly affected consumers' hedonic perception of breads. Two consumer segments with different pattern of preferences for salt in bread were identified: 58% of consumers preferred the bread with 2.00% salt while 42% preferred breads with 1.38% salt. However, the two consumer groups elicited similar responses when asked to rate the expected liking based on bread packages (without trying). Both groups showed similar choice patterns and 74% of consumers selected bread packages that did not feature warnings, reinforcing their potential to discourage unhealthy food choices. In addition, after having tried the bread, most consumers were willing to buy it again, which is promising in terms of reaching sustainable shifts towards lower salt levels.

Conclusions: Results suggests that, in the case of bread, nutritional warnings have potential to shift consumers' preferences to lower sodium content, even after trying the products.





# Associations between commercial physical activity app use, app-specific communities, social media platforms and physical activity engagement: A cross-sectional study

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### e- & mHealth (SIG)

Purpose: Commercial physical activity apps (e.g., Fitbit, Strava) have widespread reach and accessibility, and hold great potential to increase physical activity engagement. There is currently limited understanding of the capacity of such apps, and their social components to facilitate physical activity engagement. This study aimed to investigate the relationship between commercial physical activity app use and physical activity engagement. The social components of apps, in particular, app-specific communities (connecting with other app users) and existing social media platforms (e.g., Facebook, Instagram) were also examined in relation to physical activity levels. This included ascertaining the specific features (e.g., sharing, providing/ receiving encouragement, comparisons and competitions) of app-specific communities and existing social media platforms that were most beneficial in promoting physical activity.

Method: The study used a cross-sectional design. Participants completed an online survey assessing physical activity, commercial physical activity app use, and engagement with app-specific communities and existing social media platforms. Data were analysed with t-tests, Chi-square tests, Kruskall-Wallis tests and multiple linear regressions. Alpha was set at 0.05.

Results: Participants were 1432 adults aged 18-83 years (Mage =  $34.1 \pm 13.4$  years, 76.6% female). Overall, 53.1% of the sample reported engaging with a commercial physical activity app. The most commonly used apps were Fitbit (22.5%), Strava (17.1%) and Garmin (13.4%). App users engaged in significantly more physical activity than non-users (p < .001, d = 0.42). The use of app-specific communities (p = .009, d = 0.25) and existing social media platforms (p = .004, d = 0.44) was associated with greater engagement in physical activity. The strongest predictors of physical activity were receiving encouragement from family ( $\beta$  = .271, p = .001), and engagement in competitions with public app-specific communities ( $\beta$  = .208, p = .007).

Conclusions: Commercial physical activity apps and their social components are associated with physical activity, and should be utilised in physical activity interventions. Randomised controlled trials to examine commercial physical activity apps and their social components are warranted.





# Title: Advancing health impact and implementation in research: focus on consumers, markets, and governments. Subtitle: A case study on salt substitutes in Vietnam

<u>Dr Annet Hoek<sup>1,6</sup></u>, Dr. Kathy Trieu<sup>1,6</sup>, Dr. Ha Do Thi Phuong<sup>2</sup>, Mr. Michael Sieburg<sup>3</sup>, Ms. Dolly Hoang<sup>3</sup>, Dr. Colman Taylor<sup>4, 1, 6</sup>, Ms. Irene Deltetto<sup>4</sup>, Mr. Adrian Peacock<sup>4</sup>, Dr. Laura Cobb<sup>5</sup>, Dr. Jacqui Webster<sup>1,6</sup>

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Policies and environments (SIG)

Purpose

The paper highlights the importance of integrating perspectives of consumers, markets, and governments in public health research and intervention development.

We illustrate this by a project in Vietnam, where salt reduction is important due to current high salt consumption  $(\pm 10 \text{ g/day})$ . Salt, Bot Canh and fish sauce constitute  $\pm 70\%$  of dietary sodium consumed, which provides ample opportunities for interventions.

The project aims were to develop a sodium-reduced fish sauce and to assess consumer sensory acceptability, market feasibility and the cost effectiveness of introducing salt substitutes.

Methods

Different studies and methods were applied

- Product development and consumer testing providing manufacturer and consumer perspectives:

A sodium-reduced fish sauce was developed with a salt substitute (potassium salt). Foods and meals with salt substitutes will be tested in a consumer sensory test.

- Feasibility study providing market and government perspectives:

Semi-structured interviews (n=20) were held with market stakeholders (e.g. manufacturers, retail) and government stakeholders (e.g. federal/local government)

- Cost effectiveness study to inform government:

A health economic cost-effectiveness model was built for three scenarios: 1) no government intervention: voluntary introduction of salt-substituted products 2) government subsidies 3) government regulation allowing only low-sodium varieties

Findings

- Product development and consumer testing:

Preliminary findings demonstrate it's possible to develop a 35% sodium-reduced fish sauce while maintaining microbial safety and essential features. Consumer acceptability and sensory properties of salt-substitutes foods will be presented.

- Feasibility study:

The interviews highlighted current consumer and market trends, drivers and barriers for salt substitutes and sodium-reduced foods in Vietnam, expectations of different stakeholders, and parallels with iodine fortification. -Cost effectiveness study:





The model shows all three scenarios are cost saving, the government regulation strategy being the least costly and most effective. This demonstrates population sodium reduction interventions aimed at lowering blood pressure are cost-effective in Vietnam.

#### Conclusions

The Vietnam project provided proof of principle and a roadmap for introducing salt-substitutes as a sodiumreduction strategy. It shows the possibilities and advantages for both Vietnamese consumers, markets and government. Overall, we recommend that public health research and intervention development focuses more on multiple perspectives to better advance health impact and implementation.





# Metabolic biomarkers and internalizing symptoms among adolescents of healthy weight and overweight: a randomized trial

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### Disease prevention and management

Purpose: Internalizing disorders are common co-morbidities of metabolic diseases including Type 2 Diabetes; yet the acute associations between metabolic biomarkers and internalizing symptoms are understudied. This study experimentally investigated the associations between glycemic metabolic biomarkers (glucose, insulin, and C-peptide) and internalizing symptoms (positive affect, negative affect, and state anxiety) among adolescents; and assessed if these associations differed by weight status (healthy weight vs. overweight/obese defined by body mass index percentile).

Methods: Adolescents (N=34, mean age= 14.1 years, 58.8% female, 32.4% overweight/obese, 50.0% Hispanic) completed two in-lab, three-hour oral glucose tolerance tests (OGTT). Serum glucose (mg/dL), insulin (mIU/dL), and C-peptide (ng/dL) were measured at baseline and every 30 minutes after, and area under the curves (AUC) were calculated using the trapezoidal method. Adolescents reported on positive affect, negative affect, and state anxiety at pre-test and post-test using validated measures. Multilevel models stratified by weight status tested the associations between each metabolic biomarker AUC and each post-test internalizing symptom, controlling for participant demographic characteristics, randomization order, and respective internalizing symptoms at pre-test.

Results: Glucose AUC was positively related to negative affect among the participants of healthy weight ( $\beta$ =0.0001, p<.05), but not among those with overweight/obesity. Insulin AUC was inversely related to positive affect ( $\beta$ =-0.0002, p<.05), negative affect ( $\beta$ =-0.0001, p<.001), and state anxiety ( $\beta$ =-0.0002, p<.05) among the participants with overweight/obesity, but was positively related to negative affect ( $\beta$ =-0.0001, p<.01). C-peptide AUC was inversely related to negative affect ( $\beta$ =-0.002, p<.01) and state anxiety ( $\beta$ =-0.005, p<.05) among participants with overweight/obesity, while C-peptide AUC was positively related to negative affect ( $\beta$ =0.002, p<.01) among participants of healthy weight.

Conclusions: Affective responses to glucose, insulin, and C-peptide differed by weight status among a sample of healthy adolescents. Affective responses were more negative following elevated metabolic biomarkers among participants of healthy weight compared to those with overweight/obesity. Among the three biomarkers investigated, glucose AUC had the weakest associations with affective states. Additional research on these differential associations is needed to inform behavioral intervention strategies targeting the regulation of metabolic biomarkers for improving emotional health.





# Positive effects of the K-MOOC smart diet together: Healthy body weight control and individualized nutrition class on body fat and skeletal muscle

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### e-&mHealth (SIG)

Purpose: Korean Massive Open Online Course (K-MOOC), called MOOC in Korean, is a form in which learners can learn university lectures online and conducts interactive learning such as questions and discussions. K-MOOC Smart Diet Together: Healthy Body Weight Control and Individualized Nutrition class was developed to provide easy and funny nutrition health information based on scientific evidence so that everyone can practice individualized body weight control smartly for themselves. Nutrition health information consisting of nutrition education, cooking, and yoga, etc. can be used as a nutrition intervention for everyone to lead a healthy body composition. This study was conducted to confirm the effects of this class on the changes in learners' body composition.

Methods: Subjects were 379 Korean undergraduate students (223 male and 156 female) at university located in Incheon who completed the K-MOOC [Smart Diet Together: Healthy Body Weight Control and Individualized

Nutrition class during 15 weeks in 2 semesters from September 2018 to July 2019. Subjects participated in body composition measurement twice (weeks 3 and 13 out of 15 weeks) during this class. Subjects' body weight, skeletal muscle mass, and body fat mass were measured by using Inbody 370 (Biospace Co., Korea). Data were analyzed SPSS program version 20.0.

Results: During this class taking, in male students, average body fat and percent body fat significantly decreased from 17.0 kg to 16.6 kg (p<0.01) and from 22.3% to 21.7% (p<0.001), respectively. Skeletal muscle mass significantly increased from 32.5 kg to 32.7 kg (p<0.05). In female students, average body fat significantly decreased from 18.4kg to 18.0kg (p<0.05), and there was not significant but a tendency that percent body fat decreased from 32.1% to 31.4% (p=0.051). Subjects with positive changes in standard or below standard in percent body fat were 8.5% in male students and 9.6% in female subjects (p<0.001), respectively.

Conclusions: This e-learning class showed the effects on positive changes in body fat and skeletal muscle by providing nutrition health information. We suggest that this e-learning class should be continuously promoting and expanded.





# Childhood obesity prevention, energy balance, microbiome and behavioral nutrition

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#### Disease prevention and management

Most childhood obesity prevention interventions have not worked. When the changes attained statistical significance, the changes were small (and thereby not adequate to prevent obesity in populations). A number of the interventions which worked the first time, did not for a second implementation, suggesting a type 1 error on the first implementation.

All these childhood obesity prevention interventions have been predicated on the simple energy balance model, wherein weight gain is the result of energy intake exceeding energy expenditure, and the reverse for weight loss. A recent theoretical formulation of the simple energy balance model was rejected as inadequate for accounting for the known homeostatic, non-homeostatic, and cognitive feedback mechanisms among intake, expenditure and body composition. This led to the formulation of a complex energy balance model including these feedback mechanisms. The complex energy balance model has been used primarily among the obese to understand weight maintenance, and not among the lean to understand who grows into overweight and obesity. The primary insight of the complex energy balance model for the initiation of obesity has been the hedonic overconsumption of food. However, hedonic overconsumption alone faces the same feedback mechanisms.

A substantial number of influences on childhood obesity, perhaps in combination with the complex energy balance model, but apparently sometimes not, have been proposed. These non-complex energy balance models of obesity initiation factors likely include genetics, epigenetics, the microbiome, air pollution, infection with Adenovirus 36, antibiotic use before 2 years of age, and stress, among many others. This presentation selects the microbiome, and will identify the evidence for this influence on obesity and dietary behaviors which likely influence the microbiome-obesity relationship. A research agenda for behavioral nutrition and physical activity will be outlined.

Thus, the multi-etiological approach to childhood obesity prevention is an attempt both to move beyond the simple energy balance model of childhood obesity prevention (and has not worked) and to reconnect behavioral science with advances in medical science.





# An investigation into the patterns of daily sedentary and occupational sitting time in desk-based workers in Bangladesh

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Othei

Purpose: To determine the pattern of sedentary behaviour and associated factors in desk-based office workers in Bangladesh.

Background: Prolonged sitting time is associated with poor cardiovascular outcomes. People in modern workplaces spend much of their time sitting; thus, office environments are important contexts in which to implement interventions to reduce sedentary time. Most estimates of workplace sitting are based on findings from high-income countries even though almost three-fourths of non-communicable disease-related deaths occur in Low-and-Middle-Income Countries (LMICs). This study addresses this gap with evidence from Bangladesh.

Methods: A cross-sectional survey of 360 desk-based workers (>4hrs/day deskwork) was conducted in three workplaces in Bangladesh. Total and domain-specific sedentary time were measured using the SIT-Q-7d questionnaire and cardiovascular risk factors were assessed using the WHO STEPS survey. A multiple linear and a logistic regression model for identifying the associates of total sedentary time (TST) and occupational sitting time (OST) (dichotomized at median value 6.5 hours) were developed, respectively.

Results: Daily TST in the study population was 11.3 hours/day, with 6.4 hours/day identified as OST. Employees who were younger (35-39 years), male, and more educated (postgraduate) had a significantly higher TST than older employees (>=55 years), female or less educated employees. There was a statistically positive association with obesity and a negative association with moderate-to-vigorous physical activity with TST. Male sex and higher household income were significantly associated with OST. In both models, there was a statistically significant association with sitting break pattern (less frequent than 60minute interruption).

Conclusions: Urban Bangladesh ranks high from a global standpoint in terms of TST and OST. LMICs should include sedentary behaviour measures in national health surveys to establish its impact. Interventions to reduce sedentary time should be targeted to office-based workplaces, where around half of all sitting time occurs. Frequent breaks from sitting during the workday maybe a potential intervention for employers that wish to invest in the health of their employees in the absence of acceptable and low-cost physical activity interventions.





# Physically active lifestyles and healthier dietary patterns could improve metabolic health markers in women

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### Motivation and behavior change (SIG)

Physically active lifestyles and healthier dietary patterns could improve metabolic health markers in women Background: Physical activity (PA) and dietary intake are important lifestyle factors impacting long-term health outcomes. The aim of this study was to investigate relationships between adherence to physical activity guidelines, dietary patterns and body composition and metabolic health markers.

Methods: Participants were 348 healthy women aged 16-45 years from the Women's EXPLORE study. Sedentary behaviour, physical activity and adherence to the aerobic component of physical activity guidelines ( $\geq$ 150 min/week moderate intensity PA) was assessed via a 7-day hip-worn accelerometry protocol. A Recent Physical Activity Questionnaire was used to determine specific physical activities performed during recreation time. Fat and lean mass (total, regional) were assessed using air displacement plethysmography and dual x-ray absorptiometry. Metabolic biomarkers were assessed from fasting venous blood samples. Dietary patterns were extracted from dietary intake data obtained from a 220-item Food Frequency Questionnaire. All analyses were adjusted for relevant confounders.

Results: PA guidelines ( $\geq$ 150 min/week moderate intensity PA) were achieved by 66% of participants. The guidelines was met predominantly through walking (76.7% participation; 11.5 ± 19.7 min/day). Those participants meeting PA guidelines had significantly lower total and regional fat mass and percentages (p $\leq$ 0.001), BMI (p<), insulin (p<0.001), total cholesterol (p<0.001) and triglycerides (p<0.005), and significantly higher HDL-c (p<0.001) compared to participants not meeting PA guidelines.Scores for the dietary patterns 'sweet and savoury snacking', 'fruit and vegetable' and 'fats and meats' did not differ between those who did and did not meet PA guidelines, however scores for the 'refined and processed' dietary pattern were significantly lower (p<0.001) among participants meeting PA guidelines compared to those not meeting the guidelines. Further analysis will examine interactions between meeting PA guidelines and following specific dietary patterns on metabolic and body composition markers.

Conclusion: Adherence to basic physical activity guidelines has the potential to significantly improve the long-term metabolic health prospects of women. Promotion of physically active lifestyles, combined with healthy eating behaviours should be a priority in public health messaging.





# "A little bit often": Rethinking physical activity recommendations for young people with mental health in mind

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Disease prevention and management

### Introduction

The association between physical activity and mental well-being in young people is well established. Current global recommendations for young people require at least 60 minutes of moderate- to vigorous-intensity physical activity every day of the week. However, these are based on epidemiological evidence for the relationship of physical activity with cardiovascular and metabolic health outcomes. We aim to use existing data to explore the relevance of these recommendations to mental well-being outcomes in young people, with a particular focus on the frequency throughout the week and total duration of physical activity participation.

#### Methods

We examined the nationally representative 2016-2019 Active NZ survey data (n=5,841). This comprised survey items for health-enhancing recreational physical activity (frequency, duration) and mental well-being (single-item score). We used logistic regressions to examine the association of meeting physical activity duration recommendations (420minutes/week) with mental well-being (dichotomised: "at-risk" threshold) adjusted for age, sex, education and ethnicity. We repeated these analyses for incremental increases in the frequency of physical activity on days throughout the week independent of duration. We then repeated these analyses for incremental increases in the duration of physical activity independent of frequency throughout the week.

### Results

There was a positive association between meeting current physical activity recommendations and mental wellbeing (OR=1.45, 95%CI:1.28-1.65). For physical activity frequency, there was a statistically significant association with mental wellbeing only when participating on seven days/week (OR=1.41, 95%CI:1.13-1.77). For physical activity duration, there was a statistically significant association with mental wellbeing when participating at least 120 minutes/week (OR=1.52, 95%CI:1.20-1.92).

### Conclusion

Current global physical activity recommendations may not be appropriate for mental well-being outcomes in young people. Our results support the need to be active on every day of the week, but suggest that the weekly duration of physical activity may not need to be as high as currently recommended to realise significant mental health benefits. This is particularly pertinent in populations experiencing mental illness, who often have low motivation to be physically active. Further research is indicated to establish causation and understand how other components of physical activity dose influence mental health outcomes in young people (e.g. intensity, type).





# A population-based study of the associations between neighbourhood walkability and different types of physical activity in Canadian men and women

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### Policies and environments (SIG)

Purpose: Few studies have investigated whether or not associations between neighbourhood characteristics and physical activity differ for men and women. The main purpose of this study was to estimate associations between perceived neighbourhood characteristics and physical activity among Canadian adults.

Methods: This study included cross-sectional survey data obtained from urban participants enrolled in 'Alberta's Tomorrow Project' (Alberta, Canada; n=14,078), a longitudinal study. The survey included socio-demographic items as well as the International Physical Activity Questionnaire and the abbreviated Neighbourhood Environment Walkability Scale (NEWS-A). Subscale and overall walkability scores were generated from NEWS-A responses. Adjusted generalized linear models estimated the associations of participation and minutes of different types of physical activity, including transportation walking (TW), leisure walking (LW), moderate-intensity physical activity (MPA), and vigorous-intensity physical activity (VPA) with walkability scores.Results were expressed as odds ratios (ORs) for participation and beta-coefficients ( $\beta$ s) for minutes and their 95% confidence intervals (CIs).

Results/findings: Approximately 61% of the sample participated in TW or LW, 29% in MPA, and 33% in VPA. Overall walkability was positively associated with participation in TW (OR 1.05; CI 1.04, 1.06), LW (OR 1.03; CI 1.02, 1.04), MPA (OR 1.02; CI 1.01, 1.03), and VPA (OR 1.02; CI 1.01, 1.03) and minutes of TW ( $\beta$  1.41; CI 0.43, 2.40), LW ( $\beta$  1.01; CI 0.08, 1.94), and VPA ( $\beta$  1.37; CI 0.39, 2.35). Among men, street connectivity was negatively associated with VPA participation (OR 0.98; CI 0.97, 0.99), and crime safety was negatively associated with VPA minutes ( $\beta$  -10.58; CI - 19.69, -1.46). Among women, pedestrian infrastructure was positively associated with LW participation (OR 1.03; CI 1.02, 1.04), and overall walkability was positively associated with VPA minutes ( $\beta$  2.05; CI 0.94, 3.16). Notably, overall walkability was positively associated with LW participation among men (OR 1.005; CI 1.002, 1.008) and women (OR 1.009; CI 1.007, 1.01).

Conclusions: Perceived neighbourhood characteristics are associated with participation and time spent in different physical activities among Albertan adults. Interventions designed to modify perceptions of neighbourhood characteristics might affect initiation or maintenance of different types of physical activity.





# Assessment of Metabolic Profile of obese Non Alcoholic Fatty Liver Disease (NAFLD) patients from middle income families visiting a tertiary care hospital in north India: A cross sectional study

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Disease prevention and management

Purpose: To examine the metabolic profile of obese adult north Indian patients from middle-income families with ultrasound proven Non-Alcoholic Fatty Liver Disease (NAFLD), visiting the metabolic clinic of a tertiary care government hospital.

Methods: Obese patients (25-39.9kg/m2) aged 18-60 years with an ultrasound diagnosed NAFLD were included. Blood samples were analyzed for glycemia, aminotransferases and lipid profile. Anthropometry, body composition (Bodyvis BCA-2A) and Controlled Attenuation Parameter (CAP, FibroScan touch 502) were done.

Results: A total of 122 NAFLD patients (74 males), with age 41.4 $\pm$ 10.4 yrs and BMI 30.12  $\pm$  9.14 kg/m2 were studied. Half of the patients had Grade I fatty liver (50.8%) followed by Grade II (45.08%) and Grade III (4.1%). The mean CAP values were reported as 329 $\pm$ 36 dB/m. Anthropometric measurements included waist circumference (101.5  $\pm$ 9.6cm.in males and 106.7 $\pm$ 9.5 cm in females), hip circumference (101.1  $\pm$  8.8cm in males and 105.8 $\pm$ 8.0cm in females) and waist-hip ratio (1.00 $\pm$ 0.04 in males and 1.01  $\pm$  0.06 in females). The body composition analysis showed a significantly higher body fat%, Trunk fat mass and Visceral Fat Index in women as compared to men (p<0.0001). Fasting blood glucose was 99.8 $\pm$ 14.6 mg/dL. Serum total cholesterol was 182 $\pm$ 36mg/dL and triglycerides were 168.7 $\pm$  81.2mg/dL. The mean Aspartate transaminase (AST), Alanine Transaminase (ALT) levels were 40.3  $\pm$  25.6 IU/L and 55.4  $\pm$  37.8 IU/L respectively. No significant gender differences were seen in blood parameters.

Conclusion: Adverse metabolic profile can be seen in obese NAFLD patients from middle-income backgrounds in North India. It is important to develop and implement lifestyle interventions targeting middle-income patients to prevent the progression of metabolic diseases in India.





# Perspectives from employees on a workplace physical activity program: A qualitative study

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### Motivation and behavior change (SIG)

Although existing workplace interventions have shown promise in increasing physical activity (PA), they are often prescriptive with varying adherence rates, and may not reflect real-world settings. It is important to examine feasibility of workplace PA programs to ensure health benefits of employees. The aim of this study was to evaluate employee perceptions of a health and wellbeing program at a large insurance company based in Queensland, Australia. 14 employees participated in one-to-one semi-structured in-depth interviews. Interview data were recorded, transcribed verbatim and analysed thematically using Nvivo software (version 11). Data were coded and compared, with themes developed into perceived barriers and motivations to participation in PA. An inductive approach to data analyses determined emergent themes generated from the participants' responses. The emergent themes with regards to barriers to PA participation were psychosocial (e.g., lack of motivation), and environmental/organisational (e.g., work schedule and operational demands of job roles). Employees also identified numerous motivators including; physical (e.g., improving physical and mental health), psychosocial (e.g., social support, networking, external personal trainers) and organisational (e.g., strong management support, convenience) benefits that encouraged them to engage in the workplace PA opportunities. These findings suggest that future workplace PA programs should aim to reduce psychosocial and environmental/organisational barriers by targeting employees at the preintervention and planning phrase. This approach will facilitate their involvement and increase motivation for participation and enable strategies that are scalable and contextual to organisational needs and also cater to employees' preferences. This has the potential to improve health outcomes and promote social interactions which improves productivity-related outcomes at the workplace.





# Physical activity, sedentary behaviour and educational outcomes in university students: A systematic review

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Otheı

Purpose: Despite a growing body of literature investigating the relationship between physical activity (PA), sedentary behaviour (SB), and educational outcomes (EO), this relationship is still not clearly understood, particularly in the university student population. Therefore, this study aimed to systematically review available evidence focusing on the relationship between PA, SB and EO among university students.

Methods: Articles published in English and up to April 2019 were identified through a search of eight electronic databases. Papers were included in the review if they: (a) focused on undergraduate students, (b) included either PA or SB outcomes and a measure of EO, and (c) examined associations between these variables. The Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies was used to assess the methodological quality of the included studies.

Results: Thirty-five papers met the eligibility criteria and were subsequently included in the review. Majority of papers were cross-sectional (n=31), and used self-report questionnaires to assess either PA (n=32) or SB (n=9). The most common PA outcomes examined were overall PA (n=12) or aerobic activity alone (n=14). The most common measures of SB were overall sitting time (n=5) and screen time (n=7). Self-report grade point average was the most common measure of EO (n=30). From 35 included papers, 107 statistical associations were reported. Notably, over two-thirds (71%) of associations between PA and EO were non-significant (25/32), and 40% of associations between time spent sitting for leisure and EO were negative (5/9). Most papers were rated as demonstrating poor quality (22/35), with only about a fifth of included papers scored as fair quality (13/35).

Conclusions: This systematic review found mixed associations between PA, SB, and EO. Further, several methodological issues were identified with included studies, which limits the ability to draw firm conclusions. Future studies should consider using more rigorous designs, including objective measures of PA, SB and EO, to further our understanding of this area.





# iSTEP, an mHealth Physical Activity and Diet Intervention for Persons with HIV: a randomized controlled trial protocol

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### e-&mHealth (SIG)

Purpose: People with HIV (PWH) frequently exhibit neurocognitive deficits and non-AIDS disorders, including cardiovascular disease (CVD). Identifying effective treatments is a high priority. Existing physical activity (PA) interventions for PWH require strenuous PA and multiple in-person visits that limit feasibility. Mediterranean-style diets (MedDiet) reduce CVD risk, but have not been widely tested in PWH. To address these challenges, we developed a novel 6-month smartphone-based Multimedia Message Service mHealth intervention (iSTEP) designed to increase moderate PA and promote MedDiet in PWH. We are conducting a 3-arm RCT to evaluate the efficacy of the iSTEP PA intervention alone compared to a combined PA and MedDiet protocol. We hypothesize that iSTEP will increase PA and improve neurocognition compared to control, while MedDiet will reduce CVD risk relative to PA alone.

Methods: 150 adult PWH with low PA are randomly assigned to a control group (n = 50), a second group administered the iSTEP PA intervention (self-monitoring and goal-setting with daily PA messages and weekly PA goals via a smartphone platform), or a third group receiving both the PA and MedDiet intervention, including dietitian counseling, diet monitoring, and free walnuts (n = 50). iSTEP content is tailored to each participant, determined by preferred PA and MedDiet choices. PA is quantified by actigraphy and combined-sensing Fitbit data; MedDiet adherence is assessed by diet questionnaires and blood biomarkers (polyunsaturated fatty acids/carotenoids). CVD factors include BMI, cholesterol, inflammatory cytokines, and heart rate variability; neurocognitive evaluation incorporates executive function, learning, and memory. Measures are assessed at baseline and a follow-up visit after 6 months. Mixed effects model with repeated measures will analyze effects.

Results: The ongoing iSTEP RCT will finish in 2021. Data from an earlier separate pilot study evaluating the iSTEP PA intervention indicated that intervention participants (n=19) exhibited greater steps (2000 step increase) relative to control (n=21, p < 0.05). Reduced sedentary time associated with better cognition (p < 0.05).

Conclusions: Findings will enable implementation of large-scale mobile PA/diet interventions to improve neurocognition and cardiovascular health. The objective is to validate a scalable, low-cost mHealth protocol that is feasible for individuals with physical or socioeconomic limitations.





"Sofa, so good? Maybe not" Examining the relationship between sedentary behaviour, subjective well-being, and mental health: A cross-sectional study

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### Motivation and behavior change (SIG)

Purpose: Research suggests that overall sedentary behaviour (SB) and higher self-comparative levels of SB are negatively associated with subjective well-being (SWB) and mental health (i.e., depression and anxiety). However, the context/domain, of SB may influence these relationships. Hence, the purpose of this study was to determine the strength and direction of the relationship(s) between outcomes of SWB and mental health, and overall, domain-specific, and self-comparative levels of SB.

Methods: University students (M age=20.58, SD=2.92, n=821 females, n=160 males) from across Canada completed an online questionnaire. SWB (Warwick-Edinburgh Mental Well-Being Scale), depression (Center for Epidemiologic Studies Depression Scale), anxiety (State-Trait Anxiety Inventory Form-Y), overall weekly SB (International Physical Activity Questionnaire), and weekly self-comparative and domain-specific SB (Modified SIT-Q 7d) were assessed. Significant bivariate relations (p<0.05) were entered into standard multiple regression models to determine their unique predictive capability of SWB/mental health outcomes.

Results: Model 1: SWB overall model fit was R2=0.054 with WY breakfast ( $\beta$ =0.096, p=0.007), WY computer ( $\beta$ =0.093, p=0.018), WD social ( $\beta$ =0.096, p=0.010), and WD music listening ( $\beta$ =-0.086, p=0.020) being significant predictors. Model 2: Depression overall model fit was R2=0.102 with self-perceived weekly SB ( $\beta$ =0.120, p=0.001), comparative break duration ( $\beta$ =-0.059, p=0.099), WY sleep ( $\beta$ =-0.085, p=0.007), WY napping ( $\beta$ =0.080, p=0.040), WD computer ( $\beta$ =0.087, p=0.014), and WD childcare ( $\beta$ =0.068, p=0.097) being significant predictors. Model 3: Anxiety overall model fit was R2=0.058 with self-comparative weekly SB ( $\beta$ =0.111, p=0.001) and WY breakfast ( $\beta$ =-0.099, p=0.002) being significant predictors.

Conclusions: Domain/context of SB appear to uniquely influence outcomes of SWB and mental health. Interventions modifying SB to improve these outcomes may be more effective if relevant domains are targeted.





# Effect of California competitive food and beverage policies on weight status among high school students

### Dr. Emma Sanchez-Vaznaugh<sup>1, 3, 4</sup>, Dr. Brisa Sánchez<sup>2</sup>, Dr. Mika Matsuzaki<sup>1</sup>, Ms. Maria Elena Acosta<sup>1</sup>

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### Policies and environments (SIG)

Purpose: Competitive food and beverage policies ("CF&B policies") have been adopted to help prevent childhood obesity. However, few studies have examined their influence on obesity among high school students. The purpose of this study is to investigate whether California's CF&B policies influenced overweight/obesity trends among high school students and whether those effects varied by race/ethnicity.

Methods: Using statewide California data from 9thgrade students in public schools along with a quasi-experimental design, gender-stratified multilevel logistic models estimated trends in overweight/obesity between the periods before 2002-2007 and after 2008-2012 the California CF&B policies took effect and assessed whether those trends differed by race/ethnicity. Models were adjusted for student-level variables (age, race/ethnicity, physical fitness), school-level, and school neighborhood socioeconomic factors.

Results/findings: Before the policies were enacted (2002-2007), obesity was significantly increasing among both boys and girls and across all race/ethnic groups. In the post-policy period (2008-2012), overweight/obesity declined over time among boys of all racial/ethnic groups though the decline was not significant among Asian students. Obesity was no longer significantly increasing for Asian, African American and White girls, and showed slight, though non-significant, annual declines among Latina girls. The association between the policies and overweight/obesity trends, followed by Latinx, White and African American girls. Among boys, Latino children saw the largest change in overweight/obesity trends, followed by African Americans, Asians and Whites.

Conclusions: In California, CF&B policies are associated with favorable changes in population-level overweight/obesity prevalence among students in high schools, with differences in the magnitude of those improvements by race/ethnicity. Policies to regulate junk food and sugary drinks in schools may be an effective strategy to prevent obesity among students in high schools. Examining the joint role of policies to modify the food environment within and outside, but near, schools may provide additional strategies to fully reverse the obesity epidemic.





# Associations of car time with waist circumference and body mass index: Moderation by walking for transport

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### Policies and environments (SIG)

Purpose: Car use is endemic in Australian cities. Time spent sitting in cars has been associated with cardiometabolic risk, including overweight and obesity. Less is known about whether active transport, such as walking, may protect against adverse associations between car time and adiposity. We examined whether walking for transport moderates associations between car time with adiposity.

Methods: Data from 4,223 adults from the third wave of the AusDiab study (55% women, mean age: 62.8±10.8 years) were analysed. Car time (min/day) was calculated from reported previous week duration and frequency of car use. Walking for transport (yes/no) was based on reported frequency in the previous week. Body mass index (BMI) and waist circumference were measured by trained assessors. Linear mixed models, adjusted for socio-demographic characteristics and leisure-time physical activity, assessed associations between car time with waist circumference and BMI, stratified by walking for transport.

Results: Only 29.3% of participants reported any walking for transport in the previous week. These participants had slightly lower car time (mean $\pm$ sd=53.0 $\pm$ 51.6 min/day) than participants who did not walk for transport (mean $\pm$ sd=56.9 $\pm$ 59.5 min/day). Among those who did not walk for transport each additional 30 minutes/day of car time was associated with 0.40 cm greater waist circumference (95% CI: 0.16, 0.64 cm) and 0.12 kg/m2 greater BMI (b=0.12; 95% CI: 0.02, 0.22). For those who reported walking for transport, associations with waist circumference (b=0.10; 95% CI: -0.31, 0.51) and BMI (b=0.08; 95% CI: -0.08, 0.24) were not significant.

Conclusions: For the majority of participants who did not report any walking for transport, longer durations of car use were adversely associated with waist circumference and BMI. However, the magnitude of these associations was smaller and not statistically significant in participants who reported some transport-related walking. Within this car dependent population, even occasional walking for transport may be beneficial. Further research is needed to quantify the amount of walking required to offset health risks from sedentary car time.





# Relationship between the quality of school wellness policies and the degree of policy implementation using the WellSAT WellSAT-I.

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### Policies and environments (SIG)

Purpose: School districts that participate in national meal programs are required to have a school wellness policy. Previous studies examining the relationship between written policy quality and the degree of policy implementation have drawn inconsistent conclusions, which may stem from differences in the items within the assessment tools formerly available. Therefore, the purpose of this project was to assess the relationship between the quality of written school wellness policies and the degree of policy implementation using matched tools. Results can be used to inform strategies to support school wellness efforts.

Methods: Written policy quality and degree of policy implementation were assessed in this cross-sectional study using the Wellness School Assessment Tool 2.0 (WellSAT 2.0) and the WellSATInterview (WellSAT-I), respectively, in 95 schools from eight states. Fifty-six items were matched between the tools and used for data analysis. Linear regression was used to examine the relationship between written policy quality and implementation. The frequency of schools that were writing and implementing, implementing but not writing, writing but not implementing, and not writing and not implementing was calculated for each matched item.

Results/Findings: There was no overall relationship between written policy quality and the degree of policy implementation. Out of the 56 matched items, three were positively related. For 31 of 56 items (55%), the majority of schools were both writing and implementing. For 21 of 56 items (38%), the majority of schools were implementing but not writing. There were three items (5%) that schools predominately wrote about but did not implement (there is a school garden; elementary school students receive at least 150 minutes/week of PE; and there is a clear evaluation plan to assess wellness policy implementation at the school building level). Only one item (2%) was predominately neither written about nor implemented (there is a school-level wellness committee).

Conclusions: Methods of support are needed to aid districts in writing policies that are comprehensive of the efforts taking place at the school level and to aid schools in utilizing the written policy to guide school wellness efforts that are a priority for implementation.





# Musculoskeletal pain in South African wheelchair basketball players of different point classifications

#### Prof. Julian Pillay, Dr. Isabel Mateus

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Other

Purpose: During recent years, wheelchair basketball has gained worldwide popularity. Several studies have demonstrated a high prevalence of injuries amongst wheelchair basketball players. Few studies, however, have investigated the prevalence of musculoskeletal pain in the context of different point classifications – an integral part of wheelchair sport. The aim of this study was to determine the prevalence of musculoskeletal pain in wheelchair basketball players of different point classifications in South Africa and to provide information on patterns of pain distribution in relation to point classification.

Methods: A questionnaire was completed by 48 wheelchair basketball players participating in the SuperSport League Games of South Africa with point classifications ranging from 1.0 to 4.5. The results were used to determine the patterns of musculoskeletal pain distribution in relation to the different point classifications.

Results: Forty-three completed questionnaires were analysed. The prevalence of total musculoskeletal pain was 58% (n=25). Shoulder pain presented the highest overall prevalence, regardless of point classification (n=23; 92% since the start of players' wheelchair basketball careers and n=19; 76% over the last 12 months). It was found that lower point classification (1.0-2.5) players commonly experienced arm pain since the start of their wheelchair basketball careers ( $\eta$ =0.358), as well as specifically over the last 12 months ( $\eta$ =0.319), unlike higher point classification (3.0-4.5) players.

Conclusion: The study contextualises the prevalence of musculoskeletal pain to overall point classification in wheelchair basketball. Such data are important in the formation of injury prevention strategies, as athletes with impairments are predisposed to different types of musculoskeletal pain based on point classification.





# Changing the physical activity behaviour of adults with fitness trackers; a systematic review and meta-analysis.

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e-&mHealth (SIG)

### Purpose

To examine if a fitness tracker intervention changes physical activity (PA) behaviour compared to a control condition or compared to an alternative intervention.

#### Methods

Data source; searches between 01/01/2010 - 01/01/2019 were conducted in Pubmed, CINAHL, Cochrane CENTRAL, EMBASE, and PsycINFO. Inclusion/exclusion criteria; randomised clinical trials of adults using a fitness tracker to change in physical activity behaviour were included. Non-clinical trials, studies that included the delivery of structured exercise, and/or studies that only used the fitness tracker to assess physical activity were excluded. Data extraction; extracted features included characteristics of the study population, intervention components, physical activity outcomes, and results. Data synthesis; papers were pooled in a statistical meta-analysis using a fixed-effects model. Where statistical pooling was not possible, standardised mean difference (SMD) and 95% confidence intervals (CI) were calculated. Findings were presented in a narrative form and tables.

### Results

Of 2076 articles found, 21 were included in the review. A small yet significant positive effect (SMD = 0.25, 95% CI = 0.17, 0.32; p < 0.01; I2 = 56.9%; p = 0.03) was found in step-count for interventions compared to control. A small yet significant negative effect (SMD = -0.11, 95% CI = -0.20, -0.02; p = 0.02; I2 = 58.2%; p = 0.03) was found in moderate-to-vigorous physical activity for interventions compared to an alternative intervention.

#### Conclusion

Fitness trackers may enhance physical activity interventions as a positive effect is found in step-count compared to a control. However, there is no evidence of a positive effect when interventions are compared to an alternative intervention. It is unknown if results are due to other intervention components and/or clinical heterogeneity.





# Family perceptions of the Active Breed men's health program

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### Motivation and behavior change (SIG)

#### Purpose:

Active Breed was a 12-week gender-tailored weight loss and health promotion program for men delivered through a professional National Rugby League club in South-Western Sydney, Australia. The intervention comprised 12 weekly 90-minute education and physical activity (PA) sessions delivered at the club's home stadium. Education sessions focused on weight loss, PA, dietary intake, mental health, and domestic violence prevention, and PA sessions included training in the club's gyms and rugby league-related games. Family members were invited to attend one 'family night' session in week 12. This study explored family members' perceptions of the program and its broader impact on family health, wellbeing and relationships.

#### Methods:

Upon completion of the 12-week intervention, partners and children of program completers were invited to participate in one-on-one interviews (n=6) or semi-structured focus groups (2 partner-only, 2 child-only). Participants were 17 of the family members (10 female partners, 7 children [71.4% male]) related to 10 men who completed the program. Family members discussed their perceptions of the program, identified changes in their partner/father that they felt were attributable to program participation, and reflected on changes in their own health and lifestyle behaviours. Focus groups and interviews were audio recorded, transcribed verbatim, and analysed using hierarchical content analysis.

#### Results:

Family members observed a range of changes in their partners/fathers that they felt were attributable to their participation in Active Breed. These included weight loss, increased health service engagement, and improved mood, confidence, and family relationships. Several family members reported engaging in more family PA, and as men started to make more healthful decisions about dietary intake, this positively influenced their family's dietary choices. The mental health and domestic violence components resonated deeply with Active Breed participants, which led to ongoing conversations with partners and children about mental health and respectful relationships. Partners discussed the importance of family support for behaviour change and suggested actively engaging family members in future programs.

#### Conclusions:

The Active Breed program positively impacted men's health and wellbeing, and had a spillover effect for their families. The impact of the program may be maximised by engaging families more frequently during the intervention.





# Co-created insights for the design of a communication campaign to promote the use of nutritional warnings

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### Policies and environments (SIG)

Purpose: Nutritional warnings are being adopted in many countries in Latin America to enable citizens to identify food products with excessive content of nutrients associated with non-communicable diseases. The efficacy of this public policy is expected to increase if it is accompanied by a communication campaign that raises awareness of the existence of nutritional warnings and encourages citizens to use them when making their food choices. In this context, the aim of the present work was to use a co-creation approach to design a communication campaign to promote the use of nutritional warnings in Uruguay.

Methods: Three online studies involving a total of 2190 participants were conducted. In the first study, a qualitative approach was used to select the key contents, phrases and images to be included in a communication campaign. In the second study, a quali-quantitative approach was used to explore how citizens perceived a series of expressions. Using results from the first two studies, a series of graphic pieces were created and tested in the final quantitative study.

Results: Participants provided valuable insights for the design of the communication campaign, which were in line with the health belief model. The developed graphic pieces were positively perceived by participants. Pieces stressing promotion informed choices, emphasizing the negative consequences of excessive consumption of sugars, fat and sodium or promoting healthy eating did not lead to differences in participants' behavior in a simulated choice task.

Conclusions: Results from the present work suggest that an effective communication campaign to promote the use of nutritional warnings should include three main elements: position warnings as a cue to action for changing eating habits, increase the perceived risk of excessive consumption of sodium, fat and sugar, and emphasize the health-related benefits of using the warnings for making food choices.





# The Association between Symptoms of Anxiety and Depression and Sleep Among High School Students

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#### Disease prevention and management

Purpose: Given the increase in anxiety and depression symptoms, and high prevalence of sleep deprivation among adolescents, there is a need to understand the relationship between mental health and sleep. The study objective is to examine the associations between self-reported mental health symptoms and sleep duration and hygiene.

Methods: Self-administered survey data on demographics, sleep practices and symptoms of anxiety and depression were collected in Spring 2019 from 222 (out of 545) 9th grade students at an ethnically and economically diverse, semi-rural high school in Georgia, U.S. Independent two sample t-tests were conducted to examine the associations between mental health symptoms and several outcomes: average hours of sleep during weekday, change in sleep duration between weekday and weekend, and components (cognitive/emotional, sleep environment, behavioral arousal, physiological and bedtime routine) of the Adolescent Sleep Hygiene Scale (ASHS).

Results/findings: There were no significant differences in demographics between respondents and nonrespondents. Participants were 15.3 (SD 0.49) years old and 53% were female. Those with anxiety symptoms reported a mean of 6.7 (SD 1.5) hours of sleep per night during the weekdays, compared to a mean of 7.4 (SD 1.2) hours of sleep among those without anxiety symptoms (p=0.0003). Participants with anxiety symptoms also scored lower on the cognitive/emotional factor of ASHS (p < 0.0001); there were no differences in other ASHS factors (p>0.05). Those with depression symptoms had a mean of 6.9 (SD 1.5) hours of sleep, compared to a mean of 7.3 (SD 1.2) hours of sleep among those without depression symptoms (p=0.03). On average, individuals with depression symptoms scored lower on the cognitive/emotional, sleep environment, behavioral arousal and physiological factor of ASHS than those without depression symptoms (p<0.0001 to 0.02).

Conclusions: Symptoms of anxiety and depression were associated with shorter sleep duration and poorer sleep hygiene among a diverse sample of high school students. Chronic sleep deprivation and mental health symptoms both have long-term health implications for adolescents' development. Interventions to improve sleep behaviors among adolescents should consider the impacts of mental health.





# A critical analysis of national-level health-enhancing physical activity and sedentary behavior policy in China since 1995

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### Policies and environments (SIG)

Background: National-level physical activity (PA) and sedentary behavior (SB) policy is of vital of importance for active living. There is growing interest in studying national-level PA and SB policy. However, little is known about the actual situation of health-enhancing PA and SB policy in China. This study aimed to evaluate China's PA and SB policy using and then conduct a content analysis on these policies.

Methods: A comprehensive search based on web was conducted to collect PA and SB policy released in and after the year of 1995 in China. Inclusion criteria (e.g., policy is national-level; policy is related to health-enhancing aspects; policy is currently valid) was established for policy selection. Of all the selected policies, the 2nd version of the Health-enhancing physical activity policy audit tool (HEPA-PAT) including 17 assessing elements was used to evaluate them. Then, a content analysis was used to analyse 1) national recommendations on physical activity levels; 2) national goals and targets; 3) surveillance or health monitoring systems; and 4) public education; 5) strategies for promoting active living.

Results: Of all the included policies (N = 37). Data showed that 25 out of 37 policies were rated over 12 points (full score is 17 points). Content analysis indicated that most policies paid sufficient attention on promoting PA (e.g., exercise, sports), but not on limiting SB. Only few policies proposed national recommendations for PA levels. National goals of the policies were relatively unspecific and focused on children and adolescents. All the policies had approaches of public education. Most strategies of policies were prioritized in promoting PA through school contexts.

Discussion and Conclusion: Comparing with other evaluative studies using HEPA-PAT, PA and SB policy in China are relatively high-quality. Nonetheless, the strategies of the polices should be clearer and more viable. However, the effectiveness of the policies in China remains unknown. PA and SB policy in China should be improved and future studies should focus on the effects of PA and SB policy on populations' active lifestyles and health outcomes.





# Correlates of sedentary behaviour in Asian adults: a systematic review

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### Policies and environments (SIG)

#### Purpose

Ample research on factors associated with sedentary behaviour (SB) in Australia, North America and Europe exist. SB correlates in diverse Asia have received less attention. In this review, we aimed to identify multilevel correlates of SB in Asian adults.

#### Methods

We conducted a systematic search in nine databases using terms related to SB, correlates and Asia. We included studies that were observational and used quantitative methods to examine correlates of total and domain-specific SB in Asian adults living in Asia; no language restrictions were set. Two reviewers conducted title, abstract and full-text screening independently. We extracted study characteristics, correlates studied and SB outcomes from included studies. Due to study diversity, we employed narrative syntheses to summarise the evidence on individual, physical environment, social environment and political/cultural correlates of total and domain-specific SB (PROSPERO ID: CRD42018095268).

#### Results

Of 13249 papers screened, we included 49 cross-sectional studies from 12 countries. Most were from East Asia (n=28), followed by the Middle East, South-East Asia and South Asia, with four including mixed samples. The majority assessed total SB (n=31), eight used accelerometers. Screen-time, leisure-time SB, transport-related SB and occupational SB were studied less often. Researchers examined 118 correlates, with 75% of studies investigating individual factors. Increasing age and education were positively associated with total SB, while higher income was associated with more leisure-time SB. Physical environment correlates were examined in 23 studies, mainly from East Asia. Living in an urban area and a higher number of transit points in the neighbourhood were positively associated with SB, but only in East Asia. Social environment correlates featured in 19 studies. Being unmarried was associated with increased total SB; this was especially apparent for females in the Middle East. Only two studies investigated policy and culture-related correlates.

#### Conclusions

Increasing age, higher education and income were associated with SB across Asia. We recommend the following: conduct studies in lower- and middle-income countries; investigate psychological, (micro-) environmental, policy and cultural factors; conduct longitudinal research; use validated tools to measure SB.





# Physical activity policy for Australian early childhood education and care: results of a Delphi study

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### Early care and education (SIG)

Purpose: The aim was to develop a Physical Activity (PA) policy in consultation with early childhood education and care (ECEC) providers and stakeholders. The policy included ECEC specific PA recommendations clarifying the Australian National Quality Standards for ECEC.

Methods: The Delphi process was used to refine the content and coverage of the policy, identify and overcome any challenges with the proposed implementation procedures and confirm best-practice dissemination and evaluation. A national expert panel working in the fields of ECEC, pre-school education, PA-related research and PA-related policy review and development were invited to participate. 123 (response 67%) participated in the first round and 89 (response 35%) in the second round Delphi survey. Items were retained if they had >70% consensus from participants.

Results/findings: Overall, there was consensus on the key features that should constitute an ECEC PA policy. Key statements and recommendations for physical activity and sedentary time at ECEC were reported as acceptable as were implementation strategies targeting management/supervisors/educators, the physical environment and families. 10 strategies were identified as easy to implement and likely to have a strong level of influence and (e.g., foster awareness and understanding of the policy; program a range of learning experiences encouraging and using active play; embed the importance of active play in everyday experiences; break up prolonged periods of sedentary behaviours; provide many daily opportunities for outdoor play time; make the policy available to all staff, families and visitors). Key barriers and enablers to implementing strategies at the management/supervisor/educator, physical environment and family level were identified. Best practice policy dissemination and evaluation were also confirmed.

Conclusions: The Delphi process enabled refinement of the content of this Australian ECEC-specific PA policy and provided expert advice of where best to target implementation strategies and how to overcome barriers. These findings along with results from educator focus groups will be used to support the successful dissemination, implementation and evaluation of the PA policy in ECEC's across Australia.





# When teachers lead, students lead: examining associations between low-income students' perceptions of their teachers' diet and physical activity-related classroom practices and their own advocacy skills

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### Policies and environments (SIG)

Background: Classroom teachers are important stakeholders in pediatric obesity prevention, particularly for lowincome students with less access to health-promoting environments outside of school. Teachers can promote healthy diet and physical activity behaviors in the classroom, and may also play a role in building students' advocacy and leadership skills for obesity prevention in schools and communities. This study investigates the hypothesis that students in low-income schools who perceive their teachers' classroom practices and role modeling as healthpromoting will be more likely to perceive themselves as health leaders among their peers and as advocates for healthier environments.

Methods: Survey data were collected among 4th to 8th graders in 21 low- and middle-income schools in 3 school districts, including two validated scales: 16-items assessing teacher/classroom policies and practices (Likert-type response set, range 0-64, Cronbach's alpha=0.79), and the 17-item Youth Advocacy for Obesity Prevention survey (YAOP; Likert-type response set, range: 0-68, Cronbach's alpha=0.82). Multi-level linear regression models examined associations between teacher/classroom practices sum scores and YAOP sum scores, accounting for school-level effects and adjusting for gender, race/ethnicity, and BMI z-score (calculated via height/weight collection).

Results: Students (n=289) were 67.8% female, 61.2% elementary, 52.7% African American, and 16.1% Hispanic/Latino. Half (49.8%) were overweight or obese. Mean teacher/classroom policies and practices sum score was 30.5 (SD=9.93, Range=9-55), and mean YAOP score was 41.3 (SD=10.7, Range=12-64). Adjusted linear regression models showed a significant, positive association between teacher/classroom practices and YAOP scores (b=0.48, SE=0.06), p<0.001). Gender was also significantly associated with higher advocacy sum scores, with females having higher scores than males (b=3.3, SE=1.2, p=0.009). No differences were found by race/ethnicity or BMI z-score.

Conclusions: Findings indicate that when students attending schools serving low- and middle-income students perceived their teachers as role models for healthy eating and physical activity, they were more likely to see themselves as advocates for obesity prevention. Additionally, females were more likely to perceive themselves as advocates than males. School-based obesity prevention efforts should bolster the role of teachers not only as classroom rule makers, but also as role models for students to advocate for healthy eating and physical activity in schools and communities.





# Passport to Natal Health: feasibility and acceptability of a community based physical activity intervention to improve maternal health

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Othei

Purpose: To examine the acceptability and feasibility of a 12 week community based physical activity intervention, Passport to Natal Health, to improve maternal health.

Methods: Thirty-four (age:  $31 \pm 3$  years), pregnant (n=11, 24.3  $\pm 7.5$  weeks gestation) and postpartum (n=23, 11.2  $\pm 5.6$  weeks since birth) women were offered 10 free 45-60 minutes exercise classes over a 12 week period. Three weekly classes (Aquanatal, Buggy fit, and Fit mummies) were available to choose from and performed in groups of maximum 15 women. Classes took place in local community facilities in Leeds, UK, and were designed for pregnant and postpartum women and run by fully-qualified midwives and fitness-instructors. Participants' experiences with taking part in the intervention, including satisfaction, adherence, as well as motives and barriers for attending the classes were assessed post-intervention using a self-reported questionnaire and focus groups.

Results: Thirty-two (94%) participants attended at least one class. The mean number of classes attended was  $4.7\pm$  2.9. The majority (70%) of participants attended between 3-8 classes. For pregnant women, the highest proportion used 3-5 vouchers reporting that as pregnancy progressed they found it more difficult to participate, whereas the highest proportion of postpartum women attended 6-8 classes. In terms of retention, 28 (82%) returned for follow up measurements and completed a questionnaire after the intervention assessing their experience with the programme. All participants reported increased motivation to continue exercising and would recommend the programme to pregnant friends. All would attend a similar programme in the event of a new pregnancy and 96% (n=27) of participants would be willing to pay £2-£5 for a class. Reported perceived health benefits from the intervention included socialising with group members, exercise enjoyment, enhanced mood and increased motivation to continue exercising. No harmful effects of the intervention were noted in the mother.

Conclusions: findings showed implementing a community based physical activity intervention was feasible, safe, and well tolerated, which support incorporating this programme into a routine health care setting to improve maternal health.




# Effectiveness of lifestyle interventions for preventing overweight and obesity among adolescents from racial and ethnic minorities: a systematic review

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#### Motivation and behavior change (SIG)

Purpose: The adolescent period offers a key opportunity to instil long term healthy eating and physical activity habits to prevent overweight and obesity and offset related co-morbidities such as heart diseases, diabetes and depression in adulthood. Interventions to facilitate these behaviors are important, especially for adolescents from ethnic and racial minorities who observe higher risks of overweight and obesity and are more likely to present with obesogenic lifestyles than their white counterparts. This systematic review is the first to summarise key findings on the effectiveness of interventions for adolescents from ethnic minority backgrounds to inform policy and practice on how to address overweight and obesity in this at-risk population.

Methods: Seven databases including Medline, Embase, Web of Science, CINAHL, Cochrane Central Register of Controlled Trials (CENTRAL), ERIC and PsycINFO were searched from 2005 to March 2019 to identify relevant studies. Randomised controlled trials of lifestyle programs that included interventions focused on nutrition, and/or physical activity for prevention of overweight and obesity in adolescents aged 13-18 were selected. Interventions that targeted participants with chronic disease or obesity were excluded. Pharmacological and surgical interventions were also excluded. The main outcome measure was change in BMI or BMI z-score and secondary outcomes were changes in nutrition and/or physical activity levels. Intervention components for the included studies were coded according to the Behavior Change Taxonomy. Risk of bias for each study was established using the Cochrane assessment tool and the Grading of Recommendations Assessment, Development and Evaluation system was used to assess the body of evidence.

Results: From the 11365 articles initially retrieved, 30 met the inclusion criteria. Of the thirty, only six recruited and reported on effectiveness in ethnic and racial minority populations. None were effective in preventing harmful weight gain whereas 5 of 6 were successful in demonstrating changes in sugar sweetened beverages, physical activity and fruit and vegetable intake.

Conclusions: The low quality and small body of evidence limits any conclusions drawn on behaviour change techniques, intervention components and duration effective for prevention of overweight and obesity in adolescents from ethnic minority populations.





# Mapping a systems activities and networks - physical activity, nutrition and overweight/obesity

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Disease prevention and management

#### Purpose

Poor diet, physical inactivity and overweight/obesity are leading causes of the burden of disease in Australia. This study aimed to investigate the prevention system (physical activity, nutrition and obesity), of a large area health service (>725,000 residents) in Perth, Western Australia.

#### Methods

A health profile and inventory of nutrition, physical activity and overweight/obesity interventions by organisations within the area health service was undertaken to determine their objectives, target groups and strategies. A subset of organisations (n=30) were then identified to participate in the organisational network survey. Survey questions related to organisations sharing of information, knowledge, and resources, joint program planning, funding, length of partnerships and frequency of contact. Social Network Analysis (SNA) was then undertaken on the data.

#### Results / Findings

Of residents aged 16+ years in the health service area, 90% were not eating the recommended intake of vegetables, 50% were not meeting fruit recommendations, 38% were insufficiently active, and 66.6% were classified as overweight /obese. A total of 189 prevention programs were identified, 66 nutrition, 95 physical activity and 28 overweight/ obesity. The major objectives of these programs were to influence attitudes (n=164) change behaviour (n=162) and increase knowledge (n=160). The SNA data is currently being analysed and will show the organisations connections, degrees of centrality and reciprocation within the area health service.

#### Conclusion:

A significant number of nutrition, physical activity and overweight/obesity interventions were identified in the area health service. However, considering the poor diet, low levels of physical activity and high levels of overweight/obesity, it would seem they may be having limited impact. Data from the SNA will reveal connections and collaborations to inform how the network operates and how it can be strengthened to become more impactful. Stronger relationships between organisations and a reorientation of partnerships to facilitate resource sharing are essential for sound health promotion outcomes.





# A Questionnaire-based Problematic Relationship to Eating and Food Score is Associated with Diet Quality in Midlife: the CARDIA Study

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Disease prevention and management

Purpose: Excessive intake of energy and less desirable food choices are preferred during the episode of binge eating. Less is known of the energy intake and diet quality among middle-aged adults with behaviors and attitudes related to binge eating that serves as criteria of either Bulimia Nervosa or Binge Eating Disorder.

Methods: Among 3903 adults who were assessed of their eating behaviors at CARDIA study Year 10 (age 27-41 in 1995-96), 2739 participants were further assessed of their energy intake and A Priori Diet Quality Score (APDQS) and 2411 participants were assessed of four serum carotenoids (Sum4Carot) in Year 20 (2005-2006). Behaviors and attitudes related to binge eating include compensatory behaviors, anxiety associated with food or eating, chronic dieting, concerns about weight and shape, and distress about binge eating. Energy intake and APDQS were assessed using the interviewer-administered Diet History Questionnaire; Sum4Carot was assessed using modified high-performance liquid chromatography. Analysis of Covariance (ANCOVA) was used to examine the association between behaviors and attitudes related to binge eating and diet-related variables adjusted for demographic, behavioral variables, energy intake, and BMI.

Results: Energy intake, energy-adjusted APDQS score, and BMI-adjusted Sum4Carot in Year 20 were greater among participants with behaviors and attitudes related to binge eating. The findings were graded by the number of behaviors and attitudes endorsed (all p < 0.01).

Conclusions: Despite the greater energy intake, the diet quality among participants with behaviors and attitudes related to binge eating is not inferior compared to participants without such behaviors and attitudes.





# The importance of weight stigma, family functioning, and parenting practices to disordered eating outcomes eight years later in an ethnically and socioeconomically diverse sample of adolescents

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#### Disease prevention and management

Purpose: Weight stigma is highly prevalent and associated with problems of public health concern. For example, cross-sectional and longitudinal studies have consistently shown associations between weight stigma and higher prevalence of disordered eating in adolescents and young adults. Because of the vital role of family members and the home environment in adolescent psychosocial development, we are interested in understanding the weight stigma-disordered eating relationship within the familial context. The goal of this study is to build on the extant literature to examine the relative importance of weight stigma, family functioning, and parenting practices during adolescence to unhealthy weight control behaviors (UWCB) eight years later.

Methods: Ethnically and socioeconomically diverse adolescents in this prospective cohort study were surveyed within local public schools in the Project EAT 2010-2018 study (mean age=14.4 years at baseline, N=1534). Adolescents reported on eight weight stigma, parenting practices, and family functioning variables. The outcome, young adult UWCB (e.g. fasting, vomiting, laxative use), was self-reported via online and mail surveys. Logistic regression models estimated odds ratios (OR) and 95% confidence intervals (CI) of UWCB for hurtful weight-related comments from family, weight teasing from peers and/or family, poor family functioning, low parental connection, low parental monitoring, and high psychological control, adjusting for demographics.

Results/findings: All eight weight stigma, family functioning, and parenting practices during adolescence were associated with significantly higher odds of UWCB eight years later. For example, weight teasing from any source was associated with 60% higher odds of UWCB compared to no weight teasing (p<0.001). Weight teasing from family (OR: 1.42, 95% CI: 1.08, 1.87), hurtful weight-related comments from family (OR: 1.34, 95% CI: 1.06, 1.70), and poor family functioning (OR: 1.44, 95% CI: 1.14, 1.81) remained statistically significantly associated with subsequent UWCB after additionally adjusting for baseline UWCB and measured BMI percentile.

Conclusions: This study demonstrates that there are long-term consequences of weight teasing from family, hurtful weight-related comments from family, and low family functioning on disordered eating behaviors. Future research and prevention efforts should support families to refrain from weight teasing and hurtful weight-related comments, and to create a more supportive home environment for adolescents.





# Social media representation of women and girls in physical activity

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#### Policies and environments (SIG)

Purpose: Women and girls are consistently found to be less physically active than men and boys. Mass media representation has been identified as an important influence on physical activity levels, with previous research finding that traditional forms of media underrepresent women and reinforce gender stereotypes. Social media is a new, rapidly evolving form of media and a platform where women can curate their own content and chose how to represent themselves. This study sought to evaluate how women and girls are represented in physical activity in social media.

Methods: Instagram and Twitter posts were searched using key text terms and hashtag searches using a combination of physical activity search terms. Physical activity brands and influential accounts were also searched for content posted about/by women relating to physical activity. Searches were conducted in April 2019. Text, videos and images were coded qualitatively using a pre-specified coding framework using content analysis. A combination of inductive and deductive coding was used. Codes were grouped together to form themes and sub-themes.

Results: A total of 1260 posts including images, videos and/or texts were identified and analysed. A total of 39% and 45% of content posted by brands on Twitter and Instagram respectively related to women. For the key physical activity text terms, 43% and 51% of the content on Twitter and Instagram respectively related to women. The identified themes demonstrate how social media largely serves to reinforce gender stereotypes in physical activity through demonstrating femininity and sexuality over performing activities or enjoyment of activities. Posts predominantly featured white, non-disabled women with little representation of ethnic minority groups or women or girls with disabilities.

Conclusions: The findings suggest that social media serves to reinforce pre-existing gender stereotypes, largely through content posted by brands and influential accounts. Such representation may serve to dissuade women and girls from participation in physical activity. Identifying strategies and campaigns to address the representation of women and girls in physical activity are needed if we are to address gender inequalities in physical activity.





# **Poster Session P.3**





# Can a family-based intervention increase children's physical activity in Hong Kong? Preliminary results from a randomized controlled trial.

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<sup>1</sup>THE CHINESE UNIVERSITY OF HONG KONG, Hong Kong, China

#### Children and families (SIG)

Purpose: Physical activity levels between parents and children are positively associated. Parents therefore play a crucial role in shaping children's behavior, through appropriate support and modeling. To this end, a family-based intervention based on self-determination theory was designed to enhance the support parents provided to children, and to increase co-physical activity between the dyads. The effectiveness of the intervention was evaluated using a randomized controlled trial.

Methods: Children (N=158, 8-11 years, from seven Hong Kong primary schools) and their parents were randomly allocated to an experimental (n=81) or a wait-list control group. The intervention included ten sessions spread over approximately six months. Each session included a 30-minute workshop and a 60-minute period of activities tailored for parents and children to play together. Children's moderate-to-vigorous physical activity (MVPA) was measured using accelerometers (ActiGraph wGT3X-BT) for a five-day period at baseline and at end of intervention, respectively. Only valid cases, defined by a minimum wear time of three days with 8 hours, were included in the analyses. Multi-level analyses were conducted to examine the intervention effects on children's MVPA.

Results: A significant group by time interaction in favor of the experimental group was found for daily MVPA (B=8.82, 95% CI [2.38, 15.25], p =.007). The experimental group indicated a 7.29 minutes increase (p = .016) in MVPA from baseline (47.85 $\pm$ 1.90 minutes) to the end of the intervention (55.14 $\pm$ 2.60 minutes); no significant difference was found in the control group. At baseline, no differences were found between groups (p =.574). While at the end of the intervention, there was a difference between groups (p =.041).

Conclusion: Preliminary evidence suggested that the intervention was feasible and effective. The intervention provided knowledge, opportunities for parents and children on physical activity. Future studies should consider engaging more family members in interventions, and to incorporate more exercises suitable for wider age groups. Additionally, researchers could also examine if embedding family-based approaches in physical activity promotion could strengthen relationships among family members.





# The effect of parental report and child perception of parental support on children's need satisfaction in physical activity and well-being

Prof. Amy Ha<sup>1</sup>, Dr. Taoran Zeng<sup>1</sup>, Dr. Johan Ng<sup>1</sup>, <u>Miss Ying Huang<sup>1</sup></u> <sup>1</sup>The Chinese University Of Hong Kong, Hong Kong, China

Children and families (SIG)

Purpose: Based on the tenets of self-determination theory, parents' psychological need support is an important predictor of children's physical activity behaviors. By contrast, parental behaviors perceived as controlling would have negative consequence on behavioral outcomes and may even diminish the well-being of youngsters. In this study, we examined the relation between parent- and children-rated parental support in terms of physical activity, and how these affected psychological need satisfaction and frustration in children.

Methods: Questionnaires were administered to 161 children-parent dyads (children mean age = 8.77±0.81 years, 94 male) who took part in a family-based physical activity promotion program. The administered questionnaires included scales measuring need support and psychological control (by parents and children), psychological need satisfaction and frustration, and quality of life (children only). Structural equation modeling was used to test a model based on self-determination theory.

Results: The results showed that children perceived parental support and parent-report support were positively correlated (r=.18, p=.04). Children perceived parental control and parent-report control (r=.32, p<.001) was also associated. Using structural equation modeling, we found support for a model linking need support and control, need satisfaction and frustration, and quality of life of children:  $\chi^2(7)=11.40$ , p=.12, CFI=0.969, RMSEA =0.062. Positive paths were found between parents- and children-reported need support ( $\beta$ =.206, p=.016) and control ( $\beta$ =.318, p<.001), respectively. Perceived need support was related to need satisfaction and well-being. Whereas perceived control predicted need frustration, which in turn affected children's well-being negatively.

Conclusions: Results indicated that parents' self-reported need support and control are perceived similarly by their children. These behaviors were also related to children's well-being indirectly via need satisfaction and frustration. Therefore, teaching parents to become supportive, and less controlling, may result in better physical activity behaviors and well-being in their children. Engaging and educating parents may hence be an effective means to promote physical activity in children.





# Eating away from home: An examination of eating outside the home among Americans

#### Dr. Stephanie Rogus

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#### Policies and environments (SIG)

Purpose: Changes in the food environment, such as increases in the number of quick-service, sit-down restaurants, and ready-to-eat foods, has led Americans to consume more food outside the home. Food eaten outside the home is of lower nutritional quality than food eaten at home. This research presents results on consumption of food outside the home among Americans by age, income, and race/ethnicity. This study used the 2015-2016 National Health and Nutrition Examination Survey (NHANES) to examine differences in food consumption outside the home that previous studies have not examined.

Methods: This research used the 2015-2016 NHANES to assess differences in food consumed outside the home by age, income, and race/ethnicity using t-tests. It also examined differences in the share of calories consumed outside the home by meal occasion.

Results/findings: Sixty six percent of the US population aged 2 years and over consumed any food outside the home on any given day. A larger share of older children (6-11 years; 78%) and lower share of older adults (60 years and older; 46%) consumed food outside the home compared to all other age groups. A higher percentage of non-Hispanic white (66%) and Hispanic (67%) individuals consumed food outside the home compared to non-Hispanic white (77%) and Hispanic (70%) children consumed food outside the home compared to black children (60%). A higher percentage of consumers above 131% of the poverty line (65%) consumed food outside the home compared to individuals below 131% of the poverty line (57%). Lunch and dinner were the eating occasions at which consumers ate the highest share of calories outside the home.

Conclusions: Food consumed outside the home varied by age, income, race/ethnicity and by meal occasion. As the share of food eaten outside the home continues to rise, it is important to examine differences in the demographic and socioeconomic make-up of Americans who eat outside the home frequently. This will help guide policy and public health nutrition intervention efforts.





# Daily 24-h time-use profiles vary with different work patterns

<u>Dr. Lisa Mackay</u><sup>1</sup>, Mr. Anantha Narayanan T L<sup>1</sup>, Dr. Tom Stewart<sup>1</sup> <sup>1</sup>Auckland University of Technology, Auckland, New Zealand

#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Shift workers experience significant disruption in their circadian rhythm due to variable periods of sleep which may impact their physical activity and sedentary behaviour. The purpose of this study was to determine whether daily 24-hour time-use compositions vary with different work patterns.

Methods: 257 employees in the New Zealand aviation industry (47.0% Male; 34.2% aged 35 to 49 years; 66.1% European) wore Axivity AX3 accelerometers on the thigh and lower back for seven days (168 hours) and completed a sleep log diary. Daily estimates of time spent sleeping, sedentary, standing, walking and running were derived from accelerometer data and converted to ilr coordinates. Days were categorised according to the type of workday: 1) personal day, 2) standard workday, 3) morning shift, 4) day shift, 5) evening shift, and 6) night shift. Daily compositions for these workdays were compared using compositional MANOVA, with participant ID specified as an error term to account for repeated measures (daily 24-h compositions). Subsequently, a multivariate multiple comparison test (Hotelling-Lawley's T2-test with bonferroni adjustment) was used to determine which workdays significantly differed.

Results: Results of the compositional MANOVA indicated a significant difference in the daily compositions of various shifts (p < 0.001), with differences observed in all movement variables. Personal days included relatively more time spent running (mean 1.36 min/day) than other days. Workdays with night shifts were characterised by relatively less time sleeping (mean 307 min/day) and more time sedentary (mean 767 min/day) than other days. Subsequent pairwise comparisons indicated that: personal day compositions were different from all shift workdays (p < 0.05), but not standard workdays; all types of shift workdays were different from standard workdays (p < 0.05); workdays with night shifts were different from all other types of workdays p < 0.05); whereas, workdays with day, evening and morning shifts had comparable compositions (p > 0.05).

Conclusions: 24-h compositions of behaviour are dependent on the type of workday. Further studies exploring the optimal time-use profile in working populations should take into consideration daily work patterns.





# Validation of multi-pass 24-hour dietary recall and food frequency questionnaire by weighed food record in urban Ethiopian women and children

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Background: Evaluation and validation of reliable methods of quantifying an individual's nutrient intakes are important to identify groups at risk of nutrient deficiencies and develop nutritional interventions aimed at reducing undernutrition in specific population group. We examined the relative validity of a multi-pass 24-hour recall and a 7-day recall food frequency questionnaire (FFQ) with volumetric portion size estimation, compared to Weighted Food Record (WFR) in Ethiopian adult women and children.

Methods: Food consumption data were collected for randomly selected women of reproductive age (n=15) and children aged 6-59 months (n=19) from two sub-districts in urban Ethiopia using WFR followed by multipass 24-hour recall and FFQ on the following day. Portion sizes were estimated using photographs of cooking/ serving utensils, including reference objects to maximize accuracy. Wilcoxon's signed rank test was used to test difference in the median nutrient intakes between "test" dietary methods (24-hour recall and FFQ) and "reference" method (WFR). Agreement with weighed food records was conducted primarily by Bland-Altman analysis. Cohen's weighted k statistic was calculated to measure the inter-method (between 24-hour recall & WFR and between FFQ & WFR) classification agreement.

Results: Bland-Altman analysis showed FFQ marginally underestimated energy and vitamin A in women, protein and vitamin A in children while marginally overestimating iron in both groups. It also revealed 24-hour recall marginally overestimated energy in women, and protein and vitamin A in children. No significant differences between the test and reference methods were found for the median daily intakes of each nutrient among women and children. There was moderate to good agreement ( $\kappa 0.41$ -0.80) between test and reference methods for iron and protein, and good to excellent agreement ( $\kappa 0.61$ -1.00) for energy and vitamin A among women and children.

Conclusion: Dietary assessment using 24-hour recall and FFQ with volumetric portion size estimation revealed comparable estimates of dietary intake with WFR in adult women and children. This study supports the use of 24-hour recall and FFQ as an acceptable method for assessing dietary intake in adult women and children.





# Maternal stress, maternal feeding practices and child weight – preliminary data from the RESONANCE/NomNom cohort

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### Children and families (SIG)

Purpose: Multiple early risk factors for childhood obesity have been identified, including environmental influences like maternal stress and non-responsive feeding practices. Less is known about underlying biological mechanisms, for example, impacts on early development of neural appetite systems. To address this gap, the NIH-funded RESONANCE study, and its sub-study NomNom, are collecting longitudinal brain imaging data and biological specimens, in parallel with rich environmental and behavioral data relevant to obesity risk, beginning in infancy. We present preliminary associations between maternal stress, feeding practices and child weight which will form the basis for future investigation of neural mechanisms.

Methods: Mothers' Perceived Stress Scale (PSS) scores and Comprehensive Feeding Practices Questionnaire (CFPQ) scores, and child BMI z-scores (BMIz) based on measured weight and height, were available for 92 RESONANCE/NomNom mothers of children (62.0±24.0 months, 43.5% girls). Spearman correlations were examined. We additionally examined correlations between CFPQ scores and child BMIz stratified by low and high PSS scores (median split).

Results: Higher maternal stress was associated with higher restriction for health reasons (p=.032) and higher child BMIz (p=.006). Higher restriction for health reasons, and weight control, were both associated with higher child BMIz (p<.05). Higher encouragement of a balanced variety of foods, and monitoring, were associated with lower child BMIz (p<.05). Stratified analyses showed that while higher child BMIz was associated with greater restriction for weight control in both low and high stress groups (p<.005), the association with restriction for health reasons only emerged among the low stress group (p=.002 vs. p=.885).

Conclusions: Maternal perceived stress was correlated with feeding practices and child weight, with relationships between feeding practices and weight differing by stress level. Future analyses will consider the role of other household characteristics such as SES, as well as neural mechanisms. Since RESONANCE forms part of NIH's US-wide Environmental influences on Child Health Outcomes (ECHO) program, future analyses using large samples obtained from multiple cohorts will allow more complex longitudinal modelling of these relationships and their biological mechanisms.





# Prevalence of physical activity counselling and associations with behaviour among Nova Scotian breast, prostate, and colorectal cancer survivors

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#### Cancer prevention and management (SIG)

Purpose: To report the prevalence of receiving physical activity counselling and any associations with physical activity behaviour among people living with and beyond breast, prostate, or colorectal cancer.

Methods: A stratified random sample of 2062 breast, prostate, and colorectal cancer survivors was identified by the Nova Scotia Cancer Registry and mailed a questionnaire assessing physical activity, weekday and weekend sedentary time, and having received physical activity advice. ANOVAs determined differences in continuous measures and Chi-squares categorical variables.

Results: 741 completed surveys were analysed. Overall, about 30% of participants indicated having received physical activity advice from oncologists (51%) and general practitioners (54%) most frequently. Breast cancer survivors were more likely to report receiving advice than prostate or colorectal cancer survivors (40% vs. 24% vs. 25%, p>.001). Overall, no significant differences were found for meeting recommended physical activity guidelines or weekday/weekend sitting time. Colorectal cancer survivors receiving physical activity advice were significantly more like to be meeting activity guidelines (p=.021). ANOVAs revealed an overall trend of more moderate physical activity minutes with receiving activity advice (p=.060). No significant differences were found among breast cancer survivors, while prostate cancer survivors receiving advice were less likely to be sedentary (p=.038). Among colorectal cancer survivors, those receiving advice reported more moderate-to-vigorous physical activity (p=.015), total physical activity (p=.029), and less sitting time (p=.041).

Conclusions: Less than one-third of surveyed people living with and beyond cancer reported receiving physical activity advice with no differences in physical activity behaviour or sitting time overall. Despite a higher proportion of breast cancer survivors reporting receiving advice compared to prostate and colorectal cancer survivors, subgroup analyses indicated stronger associations between activity behaviour and advice among colorectal cancer survivors. Interventions are needed to determine the whether these associations hold true.





# Which one is relatively important? Paternal or maternal supports for children and adolescents' physical activity

#### Miss Jin-tao Hong<sup>1</sup>, Mr. Si-Tong Chen<sup>2</sup>, Dr. Yang Liu<sup>1,3</sup>

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#### Children and families (SIG)

Purpose: Social support from parents has a positive influence on promoting children's physical activity (PA). Since social supports were frequently examined with mixed parent gender in China, the specific associations between supports from either father or mother and PA were unclear. The objective of this study was to examine the associations between six kinds of social support from fathers/mothers (encouragement, observation, involvement, discussing benefits of PA, financial support and role model) and children and adolescents' moderate-to-vigorous physical activity (MVPA).

Methods: From September to October 2019, using a multi-stage stratified and random cluster sampling method, 1509 (age 8-18) students from 16 primary, middle and high school of two districts in Shanghai participated in this survey. MVPA and social supports were measured by self-reported questionnaires with good reliability and validity, and finally, 1307 (boys 50.5%, mean age 12.66  $\pm$  2.78) participants were included. Descriptive statistics and Chi-square were used to report the level of MVPA and differences between variables. Logistic regression was used to examine the association between paternal/maternal support and MVPA.

Results: 16.8% of children and adolescents engaged in MVPA at least 60 minutes per day with gender difference (boys vs. girls: 10.6% vs. 6.2%, p < 0.001). Compared to those who received low paternal support, boys (OR: 2.60-3.51, 95% CI: 1.75-5.25) and girls (OR: 1.84-2.81, 95% CI: 1.15-4.52) with high paternal support both exhibited a higher ratio of MVPA. As for maternal support, boys with high maternal support regardless of support type were more likely to reach MVPA (OR: 1.96-2.83, 95% CI: 1.28-4.18). Girls who received five kinds of high maternal support (except for discussing benefits of PA) had a higher likelihood for MVPA (OR: 1.79-2.73, 95% CI: 1.07-4.44).

Conclusions: The level of PA among children and adolescents was low, while boys were more physically active than girls. The findings from this study suggested that different kinds of social support from parents were important in facilitating children and adolescents' participation in MVPA, and possibly the "father-son" relationship was relatively the strongest.





# Associations between gross motor skills and executive functions in preschoolers

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#### Early care and education (SIG)

Purpose: This study aims to examine the associations between components of gross motor skills (locomotor skills, object control skills, balance) and executive functions (working memory, inhibition, shifting) and self-regulation in Australian preschoolers. As executive functions are foundational for academic achievement, promoting their development is important. This study addresses the limitations of previous research and is the first to also examine sex differences.

Methods: This study used the baseline data collected for Jump Start; a two-arm, parallel group, 18-month randomized controlled trial aimed at increasing physical activity in preschoolers while attending Early Childhood Education and Care Services (ECEC). Gross motor skills were assessed using the Test of Gross Motor Development-2 and the balance subtest of the Get Skilled Get Active. Executive functions were assessed using the Early Years Toolbox. Self-regulation was assessed using the Head, Toes, Knees, Shoulders assessment. Associations were examined using linear regression models accounting for clustering of ECEC services and adjusted for sex and age.

Results: A total of 566 preschoolers across 43 ECEC services were included (mean age = 3.2±0.4 years, 51% girls). The gross motor quotient, locomotor subtest and object control subtest were all significantly associated with visual-spatial working memory and inhibition. Balance was also associated with inhibition. The gross motor quotient and balance were associated with shifting. The locomotor subtest was associated with self-regulation. Sex differences were observed in associations with object control skills and balance. Girls demonstrated an association between balance and visual-spatial working memory and shifting, whereas boys demonstrated an association between object control skills and visual-spatial working memory.

Conclusions: Gross motor skills and executive functions are related in this sample of young Australian preschoolers. Results reinforce the need for early commencement of gross motor skill promotion and attention for sex differences as this might be important for cognitive development throughout life.





# Accelerometer-based physical activity, perceived, and actual fundamental movement skill proficiency in Hong Kong preschool-aged children

#### Miss Qing He, Prof. Amy Ha

<sup>1</sup>The Chinese University of Hong Kong, Hong Kong, China

#### Early care and education (SIG)

Purpose: This study aims to investigate the relationship among the actual fundamental movement skills (FMS) proficiency, perceived FMS and physical activity (PA) among Hong Kong preschoolers, and further to determine if actual and perceived FMS are associated with children's PA and their genders.

Methods: A hundred and forty-eight preschool-aged children (43% girls; mean age =  $4.52 \pm 0.67$  years) from five Hong Kong preschools/childcare centres were invited to complete the designated assessments. Actual FMS was rated using the Test of Gross Motor Development–2, whilst perceived FMS competency was assessed via the Pictorial Scale for Perceived Movement Skill Competence. Moderate- to vigorous-intensity PA (MVPA) was measured through accelerometers (Actigraph GT3X+) over five days. Mixed linear regression models were performed to assess associations among perceived FMS, actual FMS, and MVPA. Subsequently, mixed model regression analyses were performed to investigate the effects of actual FMS on MVPA levels by sex. All models adjusted for sex and age.

Results: Only 12.8% preschoolers met the WHO recommended 180-minute of PA per day (including 60-minute of MVPA daily). Boys were more active than girls for total PA and MVPA (p





# Physical activity and associated health and development in children aged 0-5 years: A systematic review

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#### Early care and education (SIG)

Purpose: The aim of this systematic review is to critically review the evidence on the prospective relationship between physical activity and health and development in children aged 0 to 5 years. Over recent years, there has been increasing interest in early childhood. As such, and in combination with contradicting conclusions in previous reviews, the evidence on the effects of physical activity on health and development in early childhood has been re-examined.

Methods: Three electronic databases were searched (PUBMED, SportDiscus, PsychINFO) for observational longitudinal studies and (randomized) controlled trials. All forms of physical activity in healthy children (mean age <5 years) were included as long as the amount was specified by quantity. Outcome measures included body composition, cognitive development, motor development, psychosocial health, cardiovascular health, bone and skeletal health and risks/harm. Data on study methodology, participants, exposure, outcomes and results were extracted. Methodological quality was assessed using a modified version of the ?Quality Assessment Tool for Quantitative Studies?.

Results: Thirty-nine articles were included in this review. Outcome measures were body composition (n=14), motor development (n=11), cognitive development (n=10), cardio-vascular health (n=7), social-emotional development (n=2) and bone health (n=2). Ten studies had high methodological quality. There was moderate evidence for an association between physical activity and motor development, cognitive development and cardiovascular health. There was insufficient evidence for an association between physical activity and between physical activity and body composition, social-emotional development and bone health.

Conclusions: The current scientific evidence on the effects of physical activity on health and development in young children is insufficient. Based on consistent findings from studies with weak-to-high methodological quality, there is moderate evidence for an association between physical activity and motor development, cognitive development and cardiovascular health in children aged 0 to 5 years. More high-quality studies need to be conducted in order to determine dose-response relationships between physical activity and health and development in early childhood. Special attention should be given to toddlers (ages 1-3 years) as least studies were available in this age group.





# CUPS pilot study: Evaluation of an integrated nutrition and mathematics curriculum with primary school teachers and children

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#### Early care and education (SIG)

Purpose: Schools provide an ideal environment to implement nutrition education as many children can be reached frequently and for extensive amounts of time. However, research indicates that teachers find it challenging to implement nutrition lessons due to crowded curricula and limited time available. A cross-curricular approach integrating nutrition with core academic subjects could potentially address this challenge. Therefore, the study aimed to evaluate a teaching unit that integrated nutrition within mathematics and explore teacher and student perspectives.

Methods: Four primary schools participated in the CUPS randomised controlled trial (n=72 students in Year 3/4). Students in the intervention condition (n=46) received 6 x 40 min lessons on food groups, portion size, volume and capacity. Lessons included experiential learning with mathematics cubes and food models, conducted over four weeks. The control condition continued their usual lessons on volume and capacity. Semi-structured interviews (teachers, n=3) and focus groups (students, n=15) were held immediately post-intervention. Qualitative data was analysed using a thematic approach.

Results: Preliminary results from both interviews and focus groups found the responses could be divided into content and practical themes. These themes included several subthemes related to food models, mathematics cubes, mathematics, nutrition, time and integration. Most students indicated they liked the lessons, food models and cubes. Findings from the teacher interviews aligned with results from the student focus groups. Teachers reported most students were engaged and became more aware of healthy eating and serve sizes. Although they enjoyed teaching the lessons, teachers suggested integration of volume and capacity could be further improved in order to address the time barrier for teaching nutrition.

Conclusion: CUPS uses an innovative concept to teach primary school children about healthy foods and portion size estimation while simultaneously learning about the NSW k-6 Mathematics curricular standards. Although teachers and students perceived the program as fun and interesting, lesson plans could be refined to enhance integration of curriculum content, with complementary resources expanded.





# A healthier movement behavior profile is associated with body-congruent food choices through self-determined motivations to exercise and regulate eating

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#### Motivation and behavior change (SIG)

Introduction: Physical activity (PA) has been identified as a facilitator of eating behavior regulation, in part through self-determined motivations to regulate exercise and eating behaviors. However, different patterns of PA and sedentary behaviors (e.g., sitting) appear to have distinct effects on several health outcomes and all-cause mortality, and might therefore be differently related to the way we regulate eating. Also, motivational spillover pathways linking PA and eating behavior have been previously supported. This study aimed to extend prior research by identifying different profiles of PA and sedentary time, and test whether these profiles explained internal eating markers through distinct motivational routes.

Methods: A total of 297 adults (age: 34.5±10.6yr; BMI: 23.2±3.4kg/m2) volunteered to participate in this study. Participants filled the International Physical Activity Questionnaire, Behavioral Regulation in Exercise Questionnaire, Regulation of Eating Behavior Scale, and Intuitive Eating Scale. Latent Profile Analysis and Preacher & Hayes Mediation Procedures were conducted.

Results: A 3-profiles model was retained as the best solution (++sitting/-PA, n = 89; ++PA/-sitting, n = 44; +PA/+sitting, n = 164). Participants in the ++PA/-Sitting profile showed higher self-determined motivations to exercise (ps<.001) and regulate eating (ps<0.05). No differences emerged in non-self-determined motivations and eating measures. Mediation analyses showed that participants in the ++PA/-Sitting profile (vs. ++Sitting/-PA) made more body-congruent food choices, partly through a serial mediation effect of self-determined motivations for exercise and eating (Estimate: 0.25 (0.07), 95%CI: 0.127-0.400). All analyses were adjusted for age, gender, and BMI.

Conclusions: Results extend prior evidence, showing that motivations underpinning exercise/eating have better quality when greater levels of PA are combined with lower sitting time, and by showing that self-determined motivations seem to partly mediate the effects of different patterns of PA and sedentary time accumulation on eating regulation. These findings have implications for future interventions, especially considering the important role of different patterns of movement behaviors and self-determined motivations on the regulation of health-related behaviors.





# Gender differences in the accuracy of dietary assessment methods to measure energy intake in adults: a systematic review

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: In order to inform the interpretation of nutrition data and targeting of interventions, it is important to understand whether there are gender differences in the reporting of dietary intake. The objective of this review was to explore differences by gender in self-reported energy intake compared to a reference measure of total energy expenditure.

Methods: Six electronic databases were systematically searched for published original research articles between 1980 and October 2019. Studies were included if they were conducted in general adult populations and included a measure for both women and men of self-reported energy intake, and total energy expenditure from doubly-labelled water (DLW). Two authors independently screened studies and conducted a quality appraisal of the included studies using standardised tools. Data was extracted on study characteristics, including the dietary intake assessment method used.

Results: From the database searches, 2,166 studies were identified, of which 30 met the inclusion criteria. The studies collectively included information on 4,387 individuals (n women=2,371) and the majority (n=27) were conducted in high-income countries. Sixteen of the studies were evaluated as being of a high quality in reference to the selection of participants, comparability of study groups, intervention methods and outcome descriptions. The included studies used a variety of self-reported energy intake assessment methods, including 24-hour multiple-pass diet recalls (n=13), weighed food records (n=10), food frequency questionnaires (n=9), food diaries (n=6) and diet history questionnaires (n=3). When compared to energy expenditure measured by DLW, energy intake was underestimated in all but one study for women and in all but two studies for men. Underestimation of energy intake ranged from 600-7,708 kJ/day and 430-5,600 kJ/day for women and men, respectively.

Conclusion: This systematic review has identified substantial underestimation of energy intake for women and men across a range of dietary assessment methods. As a next step, a meta-analysis will be conducted to quantify the degree of underestimation which will assist in evaluating the relationship of gender with diet and disease outcomes.





# Relationships between physical activity, cardio-respiratory fitness, and prescribed medication for risk factors of non-communicable diseases in a low-resource community: B-Healthy study

#### Prof. Sarah Moss<sup>1</sup>, Miss Naledi Moropane<sup>1</sup>, Prof. Martie Lubbe<sup>2</sup>

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#### Disease prevention and management

Purpose: The global economic burden of non-communicable diseases is significant and on the rise. Pharmacological intervention is often the choice of the initial intervention, although exercise is considered a cost-effective alternative. This study aimed to determine the relationship between physical activity, physical fitness, and medication prescribed for risk factors of NCDs in a low-resource community of Potchefstroom, South Africa.

Methods: Participants (n=200) were recruited from a convenience sample in a catchment area of two public healthcare clinics for this observational study. Prescribed medication was collected from clinic records. Objective physical activity data were collected over seven consecutive days by combined heart rate and acceleronmetry (ActiHeart®). Cardiorespiratory fitness was measured with a step test and risk factors for NCDs with measurements of blood pressure, body composition, and peripheral blood. Partial correlation coefficients were calculated, adjusted for age, to determine the strength of the association between prescribed medication for risk factors of NCDs and physical activity and cardiorespiratory fitness with an alpha level of  $p \le 05$ .

Results: Results from the 180 participants with an average age of 59,4 years, indicated that the women were classified on average as obese (BMI = 32,1 kg/m2). Hypertension was prevalent in 52% of the participants and Diabetes Mellitus type 2 in 15,6%. The partial correlation analyses found a significant inverse relationship between medicine usage and cardiorespiratory fitness (r = -0,23; p<0.001), physical activity as counts per minute (r = -0,18; p = 0,01) and moderate-to-vigorous physical activity (r = -0,15; p = 0,04).

Conclusion: Data from the present study suggests that prescribed medication use is inversely associated with high cardiorespiratory fitness and moderate to vigorous physical activity levels. Implementation of exercise interventions to increase physical activity levels could assist in lowering the cost of medication for non-communicable diseases in low-resourced communities.





# Promoting physical activity in Girl Scouts through video-based leader wellness training

#### Associate Professor Sara Rosenkranz<sup>1, 2</sup>, Ms. Katheryne Kimmel<sup>1, 2</sup>, Professor Richard Rosenkranz<sup>1, 2</sup>

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#### e-&mHealth (SIG)

Purpose: Girl Scouts troop settings have been shown to be viable for increasing opportunities for wellnesspromoting behaviors in girls. However, troop meetings are often highly sedentary, with minimal physical activity or healthful snack options. Thus, as part of an overall wellness-promotion intervention, the present study seeks to evaluate preliminary effectiveness of an online, video-based Girl Scouts troop leader wellness training intervention on troop meeting opportunities for physical activity.

Methods: A wait-list randomized control trial included eight Girl Scout troops (n=60 girls) that received the wellness video-based intervention (n=4 troops, 40 girls) or a wait-list control condition (n=4 troops, 20 girls). The intervention troops received 12 weekly training videos. The 12 videos (3-5min in length) each targeted a specific facet of wellness (fruit and vegetable availability, water availability, physical activity and sedentary time, and non-digital social connections): designed to assist leaders in identifying areas for improvement; provided approaches to overcoming common barriers; and supported leaders in setting individual goals for troop meetings. Meeting opportunities for physical activity and healthful snack provision were collected at baseline and following the 12-week intervention through objective assessment via Actical accelerometer (physical activity counts, moderate-to-vigorous physical activity (MVPA), steps), leader self-report, and direct observation by research staff.

Results/Findings: Objective physical activity results from 8 troops indicate that there was a significant condition by time interaction for MVPA (F=204.8, p<0.001). Intervention troops increased from 4.0% time in MVPA (95%CI: 3.64; 4.36%) to 11.2% (95%CI: 10.59; 11.81%). Wait-listed control troops decreased from 5.5% time in MVPA (95%CI: 4.94; 6.06%) to 3.0% (95%CI: 2.51; 3.49%). Similar interactions were observed for total accelerometer counts (F=184.9, p<0.001) and steps (F=388.3, p<0.001) during troop meetings.

Conclusions: Initial results from this online, video-based intervention appear promising for improving physical activity within the Girl Scouts troop meeting context. Future analyses from this study will include additional troops and indicators of opportunities for other wellness behaviors.





# Purchase and consumption of snack foods and soft drinks during school journeys among adolescents in the Otago region, New Zealand

<u>Ms. Margaretha Liliana Situmorang</u><sup>1</sup>, Associate Professor Kirsten Coppell<sup>1</sup>, Associate Professor Melody Smith<sup>3</sup>, Associate Professor Michael Keall<sup>2</sup>, Associate Professor Sandra Mandic<sup>1</sup>

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#### Motivation and behavior change (SIG)

Background: Active transport to school (ATS) provides an opportunity for physical activity for adolescents. However, some evidence suggests that ATS may be associated with an increased intake of unhealthy foods and drinks along the school route. This study compared the frequency of purchasing and consuming snack foods and soft drinks on the school journey in adolescents by mode of transport to school, neighbourhood level deprivation and weight status.

Methods: Adolescents (n=731; 53.5% females; 15.3±1.4 years) from 11 secondary schools in the Otago region, New Zealand, completed an online survey in 2018. Adolescents self-reported usual modes of transport to school and weekly frequency of purchasing and consuming snack foods and soft drinks on the way to/from school. Data were analysed by school transport (active/motorised/mixed), neighbourhood-level deprivation (New Zealand Deprivation Index; low (n=420; Quintiles 1+2), medium (n=158; Quintile 3) and high deprivation (n=117; Quintiles 4+5) and weight status (healthy weight vs. overweight/obese).

Results: Overall, 36.5% reported purchasing and consuming snack food and 26% soft drinks on at least one school trip (on average,  $0.91\pm1.73$  and  $0.66\pm1.50$  of 10 school trips/week, respectively). No significant differences were found by school transport mode. Adolescents from high deprivation neighbourhoods reported significantly higher frequency of snack food purchase and consumption compared to those from low deprived neighbourhoods ( $1.43\pm2.31$  vs  $0.76\pm1.52$  of 10 school trips/week; p=0.011). Soft drink purchase and consumption frequency was significantly higher among adolescents from high ( $1.23\pm2.26$  trips/week) compared with medium ( $0.64\pm1.58$  trips/week) and low ( $0.50\pm1.28$  trips/week) deprivation neighbourhoods (high vs medium: p=0.036; high vs low: p=0.002), and higher in overweight/obese versus healthy-weight adolescents ( $0.85\pm1.74$  vs  $0.57\pm1.50$  of 10 school trips/week; p=0.023).

Conclusions: The purchase and consumption of snack foods and soft drinks during adolescents' journey to/from school was not significantly different across the different modes of transport to school. Adolescents from more deprived neighbourhoods, and those who were overweight/obese were significantly more likely to report purchasing and consuming food and beverages from food outlets during the school journey compared to their counterparts. Future studies should examine whether adolescents living in more deprived areas are also more exposed to more unhealthy food outlets and advertising.





# 'That's it, me pants are coming down. Me bra's falling out': the implications of discomfort for beginner runners' affective experiences of exercise

#### Dr. Katy Kennedy<sup>1</sup>

<sup>1</sup>University of Surrey, Guildford, United Kingdom

Motivation and behavior change (SIG)

#### Purpose

How people feel during exercise may be related to their future physical activity behaviour. There is little research on the factors which might improve these affective responses to exercise, particularly for novices. This poster presents findings from a qualitative synthesis of two studies examining affective responses to exercise, specifically in beginner runners.

#### Methods

Running Commentary was a longitudinal, mixed methods field study, using go-along interviews (N=69, 13 UK beginner running groups). Participants were asked to rate how they felt and why during a run-walking session. WalkJogSmile was an online longitudinal diary study of participants (N=27) following a 9-week beginner running podcast. Participants gave qualitative feedback after running sessions and were interviewed post-study. A qualitative synthesis of results from both studies was conducted using the method of 'following the thread' after thematic analysis. One theme identified across studies is discussed here, namely 'discomfort'.

#### Results

Participants in both studies discussed discomfort, and being in discomfort influenced affective responses to exercise. Five subthemes were identified: clothing, bodily functions and needs, niggles and injuries, lungs and heart and effortful/effortless running. Running is a high intensity, high impact exercise, and this was reflected in the factors participants discussed affecting how they felt during exercise. Uncomfortable shoes, ill-fitting bras or trousers and inadequate pockets caused discomfort or irritation, and clothing was particularly important in extreme weather. Bodily functions and needs discussed by beginners included needing the toilet, digestive issues, hunger and thirst. Niggles and injuries were frequently described as causing discomfort or pain during/after running, and interfered with running enjoyment. Heart and lung-related sensations such as being breathless, having a stitch or feeling heart rate increases caused discomfort, but could also be interpreted positively or negatively. Participants often described running as a mental or physical struggle, reflecting the difficulty of beginners pacing. WalkJogSmile participants in later weeks expressed pleasure in effortless or 'automatic' running.

#### Conclusions

These results gave novel insights into factors related to affective responses to exercise in beginner runners. Applications include improved practical advice for beginner runners and improved practitioner training.





# The association between fast-food outlet density and proximity and Body Mass Index within Dutch urban and rural areas: evidence from a population-based cohort study (N=147,027).

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#### Disease prevention and management

Purpose: Fast-food outlet exposure may be associated with elevated Body Mass Index (BMI), which is a risk factor for various chronic diseases. Yet, evidence on this association is inconsistent due to a lack of accurate and comprehensive exposure measurement. We examined the association between residential fast-food outlet exposure, in terms of proximity and density, and BMI in the Dutch adult general population. Additionally, we investigated to what extent this association was modified by urbanisation level and mediated through daily caloric intake.

Methods: We linked residential addresses of baseline adult Lifelines cohort participants (N=147,027) to fast-food outlet locations using geo-coding. We computed residential fast-food outlet density within 500 metres(m), and 1, 3, and 5 kilometres(km), and proximity. Urbanisation level was defined as living in an urban ( $\geq$ 1,000 addresses/km2) or rural area (<1,000 addresses/km2). Daily caloric intake was measured using a Food Frequency Questionnaire and food composition database. We used stratified (urban versus rural areas) multilevel linear regression and mediation models, adjusting for age, sex, partner status, education, employment, neighbourhood deprivation, and address density.

Results: Participants had a mean BMI of 26.1(SD 4.3) kg/m2. In urban and rural areas, having five or more fast-food outlets within 1km was associated with a higher BMI (B=0.40, 95% confidence interval (CI): 0.12, 0.69; B=0.23, 95% CI: 0.10, 0.36, respectively). Furthermore, participants in urban and rural areas with a fast-food outlet within <250m had a higher BMI (B=0.30, 95% CI: 0.03, 0.57; B=0.20, 95% CI: 0.09, 0.31, respectively). In rural areas, participants also had a higher BMI when having at least three fast-food outlets within 500m (B=0.19, 95% CI: 0.09, 0.29). Associations were stronger in rural than urban areas for 500m density, and were not explained by daily caloric intake.

Conclusions: The presence of fast-food outlets within 1 km is associated with BMI. Although we cannot rule out reverse causation, this study provides entry points for policy-makers to create healthy living environments. (





# "It's better together": Benefits of walking regularly with peers versus primarily alone in older adults.

<u>Miss Marlene Kritz<sup>1,2</sup></u>, Prof. Cecilie Thogersen-Ntoumani<sup>1,2</sup>, Prof. Barbara Mullan<sup>1</sup>, Dr. Afroditi Stathi<sup>2</sup>, Prof. Nikos Ntoumanis<sup>1,2</sup>

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Motivation and behavior change (SIG)

Purpose:

Past research with older adults has highlighted the benefits of walking with peer groups, but not clarified how it compares to walking alone. We examined whether purposeful walking with peers (WP) at least once a week contributes to better behavioral and health outcomes in older adults than primarily walking alone (WA).

Methods:

A prospective survey design was used. Participants aged 60 and older (N =136) were recruited at the start of a 16week walking intervention from nine retirement villages in and around Perth, Western Australia. Participants who walked on average at least once a week in the final eight weeks of the intervention were included in the analysis (N =79; 66 Females, Mage (SD) = 77.73 (6.91).

Results:

We found that autonomous motivation, walking self-efficacy, functional capacity, overall body fat, and physical activity behavior improved more in those who WP (i.e., either alone or with a partner), compared to those who WA, after controlling for whether participants lived alone/with others, and their health status.

#### Conclusion:

Our results extend the current literature by providing longitudinal evidence for the added benefits of regular peer accompanied walking in older adults, and highlight the importance of investing in peer-supported interventions. We recommend interventions that promote regular walks with supportive peers and provide the choice to do so as a group or with a partner. Further understanding of characteristics and behaviors of peers that are effective as walking partners or group leaders is needed.





# A novel approach for promoting healthy eating on a budget among socioeconomically-disadvantaged people with type 2 diabetes

<u>Mrs Nazgol Karimi<sup>1</sup></u>, Prof. David Crawford<sup>1</sup>, Dr. Rachelle Opie<sup>1</sup>, Associate Professor Peter Shane Hamblin<sup>2, 3,</sup> Prof. Ralph Maddison<sup>1</sup>, Dr. Stella O'Connell<sup>1</sup>, Ms. Cheryl Steele<sup>4</sup>, Prof. Bodil Rasmussen<sup>5, 6, 7</sup>, Dr. Ashley Ng<sup>8</sup>, Prof Kylie Ball<sup>1</sup>

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#### e-&mHealth (SIG)

Purpose: Programs to support self-management of diabetes (DSM) have been shown to improve diabetes outcomes and decrease the risk of its related complications. However, of those who are socioeconomically disadvantaged, many are unable to attend and engage with these programs due to barriers such as poor access, time limitations, lack of health knowledge and competing obligations. Increased accessibility and affordability of the Internet and mobile phones offer potential to provide more accessible, easily-distributable, ongoing low-cost DSM support programs for disadvantaged people with Type 2 Diabetes (T2D). This study aims to test the appeal and feasibility and explore the potential effectiveness of a 12-week, evidence-based, web- and mobile phone-delivered healthy eating behaviour change program to enable disadvantaged people with T2D to strengthen important skills necessary to eat in a healthy manner on a budget.

Methods: A multiple methods (quantitative-qualitative) pre-post-test design pilot study is underway. Sixty lowincome people with T2D aged 18-75 years were recruited. Participants completed baseline assessments on basic demographic and clinical data, dietary intake, dietary self-efficacy and barriers to healthy eating. Participants were provided with log-in access to a website, which includes six progressive skill-based modules presenting healthy eating planning; smart food shopping; time-saving meal strategies; cooking; modifying recipes; and a final reinforcement of the earlier modules' learnings. Over the three-month intervention, participants received three text messages weekly to encourage review of selected goals and continue to engage with different components of the website and eat healthy foods. At the end of the intervention, program appeal and effects will be evaluated via the same surveys, with additional questions asking about their experience with and perceptions of the program, and feasibility assessed using website log-in data and the number of participants recruited and retained.

Results: The EatSmart website has been developed, and the first four modules have been viewed by 46 participants as of mid-February 2020

Conclusions: Results from this study will provide new insights on how disadvantaged populations with T2D may benefit from digitally-delivered behaviour change programs.





# Development plan of a hybrid exergame to help children adopt long-term hearthealthy behaviors

<u>Dr. Claudia Leong</u><sup>1</sup>, Dr. Andre Matthias Müller<sup>2, 3</sup>, Dr. Veronica Liesaputra<sup>4</sup>, Associate Professor Dione Healey<sup>5</sup>, Prof. Lisa Houghton<sup>1</sup>

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### e- & mHealth (SIG)

Purpose: Around 33% of New Zealand children are overweight and obese, and the majority deemed not to be meeting national physical activity guidelines. Exergames present a promising opportunity to get children sitting less and moving more. Previous studies report some short-term effects, while behavioral maintenance is yet to be achieved. In nutrition, artificial intelligence (AI) have been used to encourage behavior change through personalization of health messages to reduce boredom. Whereas, in the game industry, AI have shown to be highly effective in sustaining gameplay through promoting long-term engagement. Hence, we aim to develop and assess the efficacy of a novel hybrid exergame, incorporating AI using individualized data from the player's accelerometer and other game elements, to decrease sedentary behavior in children.

Methods: Using the expertise from the multidisciplinary team, behavioral analysis will be conducted through systematic reviews and qualitative interviews. Game motivation model, human-focused design and self-determination theories for game design will be explored using both qualitative interviews and quantitative group experiments. Prototype development will be based on results from behavioral analysis. Iterative qualitative user testing of the prototype through cognitive interviews will be carried out before the efficacy trial. An RCT will be performed, comparing the intervention group to a wait-list control group. Up to 100 children (10 to 12 year old), generally healthy, but not meeting the physical activity guidelines, will be recruited. Baseline and follow-up measurements will access physical activity using 7-day actigraphy/motion sensors. Validated questionnaires examining behavioral change theories will also be carried out.

Discussion: The expectation is that from the behavioral analysis, algorithms for AI will be developed, that would promote long-term engagement. From the efficacy study, the within game and app log data will be able to help explore behavioral changes among children, and improve on the algorithms used to learn children's behavior and interaction with the game. It is anticipated that the findings will contribute in helping to elucidate the evidence and theories by which AI in games can help sustain positive behavior changes in children, leading to a decrease in childhood obesity.





# Physical activity, sedentary behaviour, and barriers to exercise in people living with Dystonia

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#### Disease prevention and management

Purpose: Dystonia is a neurological movement disorder that presents as sustained or intermittent involuntary muscle contractions causing abnormal postures and movements. Physical activity (PA) is an important aspect of neurological disease management, with wide-ranging benefits for overall health and quality of life. No studies have quantified PA and sedentary behaviour (SB), nor explored barriers to being physically active in people with dystonia.

Methods: Participants diagnosed with dystonia completed a mixed-methods anonymous online survey on activity behaviours. The International Physical Activity Questionnaire (IPAQ) and Adult Sedentary Behaviour Questionnaire (SBQ) assessed self-reported PA and SB. Barriers to exercise engagement were investigated according to the five-factor social-ecological framework and dystonia-specific questions regarding the impact of exercise on symptoms were included.

Results: Two-hundred and sixty-three participants consented to the study (mean (SD) age = 55 (13) yrs, 76% Female). A large proportion of respondents (40%) reported living with cervical dystonia. Overall, the median (IQR) time spent in walking, moderate, and vigorous activity was 60 (0-120), 120 (15-300) and 0 (0-13) mins/day respectively. SB time during weekdays was 285.0 (157.5-465.0) mins/day and 345.0 (195.0-502.5) mins/day on weekends. Fifty-five percent of participants were dissatisfied with their current level of PA and 75% reported dystonia had decreased their level of PA. Fifty-seven percent found their symptoms were worsened during exercise though the after-effects on symptoms varied. Fatigue, motor symptoms, pain, and poor balance were commonly cited limiting factors. Qualitative and quantitative data indicated difficulties with more vigorous intensity activity. The common barriers to engagement were personal and governmental factors, such as physical impairments, lack of funding and lack of trained exercise professionals.

Conclusions: While more than half of respondents indicated they were not satisfied with their current level of PA, and exercise primarily worsened their dystonia symptoms, most participants were meeting the minimum guidelines. Future studies should incorporate more robust methods of PA and SB measurement and explore the mechanisms underpinning exercise-induced aggravation of dystonic symptoms to enhance life participation of people living with dystonia.





# A peer-led intervention targeting obesity-related behaviours and delivered to parents at community-based playgroups is both feasible and acceptable

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Children and families (SIG)

Purpose:

Use of autonomy promoting parenting practices in relation to eating, screen time, physical activity and sleep reduces obesity risk in young children. Obesity prevention interventions rarely focus on parenting across all four obesity-related behaviours. In addition, most are delivered by researchers or health professionals in a health service delivery setting. The aim of this pilot trial was to evaluate the feasibility and acceptability of a peer-led obesity-prevention intervention delivered to parents of young children attending community playgroups.

Methods:

Community playgroups were recruited through Playgroup Queensland, a not-for-profit organisation in Brisbane, Australia. A pilot clustered randomised controlled trial was conducted to evaluate the feasibility and acceptability of a peer-led intervention delivered over five sessions within a 10-week school term. The content and delivery mode of the intervention was informed by focus groups conducted with parents at playgroup. It was delivered by parent peer facilitators, who received training on facilitating group discussions using the "healthy conversations" concept. The conversation topics covered parenting challenges with respect to child eating, screen time, active play, and sleep. Feasibility and acceptability were evaluated via post-session surveys.

Results:

Thirty-three playgroups (220 parents) took part in the trial (intervention n=113; wait-list control n=107). Just over 74% of the parents receiving the intervention were satisfied or very satisfied with the group conversations, and 68% rated the overall program to be useful or very useful. All topics were rated positively, with the conversations about active play the most popular. Parents commented on how much they enjoyed talking about their parenting challenges and sharing information and ideas with other parents facing similar issues.

Conclusion:

A peer-led intervention targeting obesity-related behaviours in families attending community playgroups is feasible and acceptable. The peer-led "healthy conversations" delivery model, and the leveraging of existing social support networks were important and novel aspects of the intervention.





# Time-varying associations between ecological momentary assessment-reported sedentary behaviors, objectively-measured sedentary time, and affective responses among adolescents

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#### e-&mHealth (SIG)

Purpose: Evidence of acute sedentary behavior (SB)-affective state associations among youth is inconsistent; this may be attributed to a limited operationalization of self-reported SB, the lack of objective measurement of sedentary time, and the failure to account for dynamic time-varying associations. This study investigated the within-day, time-varying associations between ecological momentary assessment (EMA)-reported screen-based SB and non-screen-based SB, accelerometer-measured sedentary time, and subsequent affective states.

Methods: Participants (N=15, mean age=13.1[1.0] years, 66.7% female, 40.0% Hispanic, 66.7% healthy weight) reported screen-based and non-screen based SBs "in the past 30 minutes" and their positive and negative affect "right now" via EMA up to 7 times/day for 7-14 days. EMA prompts occurred randomly within pre-selected 2-hour time windows between 7am and 8pm. Participants simultaneously wore ActivPAL thigh-mounted accelerometers and sedentary time (minutes) in the 30 minutes prior to each EMA prompt was calculated. Separate time-varying effect models (varying slopes across the day) assessed how EMA-reported screen-based SB, EMA-reported non-screen-based SB, and accelerometer-measured sedentary time in the past 30 minutes each related to current EMA-reported positive and negative affect.

Results: Participants completed N=633 EMA surveys (255 [40.3%] reports of screen-based SB, 109 [17.2%] reports of non-screen-based SB, and 269 [42.5%] no SB reported). EMA-reported screen-based SB was positively related to positive affect from approximately 7am-9am (ßrange 0.34 to 0.89) and from 3pm-6pm (ßrange 0.28 to 0.37); and was positively related to negative affect from approximately 7am-9am (ßrange 0.23 to 0.49). Non-screen-based SBs were inversely related to positive affect from about 7am-8am (ßrange -0.63 to -0.43) and after 2pm (ßrange -0.49 to -0.27), while they were inversely related to negative affect from 10am-1pm (ßrange -0.17 to -0.14). Accelerometer-measured sedentary time was unrelated to positive affect across the day but was positively related to negative affect from approximately 6pm-8pm (ßrange 0.01 to 0.02).

Conclusions: The strength of acute associations between SB and affective states differs across the day and by operationalization of SB (screen-based vs. non-screen based vs. accelerometer-measured sedentary time); highlighting the methodological importance of taking more nuanced approaches to operationalizing time and SB in within-day studies of SB and affective states.





# What's for dinner? The healthiness of food outlets associated with the emerging trend of online food delivery services

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### e-&mHealth (SIG)

Purpose: Young people in Australia are spending \$AUD100/week eating at restaurants or ordering takeaway foods. Restaurant and take away food consumption have been associated with significant increases in daily energy, sugar, saturated fat and sodium intakes, which are leading risk factors for chronic diseases. The aim of this study was to evaluate food outlets on a popular online food delivery service to assess the healthiness of the ten most popular food outlets in each suburb as well as overall delivery costs.

Methods: Geographical areas of Sydney, Australia were selected using 2016 NSW Census data. We identified Local Government Areas (LGAs) with above-average populations (>30%) of young people aged between 15-34-years, as young people are the primary users of online food delivery services. Uber Eats was selected as it the most popular online food delivery service in Australia. In February 2020, all suburbs in the included LGAs were searched on the Uber Eats Website. The delivery time was set for 6.00PM-6.30PM for consistency. Data on the top 10 food outlets were extracted, including the food outlet name, category, and classified by type and healthiness score using The Food Environment Score (FES) (scores range from -10, unhealthiest outlets to 10, healthiest outlets). Data were analysed using descriptive statistics.

Results: Data from 2318 food outlets providing food service delivery to 233 suburbs were extracted. Most food outlets were unhealthy (average FES -6.9; SD 4.4) and most were franchise takeaway stores (42.9%, 995/2138) and local independent takeaway stores (31.8%, 738/2138). McDonald's® was the most popular food outlet in 79.8% (186/233) of suburbs. Healthier food outlets (salad/sushi bars and sandwich shops) accounted for only 5.3% (122/2318) of food outlets. The average delivery cost per order was \$AUD5.65 (range \$0-7.99).

Conclusions: The most popular food outlets on Uber Eats are unhealthy. Further research is needed to understand how online food delivery services change the geographical reach and accessibility of unhealthy food outlets, explore relationships across different socioeconomic areas and evaluate nutritional quality and costs of recommended menu items.





# Short-term efficacy of reducing screen media use on physical activity, sleep, and physiological stress in families with children aged 4-14: The SCREENS randomized controlled trial

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#### Children and families (SIG)

Purpose: During the recent decade presence of digital media, especially handheld devices, in everyday life, has been increasing. Survey data suggests that children and adults spend much of their leisure on screen media, including use of social media and video services. Despite much public debate on possible harmful effects of such behavioral shifts, evidence from rigorously conducted randomized controlled trials (RCTs) is lacking. The purpose of the SCREENS trial is to investigate the short-term efficacy of limiting leisure screen media use on objectively assessed physical activity, sleep duration and quality, and physiological stress in parents and their 4-14-year old children.

Methods: The SCREENS pilot was conducted during the fall of 2018 and spring of 2019. Based on experiences from the pilot, we developed a protocol for a parallel group RCT. The trial is being conducted from May 2019 to ultimo 2020 in 95 families with children 4-14 years recruited from a population-based survey. As part of the intervention family members must handover most portable devices for a 2-week time frame, in exchange for classic mobile phones (not smartphones). Also, entertainment-based screen media use during leisure must be limited to no more than three hours/week/person. At baseline and follow-up, 7-day 24-hour physical activity will be assessed using two triaxial accelerometers; one at the right hip and one the middle of the right thigh. Sleep duration will be assessed using a single channel EEG-based sleep monitor system. Also, to assess physiological stress (in adults), parameters of 24-hour heart rate variability, the cortisol awakening response and diurnal cortisol slope will be quantified using data sampled over three consecutive days. We will objectively monitor the families' screen media use via different software and hardware monitoring systems.

Discussion: Using a rigorous study design with state-of-the-art methodology to assess outcomes and intervention compliance, analyses of data from the SCREENS trial will help answer important causal questions of leisure screen media habits and its short-term influence on physical activity, sleep, and other health related outcomes among children and adults.





# Health vs. lifestyle influencers: Examining authenticity and credibility

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Other

Purpose: The use of Social Media Influencers (SMIs) to promote products and brands is an increasingly popular form of marketing, especially targeting young adults. However, little is known about SMIs and whether they are perceived to be authentic and credible. The discipline of nutrition science is currently facing credibility issues in the eyes of the general public, particularly on social media. This study aimed to understand consumer perceptions of SMIs and Nutrition Professionals (NPs), in relation to their credibility and authenticity.

Methods: A cross-sectional questionnaire was developed and administered to 153 Undergraduate students in May 2019, with 149 providing complete responses. Participants viewed screenshots of real-life Instagram profiles and two posts from a NP (with tertiary qualifications in nutrition) and a SMI. Main outcomes were authenticity and credibility (i.e., expertise and trustworthiness) measured on 5-point Likert scales. Multiple regression analyses were used to assess credibility and authenticity of both SMI and NP. Covariates included participant gender, perceived attractiveness, familiarity, and likeability of the source (i.e., SMI and NP).

Results: Participants were young adults (median age [25th,75th percentile]: 20[19,21]), approximately half were female (54.0%). The SMI profile was significantly more attractive (p= 0.01) and familiar (p<0.001) compared to the NP. However, participants perceived no difference between the SMI's and NP's expertise (p=0.78), trustworthiness (p=0.11), or authenticity (p=0.51). Results indicated that attractiveness was the main predictor (p<0.001) of expertise, trustworthiness, and authenticity. Familiarity was a significant predictor of trustworthiness (p<0.001) of the profile but did not predict expertise or authenticity. The post content from the NP was perceived as more authentic and trustworthy than the SMI (p<0.001). Females were more likely to perceive a post as trustworthy and authentic than males (p<0.001).

Conclusions: Holding a formal nutrition qualification had no significant effect on perceived expertise, trustworthiness, or authenticity, indicating other factors, such as attractiveness, are more important in forming a judgment of a profile on social media. If appropriate, sharing personal experiences may increase the authenticity of social media content.





# How do people interpret self-report sedentary behaviour questionnaires? A think-aloud study

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Sedentary behaviour – i.e. any waking activity that expends fewer than 1.5METs/min while seated or lying down – has emerged as a health risk factor, largely independently of physical activity. This has inspired considerable research to understand, predict, or change sedentary behaviour patterns. Much of this research has been based on self-reported sitting time. Yet, little is known about how participants interpret self-report sedentary behaviour items. Erroneous interpretations, for example, may generate unreliable or inaccurate data. 'Think aloud' methods, whereby participants narrate their thoughts as they complete a task, can provide insight into how people interpret questionnaires, and how they mentally represent the concepts under study.

Methods: 25 UK office workers 'thought aloud' as they completed 38 items from 9 sedentary behaviour questionnaires (e.g. Workplace Sitting Breaks Questionnaire, Multi-Context Sitting Time Questionnaire), as systematically selected from a pool of 30 questionnaires. Verbatim transcripts were analysed using Thematic Analysis, undertaken by three coders, to identify potential problems experienced when completing the questionnaires.

Results: Three themes emerged: interpretation problems; errors and biases in formulating responses; and motivational and affective responses to questionnaire completion. Interpretation problems included instances of uncertain interpretations, inconsistent interpretations of similar items, and interpretations that deviated from the intended meaning. Participants typically mentally encoded time spent sitting according to concurrent activities (e.g. commuting) and translating these events into a sitting time metric was effortful and prone to error. Several participants expressed surprise at their high estimated sedentary time, which appeared to motivate them to reduce their sitting.

Conclusions: Participants typically did not mentally represent sitting as 'sitting', which can cause problems when people self-generate sitting time estimates. Domain-specific items, which assess time spent in discrete seated activities, may be less burdensome and less prone to error and bias than items that require direct reflection on sitting itself. Self-reporting sitting time can have 'mere measurement effects', enhancing motivation to reduce sitting time. While this may be problematic for prospective studies that assume test-retest validity, it raises the possibility that self-reporting sitting may offer a promising sedentary-reduction intervention technique.





# Association between the Nutri-Score front-of-pack nutrition label and mortality risk in the SUN cohort

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#### Policies and environments (SIG)

Purpose: Front-of-pack nutrition labelling is a key public health policy that can be implemented as part of a comprehensive set of measures to promote healthy diets. The Nutri-Score, a five-colour summary label based on a modified version of the British Food Standards Agency Nutrient Profiling System (FSAm-NPS), is being considered for implementation in several European countries including Spain. This study aimed to prospectively assess the association between the FSAm-NPS and all-cause and cause-specific mortality in the SUN ("Seguimiento Universidad de Navarra" – University of Navarra Follow-up) cohort.

Methods: Analyses included 20,503 participants from a Spanish cohort of university graduates (mean [SD] age: 38 [12] years). Dietary intake was assessed at baseline and after 10-years of follow-up with a validated semiquantitative food-frequency questionnaire. The FSAm-NPS was calculated for each food/beverage based on their amount of energy, saturated fat, sugar, sodium, fibre, protein, fruits, vegetables, legumes, nuts, rapeseed, walnut and olive oils per 100 grams of product. The FSAm-NPS Dietary Index (DI) was computed as an energy-weighted mean of the FSAm-NPS scores of all foods and beverages consumed by each participant. Multivariable-adjusted Cox proportional hazards models were used to estimate hazard ratios (HRs) and 95% confidence intervals (CIs) for allcause and cause-specific mortality according to baseline and updated FSAm-NPS DI scores.

Results: Over a median follow-up of 10.9 years, 407 participants died. A higher baseline FSAm-NPS DI score, reflecting a lower nutritional quality of the food consumed, was directly associated with all-cause mortality (HR Q4 versus Q1 = 1.82; 95% CI: 1.34 to 2.47; p-trend<0.001) and cancer mortality (HR: 2.44; 95% CI: 1.54 to 3.85; p-trend<0.001). No association was found for cardiovascular mortality.

Conclusions: The consumption of food products with a higher FSAm-NPS score (ie, lower nutritional quality) was associated with a higher risk of all-cause and cancer mortality in a cohort of Spanish, middle-aged university graduates. These findings further support the implementation of Nutri-Score in Spain.




# ActivPAL measured activity levels of adults with acquired brain injury and validity of a wrist-worn Fitbit to measure steps and sedentary behaviour

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

#### Purpose

This study focused on measuring activity levels of adults with acquired brain injury [ABI]. Currently, there is lack of objective measurement of physical activity [PA] and sedentary behaviour in adults with ABI. The study also aimed to validate the Fitbit for measuring steps and sedentary behaviour in adults with ABI.

#### Methods

In this observational study, adults with ABI wore a Fitbit (wrist) and an activPAL (thigh) during a laboratory session (one hour) and free-living (7 days). Steps (both settings), and stepping and sedentary time (minutes; free-living) were calculated for both devices. Sedentary time included wake and sleep-time, as Fitbit data were only available in 24-hour summaries. Correlation (Spearman) and Bland-Altman analyses were used to examine the validity of the Fitbit compared to the activPAL.

#### Results/findings

Twelve adults (7 male; 46(±13) years) with ABI (11(±12) years since injury) participated. ActivPAL data showed they were awake for  $15(\pm 2)$  h/day, spent 60% of the day sitting, 29% standing and 11% stepping (7218 steps/day), all participants stepped ≥150 min/week, and approximately 95 min/day were spent in stepping bouts of <10 minutes. Fitbit steps correlated strongly with the activPAL for both settings (rho>0.90; p<0.01). Fitbit overestimated steps in the laboratory (mean difference [MD]: 13 steps, 95% Limits of Agreement [LoA]: -124-151) and underestimated steps in free living (MD: -214 steps/day, LoA: -3812-3384). Fitbit sedentary time was poorly correlated with the activPAL (rho: 0.03), overestimating by 273 min/day (LoA:-77-623).

#### Conclusions

Participants in this study spent most of their waking hours sedentary, but spent a considerable proportion in standing and stepping activities. However, only one participant met the PA guidelines of the WHO, and the majority of stepping time was in bouts <10 minutes. The Fitbit classifies this time as sedentary, which may have caused the poor correlation with the activPAL. The results of this study suggest that the Fitbit provides a valid measure for steps in this population but sedentary time should be interpreted with caution.





# Can personalised mobile technology increase physical activity and healthy diet? A systematic review and meta-analysis

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#### e-&mHealth (SIG)

Purpose: Today's sensor and mobile applications, and advances in artificial intelligence can revolutionise behaviour change science by providing personalised support to users. This review aimed to assess the effects of personalised mobile technologies on physical activity and diet.

Methods: We searched five databases until 2020, using terms related to mobile technologies, personalisation and lifestyle behaviour. Two independent researchers screened and included RCTs that assessed a personalised mobile app or tracker for physical activity or diet. Study quality was assessed using Cochrane's risk of bias tool. A random effects meta-analysis was conducted for dietary and physical activity outcomes. The cause of any observed statistical heterogeneity was explored using meta-regression. This systematic review is compliant with the PRISMA statement.

Results: Eleven studies describing ten unique interventions were included in the meta-analysis (n=2093, 50.2% women). The average study duration was 14 weeks. Four studies had at least three out of five categories assessed as low risk of bias. Five interventions targeted physical activity, two targeted diet, and three targeted both. Retention rate varied between 40% and 100%.

The most common personalised features were the content of behaviour recommendation, goal setting and feedback. All interventions except two collected behaviour data for personalisation. Two interventions collected demographic information, and only one collected user preference. Four interventions used system-captured data for personalisation, four used user-reported data, and two used both.

The meta-analysis showed a moderate, positive effect on physical activity and diet (SDM 0.727, 95% CI 0.362 to 1.093). Intervention that used system-captured data for personalisation had higher effectiveness than those that used user-reported data or both (p=0.0041). Additionally, interventions with higher retention rate also showed higher effectiveness (p=0.04).

Conclusion: This review extends the existing literature on personalised mobile interventions for physical activity and diet, by identifying factors associated with higher effectiveness, namely the use of system-captured data for personalisation and high retention rate. Mobile technologies can capture large amount of data continuously and increase retention by reducing reporting burden on users; and thus, should be explored in future research.





# Physiotherapist-prescribed physical activity after fall-related lower limb fracture: dose, adherence and physical activity outcomes from the RESTORE randomised controlled trial

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#### Ageing (SIG)

Purpose: To describe the dose prescribed, adherence and effect on physical activity (secondary outcomes) of a physiotherapist-prescribed physical activity program for people after fall-related lower limb or pelvic fracture. Design: Randomised controlled trial.

Participants: 336 community-dwellers aged 60+ who had completed usual care for a fall-related fracture in the past two years. The intervention group received 10 physiotherapist home visits and 5 telephone calls, to teach individualised weight-bearing strength and balance exercises, discuss fall prevention strategies and encourage physical activity.

Measures: Exercise dose was recorded by the physiotherapists, adherence was reported by participants and physical activity outcomes were collected with IPEQ and stage of motivational readiness for change questionnaires. Analyses: Descriptive statistics summarised dose and adherence. Regression models compared groups at 12-months after adjusting for baseline values of the outcome.

Results: Intervention group participants were prescribed an average of 6.4 (SD 1.2, n=160) home exercises and agreed to exercise 4.5 times per week (SD 2.1, n=160). By the end of trial 69% of those prescribed a home program were still regularly exercising and completed an average of 71% (SD 30%, n=110) of the prescribed exercise repetitions. There were potentially important between-group differences at 12 months in self-reported home exercise (0.39 hours/week more exercise in the intervention group after adjusting for baseline, 95% CI 0.02 to 0.77, p = 0.04, n=284), in planned activities including walking (1.46 hours/week more in the intervention group after adjusting for baseline, 95% CI 0.42 to 2.50, p = 0.006, n=283) and in stage of readiness for change ordinal scale (OR 1.66, 95% CI 1.09 to 2.55, p =0.019, n=283). There was little difference in overall physical activity (2.09 hours/week more in the intervention group after adjusting for baseline, 95%.

Conclusions: There were potentially important benefits on home exercise and planned physical activity from this physiotherapist-prescribed physical activity program for people after fall-related lower limb or pelvic fractures.





# Comparison of a photoplethysmography-based wearable device and a researchgrade accelerometer with polysomnography in youth

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: To compare sleep metrics produced by the Fitbit Charge 3 (Fitbit) and Actigraph GT9X accelerometer (Actigraph) to polysomnography (PSG) in youth.

Methods: Participants included thirty-nine youth (age=9.5±3.4 years, BMI%tile=71.4±30.4, 40% male, 61% Black) referred by their physician for an overnight sleep study due to snoring, restless sleep, or enlarged tonsils. Fitbit and Actigraph were worn on the non-dominant wrist and recorded data concurrently with PSG. Fitbit and Actigraph sleep metrics including total sleep time (TST), sleep efficiency (SE), wake after sleep onset (WASO), sleep onset, and sleep offset were extracted from Fitabase and Actilife with the Sadeh algorithm, respectively, while sleep technologists scored PSG data. Bland-Altman plots assessed agreement between devices and PSG.

Results: 77% of youth were diagnosed with obstructive sleep apnea, 8% with elevated periodic limb movement, and 15% with no sleep-related diagnosis. Compared to PSG, Fitbit overestimated TST by 0.9 min (absolute mean bias=27.9 min), while Actigraph underestimated TST by 29.4 min (absolute mean bias=34.4 min). Fitbit overestimated SE by 2.8% (absolute mean bias=5.8%) and Actigraph underestimated SE by 13.1% (absolute mean bias=13.6%). Fitbit overestimated WASO by 1.2 min (absolute mean bias=23.7 min) and Actigraph underestimated by 49.9 min (absolute mean bias=49.9 min) compared to PSG. Both Fitbit and Actigraph underestimated sleep onset by 5.5 (absolute mean bias=11.8 min) and 9.8 min (absolute mean bias=14.0 min), respectively. Both Fitbit and Actigraph overestimated sleep offset by 7.0 min (absolute mean bias=14.0 min) and 10 min (absolute mean bias=12.9 min). Linear regression indicated statistically significant trends with Fitbit and Actigraph underestimating at lower values for all sleep metrics except SE.

Conclusions: Fitbit provided comparable sleep estimates to Actigraph when compared to PSG. These data provide initial support for the use of consumer devices as an alternative to research-grade accelerometers to measure sleep in youth. Validation studies are needed in healthy youth, over several nights, and in free-living settings.





# How to measure the food environment in relation to Body Mass Index? A comparison of measures in 147,027 Lifelines participants.

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#### Disease prevention and management

Purpose: Unhealthy food environments may contribute to an elevated Body Mass Index (BMI), a major disease risk factor. Yet, it is unclear which measure most accurately reflects the food environment. Moreover, potential mediating factors within the association between the food environment and BMI need further investigation. We compared associations between fast-food outlet exposure, healthy food outlet exposure, the ratio between fast-food and healthy food outlet exposure, and the percentage fast-food outlets out of total (fast-food, healthy, and neutral) food outlets with BMI. Furthermore, we examined to what extent these associations were mediated by diet quality.

Methods: We linked baseline adult data of the Lifelines cohort study (N=147,027) to retail outlet location data using geo-coding. We computed four exposure measures within 1-kilometre(km)-density around participants' residential address; number of (1) fast-food outlets, (2) healthy food outlets, (3) ratio between fast-food and healthy food outlets, and (4) percentage fast-food outlets out of total (fast-food, healthy, and neutral) food outlets. We measured diet quality by the Lifelines Diet Score. We used multilevel linear regression and mediation models adjusting for age, sex, partner status, education, employment, neighbourhood deprivation, urbanization, sport facility density, and adjusted exposure measures for one another.

Results: Participants had a mean BMI of 26.1 (SD 4.3) kg/m2. Participants living with five or more fast-food outlets had a higher BMI than participants with no fast-food outlet within 1 km (B=0.17,95% CI:0.06,0.28). Participants living with relatively many fast-food outlets (50-75% of total food outlets) had higher BMI than participants with relatively few fast-food outlets (<25% of total food outlets) within 1 km (B=0.13,95% CI:0.03,0.22). Healthy food outlet exposure and the ratio between fast-food and healthy food outlets were not associated with BMI. Diet quality did not explain any observed association.

Conclusions: Fast-food outlet exposure may be an important risk factor for an elevated BMI. Policymakers should specifically target fast-food outlets, rather than healthy food outlets, to create healthier food environments. (





# Stakeholder Input to Inform the Adaptation and Dissemination of Ghana's Physical Activity Guidelines

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#### Policies and environments (SIG)

Purpose: Ghana is experiencing a shift in public health shift issues, including an increase in non-communicable diseases and a decrease in physical activity rates. The Ministry of Health (MOH) and Ghana Health Service (GHS) developed physical activity guidelines in 2009. However, a 2019 study found that Ghanaian older adults were not aware of the physical activity guidelines and the example activities (e.g., ballroom dancing) were not culturally appropriate. The purposes of this study were to investigate 1) dissemination of the physical activity guidelines through MOH/GHS and 2) culturally appropriate physical activities.

Methods: Through a concurrent mixed-methods design, data were collected in urban and rural regions of Ghana. Focus groups (N=2) were conducted with community stakeholders; the semi-structured guide included recommended types of physical activity. Surveys (N=12) and in-depth interviews (N=4) were conducted with purposively selected MOH/GHS employees, including research officers and non-tropical disease coordinators. Survey questions were based on the Diffusion of Innovations Theory; the semi-structured interview guide also included recommended types of physical activity. Quantitative results were analyzed through frequencies and proportions. Qualitative results were analyzed through inductive thematic coding of transcripts.

Results: Most survey respondents (72%) were not aware of the physical activity guidelines. Respondents indicated that the guidelines could be better disseminated through making regional and district directors aware of them (90%). Most common dissemination modes for new policies were internet (45%), publications (35%), and trainings (36%). Focus group and interview participants recommended physical activities including walking (N=20 meaning units), running (N=16), football (N=14), traditional games (N=14), and gardening (N=10).

Conclusions: A dissemination intervention including regional and district directors as a communication channel and packaging into user-friendly, accessible publications should be considered. Adapting the guidelines to replace unfamiliar activities with culturally appropriate activities (e.g., ampe, a traditional children's jumping game) could improve understanding uptake of guidelines. Disseminating culturally appropriate physical activity guidelines is a necessary step in translating research to practice to increase physical activity levels and prevent non-communicable diseases.





# The effects of a supermarket-based intervention on the nutritional quality of private-label foods: A prospective study

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#### Policies and environments (SIG)

Purpose: Private-label products, products that are owned by supermarkets, continue to experience increased growth and popularity amongst consumers. The aim of this study was to assess the effect of a novel intervention that provided an Australian supermarket with nutritional benchmark data to guide the formulation of healthier foods and beverages for their private-label range.

Methods: Over nine-months (April 2015 to January 2016), the supermarket ('intervention supermarket') received 35 reports that ranked the nutritional quality of their products against competitors across 150 subcategories of foods and beverages. Changes in the nutrient content of private-label products from the intervention supermarket between 2015 and 2018 were compared to the changes of three comparators (private-label products from two other Australian supermarkets and all branded products combined). The primary outcomes were mean sodium (mg/100g), sugar (100g/g), saturated fat (g/100g), energy (kJ/100g) content and Health Star Rating (HSR) (stars).

Results: Between 2015 and 2018, the intervention supermarket reduced the mean sodium content of their products (-40mg/100g, 95% confidence interval [CI] -73 to -7; p=0.02) but there were no changes for other nutrients or HSR (all p>0.05). This reduction in sodium content was significantly greater than for all three comparators (all p<0.05). Conversely, compared to the intervention supermarket, the three comparators each achieved a greater relative reduction in the sugar content of their products between 2015 and 2018 by between -3.5 and -1.6g/100g (all p<0.05). One of the comparators also had a greater relative reduction in the saturated fat and energy content of its products compared to the intervention supermarket (both p<0.05). HSR were unchanged across the intervention supermarket and comparators (all p>0.05).

Conclusions: Providing comparative nutrition data to an Australian supermarket resulted in a favourable effect on the sodium content of their products but had no beneficial effect on other nutrients or HSR. The limited impact of this intervention raises questions about the value of voluntary initiatives and the potential need for mandated initiatives to improve the healthiness of the packaged food supply.





# Relationship between physical activity behaviour and motor skills among preschool children in Malaysia: Preliminary results from SUNRISE study Malaysia

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Children and families (SIG)

Purpose: This study aimed to determine the prevalence of children aged four years who meet the WHO's 2019 guidelines on physical activity (PA). The guidelines states that children aged 3-4 years old should participate in at least 180-minutes of PA a day including 60-minutes of moderate-to-vigorous intensity PA (MVPA). A secondary aim for this study is to explore the relationship between meeting the PA guidelines and motor skills among these children.

Methods: This is a cross-sectional study. Preschool children aged four years were recruited from urban and rural localities in three states in central region of Peninsular Malaysia, namely Kuala Lumpur, Selangor and Negeri Sembilan. PA was measured using Actigraph GT3X+ accelerometers. The accelerometer was worn on the waist for five days, from Monday to Friday. Children with at least one 24-hour day of data were included in the analysis. Gross and fine motor skills were measured using the Ages and Stages Questionnaire Third Edition (ASQ-3) for age 48 months.

Results: A total of 82 children completed the study protocol. There was a good representation of boys (51.2%) and girls (48.9%), and from rural (47.6%) and urban (52.4%) areas. Accelerometer data showed that slightly more than half (57.3%, n=47) of the children participated in at least 180-minutes of PA a day. However, among them, only 30 (36.6%) also participated in at least 60-minutes of MVPA, thus meeting the WHO PA guidelines. Most children were developing on schedule without needing intervention or assessment, for gross motor skills (72.0%) and fine motor skills (69.5%). We found no significant association between sex and location with meeting PA guidelines. Further, there were also no significant association between meeting PA guidelines and gross and fine motor skills in this age group.

Conclusions: The findings showed that many preschool children in Malaysia have insufficient physical activity, particularly MVPA. Future research should focus on innovative ways to promote physical activity, especially energetic play among preschool children.





# Physical activity attitudes and discussion practices in oncology healthcare providers working with Kidney Cancer Survivors

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Cancer prevention and management (SIG)

Purpose: The benefits of physical activity (PA) in kidney cancer survivors (KCS) include improvements in quality of life (QoL), fatigue, and physical functioning. However, only 26% of KCS are sufficiently physically active to accrue these benefits. Oncology healthcare providers (OHP) can play an important role in providing PA information and recommendations to KCS.

Methods: Using a cross-sectional study design, OHP were recruited through the Kidney Cancer Research Network of Canada. OHP included oncologists, nurses, and urologists, currently working with KCS in Canada. OHP completed a self-reported on-line survey addressing attitudes, knowledge, confidence and competence discussing PA to KCS and using the guidebook, as well as current PA discussion practices. A 47-item questionnaire was developed with openand close-ended questions addressing the study objectives. Data was analyzed using descriptive statistics, including frequencies and percentages of responses to determine trends in PA discussion for this population.

Results: OHP (n=13) were mainly oncologists (n= 8; 62%). OHP hold positive attitudes towards PA for KCS both during (n=12; 92%) and after (n=12, 100%) treatment. However, they lack PA knowledge for KCS (n=7; 54%) and lack familiarity of guidelines (n=9; 69%). OHP demonstrated low PA discussion practices (n= 7; 54% not discussing PA at all) and low discussion of the guidebook with KCS (n= 8; 62% not making any KCS aware of guidebook). Barriers for PA discussion included lack of time, lack of familiarity of the guidebook, lack of funding for patient referrals to community programs, remembering to discuss it, and major medical issues taking priority. Facilitators included having hard copies of the guidebook for easier access, being familiar with the guidebook, and a website to guide patients and nurses.

Conclusion: OHP are willing to consider PA discussion to KCS as they hold positive attitudes towards it, but there are major barriers to knowledge and time that should be considered in future interventions. Addressing these barriers will enable better PA discussion practices, which may increase PA behaviour among KCS for better quality of life and health outcomes.





# Differences in physical activity during walking and playing Pokémon Go

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e-& mHealth (SIG)

Purpose: Exergames such as Pokémon Go may increase physical activity, however it is unknown how Pokémon Go impacts the volume and behavioral pattern of physical activity compared to a traditional continuous walking bout.

Methods: During spring of 2019, twenty Pokémon Go players participated in a randomized cross-over experimental study that used objective measurement tools (pedometer, accelerometer, heart rate monitor and GPS watch) and direct observation to compare a variety of physical activity-related variables (steps, intensity, heart rate, distance travelled, number of stops) during a 30-minute walk when playing Pokémon Go and not playing Pokémon Go. Participants followed the same (~1.77 km) walking path, which incorporated all eight of the possible Pokéstops (with one being passed twice) as well as two of the three Pokégyms on campus on separate days.

Results: Two distinct playing styles of Pokémon Go were identified: an intermittent style of play with periodic stopping, and a continuous style of play. Total steps, MVPA percentage, and distance travelled was significantly greater for continuous Pokémon Go participants and traditional walk conditions (p





# Fun and meaningful movement: A survey on sports and exercise in individuals with autism spectrum disorder

#### Miss Elizabeth Dovenberg<sup>1</sup>

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#### Children and families (SIG)

Purpose: Individuals with autism spectrum disorder (ASD) often experience motor difficulties and limited physical activity (PA). Nearly 80% of autistic people are estimated to also have developmental coordination disorder (DCD). This study explores three novel research questions in a New Zealand context: (1) What are the perceptions, preferences, and barriers of PA, and fitness goals of autistic individuals?; (2) What are their PA programme preferences?; and (3) What are potential impacts of DCD on their PA?

Methods: In this cross-sectional study, two versions of an anonymous survey were given to autistic adults (hereafter 'individuals'), and to parents, caregivers, and service providers of someone with ASD (hereafter 'parents'). Parents answered questions in relation to their child and also completed the Developmental Coordination Disorder Questionnaire (DCDQ), a screening tool for DCD in children aged 5-15 years. Preliminary descriptive results are reported.

Findings: Individuals. Thus far, 53 individuals (mean age  $33.9 \pm 12.7$ ; 68% female) have completed surveys. Overall, 81% believe PA will make them feel good, 100% believe PA is good for them, and 87% want to improve their physical functioning. However, just 11% engage in moderate to vigorous PA, and 29% in light PA, at least 5 times weekly; 70% want to exercise more. Several barriers were identified: poor weather, tiredness, boredom, and ASD-related challenges. Nearly 60% prefer doing a PA programme alone. Home and recreational centres are tied (~38% each) as preferred locations; swimming, running/walking, dancing, and biking are preferred activities. Parents. Thus far, 150 participants (mean age 44.6 ± 9.9; 97% female) have completed surveys. Results are similar to individuals' results, with 77% believing PA is beneficial and 65% wanting to improve physical functioning. Of 71 participants with eligible DCDOs (within age range), 68 scored in the "suspect DCD" range.

Conclusions: Results provide important insights into PA perceptions, barriers, and preferences of autistic people in New Zealand, and will be used to develop and evaluate a PA programme for this population. Interestingly, DCDQ results suggest that 96% of autistic children show indications of DCD; future research into ASD+DCD co-occurrence is warranted.





# Fresh Pantry: A novel mobile food pantry program for low-resource households

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#### Socio-economic inequalities (SIG)

Purpose. Food pantries are distribution centers where low-resource households can receive food at no cost. Used by over 46 million Americans annually, food pantries are an important part of the United States food system. Low-resource adults who use food pantries are at higher risk for nutrition-related chronic diseases; therefore, novel food pantry distribution models that provide convenient access to fresh, healthier foods need to be evaluated.

Methods. Fresh Pantry is a partnership between a food pantry and a federally qualified healthcare center that provides medical services to low-resource individuals. Fresh Pantry uses a refrigerated truck to provide monthly mobile food pantry distributions of fresh, healthier food packages on-site at the healthcare center. Food distributions are coupled with nutrition education, taste tests, and health promotion activities. Fresh Pantry aims to determine the feasibility and acceptability of this novel food pantry model, and its impact on participants' food security status and food coping strategies. This abstract reports descriptive statistics on a baseline sample (n=100) of Fresh Pantry participants and process evaluation metrics of food distributions to date.

Results. The majority of the sample was white (52%) or African American (41%) and female (75%). 12% of the sample had high or marginal food security, 31% had low food security, and 57% had very low food security. 89% of the sample used governmental assistance programs, 67% used Supplemental Nutrition Assistance Program (SNAP) benefits, and 77% had visited other food pantries >2 times in the past year. 38% and 41% of participants reported "sometimes" or "often/always" making trade offs between paying for food and other basic needs like medical care or housing, respectively. Over the first six months of the program, Fresh Pantry served 206.3+53.9 (Mean+Standard Deviation) households per distribution, providing 49.3+12.5 pounds of food to each household at each distribution (approximately 16.5+3.3 meals per person).

Conclusions. Fresh Pantry provides healthier food packages to a large volume of households with high need for food assistance. Future analyses will determine the impact of Fresh Pantry on participants over time.





# Motivation for volunteering in older peer walk leaders: A longitudinal qualitative investigation

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#### Motivation and behavior change (SIG)

Purpose: Peer volunteers offer a cost-effective avenue for promoting physical activity in the older population. However, recruiting and retaining such volunteers is challenging, and there is a lack of understanding on the underlying processes that lead to program adherence. We, therefore, aimed to longitudinally examine factors that determine levels of adherence of older volunteer walk leaders to a 16-week walking intervention.

Methods: One male and ten females (Mdn Age = 75 years, Age range = 66 – 83 years) novice peer walk leaders were interviewed twice over four months, and data were analyzed using thematic analysis. We used a longitudinal multiple case study design, informed by self-determination theory, to track three motivational profiles: program dropouts, program completers, and program maintainers.

Results: The desire to help, optimism, leadership confidence, satisfaction of basic psychological needs, and autonomous motivation were key to adherence. Autonomous motivation to volunteer and altruistic desires facilitated the use of sustainable helping strategies, leading to psychological need satisfaction and a desire to continue as a volunteer. A focus on self-orientated motives to volunteer, the use of unsustainable helping strategies, and lack of psychological need satisfaction were barriers to adherence.

Conclusions: Our results highlight that the quality of motivation to volunteer may determine helping strategies and satisfaction of psychological needs among older walk leaders. Our findings can inform future older peer leader recruitment, training, and support to maximize their levels of adherence to physical activity programs.





# Affective response to high-intensity interval exercise and moderate-intensity continuous exercise in female Cancer survivors

<u>Miss Allyson Tabaczynski<sup>1</sup></u>, Dr. Catherine M. Sabiston<sup>1</sup>, Dr. Daniel Santa Mina<sup>1</sup>, Dr. Steven J. Petruzzello<sup>2</sup>, Dr. Linda Trinh<sup>1</sup> <sup>1</sup>University of Toronto, Toronto, Canada, <sup>2</sup>University of Illinois at Urbana-Champaign, Urbana, United States

#### Cancer prevention and management (SIG)

Purpose: High-intensity interval exercise (HIIE) produces positive health outcomes for females with cancer. However, little is known regarding female cancer survivors' affective response to HIIE despite its positive association with future exercise participation. The purpose of this study was to compare affective response during (in-task) and following (post-task) HIIE and moderate-intensity continuous exercise (MICE) in female cancer survivors. Secondary outcomes included enjoyment, self-efficacy, and exercise intentions.

Methods: Following a baseline maximal graded exercise test, female cancer survivors performed 20-minutes of HIIE or MICE on separate occasions in a randomized and counterbalanced order. HIIE included 10, 60-second intervals at 125% of participants' ventilatory threshold (VT), interspersed with active rest (75% of VT). MICE was performed at 90% of participants' VT. Affective response was assessed before, during, and after exercise using the Feeling Scale, Felt Arousal Scale, and Activation Deactivation Adjective Checklist. Secondary outcomes were assessed post-exercise. Statistical analysis included condition by time repeated measures ANOVAs for affect and enjoyment measures. Paired t-tests compared differences in self-efficacy and intentions. Interpretation of results used effect size (Cohen's dz) with negative effect sizes suggesting results favoring HIIE.

Results: Participants (n=12), primarily breast cancer survivors (58.3%), had a mean age of  $51.2\pm9.3$  years, and were  $41.3\pm19.4$  months since diagnosis. In-task results indicated a large difference between conditions for affective arousal (dz= -0.72), but small differences in affective valence (dz= -0.21). Post-task affect elicited a small effect between HIIE and MICE conditions for all domains (Tension: dz= -0.31; Tiredness; dz= 0.09; Energy: dz=- 0.26; Calmness: dz= 0.25). Enjoyment (dz= -0.41), intentions (dz's= -0.23-0.38), and self-efficacy (dz's= 0.26-0.41) elicited a small effect between HIIE and MICE.

Conclusion: Preliminary evidence suggests female cancer survivors' affective responses to HIIE and MICE are comparable. To suppliment established MICE strategies, interventionists may consider using HIIE given its ability to elicit positive psychological responses and improve health outcomes. Further research is needed to understand cancer-specific factors influencing the exercise-affect relationship.





# Affective timelines across a beginner running session: a mixed-methods illustration of factors influencing how people feel during exercise

#### Dr. Katy Kennedy<sup>1</sup>

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Motivation and behavior change (SIG)

#### Purpose

Affective responses to exercise in laboratory studies predict future exercise behaviour, however there is little research on improving how people feel during real-life physical activity. Running is a simple, economical exercise with potential to improve public health. Beginner running groups are a popular way to start to run, providing an opportunity for examining behaviour change trajectories. The Running Commentary study aimed to investigate contextual factors influencing affective responses to exercise in adults joining beginner running groups.

#### Method

This was a longitudinal, mixed methods field study, using go-along interviews and follow-up online physical activity questionnaires (N=69, 13 UK groups). Participants joining beginner running groups were asked how they felt before, during and after a baseline run-walking session using the Feeling Scale (FS), a single-item 11-point bipolar scale. These results were plotted against session timepoint ('affective timelines') for individuals. Three distinct patterns of affective timeline were established using cluster analysis. Participants were also asked to articulate why they gave that particular score (qualitative data). Transcripts were thematically analysed. A mixed-methods analysis assembled example annotated affective timelines for three different patterns of affective responses for three individuals. FS scores were plotted against time, with relevant quotes from participants at each timepoint demonstrating factors influencing how participants felt.

#### Findings

Some findings were confirmatory of previous treadmill-based research, such as pre-exercise feelings, interpretation of physiological symptoms and a sense of achievement during and after running being important in how people felt during exercise. Some novel findings were: the concept of learning to run being a 'journey' or process, with ups and downs to accept, distraction from discomfort by talking to others, and social pressure or expectations around running faster than was comfortable contributing to people feeling worse during running.

#### Conclusions

These mixed-methods findings inform suggestions on improving training for beginner group leaders and future runwalk interventions. This novel method of annotating affective timelines provides a simple yet powerful illustration of affective changes during exercise, and demonstrate some of the factors which contribute to these affective responses to exercise.





# Using automated wearable cameras with 24-hour in to capture diet in adolescents

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Understanding sources of measurement error in self-reports of diet is important for advancing methods. Wearable cameras are an emerging method of observing dietary intake in natural environments. The aims of this study were to compare energy and nutrient intakes from 24-hour recalls with and without inclusion of foods from images collected using automated cameras in adolescents.

Methods: Adolescents 13-17 years (n 168) living in Dunedin, New Zealand were recruited to take part in research investigating pre-bedtime behaviours and sleep between January 2018 and May 2019. Adolescents wore a Brinno TLC120 camera from 5pm until bedtime for three evenings set to capture an image every 15 seconds. An interviewer administered 24-hour recall was completed on the day following the third evening of wear. Foods not reported in the recall were identified in the images. Nutrient intakes (energy, macronutrients, potassium, calcium, iron, beta-carotene, vitamins A, B6, B12, C) from the 24-hour recall were calculated before and after inclusion of foods identified from images.

Results: 51 boys and 68 girls wore the camera and completed a 24-hr recall the following day. Nearly 40% of participants forgot to report at least one food or beverage for the evening of the 24-hour recall. Most commonly these were biscuits, cakes and muffins (14%) and sweetened beverages (14%) followed by bread, vegetables and bread-based dishes (5%) (e.g. pizza and sandwiches). Energy intake was 5% greater with inclusion of images for boys (mean difference: 530 kJ; 95% CI: 101, 958) and 3% greater for girls (mean difference: 230 kJ; 95% CI: 107, 352).

Conclusions: Although only worn after 5pm and capturing an image every 15 seconds the use of an automated camera with 24-hr diet recalls modestly increased estimates of energy and other nutrients. Baked snacks and sweetened beverages were most often forgotten or excluded in the dietary recall.





# Motivational predictors of exercise and eating behaviors in cancer survivors: Preliminary data

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#### Cancer prevention and management (SIG)

Purpose: The number of cancer survivors is expected to keep increasing in the next decades, due to medical advances. Therefore, lifelong health issues and quality of life represent a major concern for this population. Regular physical activity (PA) and a healthy dietary behaviors (HDB) are essential to improve cancer survivors' health and quality of life. However, most survivors do not meet behavioral guidelines. Motivation quality seems to be an important determinant of sustained behavior adherence. This study aimed to analyze motivational indicators, as per Self-Determination Theory, and their association with PA levels and HDB in cancer survivors, regardless of cancer type and disease stage.

Methods: A total of 91 cancer survivors (age:46.3±9.1yr; BMI:25.5±4.9kg/m2; time of diagnosis: 43.4±44.9 months) volunteered to participate in this cross-sectional study. Participants completed the International PA Questionnaire, the Behavioral Regulation for Exercise Questionnaire - 4, the Regulation of Eating Behavior Scale and some questions regarding their HDB based on World Cancer Research Fund guidelines. Multiple linear regression analyses were conducted.

Results: Insufficient levels of PA (i.e below the recommended guidelines) of  $140.7\pm240.3 \text{ min/wk}$ , and a moderate to high frequency of HDB were found in this sample of cancer survivors. Integrated motivation was identified as the only significant predictor of PA ( $\beta = .301$ ; p = .004). HDB were positively predicted by intrinsic ( $\beta = .393$ ; p < .001) and external ( $\beta = .219$ ; p = .025) motivations to regulate eating, and negatively by amotivation to regulate eating ( $\beta = .305$ ; p = .004) and amotivation to exercise ( $\beta = -.302$ ; p = .002).

Conclusions: Preliminary findings suggest higher adherence to HDB compared to PA in this sample of cancer survivors. It further supports the role of more self-determined motivations on the adoption of healthy PA. Regarding HDB mixed findings were found (i.e. both extrinsic and intrinsic forms were associated with healthy diet). These findings have implications for future interventions and practice, especially considering the lower integration of PA services and specialists in standard care compared to diet services and professionals.





# The prevalence of nutrition risk and associated risk factors among preschool children in New Zealand using the 'Nutrition Screening Tool for Every Preschooler' (NutriSTEP)

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Early care and education (SIG)

#### Purpose:

Nutrition screening provides an opportunity to assess nutrition behaviours before the markers for poor nutrition are apparent. This study aimed to determine the prevalence of nutrition risk among preschool children in New Zealand (NZ) using a validated and parent administered nutrition screening tool 'Nutrition Screening Tool for Every Preschooler' (NutriSTEP) and to identify factors associated with nutrition risk.

#### Methods:

A convenience sampling method was used to reach parents and caregivers of NZ preschool children aged two to five years through childcare centres and parent-focussed organisations. Parents and caregivers who had resided in NZ for at least five years were invited to complete an online survey. The parent and child's weight, age, geographic location, parental education level, household income and household composition were assessed. The 17 item NutriSTEP tool was used to assess food intake, physical activity, screen time and the eating environment. Responses to the NutriSTEP items were scored between 0 and 4; maximum score 68. Participant scores were stratified by moderate/high risk (score >20) and low risk (score  $\leq$ 20). Associations between parent and child characteristics and nutrition risk status were determined. Predictors of moderate/high nutrition risk were explored using logistic regression.

#### Results:

A total of 505 eligible parents/caregivers (mean age 35.2+4.5 years) completed the questionnaire. Most (99%) were women, of NZ European ethnicity (81%) and had a university or other tertiary education (76%). Half the children were girls (50.3%) and 92% came from a two parent/caregiver family. A fifth (19%) of the pre-school children were at moderate to high nutrition risk and 81% were at low nutrition risk. Pre-school children were more likely to be at moderate to high nutrition risk if they were of non-NZ European ethnicity (OR 2.41, 95% CI 1.36, 4.24); living in single parent families (OR2.84, 95% CI 1.44, 5.63) and with a non-university educated parent (OR 2.32, 95% CI 1.44, 3.743).

#### Conclusions:

Findings highlight the pivotal role of parental sociocultural factors in the nutrition risk status of NZ pre-school children. NutriSTEP is a useful tool to assess the nutrition habits of those most in need to provide targeted and appropriate dietary intervention.





# Implementing and evaluating the Daughters and Dads Active and Empowered program at scale: a plan of action

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#### Implementation and scalability (SIG)

Purpose: Implementation of evidence-based physical activity (PA) programs is important for conferring maximum benefit to public health. The mechanisms which drive the implementation process are complex but crucial for ensuring implementation success however few studies have examined these processes as a whole. This study outlines the implementation framework, strategies and evaluation plan for implementation of the evidence-based Daughters and Dads Active and Empowered (DADAE) program at scale across NSW Australia in partnership with the NSW Government Office of Sport (OoS).

Methods/Results: DADAE is a 9-week PA program for primary-school aged girls and their fathers which improves daughters' and fathers' PA levels and screen-time and daughters' fundamental movement skills and social-emotional wellbeing. The University of Newcastle has partnered with the NSW OoS to deliver two versions of the program (the original "Classic" and a condensed "Weekender") across multiple regions of NSW using OoS staff and resources. The Consolidated Framework for Implementation Research will be operationalised to identify facilitators and barriers to implementation across five domains (intervention characteristics, outer setting, inner setting, characteristics of individuals, implementation process) and develop a package of implementation strategies. An advisory body will be formed to guide the development of multilevel strategies to assist implementation (e.g., stakeholder engagement, communication plan, recruitment plan, program-delivery training, fidelity checks, program adaptation). A type II hybrid effectiveness-implementation design will be used to assess both implementation outcomes and effectiveness of the two program models to improve PA. Implementation evaluation will be guided by implementation indicators synthesised by the McKay et al. Delphi review including domains: adoption, dose delivered, reach, fidelity, cost, sustainability, feasibility, acceptability and compatibility. Implementation measures will be collected through surveys (program deliverers, participants), focus groups (program deliverers, advisory body), administrative records and interviews with project staff at multiple levels during development, delivery and upon completion of program implementation.

Conclusions: This study will provide a detailed example of a comprehensive plan and evaluation of the implementation process for an evidence-based PA program at scale. This will allow a contextual reflection of how implementation planning leads to implementation outcomes upon completion.





# Effects of the ACTIVity And TEchnology (ACTIVATE) intervention on healthrelated quality of life and fatigue outcomes in breast cancer survivors.

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#### Cancer prevention and management (SIG)

Background: The benefits of an active lifestyle after a breast cancer diagnosis are well recognized, but the majority of survivors are insufficiently active. In the general population, consumer-based wearable activity trackers have shown promise as a potential mode in which to facilitate physical activity. The ACTIVATE Trial examined the efficacy of a wearable-based intervention to increase physical activity and reduce sedentary behaviour in breast cancer survivors. This paper examines the effects of the intervention on health-related quality of life (HRQoL) and fatigue at 12 weeks (T2; end of intervention) and 24 weeks (T3; follow-up).

Methods: Inactive and postmenopausal women who had completed primary treatment for stage I-III breast cancer were randomized to intervention or waitlist control. Physical activity and sedentary behaviour were measured by Actigraph®and activPALTMaccelerometers at baseline (T1), end of the intervention (T2), and 12 weeks follow up (T3). HRQoL and fatigue were measured using the Functional Assessment of Cancer Therapy-Breast (FACT-B) and the Functional Assessment of Chronic Illness Therapy-Fatigue (FACIT-Fatigue). Primary intervention effects were evaluated comparing intervention and waitlist group at T2 using repeated measures mixed effects models.

Results: Overall, 83 women were randomized and trial retention was high (94%). A 4.6-point difference in fatigue score was observed between groups at T2 (95% CI: 1.3, 7.8) indicating improvement in fatigue profiles in the intervention group. In within groups analyses the intervention group reported a 5.1-point increase in fatigue from baseline to T2 (95% CI: 2.0, 8.2) and a 3.3-point increase from baseline to T3 (95% CI: 0.1, 6.41).

Conclusions: Despite small improvements in fatigue profiles, no effects on HRQoL were observed. While the ACTIVATE Trial was associated with improvements in physical activity and sedentary behaviour, more intensive or longer duration interventions may be needed to facilitate changes in HRQoL. This evidence adds support to clinical recommendations for cancer survivors to incorporate physical activity as part of their post-treatment rehabilitation and recovery plan.Future research should continue to utilize device-based assessments for optimal precision in measuring daily movement and posture.





# Who is missing out? Understanding the impact of socioeconomic deprivation on participation in play, active recreation and sport.

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose Who is missing out? Understanding the impact of socio-economic deprivation on participation in play, active recreation, and sport.

Method Active NZ is Sport NZ's national participation survey. Re-designed during 2016, continuous data collection began on 1 January from New Zealanders aged 5-plus. For the very first time adults and young people are surveyed using the same method, answering questions about behaviour and attitudes. The sample is drawn from the electoral roll, and using a sequential mixed method approach, up to five contacts are made to improve the response rate. Adults have the opportunity to complete the survey online or in hard copy. The young people's survey is online only. Between ages 5-11 adults complete for and alongside, their young people, while between ages 12-17 young people complete themselves - clarifying with others as needed. Each year we capture participation data from around 20,000 adults and 6,000 young people.

Results Using Active NZ data collected in 2017 and 2018 from more than 60,000 New Zealanders aged 5plus, we applied the New Zealand Deprivation Index for 2013 to the survey results to understand differences in participation by people from high deprivation areas compared with those from low deprivation areas. The New Zealand Deprivation Index was constructed more than twenty years ago by health policy researchers from the University of Otago to develop small area indexes of socioeconomic deprivation for New Zealand to help with funding, research and service delivery decisions. Through our analysis, we found that young people from high deprivation areas have the confidence and competence to be active, want to increase their participation more-so than young people from low deprivation areas, but face cost and transport barriers - especially in the context of competitive, organised structures. Compared with young people from low deprivation areas, they are they are less likely to understand the benefits of being active. Lower levels of knowledge about the benefits of being active continues into adulthood, made worse by lower levels of interest and motivation by adults from high deprivation areas to increase their participation.

Conclusions Improving understanding of the benefits of being active and reducing access barriers will help to increase participation for young people from high deprivation areas.





# Foreign research on 24-hour movement behavior among preschoolers: Origins, progress and implications for China

#### Miss Fei Wang<sup>1</sup>, Mr. Si-Tong Chen<sup>2</sup>, Miss Jin-Tao Hong<sup>1</sup>, Dr. Yang Liu<sup>1,3</sup>

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#### Early care and education (SIG)

Purpose: The objectives of this study were: 1) to systematically review and summarize previous research on 24-hour movement behaviors among preschoolers in foreign countries; and 2) to draw implications and provide recommendations for Chinese future research in this area.

Methods: A scoping review was conducted of the available English literature on 24-hour movement behavior among preschoolers, by searching Web of Science (WOS), PubMed/MEDLINE, ERIC, and SPORTDiscus.A total of 4,848 references were retrieved from the databases. All references were imported into EndNote X9, and 3,615 of them remained after removing duplicates. After screening through the titles and abstracts, 95 publications were retained and their full-texts were assessed against the inclusion criteria. This resulted in the inclusion of 20 articles. Additional 7 articles meeting the inclusion criteria were retrieved from the reference lists of the included papers and related reviews, and, finally, 27 papers were included.

Results: The number of studies on preschool children's 24-hour movement behaviors has been increasing in recent years. There were few international studies (n = 3, 11.1%). Most of the studies applied cross-sectional design (n = 19, 70.4%). The prevalence of preschool children meeting the 24-hour movement behavior guidelines was low, ranging from 2% to 49.6%. The findings from correlational studies were inconsistent.

Conclusion: Overall, the foreign research on 24-hour movement behaviors among preschoolers is in its infancy, and there is still much room for improvement in terms of research quantity, variety and quality of evidence. Furthermore, the implications for Chinese future research and public health practice related to preschool children's 24-hour movement behaviors are as follows: 1) there is a need to develop 24-hour movement behavior monitoring system for preschool children in China; 2) research on 24-hour movement behaviors among Chinese preschool children should be encouraged; and 3) Chinese national and subnational governments should consider formulating policies related to 24-hour movement behaviour of preschool children.





# Trends in physical fitness, growth, and nutritional status of Chinese children and adolescents: a retrospective analysis of 1.5 million students from six successive national surveys between 1985 and 2014

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#### Motivation and behavior change (SIG)

Purpose Physical fitness is strongly associated with health, and to our knowledge, trends in physical fitness have not been described. We aimed to assess trends in physical fitness and its association with the nutritional transition among Chinese children and adolescents.

Methods Data from Chinese school students aged 7–18 years were extracted from six successive national surveys undertaken between 1985 and 2014. Six components of physical fitness (forced vital capacity, standing long jump, sit-and-reach, body muscle strength, 50 m dash, and endurance running) were measured repeatedly in each survey and aggregated as a summary physical fitness indicator (PFI). Growth and nutritional status were defined by the use of WHO definitions. We used fractional polynomial regression and generalized additive models to assess associations between PFI and nutritional outcomes.

Findings Between 1985 and 2014, 1 513435 students participated in the Chinese national surveys, and 1494485 were included in our study. We observed a decline of the PFI during 1985–2014 (overall PFI change –0·8), albeit with an increase from 1985 to 1995 (PFI change 1·2), coinciding with a shift in the major nutritional problems from stunting and thinness to overweight and obesity. Both undernourished (PFI -2·44 for thin and -3·42 for stunting) and overnourished (-1·49 for overweight and -3·63 for obese) students had a lower PFI than that of those with normal weight (-0·41) in 2014. Boys had a larger decline in PFI than girls in 1985-2014, especially boys with obesity (PFI change -2·7). We observed the highest PFI in 1995 (1·17), when the proportion of students with normal weight was highest.

Conclusions Our study supports the continuation of policies to improve physical fitness that focuses on undernutrition, including economic subsidies, in poorer rural regions. However, for most of China, taxation of unhealthy foods, promotion of physical activity, reduction in academic pressures, promotion of dietary diversity, reduction of sedentary time, and engagement in formal sporting activities should be elements of policies to promote healthy weight status and prevent obesity in school students, which will also support physical fitness.





# Identification of lifestyle patterns in children aged 6-8 years.

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Typically, lifestyle behaviours (e.g., diet, physical activity, sedentary behaviour and sleep) are considered individually as predictors of health. However, these behaviours do not occur in isolation. Identifying patterns of these behaviours collectively may help to understand their synergistic influence on health and better inform and evaluate prevention and intervention strategies. This study aims to identify lifestyle patterns in a contemporary Australian dataset.

Methods: Data from the second wave (2011/12; child age 6-8y, n=432) of the HAPPY study (Melbourne, Australia) were used. Parent reported data were obtained on diet (fruit, vegetable and discretionary food intake), physical activity (outdoor play and organised sport), sedentary behaviour (screen time, videogame use and quiet playtime) and sleep for a usual week, along with accelerometry data (moderate- to vigorous-intensity physical activity [MVPA] and sedentary time). Latent profile analysis was conducted in Mplus to derive lifestyle patterns. A number of goodness of fit statistics (Bayesian information criteria, adjusted Lo-Mendel-Rubin test and the bootstrap likelihood ratio test) were used to select the optimal model.

Results: A three-pattern solution was identified. Patterns were labelled as: (1) Unhealthy (low sleep, low physical activity, high overall sedentary behaviour, low fruit and vegetable, and high discretionary food intake); (2) Active healthy eaters (high outdoor play, high fruit and vegetable intake, low screen time and videogame use but high quiet playtime); and (3) Active unhealthy eaters (high sleep, high physical activity, high MVPA, low sedentary time, low fruit and vegetable consumption and high discretionary food intake).

Conclusions: Health behaviours co-occur, and considering lifestyle patterns rather than individual behaviours is likely to be more effective in planning and promotion of prevention and intervention strategies targeted at improving health outcomes in children. This patterning of behaviours warrants an integrative approach to target complex multi-faceted issues like obesity. Much as dietary patterns have helped understanding of associations between diet and health, lifestyle patterns may potentially improve understanding of how behaviours influence health.





# Earlier shuteye time is more strongly associated with healthy dietary habits than bedtime in adolescent females

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Short sleep duration is related to poorer health. During the school term, sleep duration in adolescents is largely controlled by the time they go to bed. However, in-bed screen-time is now common practice for many youth before sleep. Therefore, reported bedtime (which is typically used in sleep diaries and questionnaires) may not correspond with the time they try to go to sleep, known as shuteye time. Our objective was to describe the bedtimes and shuteye times of female adolescents and relationships with weight status, healthy dietary habits, and motivation for food choice.

Methods: The SuNDiAL project was a cross-sectional study of females aged 15-18 years from thirteen high schools across New Zealand. 'What time did you lie down in bed last night?' and 'What time did you try to go to sleep last night?' was collected as part of a daily activity diary over six days. Height and weight were measured by trained researchers. Dietary habits were assessed with the Dietary Habits Questionnaire and food choice motivations by The Food Choice Questionnaire. Logistic and linear regression models were used to estimate associations, with adjustment for age and area-level deprivation, and accounting for school clusters.

Results: 136 female adolescents of mean (SD) age 16.8 (0.9) years completed a daily activity diary (97% had at least five days). Mean bedtime was 10:11pm (SD=57 mins) and mean shuteye time was 11:04pm (SD=55mins). Later shuteye time was strongly associated with not meeting fruit and vegetable consumption guidelines (2+ and 3+ a day, respectively) and with not eating breakfast at least five times a week (OR (95% CI): 0.57 (0.41, 0.78); 0.56 (0.33, 0.97); & 0.45 (0.32, 0.63) respectively). Additionally, those with later shuteye times were more likely to be trying to lose weight but were less likely to be motivated by health for food choice. There was no evidence of association between later bedtime and healthy behaviours, except for breakfast consumption (OR (95% CI): 0.67 (0.50, 0.91)).

Conclusions: Female adolescents with later shuteye time had less healthy dietary habits, but this was not the case for later bedtimes. Future research should ensure that shuteye time is assessed.





# Scaling up an effective school-based physical activity intervention: Lessons learned from the iPLAY study

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#### Implementation and scalability (SIG)

#### Purpose

Comprehensive school-based physical activity programs have the potential to improve the health and wellbeing of children, but only if they can be successfully delivered and implemented at scale. When scaling-up interventions, unforeseen problems arise that were not present during efficacy trials. The iPLAY program is an example of a school-based physical activity intervention originally tested in eight schools and since scaled up to over 150 schools, reaching more than 43,000 students. The purpose of this study is to describe strategies which enabled iPLAY to be successfully delivered at such scale.

#### Methods

The iPLAY academic staff and project officers reflected on the changes made to the program over the course of scaling up the intervention. These changes occurred during regular project meetings over the course of 4 years delivering iPLAY.

#### Results

The iPLAY team identified multiple strategies for improving the delivery of the program. The first related to administrative strategies. Initially, iPLAY participants provided their details via email which were then collated and added to the project website, creating regular transcription errors. Building a more rigid recruitment pipeline, where participants registered directly on the website, reduced errors and administrative load. This allowed project staff to ensure that participant information was centralised, such as teacher accreditation numbers. The next set of strategies related to improving efficiency. School progress was originally tracked using a spreadsheet, but this proved difficult to maintain at scale and over multiple delivery sites. Instead, the team developed a project delivery system which clearly indicated which tasks needed completing for which schools, and ensured the team could quickly check school progress. Finally, the original iPLAY intervention was delivered using PowerPoint slides during face-to-face workshops. During the scale up, the team moved to dynamic Google-based content embedded in the project website, so that content could be updated remotely ensuring all team members used the most current intervention content.

#### Conclusions

The iPLAY program demonstrates that interventions can be delivered at scale, but adaptation is often required. The lessons learned during this process should prove useful to others seeking to deliver efficacious interventions at scale.





# What makes older adult gym members unique?

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Ageing (SIG)

#### Purpose

Maintenance of functional capacity is critical to active ageing. With the growing older adult population, understanding the unique aspects associated with older adult exercisers is critical to effective exercise programming, supervision and interaction with instructors to positively affect health outcomes. The aim was to investigate perceptions of exercise instructor interactions with older adult members of an exercise facility.

#### Methods

As part of a pilot study into older adult usage of exercise equipment, semi-structured interviews of seven exercise instructor staff at a public facility were conducted to elicit their perceptions of working with active older adult members (>65 years). Recorded interviews were transcribed verbatim, and subsequently thematically analysed.

#### Findings

The main theme emergent from the instructors was that their older adult members differ from the typical younger gym users in many respects. Older adults required higher levels of instructor time, with programming often more complex due to health and physical limitations. The instructors perceived older adults as creating a unique social atmosphere while exercising. Instructors noted that functional progression was not always a priority; rather older adult members placed greater value on the social aspect of exercising. Many older adults found the facility an environment requiring personalised support for their perceived self-confidence and self-efficacy for effective exercising.

#### Conclusions

To positively enhance physical function, the unique aspects of older adult users need to be recognised and accommodated by exercise instructor staff and management. Training of instructors who work with this cohort should include social interaction aspects in addition to consideration of their specific physical and cognitive characteristics.





# Fidelity of implementation of a comprehensive intervention to increase student physical activity in elementary schools

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#### Implementation and scalability (SIG)

Purpose: To examine intervention implementation in a Type 1 Hybrid Effectiveness-Implementation clusterrandomized controlled trial of the Health Empowers You! intervention. The two-year intervention is designed to impact school-level physical activity (PA) practices and policies, increase student PA, and improve subsequent health and academic outcomes. A large sample size, objective PA measurement (accelerometry), and a hybrid approach make this study innovative. As a Type 1 hybrid, the primary goal is measuring student PA, with assessing implementation fidelity as a secondary aim.

Methods: The study occurs in 40 elementary schools in Gwinnett County Public Schools, a large, diverse public school district in suburban Atlanta, Georgia. Schools were randomized to the intervention (n=20) or control (n=20). The study recruited 4,970 fourth grade students in the Fall 2018 semester in 240 teachers' classes. Teachers at intervention schools received support from PA specialists who provided face-to-face training, web content, weekly calendars with PA resources, monthly training webinars, and exercise equipment to help them incorporate PA into the school day. Control and intervention teachers completed a PA reporting form quarterly. Students wore an accelerometer for two week-long periods (one week per semester).

Results/findings: Implementation fidelity analyses found that teachers at intervention schools reported using classroom PA breaks at significantly higher rates than control teachers (average number of breaks per week: 5.66 (intervention) vs 1.17 (control), p<0.001), and use of PA breaks did not decrease significantly during the year. Other intervention-related behaviors (e.g., utilizing physical activity workbook resources) decreased over the year, while teachers' use of the provided PA equipment increased. Initial analyses indicate that higher levels of implementation might be associated with higher levels of moderate and vigorous physical activity during the school day. Additional analyses are being conducted to account for missing teacher-reported responses.

Conclusions: Given high reported implementation fidelity among teachers at intervention schools, the study yields insights on how to implement changes to promote student PA during the school day, and will illuminate how PA subsequently impacts student health and academic outcomes across diverse populations in Georgia.





# 'Stepped-down' intervention programs to promote self-managed physical activity in military service veterans: A systematic review

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Ageing (SIG)

PURPOSE: Active Choices is a 'stepped-down' intervention program funded by the Australian Department of Veterans' Affairs. The program seeks to facilitate the transition of clients from the care of an allied health professional (e.g. exercise physiologist or physiotherapist), to self-managed physical activity (PA) preferences, within their local active communities. To inform program development, we conducted a systematic review of evidence on the effectiveness of interventions to promote self-managed PA in military service veterans.

METHODS: Literature searches (e.g. MEDLINE, PsycINFO and PubMed, up to September 27th, 2019) identified randomised controlled trials that assessed self-managed PA interventions in military service veterans. Data were extracted on study characteristics, intervention strategies (assessed against a taxonomy of behaviour change techniques), and PA change. The strength of the evidence base was assessed on study quality (poor, fair, or good), the direction of PA change (positive or no effect), and then rated as 'supportive, promising, unknown, or unsupportive'.

RESULTS: Searches identified 28 studies (19 unique datasets and intervention programs, all from the USA). Participants (n= 45 to n=1092) were typically older aged (mean age 55+ years) males with high risk comorbidities (e.g. diabetes, post-traumatic stress disorder, or musculoskeletal disorders). Overall, 64% (n=18) of studies found positive intervention effects (mean increase of 53 minutes/week of self-reported moderate intensity PA). Program duration was typically 6 to 12 months. The behaviour change techniques most frequently utilised by interventions that observed positive intervention effects were education, social support, goal setting and review of goals, and self-monitoring. Study quality (good), and direction of change (positive intervention effects observed in the majority of studies), indicated that the strength of the evidence base was promising (evidence suggestive of beneficial effect but further research required).

CONCLUSIONS: 'Stepped-down' programs have the potential to help military veterans transition from allied health care to effective self-management of physical activity. However, the US-centric nature of the evidence base suggests that well-controlled, proof of concept research is required as a pre-requisite to larger, scalable studies in the Australian context.





# Knowing Your Neighbourhood: understanding the impact of the food and physical activity environment on child health in Taranaki, New Zealand

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Aotearoa/New Zealand has the second highest rate of childhood obesity in the OECD. In 2012, the Taranaki District Health Board and Sport Taranaki implemented a multidisciplinary community-based programme, Whānau Pakari, for tamariki (children) and rangatahi (adolescents) affected by obesity in the Taranaki region. A randomised control trial (RCT) was embedded within the programme to assess efficacy of the service. The aim of our research was to investigate associations between the clustering of food and activity destinations, and children's dietary behaviours and physical activity from the Whānau Pakari cohort, using novel child-specific geospatial methods.

Methods: This research is a retrospective observational cross-sectional study involving a subset of the cohort of 239 children and adolescents who were enrolled in Whānau Pakari. As part of the RCT, enrolled children completed a physical activity questionnaire and comprehensive dietary history. Our study expands upon the RCT by investigating links between participants' health behaviour and outcome data, and children's nutrition and physical activity environments. Geospatial data collated from New Plymouth District Council and several open-data sources were integrated to develop novel child-specific environmental measures related to children's homes and schools.

Results: Exploratory analyses of the data examined associations between physical activity, diet, and novel environmental measures. Preliminary findings suggest that the food and activity environments surrounding children's homes and schools are associated with the physical activity and dietary behaviours of Taranaki children.

Conclusion: Our novel approach to investigating child-specific measures of food and activity environments provides new evidence of the relationship between the environment and child health. We show that data linking and testing novel geospatial methods allows the influence of environmental factors on child health to be considered. This research provides evidence to improve the effectiveness of public health interventions and district planning, and gives the community information to improve the built environments for tamariki and rangatahi of Taranaki.





# Sub-maximal 20m shuttle-run test predicts cardiorespiratory fitness and is less unpleasant for children

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Cardiorespiratory fitness (CRF) during childhood is a strong predictor of future health outcomes. The 20 metre shuttle run test (20mSRT) is a popular fitness test used worldwide to assess CRF. However, the 20mSRT is a maximal exercise test which may be unpleasant and induce an acute negative emotional response (i.e. negative affect). Previous research has shown negative affective response to adversely affect future physical activity behaviours. The study determines the validity and reliability of using rating of perceived exertion (RPE) reported during a sub-maximal 20mSRT to predict peak oxygen uptake (VO2peak) in children while minimising negative affect.

Methods: Twenty-five apparently healthy children (n=14 male; 12.7±0.6y) participated in four testing sessions. During all sessions, RPE were collected using the 'Eston-Parfitt 0-10 pictorial RPE Scale'. Affective responses were also measured using the 'Feeling Scale'. In the first session, participants performed a graded exercise test (GXT) to volitional exhaustion to assess VO2peak using online gas analysis. Subsequently, participants performed a sub-maximal 20mSRT twice with the test ending when participants reported RPE7. In the final session, participants performed the 20mSRT to volitional exhaustion. The sub-maximal RPE-speed relationship were extrapolated to predict speed at RPE9 and 10. The predicted speeds were then converted into VO2peak using the ACSM prediction equation.

Results: Repeated measures ANOVA reveal a significant main effect for VO2peak method (p<0.001), with RPE9 and 10 higher than 20mSRT, but no different to the GXT VO2peak. ICC also revealed high reliability ( $\sim$ 0.9) between the two sub-maximal 20mSRT. Repeated measures ANOVA show significant differences in end-point affect across methods (p<0.05). Post-hoc analyses reveal affect was less negative in the sub-maximal 20mSRT that the maximal conditions.

Conclusions: The 20mSRT offers a practical alternative where laboratory-based exercise testing is not feasible. However, the maximal 20mSRT induces negative affect. Acute affective response to exercise is a strong predictor of future physical activity behaviours. RPE collected during a sub-maximal 20mSRT can be used to accurately and reliably predict VO2peak in children while minimising negative affective response.





# Documenting food security status of Native Hawaiians and Pacific Islanders and comparing food security status across race/ethnicity in the US: analysis of two national surveys

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#### Policies and environments (SIG)

Purpose: This study documents food insecurity prevalence among a nationally representative sample of Native Hawaiian and Pacific Islander (NHPI) adults in the US, and compares differences in food security status across races/ethnicities in the US. NHPI experience severe disparities in diet-related chronic diseases compared with the general US population. Further, NHPI in the US are typically aggregated with Asians - or are excluded from analyses - in population-based surveys due to small numbers of respondents. This study provides the first population-based estimate of food insecurity among NHPI in the US.

Methods: This study used data gathered in the 2014 National Health Interview Survey (NHIS) and the 2014 NHPI NHIS, a first of its kind oversampling of NHPI in the US. Food security status was assessed in each survey using US Department of Agriculture's 10-item Adult Food Security Survey Module. After accounting for missing data on the food security measure, the final study sample comprised 38,860 respondents, representing 235,250,552 civilian noninstitutionalized adults in the US. Descriptive statistics were used to summarize food security status among NHPI, and comparisons of food security status across racial/ethnic groups were made using Rao-Scott chi-square test and multinomial logistic regression models.

Results: Approximately 1 in 5 NHPIs (20.5%) were considered food insecure: 12.5% reported low food security and 8.0% reported very low food security. Significant variation in food security status was observed by race/ethnicity (p





# Validation of the SOFIT+: Relating physical activity promoting practices to moderate-to-vigorous physical activity in 5-6 year old children

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: This study validated the modified System for Observing Fitness Instruction Time (SOFIT+) in 5 to 6 years old children. The tool has been validated in older children (i.e., 7-14yrs) and is designed to capture teaching practices that both promote moderate-to-vigorous physical activity (MVPA) during physical education (PE).

Methods: Participants (n=165, 53.3% female, 5-6yrs) were recruited from nine primary schools participating in the SAMPLE-PE randomised controlled trial. Video recordings of 45 physical education lessons (3 per class) from 9 teachers/coaches were coded using an age-appropriate modified version of the SOFIT+. Inter-rater reliability was assessed on 30% of coded lessons. A SOFIT+ index score (+1 for PA promoting or absence of PA discouraging practice) was calculated for each 40 second(s) scan. Children's moderate-to-vigorous physical activity (MVPA) was estimated using wrist-worn accelerometers. Multinomial logistic regression assessed the relationship of both the SOFIT+ index score and individual MVPA promoting practices with children's MVPA.

Results: Percent agreement was >85.5% for each observed SOFIT+ variable. Compared to engaging in 0-9s of MVPA per 40s scan, a 1 unit increase in the SOFIT+ index score was associated with an increased likelihood for girls to engage in 10-19s (OR=1.59, 95%CI=1.53-1.66), 20-29s (OR=2.13, CI=2.02-2.25) and 30-40s (OR=3.00, CI=2.76-3.28) of MVPA. Similarly for boys, a 1 unit increase in the SOFIT+ index score was associated with an increased likelihood to engage in 10-19s (OR =1.56, 95 % CI=1.50-1.63), 20-29s (OR=2.11, CI=2.00-2.22) and 30-40s (OR=2.97, CI=2.76-3.20) of MVPA. The vast majority of the observed teaching practices were significantly related to children's MVPA. For example, during discovery practice activities girls and boys were 29.69 (CI=19.08-46.20) and 27.67 (CI=24.5-36.36) times as likely to engage in 30-40s compared to 0-9s of MVPA, respectively.

Conclusions: SOFIT+ can produce valid and reliable data to examine teaching behaviours related to PA promotion. Furthermore, the relationship between individual teaching behaviours and children's MVPA was generally in line with previous research and could inform practitioners' PA promotion behaviours.





# Child and adolescent dietary interventions for obesity and non-communicable disease: A review of health economic modelling studies

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#### Policies and environments (SIG)

Purpose: The tenfold increase in the prevalence of child and adolescent obesity globally over the last four decades and the associated rise in noncommunicable disease has increased pressure on finite healthcare budgets. Poor dietary intake is a key factor in these trends. Health economic simulation modelling is a method of estimating the cost-effectiveness of dietary interventions in order to determine the 'best buys' for reducing obesity, disease, and inequalities. However, despite methodological advances, few child and adolescent dietary interventions have been modelled and no dedicated reviews have been conducted. This narrative review aimed to assess and compare modelled child and adolescent dietary interventions, health and economic impacts, modelling methodologies, and the quality of studies.

Methods: Five databases, reference lists of included papers, and key authors were searched for model-based health economic evaluations of dietary interventions targeted at or inclusive of individuals 5-18 years and published in English between January 2000 and September 2018. Dietary interventions were defined as those intended to alter food or beverage consumption, total energy or macronutrient intake, or overall diet quality in order to prevent or treat obesity and diet-related disease. Interventions could incorporate other components (e.g. physical activity). Interventions targeted at singular micronutrients were excluded.

Findings: The 19 publications identified largely conducted cost-utility analyses (63%) using Markov macrosimulation models (45%). A narrow range of primarily high-income populations were modelled (95%; United States 47%, Australia 32%). Dietary interventions were predominantly focused on primary prevention (89%) and reducing sugar-sweetened beverage intake (33%), targeted at a specific population group (69%), and delivered in school settings (44%). Methodologies used varied considerably, especially time horizons, intervention effect decay rates (if considered), and diseases and outcomes modelled. Additionally, the quality of model details reported was often poor. Population-wide interventions were typically most cost-effective.

Conclusions: Modelling of child and adolescent dietary interventions is a growing research field. However, the limited populations and interventions modelled and methodological heterogeneity currently offers limited information for comparing interventions and determining 'best buys'. Further studies modelling a wider range of dietary interventions and employing consistent methodologies are required.





# A research infrastructure for healthy and sustainable diets for the 21st century, with a use case on big data in childhood obesity

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#### e- & mHealth (SIG)

Purpose: The impact of food environments on personal health is without debate. In order to develop innovative approaches to shift to healthy and sustainable diets, reducing the rates of overweight and obesity, transdisciplinary and cross-sector research must be facilitated. Currently, a lack of standardization and cross-talk between the life and social sciences is hindering progress towards these goals.

Methods: Here, we present the Food Nutrition and Health Research Infrastructure (FNH-RI), an RI in the design phase, pending approval from the European Strategy Forum for Research Infrastructures. FNH-RI aims to develop a European platform for data, tools and services to improve transdisciplinary research on the determinants and benefits of healthy and sustainable diets. In this project, citizens act as link between the agri-food and health sector. The platform will provide research data, tools and services on food production and sustainability, as well as consumer behaviour and health, including physical activity and the diet-induced effects of non-communicable disease. Traditionally, research data is collected through projects. Using new technologies, it has become possible for consumers and citizens to collect various and large amounts of data (big data) about themselves and their surroundings.

Results: A use case underway for the FNH-RI is as a host, reuse and dissemination portal for the citizen science big data project on childhood physical activity, food environments and obesity: BigO. BigO is a European Union project entering its final phase, which has collected and analysed big data on children's physical activity and their living environment, in order to enable public health authorities to plan and execute effective programs to prevent obesity. Traditionally, once individual projects end, re-use and dissemination of data is hindered.

Conclusion: FNH-RI will allow maximal exploitation of data such as that generated by BigO, enabling data linkage and legacy and maximal policy impact.





# Post-exercise appetite and ad libitum food intake responses to acute bouts of moderate- versus high-intensity exercise in young male adults: a randomized crossover trial

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#### Motivation and behavior change (SIG)

Purpose: To investigate the effects of a single moderate- or high-relative intensity exercise session on subsequent appetite and energy and macronutrient intakes, which depend on food choice and feeding behavior.

Methods: Twelve males aged 22±1 years participated in this randomized crossover study. The appetite and food intake were evaluated following 2 bicycle ergometer trials (moderate-intensity trial [MOD]: at lactate threshold intensity over 90 min; high-intensity trial [HIGH]: at a blood lactate accumulation of 4mmol/L over a duration of equivalent energy expenditure as MOD) and a rest trial (CON). The participants were asked to purchase and consume meals consisted of foods available at supermarkets, convenience stores and cookshops as desired (ad libitum) after each trial. Energy and macronutrient intakes were calculated using the nutrition facts on the food labels. The subjective feelings of appetite were evaluated before and after exercise using 100-mm visual analogue scales.

Results: Significant time×trial interactions were observed for the subjective feelings of hunger, satiety, desire to eat, prospective food consumption and desire to eat fatty, salty or sour foods. Immediately after HIGH, the parametric values of hunger (effect size, ES: 0.81), desire to eat (ES: 0.95), prospective food consumption (ES: 0.81) and desire to eat fatty (ES: 1.17) or salty foods (ES: 0.87) were significantly lower and the satiety (ES: 0.91) was significantly higher than those after CON. The mean energy intake after HIGH was lower than that after CON (ES: 0.52); however, no significant difference was observed between the 2 trials. A one-way ANOVA revealed a significant difference in protein intake among three trials; the mean protein intake after HIGH was lower than that after CON (ES: 1.01). In contrast, no significant differences were observed in energy and macronutrient intakes between MOD and CON. Conclusions:The results showed that in young adult males, high-intensity exercise suppresses appetite, especially

the desire to eat fatty and salty foods, and influences temporal food choice such that protein intake immediately after exercise is low. However, moderate-intensity exercise does not find significant effects on the subsequent appetite and feeding behavior.




## Eating behaviors in relation to gestational weight gain and postpartum weight loss: a systematic review

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#### Children and families (SIG)

Purpose: Whereas food intake is commonly studied as a determinant of weight in pregnancy and postpartum, eating behavior remains understudied in these periods and an overview of relationships between eating behavior and weight is lacking. Restrained eating, emotional eating and eating due to cravings are associated with weight gain among general populations, and might also be associated with gestational weight gain (GWG) and postpartum weight retention (PWR), which increases the risk of obesity on the long term. The purpose of this systematic review was therefore to investigate the associations between eating behaviors and GWG and PWR.

Methods: Systematic searches of the MEDLINE, EMBASE, and Web of Science databases were conducted. Two reviewers independently performed title and abstract screening, full-text screening, data extraction and quality appraisal. Consensus between the reviewers was achieved by discussion after each phase.

Results: Thirteen studies were eligible for review. Four of nine studies showed a 0.8-2.2 kg higher GWG among women high in restrained eating compared to those low in restrained eating; two studies found weak associations between external eating and GWG; three of four studies showed an association between higher emotional eating scores and increased GWG; three demonstrated that more food cravings were associated with higher GWG. Two out of three studies showed lower PWR among restrained eaters. Disinhibition and external eating were not associated with GWG nor PWR.

Conclusion: This review indicates that food cravings, and restrained, external, and emotional eating are possibly related to an increased GWG. Restrained eating is potentially related to an decreased PWR, which implies that the postpartum might be a more suitable phase for the initiation of cognitive behavioral lifestyle interventions than pregnancy. Influencing eating behavior in the postpartum might generate a reduction of PWR, an subsequently reduce long-term obesity.





## (Un)healthy eating at school: pre-adolescents' food choices during the transition from primary to secondary school

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#### Children and families (SIG)

Purpose: Eating behaviours tend to become less healthy from childhood to adolescence. This decline could be influenced by life events. An important life event for children is the transition from primary to secondary school. Little is known about the influence of school transitions on eating behaviours. This study will use a Self-Determination Theory (SDT) perspective to get more insight into eating behaviours during the school transition.

Methods: This longitudinal study follows Dutch pre-adolescents from their last year of primary school (T1) into their first year of secondary school (T2). A total of 142 pre-adolescents (M = 12.2 years, 55.6% boys) from nine primary schools participated at T1 by completing questionnaires. The questionnaire included measures on snack and beverage intake at school and constructs from SDT, including healthy eating motivation, food-related autonomy and competence to eat healthily. In addition, pre-adolescents' perceived school encouragement to eat healthily was measured. The present study used data from T1, as data collection for T2 is ongoing. A healthy snack and beverage ratio was calculated by dividing healthy intake by total healthy and unhealthy intake. Correlation analyses were performed to assess associations between study variables.

Results: Preliminary results at T1 show that pre-adolescents had an average healthy beverage ratio of 64% and a healthy snack ratio of 61%. Pre-adolescents with a higher healthy beverage ratio had more autonomous motivation to eat healthily. No significant correlation was found between the healthy snack ratio and motivation to eat healthily. Regarding food-related autonomy, pre-adolescents who purchased more foods had a lower healthy snack ratio. Competence to eat healthily was positively associated with the healthy beverage ratio. 62% of pre-adolescents agreed that their school encouraged them to eat fruit or vegetables. Furthermore, 36% agreed that their school encouraged them to drink water, which was positively associated with pre-adolescents' healthy beverage ratio.

Conclusions: This study provides insight into the influence of individual and environmental factors on preadolescents' eating behaviours during the transition from primary to secondary school. Results could inform schools on promoting healthy intake during this transition.





## The healthiness of household food and non-alcoholic beverage purchases by store type in New Zealand

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

#### Purpose

Assessing the healthiness of food purchases by store type has the potential to inform the development of effective and equitable food policies to improve population diets.

#### Methods

We used Nielsen Homescan panel data collected between October 2018 and October 2019 to assess household food purchases by food store types across New Zealand (NZ). The Nielsen NZ Homescan panel is a cohort of households that is nationally representative of NZ in terms of selected demographics and socioeconomic status. Homescan only collects information on food/drinks brought into the home. We linked the panel data with the food composition databases (e.g. Nutritrack and Foodfiles) in order to extract data on nutritional composition of foods or drinks purchased.

We developed a store classification tool, and classified stores into supermarkets, grocery stores, convenience stores, fruit and vegetable shops, meat and fish shops, or bakery shops. We excluded alcoholic beverages, liquor stores, stores with only online and/or delivery services, stores with no specific name, and stores where food retail was not their core business. We calculated a Health Star Rating (HSR) for all food and drink purchases, and used HSR to measure product healthiness by store type. A product with a HSR of 3.5 or more was defined as 'healthy'.

#### Results

We analysed data on over 21,000 unique products, purchased by approximately 1800 households from 29 store brands, comprised of 9 supermarket brands, 2 grocery store brands, 9 convenience store brands, 3 fruit and vegetable shop brands, 4 meat and fish shop brands, and 2 bakery brands. Supermarkets accounted for 93% of household foods or drinks purchased, grocery stores for 4%, convenience stores 1%, fruit and vegetable shops 1%, meat and fish shop 0.5%, and bakery shops about 0.5%. Detailed results on healthiness of food by store type will be presented for the first time at the ISBNPA conference.

#### Conclusions

Supermarkets account for most foods and drinks purchased by New Zealand households for consumption at home. The diversity of store types from which products are purchased however offers an important opportunity to examine in detail product healthiness, cost, and promotions by store type.





## Relationship between daytime activity behaviours and sleep quality in youth

#### Prof Stephen H. Wong<sup>1</sup>, Dr. Wendy Yajun Huang<sup>2</sup>

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Children and families (SIG)

#### Purpose

Evidence of the association between daytime time-use behaviours and sleep has been inconsistent and primarily focused on sleep duration. The aim of this study was to examine the relationships of daytime physical activity (PA) and sedentary behaviours with sleep quality in youth aged 11 to 18 years.

#### Methods

The analytic sample consisted of 322 boys and 294 girls aged 11-18 years. The adolescents wore anactivPALTM for 7 consecutive days to measure PA of different intensities, sedentary time (ST), and sleep duration. The Pittsburgh Sleep Quality Index (PSQI) was applied to measure the quality of sleep. Puberty stage was self-reported using validated questionnaires. Generalized linear models were performed to assess the association of ST, light-intensity PA (LPA), and moderate-to-vigorous PA (MVPA) with sleep quality, adjusting for sex, age, body mass index, and puberty stage. Isotemporal substitution models were used to estimate the effects of replacing the same amount of one daytime time-use behaviour with another activity behaviour on sleep quality while holding total daytime (ST + LPA + MVPA) and sleep duration constant, as well as adjusting for the covariates.

#### Results

The self-reported PSQI scores ranged from 1 to 18. Approximately 91.6% of the adolescents had a score of 5 or higher. Reallocating one hour of MVPA with the equal amount of ST (B = 1.761, 95% CI: 1.015 – 3.053) or LPA (B = 2.017, 95% CI: 1.108 – 3.673) was associated with higher PSQI score while holding sleep duration constant. Replacing one hour of ST with the same amount of LPA was not related to change in sleep quality.

#### Conclusions

The findings suggested that replacing time spent in MVPA with ST or LPA was associated with poorer sleep quality in adolescents.





## Knowledge on diet, dietary pattern and associated factors among the elderly in Medical Officer of Health Area Bulathkohupitiya

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Ageing (SIG)

#### Purpose

Malnutrition among elderly is a worldwide public health problem. However, information on knowledge and dietary pattern of elderly in Sri Lanka is limited.

#### Objectives

To describe the knowledge on diet, dietary pattern and associated factors and to determine the association between the knowledge on diet and the dietary pattern among the elderly in Medical Officer of Health (MOH) area, Bulathkohupitiya

#### Methods

A community-based cross-sectional study was conducted in Bulathkohupitiya MOH area. Sample size was 512. Sixty years and above elderly were recruited by cluster sampling. Public Health Midwives collected data using an interviewer-administered questionnaire and a 24-hour dietary-recall. Descriptive analysis was done for sociodemographic and other associated factors and associations were calculated using chi square test and Odds ratio.

#### Results

Response rate was 98%(n=502). The age distribution was 60 to 93 years and mean age was 67.2years. Dietary knowledge was generally adequate with 62%(n=312) scoring 50% or more marks. Knowledge was positively associated with young age (OR=1.6;95%CI=1.09-2.36;p=0.017) and negatively associated with low educational level (OR=0.15;95%CI=0.10-0.22;p<0.001) and non-participation in social-activities (OR=0.24;95%CI=0.14-0.42;p<0.001). Television (OR=2.78;95%CI=1.88-4.12;p<0.001) and newspapers/books (OR=4.29;95%CI=2.73-6.72;p<0.001) were statistically significant as sources of dietary knowledge. Health sector contribution for knowledge was inadequate (12.2%,n=61).

Dietary pattern was cereal/tubers based (100%,n=493), with a poor proportion meeting dietary recommendations in vegetable (5%;n=25); dairy (11%;n=53) and fruit (12%;n=57) consumption. Food availability and income of elderly were associated with consumption of better quality foods (p<0.05). Food variety score (r=0.308), Dietary diversity score (r=0.206) and Dietary serving score (r=0.237) positively correlated (p=0.01) with dietary knowledge.

#### Conclusions

Dietary quality and quantity of elderly have to be improved. Health sector should contribute more to increase dietary knowledge. Food availability and income for elderly have to be enhanced.





## Are young adults' needs being met?: an analysis of the experience of sport club members

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Ageing (SIG)

#### Purpose

Data from Sport NZ's national participation survey, Active NZ, show a steep decline in participation in physical activity from teenage years into early adulthood. The decline spans across various forms of physical activity, including participation through sports clubs. This study focussed on experiences within a sports club context in Aotearoa, New Zealand. The purpose was to provide National Sport Organisations with data to develop interventions aimed at improving club member experience.

#### Methods

Data were collected via an online survey of club members in ten sports in Aotearoa, New Zealand, between July 2018 and April 2019. We examined data from c. 30,000 club members. Satisfaction with overall club experience was used as a key metric. Self-reported satisfaction across several areas were used to understand various aspects of experience. Participant reasons for belonging and other factors of the experience were also considered. Results from four age categories (5-12 years, 13-18 years, 19-34 years and 35+ years) were analysed and compared.

#### Results

The main reason for belonging to a club changes throughout people's lives. Most young adults belonged to a club to 'play competitively' or 'have fun / play socially'. It appears changing needs are not being sufficiently addressed by sports clubs, especially in the transition to young adulthood. Satisfaction with overall club experience was lowest among young adults (19-34 years). Young adults experienced significantly lower levels of satisfaction across a range of areas, including: quality/availability of officials, fulfilling potential, coaching, fairness of opportunities, professionalism & club management, providing information, playing venues and value for money.

#### Conclusion

Satisfaction with the overall experience, and contributing factors, are significantly lower for young adults than for other age groups. For several reasons, the needs of this group are not being met. The results indicate the importance of tailored interventions aimed at improving the experience for young adults within sports clubs. Improving the quality of club experience for this group has the potential to contribute to reducing the decline in physical activity.





## Muscle-strengthening activities and sociodemographic correlates among adults: Findings from samples in China Mainland

#### Prof. Hejun shen<sup>1</sup>, Dr. YouLiang Lin<sup>2</sup>

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Motivation and behavior change (SIG)

Background: Growing research has investigated the level of muscle-strengthening (MS) activities and its correlates among Western populations; however, scarce attention has been laid on the issues among Chinese adults. This study aimed to describe the level of MS activities and to explore the relationships of sociodemographic correlates of MS activities in a large sample of Chinese adults.

Methods: 3073 adults were recruited from 13 cities in Hubei Province. A self-reported questionnaire was employed to collect data on MS activities and sociodemographic information among participant of this study. According to the World Health Organization physical activity guidelines (MS activities should be accumulated at least 2 days a week). Multivariable logistic regression was used to explore the sociodemographic correlates of MS activities. The statistical significance level was set up as p < 0.05.

Results: Of all the included participants, the prevalence of MS activities was 28.5%. MS activities among the total samples were associated with sex (aOR for male = 1.98, 95%CI: 1.67-2.34) and family composition (aOR for multiple children = 1.35, 95%CI: 1.12-1.64). Among males, normal weight status (aOR = 1.39, 95%CI: 1.08-1.78) and multiple children (aOR = 1.58, 95%CI: 1.21-2.05) were associated with MS activities. There was no association of sociodemographic factors with MS activities among females.

Conclusions: Approximately 70% of adults in Hubei Province do not engage in recommended MS activities. These activities were associated with sex and family composition, which differed between sexes. This study provides sex-specific information on MS activities interventions. Future studies should use improved designs to explore more sociodemographic and other dimensional correlates of MS activities among Chinese adults, which provides evidence base for improved health behaviour interventions.





## Physical activity to underpin a school curriculum: A longitudinal study on children's academic achievement

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#### Early care and education (SIG)

Objective: Physical Activity (PA) has previously been the responsibility of the school Physical Education (PE) department, and growing concerns to the nation's health have led to this responsibility spread to all involved in educational settings. This study will use mixed-methods to take a longitudinal approach to academic performance since the introduction of a physically active school curriculum.

Methods: The focus of the study is a primary school based in the West Midlands (UK) teaching children aged 7 to 11. Academic performance was based on combined Maths and English statistics from nationally recognised Statuary Assessment Test from pre-intervention right through to 2019. Performance across the country in SATs at Key Stage 2 is measured against the percentage of children who are working at expected levels for their age in both Maths and English. This is the only statistical data in the UK that can directly compare a school's academic performance to the national standard. Structured interviews with teachers identified the details of the school curriculum that have physical activity embedded whilst also gathering reasons as to how this has transferred to academic performance. Focus groups with year 5 and 6 children collected data on their views on PA within the school.

Results/Findings: SATs for Maths and English combined increased significantly after the introduction of a PA school curriculum. Emergent themes from focus groups and interviews were positivity, improvements and interpellation.

Conclusions: This is an example of how a school has used PA policy not only to improve the health and well-being of the pupils who attend but also how it can also help improve academic performance. From the findings of this study the hope is that other schools will be encouraged to implement a similar policy to assist with health and academic success rather than reducing PA and increasing numeracy and literacy time to perform well during SATs.





## Urban densification and increases in physical activity over 12 years

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#### Policies and environments (SIG)

#### Purpose:

Densification (population density increases over time) of urban neighbourhoods can be accompanied by moreaccessible retail, service, transport, and recreational destinations, which may influence residents' physical activity. Cross-sectional studies reported associations of population density with physical activity. However, the effects of density increase on physical activity are less clear. We examined the association of urban densification with changes in physical activity over 12 years.

#### Methods:

The Australian Diabetes, Obesity and Lifestyle study collected data from adults living in 42 study sites in 1999–2000, 2004–05, and 2011–12. We investigated 2,354 participants who did not change their residences during the study period. Densification rate was calculated using a linear growth model where population density within a 1-km radius buffer around participant's residence at each time point was fitted. Self-reported time spent in both walking (for recreation and transport) and moderate-to-vigorous physical activity (sum of walking, moderate-intensity, double vigorous-intensity) were examined. Generalised linear mixed models were used.

#### Results:

At baseline, the mean population density was 13.0 (SD=7.4) persons per hectare. The mean densification rate was 0.8% per year relative to baseline density (range: -4.1% to 7.8%). The mean walking and MVPA durations at baseline were 123.0 (SD=164.3) mins/week and 290.2 (SD=349.6) mins/week, with mean increases over the 12-year period of 52.5 (SD=231.2) mins/week and 67.6 (SD=433.6) mins/week, respectively. After adjusting for socio-demographic confounders and baseline population density, each 1% annual densification was associated with 8.4 (95%CI: 0.5, 16.4) mins/week increase in walking and 14.9 (95%CI: 0.3, 29.6) mins/week increase in MVPA over the study period.

#### Conclusions:

Our findings suggest that urban densification can lead to population-level physical activity increases regardless of baseline density levels. In the global context of urbanisation, planning strategies to increase population density (rather than expanding urban boundaries) to accommodate population growth can be justified from a perspective of physical activity promotion. However, research is also needed to examine the overall health and wellbeing implications of urban densification.





## Validation of the behavioral regulation in exercise questionnaire (BREQ-3) among Japanese adults

#### Dr. Hiroshi Matsumoto<sup>1</sup>

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Motivation and behavior change (SIG)

#### [Purpose]

The purpose of this study was to assess the factorial validity of a Japanese version of the Behavioral Regulation in Exercise Questionnaire (BREQ-3; Markland and Tobin, 2004; Wilson et al., 2006; Cid et al., 2018). The BREQ-3 is a multidimensional self-report measure designed to evaluate behavioral regulation in exercise domain from the perspective of self-determination theory. It comprises 18 items amotivation, external regulation, introjected regulation, identified regulation, integrated regulation and intrinsic motivation on a 7 point Likert-type scale, and has been used extensively in recent research.

#### [Methods]

The sample comprised 1063 adults (Mage = 44.7 years, SD =  $\pm$ 14.0, 574 men) who completed the Japanese BREQ-3, which was created by the back-translation procedure.

#### [Results]

Confirmatory factor analyses provided support for the tenability of the hypothesized factor structure of the Japanese BREQ-3 (SRMR=.065; NNFI=.93; CFI=.95, RMSEA=.08) and for the invariance of the factor loadings and inter-factor covariances. Subscale reliabilities (Cronbach's alpha coefficient) ranged from .80 - .96.

#### [Conclusions]

The results demonstrated that the factorial validity and reliability of Japanese BREQ-3 is acceptable, suggesting that it may be useful to enhance our understanding of exercise motivation from the perspective of self-determination theory.





## Associations of moderate-to-vigorous physical activity with academic performance and academic burden among chinese school-aged students

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#### Children and families (SIG)

Purposes: Since academic performance (AP) of students has received much attention from families and schools, moderate to vigorous physical activity (MVPA) may be a negative factor in improving AP. In addition, Chinese school-aged students were exposed to higher academic burden (AB). This study examined the relationships of MVPA with AP, AB among Chinese students.

Methods: This study used cross-sectional design, which was conducted in provinces/cities of Shanghai, Jiangsu, Anhui and Zhejiang from September to October in 2019. Using a multi-stage sampling and random cluster sampling based on classes in areas, 3111 participants were recruited. The Health-Behavior School-aged Children questionnaire (HBSC) was used to collect participants' information on MVPA, AP, AB and other demographic parameter. The Binary logistics regression was used to analyze the relationships among daily MVPA, AP and AB.

Results: Of all 2838 participants aged 7 to 19 years (mean:  $13.1 \pm 2.39$ ; 46.9% of boys), the prevalence of MVPA was 10.4%. Compared to students without daily MVPA, the students who reported that they met the PA guidelines had better AP (On the weekdays: OR = 1.46, 95% CI: 1.03-2.07, On the weekends: OR = 1.46, 95% CI: 1.14-2.54, respectively). In the grade group, only the middle grades students who reported that they met the PA guidelines had better AP (On the whole week: OR = 2.12, 95% CI: 1.02-4.36, On the weekdays: OR=1.87, 95% CI: 1.19-2.93, On the weekends: OR = 3.17, 95% CI: 1.48-6.81, respectively). Compared to students without daily MVPA, students who reported that they met the PA guidelines were less likely to have AB (On the whole week: OR = 1.71, 95% CI: 1.25-2.50, On the weekends: OR = 1.52, 95% CI: 1.15-2.01, respectively).

Conclusions: The prevalence of MVPA among Chinese school-aged students were low. On the weekends, students with daily MVPA has a positive relationship with their AP and AB, but there was a difference between weekdays and weekends among students.





## Association of the amount and pattern of physical activity with arterial stiffness - The Maastricht Study

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#### Disease prevention and management

Purpose: Arterial stiffness is an independent risk factor for cardiovascular disease (CVD) and can be beneficially influenced by physical activity. However, it is not clear how physical activity pattern over a week is associated with arterial stiffness. Therefore, we examined the associations of the amount and the pattern of higher intensity physical activity with arterial stiffness.

Methods: Data from The Maastricht Study (n=1699; mean age:  $60\pm8$  years, 49.4% women, 26.9% type 2 diabetes (T2DM)) were used. Arterial stiffness was assessed by carotid-to-femoral pulse wave velocity (cfPWV) and carotid distensibility (carotid DC). The amount (hours/day) and pattern of higher intensity physical activity were assessed with the activPAL3®. Activity groups were: inactive (<75min/week), insufficiently active (75-150 min/week), weekend warrior (>150 min/week in ≤2 sessions), and regularly active (>150 min/week in ≥3 sessions).

Results/findings: After adjustment for demographic, lifestyle, and cardiovascular risk factors, higher intensity physical activity was associated with lower cfPWV (amount: -0.35[-0.65;-0.05], insufficiently active: -0.33[-0.55;-0.11]; weekend warrior: -0.38[-0.64;-0.12] and regularly active: -0.46[-0.71;-0.21] (reference: inactive)). These associations were stronger in those with T2DM. There was no statistically significant association between higher intensity physical activity with carotid DC.

Conclusions: Participating in higher intensity physical activity was associated with lower cfPWV but there was no difference between the regularly actives and the weekend warriors. From the perspective of arterial stiffness, engaging higher intensity physical activity, regardless of the weekly pattern, may be an important strategy to reduce CVD risk, particularly in T2DM.





## Cost comparison between healthy, sustainable, and current menus: a modelling study in Mexico.

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#### Policies and environments (SIG)

Purpose: Evidence from developed countries suggests that healthy diets are more expensive than unhealthy ones. This has not been tested in Mexico. Hence, we created menus that follow Mexican dietary recommendations, EAT-Lancet commission's reference diet, or the current intake of the Mexican population and compare their cost.

Methods: We followed the INFORMAS food prices' protocol and created menus using the DIETCOST programme. The menus were created for a reference household comprised by two adults, one adolescent male, and one girl. We selected 110 common foods based on the Mexican National Nutrition Survey (ENSANUT). Food prices were obtained from the Consumer Price Index from 2011 to 2018. Nutrient and food groups targets for each type of menu followed recommendations (Mexican guidelines, and EAT-Lancet), or the current intake of the population according to ENSANUT. We estimated and compared the total cost of the menus obtained from the DIETCOST programme (110 to 548 menus per person and diet).

Results/findings: In 2018, on average, the total cost (MXN/per household) for a 2-week menu was 3,702 for the EAT-Lancet diet, 3719 for the Mexican healthy diet, 4629 for the current Mexican diet, and 4224 for a current Mexican diet but with the same energy content as the healthy diets (current isocaloric). The differences the in cost between the current isocaloric and the healthy diets came from costing –16.8 and -10.7 MXN/person-day from animal sources and dairy, -12.2 and -10.1 from discretionary food and beverages, and +9.4 and +13.6 from fruit, vegetables, grains, and legumes (EAT-lancet and Mexican healthy, respectively). Twenty percent and 39% of current isocaloric menus were cheaper than the average EAT-Lancet and Mexican healthy menus, respectively. From 2011 to 2018, the cost of all menus increased over time, but the increase in the current menus was larger compared to the increase in the healthy ones.

Conclusions: Menus based on the Mexican and EAT-Lancet recommendations were cheaper than menus based on the current Mexican diet. These findings suggest that cost might not be an important barrier for adopting a healthy diet in Mexico.





## Development of the wholistic compass app: A measure of indigenous youth development through sport and physical activity

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Positive youth development is a strength-based perspective recognizing all young people hold potential for positive, successful, and healthy development (Lerner et al., 2005). For Indigenous youth, participation in sport and physical activity (PA) may positively contribute to physical, mental, emotional, and spiritual well-being (Lavallée, 2007). However, there are no available validated measures to evaluate such developmental benefits (Bruner et al., 2016). Therefore, the purpose of this research was to develop and validate the Wholistic Compass, a culturally relevant measure of Indigenous youth development through sport and PA.

Methods: Guided by a Two-Eyed Seeing approach (Bartlett, Marshall, & Marshall, 2012), we undertook a four-phase research program to address the stated purpose. Phase 1 was designed to gain an understanding of Indigenous youth development through sport and PA. Thirteen sharing circles were conducted with 99 Indigenous youth across Canada. Phase 2 assessed item content validity through Think Aloud interviews with 15 Indigenous youth. In Phase 3, the Wholistic Compass Application (App) was developed and a pilot study was conducted with 231 Indigenous youth. Phase 4 is the current validation phase.

Results: Phase 1 findings provided the basis for item generation across the four Medicine Wheel quadrants (physical, mental, emotional, spiritual), and items associated with connections to others, perceived barriers to participation, and social support. Phase 2 resulted in item wording modifications and highlighted the need for a mobile App to appeal to youth participants, which was created in consultation with the project Governing Council. Phase 3 involved an exploratory factor analysis to test initial reliability and validity for the measure. Following item analysis, 7 items were removed, 16 items reworded, and 17 items added (12 of which make up an ethnic identification scale; Bombay et al., 2010). Presently, we are seeking 600 Indigenous youth to validate the final 91-item measure (Phase 4).

Conclusions: There is initial empirical evidence to support the validity of the Wholistic Compass App as a culturally relevant, self-assessment questionnaire that evaluates Indigenous youth development in sport and PA. Further psychometric testing is required to examine other elements of the measure's validity.





## A systematic review of mass media campaigns to improve beverage consumption

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Other

Purpose: Beverages are important components of overall diet, contributing substantially to hydration and nutrient intake. However, overconsumption of sugar sweetened beverages (SSB) is a global concern, while water consumption is generally inadequate. Mass media campaigns (MMCs) are popular cost-effective approaches to promote healthy behaviors and reach large, diverse populations but their impact on beverage consumption is not well documented. We synthesized information about design, evaluation, and effectiveness of MMCs intended to change beverage behaviors.

Methods: We searched five databases (PubMed, EMBASE, CINAHL, Web of Science, CABAbstracts) from inception through February 2019. Eligible studies evaluated MMCs to encourage favorable beverage consumption (e.g., water), discourage unfavorable beverage consumption (e.g., SSBs), or both; were published in English; and measured intake, purchases, or sales. Study screening and extraction were completed independently and in duplicate. Study quality was assessed using the Newcastle-Ottawa Scale (maximum score: 9).

Results: The search yielded 11,101 citations; fifteen studies representing fourteen interventions were included (conducted in North America, n=11; Australia, n=3). Six interventions focused on changing SSB behaviors, six on milk behaviors, and two on multiple beverages (e.g., water and juice). Eight interventions targeted entire communities, four focused on caregivers of young children, and three were culturally tailored for specific racial or ethnic populations. In all interventions, MMCs were delivered using multiple media platforms including television, social media, radio, print, or web. Only two measured outcomes more than one year after campaign introduction, and one compared effectiveness of campaign dissemination approaches. Eleven interventions included at least one significant improvement in a beverage outcome (increasing favorable, n=2; decreasing unfavorable, n=4, combination, n=5), though results across studies were largely not comparable due to inconsistency in measurement. Nine interventions reported reach/intensity. Studies were generally of poor to moderate methodological quality (average score 4/9).

Conclusions: Because of variety in study design, outcome assessment, and follow-up, the extent to which MMCs meaningfully change beverage-related behaviors is unclear. Future evaluations should rigorously assess short and long-term campaign impacts using objective data including measures of intensity, reach, and cost-effectiveness.





## Access to childcare disrupts the link between decreased maternal sleep and increased depressive symptoms

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#### Children and families (SIG)

Purpose: Sleep disruption is common among postpartum women due to newborns' irregular sleep patterns and immature circadian rhythms. Reduced sleep can compromise mothers' daytime functioning and is linked with depressive symptoms. Access to childcare may alleviate parenting burden and protect new mothers against symptoms of depression, which has implications for both maternal and child health. This study examined the indirect effect of infant's sleep on maternal depressive symptoms through mother's own sleep and assessed whether these patterns differed depending on mothers' access to childcare.

Methods: Participants were from the Nurture study, a birth cohort of 666 women and their full-term infants in the southeastern United States. Mothers completed questionnaires during home visits when their infants were 3, 6, 9, and 12 months old. The Edinburgh Postnatal Depression Scale (EPDS) was used to measure depression. Mothers self-reported sleep duration for themselves and their infants, childcare arrangements, marital status and income. Multi-level moderated-mediation models were run using MLmed accounting for income and marital status.

Results: Mothers reported a median of 7 and 9 hours of sleep for themselves and their infants, respectively. Income was < 20,000 annually for 55% of the sample. Mothers reported access to childcare on 44% of occasions; 21% of EPDS scores were in the 'elevated' range. On occasions when infants slept one hour less than typical, mothers slept 11 minutes less (B = 0.185, 95%CI 0.013 to 0.268), which corresponded to increased depressive symptoms, conditional on childcare access (B = 0.260, 95%CI 0.011 to 0.509). Decreased maternal sleep mediated the association between infant sleep and elevated depressive symptoms, but only on occasions when mothers did not have access to childcare (indirect effect = -0.048, 95%CI -0.001 to -0.017). Decreased maternal sleep was not linked with increased depressive symptoms (indirect effect = -0.001, 95%CI -0.038 to 0.034) when mothers had access to childcare.

Conclusions: Access to childcare appeared to disrupt the link between reduced maternal sleep and increased depressive symptoms. Regular access to childcare may be a viable method to mitigate elevated feelings of depression for new mothers.





## Longitudinal associations between nighttime sleep duration and body mass index trajectories in early childhood: a dual trajectory analysis

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Children and families (SIG)

Purpose: Sleep duration has been implicated in the development of childhood obesity. However, the majority of existing studies are limited to examination of cross-sectional and prospective associations. Longitudinal associations between changes in sleep duration and body mass index (BMI) z-scores in early childhood remain to be explored. This study aimed to examine the interrelationship between developmental trajectories of sleep duration and BMI z-scores in early childhood.

Methods: Data from the Melbourne InFANT program, a prospective cohort with infants aged 3 months and followed up until age 60 months, were used. Sleep duration and BMI z-scores were collected at ages 3, 9, 18, 42 and 60 months. A dual trajectory model was used to assess the longitudinal interrelationship between sleep duration and BMI z-score trajectories from ages 3 to 60 months, and to assess the influence of child and maternal factors.

Results/findings: Three sleep duration trajectory groups were identified: "Long stable" (61%), "Catch-up long" (23%), and "Short stable" (16%). Four BMI z-score trajectory groups emerged: "Low" (17%), "Normal-low" (48%), "Normal-high" (25%), and "High" (10%). Children from "Low", "Normal-low", and "Normal-high" BMI z-score groups were more likely to be members of "Long stable" sleep duration group (probability: 0.64). By contrast, children from "High" BMI z-score group had a similar probability of belonging to all sleep duration groups with a probability of 0.30, 0.31 and 0.39, respectively. Both "Catch-up long" and "Long stable" sleep duration group were more likely to be in the "Normal-low" BMI z-score group with a probability of 0.54 and 0.49, respectively. Compared to the "Low" BMI z-score group, short breastfeeding duration (<6 months) and maternal pre-pregnancy overweight/obesity increased the probabilities of following "Normal-high" and "High" BMI z-score groups after controlling for sleep trajectory groups.

Conclusion: Our study revealed strong interrelationships between developmental trajectories of sleep duration and BMI trajectories in early childhood, with breastfeeding duration and maternal pre-pregnancy overweight/obesity as influencing factors. The findings highlight the importance of promoting healthy maternal pre-pregnancy body weight, longer breastfeeding duration, and adequate sleep duration in children to support healthy child growth and body weight development in early childhood.





## The use of the behaviour change wheel in the development of ParticipACTION's physical activity app

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#### e-&mHealth (SIG)

Purpose: Despite the exponential grow of smart phone applications (i.e., apps) to support health behaviours, the majority lack embedded evidence-based behaviour change theories. ParticipACTION, Canada's leading physical activity social marketing organization, recently launched an app with the goal of encouraging Canadian's to sit less and move more, with embedded behaviour change theories at the core of its development. The purpose of this study was to provide a detailed and systematic outline of how a theoretical behaviour change framework was applied in the development of ParticipACTION's app to support increased Canadian's physical activity levels.

Methods: The Behaviour Change Wheel (BCW) framework, a theoretically-based approach for intervention development, along with collaboration with the commercial app industry guided the development process. Specifically, a behavioural diagnosis was used to understand what needs to change for the targeted behaviour to occur. Current literature, along with a series of focus groups and market research provided data to inform the app development.

Results: The behavioural diagnosis revealed that the app needed to target individuals' physical and psychological capabilities, physical and social opportunities, and reflective and automatic motivations in order to increase physical activity levels. To accomplish this, 6 of possible 9 intervention functions (education, persuasion, incentivization, training, environment restructuring, and enablement), and 2 of 7 policy categories (communication and marketing, environment and social planning) were selected from the BCW to be included in the app. Goals and planning, feedback and monitoring, behaviour identification, action planning and knowledge shaping were selected as the main behaviour change techniques for the app.Collaboration with a mobile app development firm helped to embed the selected behaviour change techniques, policy categories, intervention functions, and sources of behaviour within the app.

Conclusion: Using a systematic approach, this study used the BCW to ensure the health promotion app was theoretically informed. Future research will evaluate the effectiveness of the theory-driven app in increasing Canadian's physical activity levels.





## Physical activity and sedentary time prevalence among Chinese children and adolescents: Variations, gaps, and recommendations

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Abstract: Physical activity (PA) and sedentary time (ST) assessment are of particular importance in the promotion of health in young people. However, there is no comprehensive overview of PA and ST from national surveys among Chinese children and adolescents.

#### Methods:

Following a literature search for Chinese national health surveys, this study focused on searching papers or articles from nationwide surveys. Eight surveys were targeted, of which were Chinese Youth Risk Behavior Survey (CYRBS), Physical Activity and Fitness in China—The Youth Study (PAFCTYS), China Health and Nutrition Survey (CHNS), Global School-based Student Health Survey (GSHS), National Physical Fitness and Health Surveillance (NPFHS), Chinese Children Dietary Index (CCDI), China Education Panel Survey Junior High Cohorts study (CEPS) and China's Report Card. 10 eligible papers were obtained and one additional paper was found through filtering the reference lists of the 10 papers. In sum, 11 paper met the inclusion criteria for further analysis. Data on publication year, measures, PA and ST prevalence were extracted.

#### Results:

Of the 11 included studies (published from 2007 to 2019), the majority applied self-reported questionnaires to estimate PA and ST prevalence, whereas only one paper employed accelerometer to assess PA and ST prevalence among Chinese children and adolescents. Owing to different cut-offs to determine PA and ST prevalence, the ranges of overall PA and ST prevalence among Chinese children and adolescents over the past decade were from 5.6% to 35.4%, and from 7.1% to 78%, respectively. It also found that male or younger children and adolescents showed higher PA prevalence, but there was no clear pattern of ST prevalence among Chinese children and adolescents.

#### Conclusion:

A large variation in PA and ST prevalence was observed. Such variations were attributable to methodological and practical issues. This study highlights the current gaps in estimating national PA and ST prevalence among Chinese children and adolescents, which should be addressed. Standardized measurement protocols to estimate PA and ST prevalence more accurately among Chinese children and adolescents are urgently required.





## Structure and trends in preference of individual physical activities

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#### Motivation and behavior change (SIG)

Regularly observed and sufficient physical activity (PA) of young people depends on the creation of conditions for success in the preferred PA. Therefore, we consider the diagnostics of PA preferences to be an irreplaceable part of PA diagnostics.

The aim of this study is thus to (a) detect the state and trends in the preferences of individually oriented PA of young people in different education and sports environments in the context of weekly PA; (b) to detect the associations among developing preferences of track and field and the fulfilment of recommendations within a weekly PA. In the research conducted from 2007 to 2017 participated in total 16116 participants aged from 14 to 26. We have realized a sports preferences questionnaire and weekly PA questionnaire IPAQ-long in order to detect the preferences in the individually oriented types of PA. The biggest long-term stability among the Czech and Polish boys and the Czech girls showed swimming and cycling and among Polish girls swimming and skating. The most significant increase of preferences was detected in track and field, especially among the Czech girls and boys. The girls and boys who prefer track and field meet weekly PA recommendations significantly more than those who do not prefer it. Both Czech and Polish boys and girls showed that those who prefer athletic/running activities fulfil significantly more recommendations to a weekly PA; specifically at least 5 times a week for a minimum of 60 minutes of MVPA and simultaneously at least 3 times a week for a minimum of 20 minutes of vigorous PA. Preferences of athletic/running activities also increase the chance of fulfilment of above-mentioned recommendations to a weekly PA with both girls (OR=1.801, CI=1.571-2.065) and boys (OR=1.655, CI=1.437-1.905). These preferences are also important predictors for fulfilment of PA recommendations.

The knowledge of trends in preferred types of PA has a predictive meaning for supporting physically active lifestyle of young people and for creation of optimal conditions to pursue popular types of PA.





## Nutrition and physical activity challenges among migrant populations

#### Dr. Tasha Peart<sup>1</sup>

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Other

Purpose: Globally, the prevalence of chronic diseases is increasing with an estimated 422.7 million cases of cardiovascular diseases. Among sub-groups including migrants, the prevalence is also increasing. A major contributory cause to chronic diseases such as obesity and diabetes include access to nutrition and physical activity resources and reducing sedentary behaviors. Although much is known about the barriers to health care and chronic disease risk factors for native populations, less is known about immigrant groups including refugees. Globally, with the increase in immigrants traveling from their native countries, more research is needed to better understand the unique challenges in accessing healthcare as well as nutrition and physical activity resources among this population.

Methods: A literature review was conducted to identify research articles published on the aforementioned topic. Databases from which articles were retrieved include PubMed. Data analysis included identifying descriptive codes to label the data and more advanced/inferential coding to identify patterns or themes and sub-themes.

Results/Findings: Globally, immigrants including refugees and those who resided in border communities faced significant challenges with access to nutrition and physical activity resources, including limited income, language barriers, and acculturation. Interventions that incorporated a trained community health worker and were theory-driven were the most successful. In some low-to-middle income countries, medical interpreters for cross-border immigrants were inadequate in the health care environment. In contrast, in high-income countries that have some form of universal health insurance, these countries made improvements in promoting health literacy among immigrants, providing adequate language interpreters, and delivering training in cultural competency to medical professionals.

Conclusion: Future research should integrate more mixed methodology approaches to learn about the unique challenges in accessing healthcare as well as nutrition and physical activity resources among this population. Future public health initiatives may include improving culturally competency trainings for medical professionals.





## Comparison of different outdoor childcare settings for promoting active risky play in early childhood

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#### Early care and education (SIG)

Purpose: Active risky play in the early years has been linked to improved motor development and increased physical activity. The natural environment provides affordances for young children to engage in active risky play making outdoor childcare an ideal setting for fostering motor development and physical activity. This study aimed to compare two different types of outdoor childcare provision and the levels of active risky play.

Methods: Direct observations of nine outdoor childcare days were conducted during June/July 2019 across five Scottish centres involving 68 children (41 boys, 27 girls) aged 2-5 years. Four childcare centres had no suitable natural environment on-site and therefore children walked or were bused to nearby parks or woodland once per week (termed satellite outdoor childcare). One centre was a full-time outdoor kindergarten. A standardised observation schedule was used to describe the outdoor area and how it was used, including the time spent in activities. Comparison of satellite and full-time outdoor centres was carried out through qualitative descriptive analysis.

Results: Seven different parks/woodlands were used by the five childcare centres, with both satellite and full-time centres using different and exclusive outdoor environments. Children spent between 1h45min and 4h00min outdoors in satellite settings compared to a maximum of 5h30min for children attending the full-time centre. Children were physically active on average 73% and 61% of their outdoor time in satellite and full-time outdoor childcare, respectively. Of the total physical activity time, children spent 38% (25-80min) in active risky play in satellite and 32% (45-80min) in full-time outdoor centres. Affordances offered by the different parks/woodland did not differ between type of outdoor centre and children engaged in active risky play by swinging on ropes and hammocks tied to trees and climbing on fallen trees.

Conclusions: Children attending full-time outdoor childcare centre spent less time in active risky play compared to children in satellite centres. Use of different parks/woodland did not influence the natural affordances linked to active risky play. Future research should explore if novelty of the outdoor environment and limited opportunities for exposure to the outdoors influence childcare practice allowing for more active risky playtime.





## Differences in lifestyle behaviors, inflammatory markers, and body mass index among cancer survivors and non-cancer survivors

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#### Cancer prevention and management (SIG)

Introduction: For cancer survivors, a healthy diet, physical activity and weight management can prevent chronic disease, improve health-related quality of life, and decrease mortality. Elevated levels of inflammatory markers may influence biological mechanisms that link poor diet, alcohol consumption, low physical activity, and obesity with cancer recurrence and second primary cancers. However, research suggests that cancer survivor's lifestyle behaviors may not be difference from the general population. The purpose of this study is to examine differences in fruit and vegetable (FV) and alcohol intake, physical activity (PA), body mass index (BMI) and inflammatory biomarkers among cancer survivors and non-cancer survivors.

Methods: Data is from the Midlife in the United States (MIDUS) collected during the MIDUS Refresher phase (2011-2016) of middle-aged and older adults. Study participants completed telephone-administered surveys to assess sociodemographic factors, lifestyle behaviors, and objectively collected anthropometric measures and biomarkers. We compared intakes of FV, moderate PA, BMI, and inflammatory biomarkers (C-reactive protein (CRP) and Interleukin-6 (IL-6)) between cancer survivors and non-cancer survivors. Multivariate logistic regression analysis compared prevalence of lifestyle behaviors between both groups.

Results: Participants were 863 (776 non-cancer survivors; 86 cancer survivors). Overall, the sample was 52.1% female, 70.2% non-Hispanic White, 52% > college/higher, 39.6% current smokers, 70.1% drank alcohol, 74.6% were overweight/obese, and mean age was 50.8. Bivariate analysis revealed cancer survivors were older (p<.0001), higher incomes (p=0.041), overweight/obese (p=0.000), did not achieve recommended guidelines for PA and FV (p=0.035), elevated IL-6 levels (p=0.027) and reported less frequent binge drinking (p=0.014) compared to non-cancer survivors. After adjusting for covariates, cancer survivors were less likely to frequently binge drink (OR=0.52; CI=0.31-0.96) than non-cancer survivors. There were no significant differences for the other lifestyle behaviors and biomarkers.

Conclusions: Although cancer survivors were less likely to frequently binge drink than non-cancer survivors, achieving the recommended guidelines for diet, PA and BMI is a concern, indicating the need for targeted behavioral interventions.





## Psychological and behavioural characteristics of women achieving clinical weight loss in response to a 14-week program.

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#### Motivation and behavior change (SIG)

Purpose: There is large variability in response to weight loss attempts. This study characterised the psychological and behavioural markers of clinical weight loss (5% of starting body weight) during a 14-week program.

Methods: This study was conducted as secondary analysis of the SWIPS trial which recruited 96 women ( $41.0 \pm 12.6$  years;  $34.0 \pm 3.6$  kg/m2; completers n=80) who had voluntarily enrolled in healthy eating-based weight loss programs. After a two-week run-in period, psychometric eating behaviour traits were assessed using validated questionnaires (restraint, flexible, rigid, disinhibition, hunger, binge eating and craving control). On four days during the trial, under controlled laboratory settings participants' evening meal, evening snack and total day energy intake (TDEI) were objectively assessed in response to meals varying in energy density days. Based on objectively measured body weight in weeks 1 and 14, participants were classified as clinical weight-losers (CWL; lost  $\geq 5\%$  of starting body weight; n=41), non-clinical weight-losers (NCL; lost  $\leq 3\%$  of starting body weight, n=33), or unclassified and excluded from the analysis (lost 3.1-4.9%, n=6).

Results: Mixed ANCOVAs controlling for early weight loss and weight loss program, revealed that CWLs scored significantly higher in craving control compared to NCLs. During the program, CWLs showed significant increases in flexible eating and significant decreases in trait binge eating; NCLs' eating behaviour traits did not significantly change. At the end of the trial, CWLs also scored significantly lower in disinhibition and hunger. Restraint and rigid eating style did not significantly change or differ between CWLs and NCLs. In the laboratory, while evening meal and TDEI did not significantly differ, CWLs consumed significantly fewer snacks (kcal) compared to NCLs.

Conclusions: In this trial, compared to NCLs, CWLs were characterised with high craving control and flexible eating and low trait binge eating and low snack energy intake. Future weight loss programs should target these eating behaviour traits and regulated snack intake to support clinical weight loss.





## Feasibility testing of the "Strong Culture, Healthy Lifestyles" afterschool cultural activity program and evaluation methods with Australian Indigenous children

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#### Children and families (SIG)

Purpose: The intergenerational impact of colonisation has meant that Australian Indigenous children are often not provided with opportunities to engage with, learn and connect with their culture and this is having an ongoing effect on their health and well-being. Afterschool cultural programs have been identified by the participating Indigenous communities as a potential strategy to promote cultural connectedness and healthy lifestyle behaviours in Indigenous children. However, limited information is known about the feasibility of implementing and evaluating such programs. The purpose of this study was to explore the feasibility of implementing and evaluating the "Stronger Culture, Healthy lifestyles" afterschool cultural program.

Methods: This was a single group non-randomised pre-test/post-test feasibility study. Australian Indigenous children and their siblings aged 5-13 years, and their parents/caregivers from three Indigenous communities in New South Wales, were recruited to participate in the program and research. Children participated in a 10-week cultural program, two afternoons per week. The primary outcomes were the feasibility of the program and study methods, including recruitment and retention rates, percentage of the program delivered as planned (direct observation), compliance with data collection, program attendance, and program enjoyment. Data were summarised using descriptive statistics.

Results/findings: A total of 120 children enrolled in the programs with an average of 20 children per program, and 92% were retained at follow-up. Of these, 111 parents also consented to their children being part of the research activities with a retention rate of 91%. The average program attendance rate was 70%. Only 61% of the agenda was delivered as planned on observation days, with poor weather and mentor illness being the main reasons for changes to agendas. Eighty-nine percent of children reported a high level of enjoyment for the programs. Compliance with data collection ranged from 47% for follow-up yarning to 91% for baseline height and weight (average across all outcome measures = 74%).

Conclusions: Exploring the feasibility of interventions and study methods is a critical step in the process of developing and conducting full-scale trials. This study enabled the identification of feasibility indicators and areas for improvement, which will be addressed to ensure the larger trial of the afterschool cultural program is relevant, meaningful and effective.





## Application of the theory of planned behaviour to physical activity in China: A cross-cultural comparison of Chinese and Western samples

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#### Motivation and behavior change (SIG)

Purpose: To reduce the levels of physical inactivity in China, the theory of planned behaviour (TPB) presents a suitable theoretical framework and guideline. However, the relative contribution of some TPB variables may vary across cultures. The present study applies the TPB to predict physical activity behaviour in Chinese college students and compares the strength of the effects of TPB variables on physical activity among Chinese and Western samples.

Methods: This study used a cross-sectional design. The Chinese sample consisted of 892 college students. Data for the Western sample were inferred from a meta-analysis by Hagger, Chatzisarantis and Biddle. Main Outcome Measures: Participants' attitude toward physical activity, subjective norm regarding physical activity, perceived control over physical activity behaviour, intention to be physically active, and self-reported physical activity behaviour.

Results: The TPB reliably predicted physical activity behaviour in the Chinese sample, but the effects of subjective norm and perceived behavioural control on intention were significantly stronger in the Chinese than the Western sample.

Conclusions: The TPB can be applied to predict physical activity among Chinese college student population, with subjective norm and perceived behavioural control having a stronger role than in Western culture.





## eHealth-based social communication among Chinese college student: A qualitative study

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#### e-&mHealth (SIG)

#### Background

The dramatic development of information technology is leading to profound transformations in online communication, substantially orienting the innovations in eHealth-based social communication. However, it is still unclear how the existing or newly built online social networks function on individuals' health-care. Objectives

This study aimed to investigate the online interpersonal sources and their applications in Chinese college students' healthcare.

#### Methods

Semi-structured interviews were conducted with qualitative thematic analysis method. Eighteen Chinese college students were purposely recruited, included three males and three females of each sex from sports, medical, and ordinary non-health-related majors.

#### Results

Five themes were identified as following:

- 1) Relationship creating and strengthening (e.g. "build trustworthy relationships with professionals" "know someone with similar health concern/interest online" "new ways for showing care", etc.)
- 2) Help seeking and offering (e.g. "tend to seek and share help with people already known offline" "be cautious and prepared to take responsibility when communicating with strangers", etc.)
- 3) Information relaying and sharing (e.g. "provide both emotional support and educational platform" "restrict to a knowledge field that the networks preferred" "don't feed the trolls", etc.)
- 4) Decision-making enhancing (e.g. "take stories or applied process that others went through as the reality references" "cross-check goes different ways" "the quality of network sites lies with the quality of users", etc.)
- 5) Self-data exposing (e.g. "tend to post the self-tacking data to those already known" "Step-counting in instant messaging especially WeRun made my self-data passively exposed" "be aware of information safety", etc.)

#### Conclusions

Different patterns of eHealth communication have been discussed, showing that participants' perceptions on "strong ties (person you already know)" and "weak ties (strangers or online-new-friends)" were prominently different. Further study is necessitated to compare the effects of "strong ties" and "weak ties" on health-care. Novel interpersonal communications were found, e.g. self-data-focused long-distance family/friend sharing and health-based new friendship building. This study contributes to clarifying the existing eHealth communication modes, which might provide useful information for constructing relationship-relevant eHealth intervention in the future.





## Are people with a mental health condition interested in changing their physical activity

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#### Disease prevention and management

People with a mental health condition experience a disproportionate burden of chronic disease, and consequently die a median of 10 years earlier than the general population. This is contributed to by a higher likelihood of engaging in modifiable risk behaviours, including inadequate physical activity. The aims of this study were to determine, among a sample of people with a mental health condition, engagement in physical activity and interest in behaviour change.

A cross-sectional telephone survey was undertaken with clients (with a range of psychiatric diagnoses) of community mental health services in NSW, Australia (N=77). Participants were asked to report their engagement in physical activity and sedentary behaviours using the Simple Physical Activity Questionnaire (SIMPAQ). Participants self-reported their interest and confidence in changing their physical activity on a scale of 1 to 10 (10 being the highest), and any attempts to change their physical activity in the last 4 months.

Preliminary findings indicate that the average number of minutes walking per day was 45.70 (SD 82.02); on an average of 3.78 (SD 2.64) days each week. On average, participants reported 11.75 (SD 22.40) minutes of exercise or sport per day on 1.32 days per week (SD: 2.09); with 55.84% of participants reporting no exercise/sport each week. Participants spent an average of 72.83 (SD 112.39) minutes doing other activities (such as gardening or chores) each day. An average of 12.11 (SD 3.49) hours of sedentary time with an additional 50.57 (SD 68.15) minutes spent napping each day was reported. The proportion of participants with high ratings (7+) of interest in changing their physical activity (59.74%) was greater than those with high confidence (42.86%). 61.04% of participants had attempted to change their physical activity.

Although most participants were interested in changing their physical activity and were attempting changes, ratings of confidence to change were low. These results, coupled with the finding that a high proportion were not engaging in any exercise or sport activities, suggests there is need to identify effective, population-level supports to encourage people with a mental health condition in making positive lifestyle changes.





## A mental health informed physical activity intervention delivered online for emergency service workers and their informal carers

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#### e-&mHealth (SIG)

Purpose: In populations at high risk of poor mental health, physical activity (PA) interventions offer a preventative and treatment strategy. Online technologies including social media may be a potential platform for delivering accessible and low-cost group-based physical activity interventions. Emergency service workers (police, fire and ambulance) face a significantly increased risk of experiencing poor mental health, as do the people who care for them including partners, family members and friends. This study therefore aims to determine if an online PA intervention delivered through Facebook is feasible, acceptable and efficacious in improving mental health in emergency service workers and their informal caregivers. The iterative development of this intervention has occurred through collaboration with advisors with lived experience of working within the emergency services, and of living with mental illness.

Methods:The 10-week program was delivered via a private Facebook group and facilitated by an exercise physiologist, a dietitian and peer support members. We provided motivation around different weekly topics (e.g. goal setting and reducing sedentary behaviour) and provided participants with a Fitbit. We examined the feasibility, acceptability and explored the impact on mental health symptoms, sleep quality, quality of life and PA levels. A novel multiple time series design was applied to assess levels of psychological distress, with participants acting as their own control prior to the intervention.

Results: Twenty-four participants (n=12 emergency service personnel and n=12 carers) were recruited and 88% (n=21) completed the program, demonstrating it was feasible and acceptable. Exploratory analyses found significant reductions in psychological distress across the intervention (b = -1.067, p = 0.003). Pre and post analysis showed significant improvements in quality of life (Cohen's d=0.603) and minutes of walking (d=0.549). Changes in perceived social support to exercise and sleep quality were non-significant.

#### Conclusions

Using Facebook to deliver a mental health informed PA program is feasible and yields significant improvements in mental health symptoms and quality of life. An adequately powered trial of n=80 (4 waves of n=20) is subsequently underway.





## Physical activity and sedentary behavior in very old Chinese Singaporeans

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Ageing (SIG)

#### Introduction

In Asia, the proportion of people aged at least 85 years is projected to triple by 2050. Being active and less sedentary comes with various benefits for the very old. However, no population-based physical activity (PA) and sedentary behaviour (SB) research in this age group is available in Asia. Our aim is to describe the patterns of PA and SB in very old Chinese Singaporeans, and to identity factors associated with both behaviors.

#### Methods

As part of the Singapore Chinese Health Study, data from 1,000 older adults ( $\geq$ 85 years) was obtained crosssectionally between 2017 and 2018. Information on domain-specific PA, and SB were collected using the Global Physical Activity Questionnaire. We used descriptive statistics to examine time spent in occupational, transport, leisure and total moderate-to-vigorous PA (MVPA), and SB. We conducted multivariate logistic regression to examine socio-demographic, psychological, social, behavioral, and physical as well as cognitive health-related factors associated with total MVPA and SB. Due to the absence of specific guidelines we used the median-split method do derive our outcomes.

#### Results

The final sample of 963 participants had a mean age of 87.9 years (SD 2.4), and 64.5% were female. Median weekly MVPA was 50 minutes (IQR 0, 150) and active transport accounted for 79.4% of all PA. Only 3.8% of the participants reported vigorous PA. In the fully adjusted model, higher age, female sex, low life satisfaction, staying with others, no social activities, limited alcohol consumption and smoke exposure, more daily SB, lower functional capacity and worse memory were associated with engaging in less than 50 minutes of weekly MVPA. Median daily SB time was 10 hours (IQR 0, 12). Lower age, male sex, not being retired, better psychological wellbeing, not receiving needed help, worse perceived health, and lower functional capacity, were associated with spending more than 10 hours being sedentary per day.

#### Conclusion

About 50% of very old Chinese Singaporeans accumulate less than 50 minutes of weekly MVPA; most of it is moderate and stems from active commutes. Occupational and recreational PA is low. We identified factors associated with PA and SB; these can inform intervention development.





## Exploring associations between commuting time and fruit and vegetables consumption in both 20-minute and non-20-minute neighbourhoods

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#### Policies and environments (SIG)

Purpose: Commuting time is increasing, and people are becoming more time scare. Time scarcity can contribute to poorer health by restricting people from engaging in behaviours essential for good health such as exercising and eating healthy foods. The 20-minute neighbourhood (20MN) concept advocates that neighbourhoods should provide residents with the ability to meet "every day, non-work needs locally, primarily within a 20-minute walk" and is said to encourage healthy and local living. This study assessed the associations between daily commuting time and eating behaviours, comparing residents within the 20MN and outside the 20MN.

Methods: This cross-sectional study conducted across 2018-2019 included 320 residents living in Melbourne and Adelaide. Eating behaviours were examined on two categories: daily fruit consumption and daily vegetable consumption. Commuting time was measured in daily minutes spent travelling from home to work and vice versa. Data were analysed using ANOVA models to assess the associations between commuting time (<30 minutes; 30-59 minutes; 60+ minutes) and fruit and vegetable consumption. Analyses were performed for the whole sample and by 20MN vs non-20MN.

Results: Increased commuting time was linked to a lower daily fruit consumption and lower daily vegetable consumption. Results were similar in both 20MN and non-20MN suggesting that a 20MN did not assist in better dietary behaviours when commuting time was longer.

Conclusions: The results indicate that longer commuting time may be associated with poorer eating patterns. These findings are relevant to both urban planners and researchers exploring the role of time scarcity on health. Further research in this area will provide insight into the understanding of work-life balance and how environmental contexts influence dietary behaviours.





## Assessor perceptions for quality implementation of infant and young child feeding and physical activity in early education and care settings in Australia

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Early care and education (SIG)

#### Purpose

The implementation nutrition and physical activity guidelines within Australian early childhood education and care (ECEC) is integral for the health of children. The quality assessment of services within the Australian National Quality System is undertaken by the Department of Education assessors in line with legislation. Assessors have a unique perspective on monitoring and assessment due to visiting multiple services in their region and collaborating with assessors from other regions.

This study sought to capture the under-explored experiences of assessors for ECEC services in Queensland, to give insight into the implementation of infant and young child nutrition and physical activity within the National Quality Framework.

#### Methods

Five multi-region teleconferences using professional conversations with Assessors (n=10) who assess metropolitan, regional and remote areas were conducted in Queensland, Australia to inform qualitative analysis of data guided by the Framework method and Social Cognitive Theory.

#### Results

Four identified themes emerged using inductive and deductive analysis, guided by Social Cognitive Theory impacting the implementation of nutrition and physical activity guidelines: (1) Supportive Equitable Environments; (2) Efficacy; (3) Working with Parents; and (4) Regulatory Compliance. Important findings included increasing visibility of infants and young children in policies; focussing educator training to build efficacy in infant and young child feeding and physical activity, working with parents and increasing educator efficacy for the assessment process to increase collective agency.

#### Conclusions

This study presents the results of the first Australian study investigating the experiences of assessors who help to implement NQF legislation and uphold quality through assessment and ratings of services. Inclusion of assessors in future studies as key stakeholders will increase best-practice for educators and short- and long-term health outcomes for infants and young children in ECEC settings.





# Youth in action for health: Utilizing a Youth Participatory Action Research/YPAR approach to address food insecurity among ethnically diverse low-income high school students

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#### Policies and environments (SIG)

Background: Food insecurity has been linked to poor adolescent health and negative educational outcomes. The Youth in Action for Health project aims to integrate public health inquiry with a Youth Participatory Action Research (YPAR) approach in an ethnically diverse high school Biomedical Academy in Vallejo, California with the specific aim of addressing adolescent health issues such as food insecurity.

Study Aims: Describe levels of food insecurity among participating students and strategies to increase student's health promotion/advocacy skills.

Methods: A mixed methods approach included administering surveys to 11th grade BioMedical Academy Students (n=76) to assess levels of food insecurity. Questions were adapted from the California Healthy Kids Survey measuring food insecurity using the following proxy variables: access to healthy food at home and school, eating breakfast, and skipped meals due to finances. Other variables measured included perception of school success and primary language spoken at home. Descriptive statistics and contingency table analysis were used to characterize each variable and determine associations. Assessment of the role of Peer Health Promoters (PHP, n=12) included qualitative assessment of focus groups and written responses to open ended questions.

Results: Surveys indicated 41% of students skipped breakfast, and 43% of students sometimes or often skipped meals due to finances. Additionally, 37% and 67% reported not having access to healthy food at home and school, respectively. No significant association was found between food insecurity and school success. However, speaking a language other than English at home was associated with access to healthy food at home (p = 0.009), suggesting the healthy immigrant effect.

PHPs assisted with implementation of 12 interactive health promotion classroom sessions reaching 115 students. Students reported gaining public health knowledge, leadership, and public speaking skills and were able to pass this knowledge on to their peers in a way that was relatable and informational. Resources for healthy and affordable food were shared in classroom settings.

Conclusion: These results highlight a need to develop programs to improve food security at home and schools, especially among ethnically diverse youth. YPAR methods are an innovative approach to engage youth in these efforts.





## e- & mHealth interventions targeting nutrition, physical activity, sedentary behaviour and/or obesity among adults: A scoping review of systematic reviews

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#### e- & mHealth (SIG)

Purpose: The number of systematic reviews evaluating e- & mHealth interventions targeting nutrition, physical activity, sedentary behaviour and/or obesity has increased over time. The focus of the systematic reviews vary (e.g. type of interventions, population groups, technologies used, and outcomes of interest). While there is noticeable overlap between the systematic reviews, there are also potential gaps in the evidence synthesis. Therefore, the aim of this scoping review is to examine the extent, range and methodological quality of systematic reviews undertaken to evaluate e- & mHealth interventions targeting nutrition, physical activity, sedentary behaviour and/or obesity among adults.

Methods: Six electronic databases were searched for systematic reviews of experimental studies published from the year 2000 up to 27th October 2019. For inclusion the systematic review had to evaluate e- & m-Health behavioural interventions for adult populations with the primary aim of improving nutrition, physical activity, sedentary behaviour and/or treating or preventing overweight and obesity. e- & mHealth interventions included those that used websites, computers, e-mail, mobile/smartphones (apps or text messages), digital games, telehealth and/or monitoring devices as a component of the behavioural intervention. Studies were selected for inclusion by two independent reviewers. Data were extracted by one reviewer and checked by a second reviewer, and the quality of the systematic review methodology was assessed by two reviewers using the AMSTAR 2 tool.

Results/findings: Of the 1040 records identified, 298 full text articles were assessed for eligibility and 107 systematic reviews met the inclusion criteria. Data will be presented to summarise the systematic reviews inclusion criteria for participants, interventions, comparators and outcomes, as well as methodological quality.

Conclusions: The scoping review will identify knowledge gaps in the evidence synthesised to date regarding the evaluation of e &-mHealth interventions targeting nutrition, physical activity, sedentary behaviour and/or obesity, and therefore identify potential for future systematic reviews or research. As a secondary outcome, the scoping review will also highlight the strengths and limitations of existing systematic reviews and highlight potential for a systematic reviews.





## Novel methods of analyzing ankle-worn accelerometers in pregnant women

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Physical activity is a key behavior for obesity prevention and treatment, particularly for vulnerable populations such as pregnant women and young children. Physical activity patterns, however, are complex. Characteristics of these activities, such as intensity, duration, variation, and temporality, likely have differential influences on health. Standardized methods to analyze these data, specifically for pregnant women or using ankleworn accelerometers, do not exist. Thus, the overall objective of this project was to use innovative data-based methods for analyzing accelerometer data in pregnant women.

Methods: This study utilized data from the GLOWING study (clinicaltrials.gov identifier: NCT01131117) at the Arkansas Children's Nutrition Center. 224 women (88% white, 96% non-Hispanic) in their first trimester (12 weeks) of pregnancy wore Actical accelerometers (Phillips Respironics, etc) on their ankle for 7 days, 24 hours per day. Demographics, height and weight were assessed using standard methodologies. Body composition of their offspring was assessed at 24 months using quantitative nuclear magnetic resonance (EchoMRI-AH, EchoMRI, Houston, TX). An iterative process will be used to explore the data and associations between activity metrics with mothers' characteristics and children's body composition outcomes.

Results: 208 participants were included with at least 5 days of monitoring. Using the data-based methods, we were able to infer total activity, regularity and quantity of sleep, sedentary time, and the pattern of activity between days to describe activity patterns. This last metric leverages a signal processing method, namely "dynamic time warping," to quantify pattern behaviors in daily routines with values ranging from zero to one; values closer to zero indicate more regular behaviors. Mean total activity counts were 1,343,234 (SD 518,518.1) and total sleep was 7.9 hours per day (SD 2.6). The mean patternicity score was 0.14 (SD 0.08). Early analyses demonstrate the efficacy of these metrics in predicting physical parameters of the mother (i.e. BMI), and analysis of the correlations between these metrics and their children are ongoing.

Conclusions: Building on existing literature in activity recognition with accelerometers, our study introduces additional metrics from ankle-worn accelerometers using these data-based methods. These metrics may be helpful in understanding patterns of activity in pregnant women.





## Exploring the provision of Tai Chi and Qigong in a large Australian city

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#### Policies and environments (SIG)

Purpose: Tai Chi and Qigong are increasingly investigated for their health benefits, particularly among older age groups and those with medical conditions. However, population studies show relatively low participation rates in Western societies. In Australia, participation prevalence is about 0.6% (Vergeer et al., 2017). We know little about why this may be the case. One missing element in understanding participation behaviour is information about the provision of these practices. The purpose of this study was to explore the provision of Tai Chi and Qigong in Melbourne, Australia.

Method: Data were collected via internet searches. We focused on events offered (e.g., classes, workshops) and recorded information about various event features, including type, costs, time, target group, venue, and location. Results were reported using descriptive statistics.

Results: A total of 315 events were found (227 for Tai Chi, 80 for Qigong, 8 for combined offerings), in 105 out of 275 (38.2%) postcode areas. The majority of events were weekly classes (94.9%), with an average duration of 68.0 minutes. Mornings constituted the most common class time. Average class cost was Aus\$12.85 (range Aus\$0-\$35). For the majority of events (76.3%), no target group was mentioned on the webpage. Only 4.4% specifically targeted seniors and 3.5% specifically mentioned health conditions. The most commonly used venues were community centres or halls (34.9%), church halls (14.3%), and martial arts schools (10.0%). There were some differences between Tai Chi and Qigong in venue types used and average class costs.

Conclusions: Despite a large body of research focusing on the health benefits of Tai Chi/Qigong for older people, only a small percentage of offerings were specifically targeted at this age group, and only a small percentage mentioned specific health conditions. This raises the question to what extent the Tai Chi/Qigong teaching community is prepared or equipped for delivering Tai Chi/Qigong to older people and/or those with health conditions. At the same time, mornings being a common class time suggests that many classes cater for people who are free during the day. Participation costs imply a relatively low financial barrier.




# Physical activity motivators and benefits in people living with Cervical Dystonia

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#### Motivation and behavior change (SIG)

Purpose: Dystonia is a poorly understood neurological movement disorder presenting as abnormal postures and uncontrolled movement of a body part or parts. Cervical dystonia (CD) is a dystonia affecting the neck. Research in chronic populations generally indicates physical activity (PA) has benefits for both psychological and physical wellbeing. Little is known about the potential benefits of exercise for those living with CD, and recent evidence indicates most find exercise worsens physical symptoms like tremor, abnormal head posture, pain and fatigue. Despite this, some people with CD do continue to exercise regardless of symptom aggravation; the reasons for this are unknown.

Methods: The study followed a previously published mixed methods protocol to explore PA motivation and benefits in people living with CD who met weekly PA minimum guidelines. Surveys were distributed online. Questionnaires included measures of self-efficacy, self-determined motivation, optimism and pessimism, dystonia severity and quality of life. There were open-ended questions that further explored underlying reasons for PA engagement. Six individuals participated in semi-structured interviews which allowed greater depth of exploration of the research question.

Results: There were 96 (55 male) respondents that met the minimum guidelines for weekly PA. The main findings were that participants attributed feelings of accomplishment and control to their engagement in PA activity despite living with dystonia. The main benefits were enhanced physical and mental well-being, greater control of dystonia symptoms, enhanced life satisfaction and quality of life. Engaging in PA helped individuals to maintain a positive outlook on life.

Conclusions: Physical activity is an important component of self-management in people living with CD who continue to exercise despite symptom aggravation during or after exercise. Engagement in PA and exercise may enhance optimism and life satisfaction as well as improving quality of life. PA as a therapeutic intervention should be utilised by exercise and health professionals managing dystonia. Interventions that aim to increase PA engagement in those with CD who are less active should focus on self-determined motivation and self-efficacy to increase competence for PA, which may in turn, enhance their quality of life.





# Maternal modeling online: Assessing the dynamics of mother/daughter dyads on social networking sites using the actor-partner interdependence model

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### e-&mHealth (SIG)

Purpose: This study aimed to understand the dyadic relationships between social networking site (SNS) behaviors (i.e., use, photo activities, and interaction activities) and self-esteem, body satisfaction, societal and interpersonal aspects of appearance ideals, eating disorder symptoms/concerns, and physical activity behaviors among mothers and their early adolescent daughters.

Methods: The dyad comprised of the mother and the daughter used at least one of the same SNS platforms and had access to each other's account (i.e., each other's friends/ followers, or the mother monitors the daughter's account and the daughter is a friend/follower of the mother). The daughters must have been born within 2003-2007, making their age between 11-14 years in the calendar year that the study was conducted. The dyads completed an online survey that used parallel questioning. Data were analyzed using a pooled regression actor-partner interdependence model for 40 mother/daughter dyads.

Results: SNS behaviors predicted outcome variables for both mothers and daughters individually. In addition, the mothers' overall SNS use predicted daughters' lower self-esteem, lower body satisfaction, higher internalization of beauty standards, and higher eating disorder symptoms/concerns. The mothers' photo activity/exposure was related to daughters' higher internalization of beauty standard, and higher eating disorder symptoms/concerns. Lastly, mothers' SNS interaction activities were related to daughters' higher self-esteem and lower physical activity frequency.

Conclusions: This study suggests that SNS behaviors predict outcome variables for both mothers and daughters individually (actor effects). In addition, maternal modeling exists on SNSs, as a number of relationships where the mothers' predictor variables were associated with the daughters' outcome variables (daughters' partner effects) were statistically significant. Thus, suggesting that mothers need to foster positive SNS behavior, and that greater emphasis should be placed on discouraging negative modeling behaviors online.

The study findings add important literature to the paucity of empirical data that exists on understanding the online mother/daughter relationship.





# Physical activity promotion with smartphone applications and trackers: a systematic review and meta-analysis focusing on behaviour change components

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#### e- & mHealth (SIG)

#### Purpose

The aim of this study was to determine the effectiveness of physical activity interventions involving apps or trackers that provide automated and continuous self-monitoring and feedback.

#### Methods

Systematic review and meta-analysis of randomised controlled trials in adults without chronic illness, testing a mobile app or an activity tracker with automated and continuous self-monitoring and feedback, compared to a group not involving these components. The primary outcome was a physical activity measure (e.g. step count). Eight databases were searched for studies from 2007 to 2020. PRISMA guidelines were followed and screening was conducted by independent researchers. Included studies were assessed using Cochrane's risk of bias tool. Continuous outcomes were pooled using random effects meta-analysis and all effect sizes were transformed into standardised difference in means (SDM).

#### Results

Twelve studies were included in the meta-analysis (n=3010 participants). Average study duration was 15 weeks. All studies included a tracker and 6 also included a smartphone app. Most studies included other technological components, such as a website (n=8), email (n=5), text-messaging (n=2), or an online social network (n=3). The most frequent behaviour change technique (apart from self-monitoring and feedback on behaviour) was goal-setting. Nine studies mentioned a behaviour change theory, most commonly social cognitive theory.

The meta-analysis showed a moderate positive effect on physical activity (SDM 0.345; 95% CI 0.17 to 0.52; I2=67%; T2=0.051), corresponding to 1869 steps/day. Interventions involving behaviour change techniques from the goals and planning group and studies mentioning a behaviour change theory were more effective (p=0.039 and p=0.014, respectively).

#### Conclusions

Apps and trackers with automated and continuous self-monitoring and feedback are effective in promoting physical activity, particularly when based on behaviour change theory or including behaviour change techniques from the goals and planning group. Providing automated self-monitoring and feedback, with goals and planning techniques, and reducing user burden by automating the delivery of additional behaviour change techniques may improve engagement and effectiveness and should be explored in future studies.





# A qualitative, multi-stakeholder analysis of needs, wants, and barriers related to next generation consumer engagement with food: Findings from WeValueFood, a Pan-European project

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Children and families (SIG)

Purpose: Society is becoming increasingly disengaged with the food we consume, which is reflected in poor levels of knowledge about source, supply chain, and nutrition. Next generation consumers (NGC) in particular, that is those from pre-school to university age, demonstrate low engagement with food. The WeValueFood project thus aims to develop and pilot novel food engagement strategies with NGCs. This qualitative study aims to contextualise the current landscape of NGC food engagement as seen from a multi-stakeholder perspective, in order to guide development of novel NGC food engagement strategies.

Methods: A qualitative exploration of needs, wants, barriers and aspirations to NGC food engagement was conducted across Europe (NI, Finland, Spain, Italy, England, Iceland, and Poland). In total, 31 semi-structured interviews, 9 focus groups, and 5 workshops were conducted, capturing 124 individuals, including NGCs, parents, educators, and Agrifood industry. Thematic framework analysis was conducted by QUB to produce a codebook, which European partners then used to conduct content analysis. All data was then consolidated and analysed.

Results: Stakeholders believe NGC interest in food is deteriorating and that NGCs are under many influences, including peers, shifting social norms, and culture. Educators struggle with time and money restrictions, and limited access to resources. Stakeholders believe strategies aiming to engage NGCs with food are important, and topics deemed important include the body and health, and food source/origin. Stakeholders believe strategies should include practical activities (e.g. cooking classes) and school trips (e.g. farm visits).

Conclusions: Stakeholders believe there are key barriers and gaps to be addressed in the development of new NGC food engagement strategies. Findings from this study contextualise the current landscape of NGC food engagement from a multi-stakeholder perspective and will help inform the next steps in the WeValueFood project.





# Relationship of eating behaviours with weight status and body fatness among Malaysian children of different ethnicities

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#### Children and families (SIG)

**Purpose**: Ethnicity and food culture are important factors that influence eating behaviour, which in turn is related to the development of childhood obesity. Thus, this study aimed to determine the eating behaviour of Malaysian children and its association with weight status and body fatness.

**Methods:** A cross-sectional study was conducted among 266 children aged 9-11 years, comprising 92 Malays, 82 Chinese and 92 Indians. Eating behaviour was determined using Children Eating Behavior Questionnaire (CEBQ) as proxy-reported by parents. Four subscales in CEBQ measured food approach behaviours, namely food responsiveness (FR), enjoyment of food (EF), emotional overeating (EOE) and desire to drink (DD). While subscales of satiety responsiveness (SR), slowness in eating (SE), emotional undereating (EUE) and food fussiness (FF) reflected food avoidant behaviours. Children were measured for weight, height and waist circumference (WC), while body fat percentage (%BF) was assessed using bioelectrical impedance technique. Body mass index (BMI) and body mass index-for-age z-score (BAZ) were computed.

**Results:** Approximately one-third of the children were categorized as overweight or obese. Indians who had highest WC and %BF were observed to have significantly lower score in FF subscale; and higher score in SR compared to Malays and Chinese. Overall, food approach subscales (FR, EF, EOE) were positively correlated (r=0.153 to 0.266) while food avoidant subscales (FF, SR, SE) were negatively correlated (range r=-0.164 to -0.259) with BMI, BAZ, and WC (p<0.05). FR, EF and DD subscales were positively correlated (r=0.130, 0.232, 0.134), while SR was negatively correlated (r=-0.151) with %BF. However, among Indian children, there was a negative correlation of DD (r=-0.089) and positive correlation of FR (r=0.085) and EF (r=0.152) with WC. Moreover, EUE was positively correlated with BAZ (r=-0.089) among Indian children.

**Conclusions**: Except for Indian children, eating behaviours, particularly high food enjoyment, low satiety responsiveness and slow in eating were consistently correlated with weight status and body fatness in this Malaysian sample of children. Ethnic differences should be considered when planning strategies to promote healthy eating behaviours among children, which may subsequently benefit childhood obesity prevention efforts.





# Assessment of diet and physical activity among prostate cancer survivors: data from the Health Information National Trends Survey (HINTS)

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#### Cancer prevention and management (SIG)

#### PURPOSE:

Prostate cancer (PCa) is the most common cancer diagnosis in men and the third most common overall. Furthermore, prostate cancer is known to disproportionally affect Black men. Evidence shows that diet and physical activity may play a role in decreasing the risk of PCa progression and improving outcomes. The purpose of this study is to explore lifestyle behaviors of men with and without prostate cancer. Additional comparisons were made between Non-Hispanic Black (NHB) and Non-Hispanic White (NHW) men.

#### METHODS:

Data obtained from the Health Information National Trends and Survey (HINTS), a nationally representative dataset of US adults, were analyzed. Males, 50 years of age and older, without a history of cancer (n = 1963) and with a PCa diagnosis (n = 192) were identified. Respondents reported their height, weight, daily fruit and vegetable intake, physical activity, sedentary behavior, and strength training. Data were weighted to calculate population estimates. Multivariate logistic regression analyses were conducted to examine the independent association of demographic factors with health behaviors.

#### **RESULTS**:

The overall weighted sample was 76.7% NHW, 13.2% NHB, 65.4% post high school education, 39.6 % >\$75,000 annual income, and 55.7% were married or cohabitating, PCa survivors were older compared to men without cancer (p<.0001). Both PCa survivors and men without a history of cancer reported a BMI of 25 or greater, less than 150 minutes of moderate physical activity, less than 2 days of strength training per week, and 6 hours or more of sedentary behavior daily. PCa survivors were more likely to consume at least 1 cup of vegetables daily compared to men without a history of cancer (OR 2.49; 1.25 – 4.95). Among PCa survivors, NHB were younger (p=.000) and consumed less than 1 cup of vegetables daily (63.0% vs. 38.2%),but were less likely to report more than 6 hours of sedentary behavior (OR .064, .004 - .99) compared to NHW men.

#### CONCLUSIONS:

Results suggest PCa survivors do not completely follow recommendations for healthy eating and exercise with some disparities between race. Increased efforts in promoting diet and exercise among PCa survivors is warranted.





# Screen time: pattern and, its association with caregiver practices among preschool children of 3-5 years in Medical Officer of Health area-Kegalle

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Children and families (SIG)

#### Purpose

The time spent sedentary using screen media is defined as screen time. Caregivers play an important role in promoting or limiting the screen viewing behavior of the children.

Aim of this study was to assess the pattern of screen time, association of screen time with caregiver practices among three to five old children in Medical Officer of Health area Kegalle

#### Methods

Community based cross sectional study was conducted among 510 caregivers, selected by two stage cluster sampling method. An interviewer administered questionnaire was used to collect data.

#### Results

Response rate was 91.3% (n=466). Pattern of screen media use among preschool children was almost similar during weekdays and weekends. A significant proportion of preschool children (n=149, 32%, 95% CI [27.9, 36.4]) used the screen devices exceeding international recommendation of one hour per day. Majority (n=362, 75%) used only one or two types of devices. TV (n=381, 85%) was the most common screen devices used by the preschool children. Cartoon was the most commonly watched program.

Imposing rules, on the duration of screen media use (X2=4.60, p=0.032), on the time of the day of screen media use (X2=5.44, p=0.02), on the day of the week of screen media use (X2=7.81, p=0.005), and on the type of programme (X2=3.96, p=0.0481) were associated with children using screen media for more than one hour.

Allowing children to use screen devices during household chores by the caregivers was significantly associated with the screen time of more than one hour (p=0.004). The use of screen media to facilitate feeding of the child (X2=0.71, p=0.398), for soothing of the child during crying, to divert the attention of children during fight with siblings (X2=2.55, p=0.276) were not associated with the screen time of the preschool children.

#### Conclusions

Caregiver practices are associated with children's use of screen media for more than one hour. Awareness need to be raised among caregivers regarding the negative effects of high screen time.





# Attitudes and habits concerning nutrition and physical activity in Croatian students

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Unhealthy nutrition and physical inactivity are leading global public health risks and cause many noncommunicable chronic diseases today. The aim of this study was to determine differences in knowledge, attitudes and habits concerning physical activity and proper nutrition in students of the University Department of Health Studies in Split.

Methods: The subject sample included 228 students of five study programmes of University Undergraduate and Graduate study, aged 18 – 41 years.

The instrument used was the newly-constructed Questionnaire on students' attitudes and habits concerning nutrition and physical activity, with 35 statements assessed on a 5-point Likert scale. The other variables were: sex, age, study programme, body height, body mass, active sports engagement, and place of residence according (town, village). The study was conducted during regular classes in July 2018. The students were informed on the purpose of the study and given necessary instructions. The Ethical Board of the Faculty issued the necessary permit for the conduction of the study, and all subjects gave their written consent for participation.

Results: The study showed with statistical significance that female students followed guidelines concerning proper nutrition and physical activity more than male students, older students had better attitudes and knowledge on proper nutrition and physical activity, but also claimed to have less time for physical activity, i.e., younger students participated more in physical activity. Significant differences were found between students from different study programmes. Significantly the lowest prevalence of smoking was reported by students of Medical Laboratory Diagnostics, Nursing and Radiation Technology, whereas smoking prevalence was the highest among Physiotherapy students. Students of Graduate study and Obstetrics participated least in physical activity, whereas Physiotherapy students participated most. On the other hand, Physiotherapy students were the most sedentary.

Conclusions: Female students have better attitude and follow the guidelines on proper nutrition and physical activity more. Younger students follow the guidelines on proper nutrition less than older students but participate more in physical activity. The differences in habits and attitudes concerning proper nutrition and physical activity were found between different study programmes. Future studies should include all students of University of Split.





Exploring the feasibility and acceptability of data collection and culturallytailored intervention components for type 2 diabetes prevention among UK Arabs

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Other

Purpose: Arab ethnic groups in the UK are at higher risk of developing type 2 diabetes (T2D) compared to the majority population, yet, there is limited culturally-tailored research aimed at reducing health disparities to improve T2D risk. The aim of this study was to explore the feasibility and acceptability of data collection and potential intervention components for a T2D prevention programme targeting Arab ethnic groups.

Methods: The study was underpinned by behavioural change theory and the UK Medical Research Council's guidance on the iterative development of complex interventions. Measures included 24-hour dietary recalls, the International Physical Activity Questionnaire, body mass index, blood pressure and HbA1c. Ten intervention sessions were planned to improve diet and increase physical activity (PA), which included seven gender-specific PA, nutrition and cooking workshops; a health promotion event; and two Friday sermons delivered by local faith-leaders which incorporated messages promoting favourable health-related behaviours. One of the PA sessions, the health event and sermons were delivered in mosques. Sessions were evaluated using questionnaires incorporating Likert scales e.g. on the usefulness of new information, ranging from 1-5 (1=poor; 5=excellent), and qualitative interviews.

Results: Participants included 69 men and women aged 18-62 years who self-identified as being of Arab ethnicity. There was 100% completion of all measures and 0% missing questionnaire data, indicating the measures were feasible and acceptable. The four mosque sessions were successfully delivered; however, low recruitment prevented the delivery of the remaining six sessions that lacked a community-based collaborative element. All sessions evaluated well, e.g. overall, 67% of participants rated the new information three and above on the Likert scales. Qualitative analysis suggested that participants felt they would benefit from Friday sermon components and were inspired following the sessions to make positive changes to their diet and PA.

Conclusions: The measures and faith-based components, such as Friday sermons, were feasible and acceptable and could potentially lead to positive lifestyle modifications. A pilot study is needed to further explore proof of concept, prior to testing effectiveness and sustainability in community settings for UK Arabs.





# Australian evidence on physical activity-promoting built environments and cardiometabolic health: Implications for research and policy

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#### Policies and environments (SIG)

Purpose: Environmental and policy initiatives to influence physical activity for transport and recreation are key elements of chronic disease prevention strategy. However, there is limited knowledge about whether design features to promote physical activity lead to improved health outcomes. To inform policy recommendations and identify research gaps, we examined Australian evidence assessing associations between cardiometabolic health indicators with activity-promoting neighbourhood built environment attributes, including urban green space.

Methods: Database searches identified Australian peer-reviewed studies published since 2000 that assessed associations of built environment attributes hypothesised to promote physical activity (density, distance to amenities/services, land use diversity, route characteristics, walkability) and/or attributes of green space with at least one cardiometabolic health marker (adiposity, diabetes, cardiovascular, blood pressure, cholesterol). The strength of the evidence was assessed using a weighted Z-test meta-analysis method incorporating study methodological quality.

Results: Twenty-four studies (137 exposure-outcome associations; n=380,293 participants) were included. The majority of studies (14/24) were cross-sectional and eleven were judged low quality. Obesity-related outcomes were commonly examined (17 studies); the most common exposures were public open space (11 studies) and walkability (10 studies). Meta-analyses found strong evidence for associations of higher walkability with lower risk of obesity (p=0.001) and type 2 diabetes (p=0.008). There was strong evidence for the association of greater population density with lower risk of obesity (p=0.001). No evidence was found for associations of public green/open space attributes, route attributes or destination accessibility with cardiometabolic health outcomes.

Conclusions: The findings suggest that living in more walkable and dense areas has the potential to be protective against obesity and diabetes risk in the Australian context. To improve the evidence base, opportunities for future Australia research include assessing the health effects of urban sprawl and access to public transport; and examining associations between built environment attributes with a broader range of cardiometabolic health indicators. Longitudinal studies and natural experiments may also assist with providing stronger evidence-based recommendations for urban design initiatives to improve population health.





# Psychometric properties of the Chinese version of weight related eating behavior questionnaire (WREQ)

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

#### Purpose

Psychological aspects of eating behavior, such as external eating, emotional eating and dietary restraint are posited to be associated with overeating and obesity. However, no appropriate instrument was available for Chinese populations. This study aimed to translate and transculturally adapt a weight-related eating questionnaire (WREQ-C) for assessing the psychological aspects of eating behaviour in Chinese adults and evaluate its psychometric properties.

#### Methods

The WREQ is a 16-item self-reported instrument that measures external eating, emotional eating, routine restraint and compensatory restraint. It was translated, adapted, and administered to 970 Chinese adults (mean age 32.2, SD 13.4) as an online survey. The structural validity was examined using confirmatory factor analysis and internal consistency was assessed at subscale levels by Cronbach's  $\alpha$  coefficient. The Dutch Eating Behaviour Questionnaire (DEBQ) was used as a reference standard for convergent validity. Test-retest reliability was done at a 2-week interval (n=30). Linear regression was used to examine the associations of the WREQ-C subscale scores with body mass index (BMI) and gender.

#### Results

The proposed 4-factor structure for the WREQ was appropriate for the Chinese population (CFI=0.96, SRMR=0.04 and RMSEA=0.06) and demonstrated satisfactory internal consistency of 0.75 for routine restraint, 0.78 for compensatory restraint, 0.78 for external eating and 0.90 for emotional eating. The correlation between the corresponding WREQ-C subscales and DEBQ ranged from 0.63 to 0.81 (P<0.001). The WREQ demonstrated moderate to good test-retest reliability with intraclass correlations of 0.76 to 0.89 (P<0.001). Females reported higher scores of dietary restraint, emotional eating and external eating than male (P<0.05). Routine restraint ( $\beta$ =0.13, P=0.004), external eating ( $\beta$ =0.12, P<0.001) and emotional eating ( $\beta$ =0.12, P<0.001) scores were positively associated with the BMI whereas compensatory restraint score ( $\beta$ =-0.09, P=0.03) was negatively associated with BMI.

#### Conclusion

The 16-item WREQ-C demonstrated to be a reliable and valid measure for assessing external eating, emotional eating, routine restraint and compensatory restraint in Chinese adults.





# Self-report and accelerometer-based sedentary behaviors are not associated with cardiorespiratory fitness and obesity outcomes in Chinese adolescents

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Policies and environments (SIG)

#### Background:

The evidence on the relationship of sedentary behavior (SB) with cardiorespiratory fitness (CRF) and obesity remains inconsistent in children and adolescents. The purpose of this study was to examine the associations of both accelerometry-assessed total SB time and self-report TV watching and homework time with CRF and obesity independent of PA in Chinese middle school students.

#### Method:

ActiGraph accelerometers were worn on the right hip for seven consecutive days to measure SB and PA. Data was included if an accelerometer was worn 10 hours or longer a day and at least four days including one weekend day. SB was also measured using the participant recalls of hours they spent on TV and homework in the past seven days. Obesity was assessed by percent body fat (%BF) using a bioelectrical impedance analyzer. CRF was assessed by the 20-meter shuttle run. Multiple linear regression was performed to test whether the SB were associated with CRF and BF% independent of PA. Models were adjusted for age, sex, city, pubertal status, family income, parent education, LPA and MVPA.

#### Results:

Data collected from 198 middle school students was analyzed ( $12.61\pm0.59$ yrs, %female=55.6). The average SB was  $65.04\pm13.91$  hours per week as measured by accelerometers. Time spent on TV and homework during the past seven days were  $3.75\pm3.64$  hours and  $16.32\pm7.58$  hours, respectively. Accelerometry-measured SB was not associated with BF% (p=0.171) or CRF (p=0.406) after controlling for PA and other covariates. Similarly self-report TV time was not related to BF% (p=0.565) and CRF (p=0.122) and self-report homework time was not associated with BF% (p=0.634) and CRF (p=0.244). However, accelerometry-measured MVPA was inversely associated with BF% ( $\beta$ =-0.013, p=0.009) and CRF ( $\beta$ =0.102, p<0.001), after adjusting for accelerometry-measured SB time.

#### Conclusion:

These findings indicate that SB measured by accelerometry and self-reports were not independently associated with BF% and CRF in Chinese adolescents. Conversely, MVPA predicted obesity and CRF.





# Adolescents' awareness of their physical activity level: a comparison of meeting physical activity guidelines using self-report versus device-based measurements

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Physical activity is a multi-dimensional behaviour that takes place in a variety of domains, which makes evaluating one's own physical activity level challenging. A lack of awareness of one's own physical activity level has been related to adolescents not seeing the need to change and hence being unaffected by public health messages promoting physical activity. Therefore, the aim of this study was to compare adolescents' self-reported and sensorbased assessment of physical activity.

Methods: In a sample of 423 adolescents (270 females; aged  $15.03 \pm 1.43$ ) from the Built Environment and Active Transport to School (BEATS) and BEATS Rural Studies, physical activity was assessed using both self-report (using a validated single survey item) and accelerometer measurements (7 days accelerometry; wear time  $\geq 5$  day for  $\geq 10$  hours/day). Participants were classified into four profiles based on meeting or not meeting physical activity guidelines using self-report and device-measured physical activity: 'Realistic Active' (n=43; 10.2%), 'Realistic Inactive' (n=233; 55.1%), 'Over-estimator' (n=40; 9.5%), and 'Under-estimator' (n=107; 25.3%).

Results: No significant differences existed for age, ethnicity, neighbourhood deprivation score, and weight status among the four profiles. However, there was a higher proportion of males in the 'Realistic Active' profile compared to other profiles. Self-perceived health was different across profiles. Adolescents in the 'over-estimator' and 'realist active' profiles reported significantly higher self-perceived health status compared to the other two groups (p<0.001)"Under-estimator" and "realistic inactive" profiles had lower proportions of adolescents participating in sports at school and outside school compared to the other profiles. The "Realistic-active" profile had the highest proportion of adolescents meeting recommended screen time guidelines. Although not significant, the "under-estimator" profile had the highest proportion of adolescents reporting active transport to school.

Conclusions: The majority of adolescents in the BEATS Studies were accurate in their self-reported physical activity. However, 10% over reported and 25% underreported their physical activity relative to sensor-based assessment. This may be due to misperceptions about the role of active transportation and sport as sources of physical activity. Thus, more and better examples of various sources of physical activity should be provided on self-report measures.





# Integrated motivational interviewing and cognitive behaviour therapy elicits physical activity change and improves health of adult ambulatory care patients in a regional hospital: the Healthy4U-2 randomised controlled trial

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#### Motivation and behavior change (SIG)

Purpose: Insufficient physical activity (PA) is associated with an increased risk of chronic disease. Almost 40% of preventable hospital episodes are attributable to chronic disease. Despite this, behavioral interventions for increasing self-management of PA in the hospital setting remain underutilised. Hospital surgeons undertake high volumes of non-admitted consultations annually and have potential to influence behaviour change amongst patients. This study empowered hospital surgeons to refer suitable participants to a behaviour change intervention. This study aimed to examine the effectiveness of a twelve-week, behaviour change intervention for changes in PA and health-related outcomes in adults presenting to a non-admitted hospital clinic.

Methods: A randomized controlled trial was conducted where 120 insufficiently physically active adults were referred to the study by surgeons consulting at an ambulatory hospital clinic. Participants were randomised to an intervention group that received an education session and five 20-min telephone sessions of integrated motivational interviewing and cognitive behaviour therapy (MI-CBT), or to a control group that received the education session only. ActiGraph GT3X accelerometers were used to measure moderate-to-vigorous physical activity (MVPA) at baseline and follow-up (3-months). Secondary outcome measures (anthropometrics and PA self-efficacy) were also assessed at both time-points.

Results: At baseline, the mean age and MVPA of participants (n=120, 76% females) were  $53 \pm 8$  years and  $15 \pm 5$  min/day respectively. Mixed model ANOVA demonstrated the treatment allocation influenced the pattern of PA over time (p<0.001). At follow-up, the intervention group averaged 23 min/day of MVPA, a mean difference of 8 min/day (95%CI:5 to 11 min/day) relative to baseline. The control group averaged 13 min/day at follow-up, an average decrease of 2 min/day (95%CI: -3 to 0 min/day) over the period. Significant changes were also observed in mass (p<0.001), waist circumference (p=0.027), body mass index (p<0.001) and PA self-efficacy (p<0.001) in the intervention group. No changes were observed in these parameters amongst the controls.

Conclusions: The behaviour change intervention resulted in beneficial changes in PA, anthropometrics and healthrelated outcomes in insufficiently active participants recruited from ambulatory hospital clinics. The effectiveness of the intervention to maintain the changes out to 9-months will be examined.





# Improving executive function: Does the intensity of a single bout of aerobic exercise matter?

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Othei

Purpose: Prior work has demonstrated a single bout of aerobic exercise of moderate-to-vigorous intensity confers benefits to executive functions (EFs). The purpose of this study was to determine whether aerobic exercise-driven improvements to EFs are present at very light and/or light intensities via a hands-, language-, and numerosity- free oculomotor task which is highly sensitive to subtle changes to EFs.

Methods: A cross-over counterbalanced design was employed to assess EF benefits. A cardiorespiratory fitness assessment on a cycle ergometer (VO2 max) was implemented to ascertain lactate threshold (LT). Following the VO2 max test, participant's very light (0% LT), light (40% LT), and moderate (80% LT) were tabulated. Participants performed a 10-min single bout of very light-to-moderate intensity aerobic exercise (i.e., via a cycle ergometer) and pre- and post-exercise control was examined via the antisaccade task (i.e., goal-directed eye movement mirror-symmetrical to a visual stimulus). Antisaccades are mediated via the same frontoparietal circuitry that show task-dependent changes in activity following single bout and chronic exercise and are therefore an ideal tool for examining post-exercise executive changes.

Results: There was a 24 millisecond (ms) and 14 ms reaction time (RT) reduction in pre- to post-exercise antisaccade RTs for moderate (p<0.000, d=2.819) and light (p<0.000, d=0.824) intensity, respectively. In contrast, no such difference was seen for very light intensity (p=0.381, d=0.352).

Conclusions: Accordingly, we propose that a single bout of acute aerobic exercise improves executive control and is a finding we attribute to an exercise-induced neuronal efficiency within the frontoparietal networks supporting antisaccades. Furthermore, we propose that the benefits conferred to EFs are dependent on exercise intensity—present at both moderate and light intensity but not at very light intensity.





# University staff sitting time during working hours

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<sup>1</sup>Meisei University, Tokyo, Japan

#### Other

#### Purpose:

Recently, awareness of health disorders caused by prolonged sitting has been increasing. It has been pointed out that prolonged sitting is closely related to the risk of death from cardiovascular diseases and is a risk factor for obesity and various metabolic diseases. In this study, we measured the physical activity of the staff of the university and were intended to clarify those current situations.

#### Methods:

Seventeen university employees were recruited as subjects, and physical activity during work was measured for two weeks (10days) using an accelerometer (Lifecorder Suzuken Co.). The physical activity intensities 0 and 0.5 that can be measured by an accelerometer were defined as the physical activity intensity of the sedentary behavior, and their continuous hours were defined as the continuous hours of the sedentary behavior.

#### Results/findings:

The average working time was  $570.4\pm88.3$  minutes per day. The average continuous sitting time was  $11.5\pm3.9$  min. The continuous sitting time for one sitting was not long, but the total sitting time in the working hours per day was  $67\pm8\%$ . Previous studies show that adults spend for sitting 55-60% of their time per each day. The results of this study indicate that the percentage of sitting behavior in working hours during the day was greater than in previous studies.

#### Conclusions:

The university staff took up sitting time for about 70% during working hours, and it was clear that they sat for 6 hours 30 minutes per day while working. In the future, it is necessary to consider the characteristics of the department to which they belong and consider ideas for reducing sitting behavior.





# Dimensions of hardship, parent stress, and child diet: Early life indicators of risk

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#### Socio-economic inequalities (SIG)

Background: Parenting stress is a known contributor to child nutritional risk. Low-resourced families are likely to experience various material hardships that may increase stress around parenting. Yet, links between material hardship and nutritional risk, and how different dimensions of material hardship may increase parenting stress and child nutritional risk are largely unknown.

Methods: Data were collected from the Fragile Families and Child Wellbeing Study from mothers and children (n = 4,898) in 20 US cities followed from birth through age 9 years. Material hardship was measured (8 items) when children were 5-years-old. Mothers self-reported parenting stress and child consumption of saturated fats and added sugars (SoFAS; sweets, chips, soda) when children were 5 and 9 years-old. Structural equation modeling tested factor structures of material hardship, direct associations between each hardship factor and SoFAS consumption, and parenting stress as a mediator of the association.

Findings: Exploratory factor analysis showed two underlying factors of material hardship: basic needs and housing hardships. Housing hardships were associated with increased consumption of sweets and chips at age 5, and basic needs hardships were associated with increased consumption of sweets and soda at age 9. Each hardship factor operated through parent stress, which in turn predicted higher SoFAS consumption.

Discussion: Implications support the need for future research to address stressors of deprivation that move beyond simplistic measures of income poverty to include specific dimensions of hardship. This work will help advance our understanding of how to promote healthy child diet and prevent long-term chronic disease.





# Children's perspectives on physical activity: A qualitative synthesis

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Children and families (SIG)

#### Purpose

There have been many efforts to increase UK primary school children's physical activity, but they have largely been ineffective. One reason for this could be that children's perspectives are rarely considered during intervention design. With a view to informing future interventions, this review aimed to consolidate what is currently known regarding UK children's perspectives on physical activity.

#### Methods

An online search of seven databases (CINAHL, EThOS, IBSS, Medline, PsychInfo, Scopus and Web of Science) was conducted to identify relevant articles published between January 2004 and October 2019. Reference lists of reviews were hand searched, and the authors of key papers were contacted. Two independent reviewers performed title, abstract and full-text screening, data extraction and quality appraisal. Papers were included if they reported physical activity related qualitative data from children aged between 5-11 years living in the UK. Studies involving children from a broader age range were included if quotes were age labelled. Data were coded in NVivo and analysed using thematic synthesis.

#### Results

Of 19,610 articles identified, 20 were included in the final review. 13 studies were concerned with general physical activity, 3 focused on physical education, 2 on sport, 1 on active travel and 1 on active play. Children reported being active with friends and family and in a variety of locations (e.g., outdoors, at parks and at school). Children felt physical activity engagement was important due to learning and skills development and the improvement and maintenance of health and fitness. Across studies, several themes associated with physical activity engagement were identified, including enjoyment and fun, perceptions of safety, availability and suitability of equipment and activities, and the social environment created by friends, family, teachers, and coaches. Across all contexts, child-led activities were favourable.

#### Conclusions

This is the first qualitative synthesis of children's perspectives on physical activity. The available studies highlight several psychological, social and environmental factors that children consistently identify as related to their physical activity. Future strategies to increase children's physical activity should involve children in designing and developing intervention components to ensure that activities are appealing, fun and age appropriate.





# Association between socio-economic status and physical activity among children and adolescents in China

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#### Socio-economic inequalities (SIG)

Purpose: To understand the physical activities of children and adolescents in China and their socio-economic status; to explore the correlation between different socio-economic indicators and the physical activity of children and adolescents, and to investigate the impact of socio-economic status on the physical activity among children and adolescents.

Method: A total of 2486 students (average age 12.2±2.3, male 49.5%) in Anhuiprovince, Jiangsu province and Shanghaiwere investigated by questionnaire. Using descriptive statistics to analyze the survey participants' physical activities and socioeconomic status, and using chi-square tests to compare the differences in variables between different genders, school segments and regional groups; Pearman correlation analysis analyzed the relationship between socioeconomic status and the number of Moderate-to-Vigorous Physical Activity(MVPA) days for children, adolescents; and further analyzed the impact of socioeconomic status on MVPA for children, adolescents with binary logistic regression.

Result: In general, 11.0% of children and adolescents achieved MVPA for 7 days (boys' rate is 13.9%, girls' rate is 8.4%), and the rate of reaching MVPA recommendation on weekends is 26.0% (boys' rate is 30.7%, girls' rate is 21.5%). Parental education, self-assessment Socio-economic Status (SES) and Family Affluence Scale(FAS) were positively correlated with physical activity of children and adolescents (p<0.05), and had significant effects on physical activity of children and adolescents. For different genders, parental education and FAS are positively related to physical activity of boys and have a significant effect (p<0.05); parental education, self-assessment SES and FAS are positively related to physical activity of girls and have a significant effect (p<0.05).

Conclusion: (1) China's children and adolescents are not optimistic about reaching the recommended level of MVPA. (2) The overall socio-economic status is relatively low; the socio-economic status of boys' families is better than that of girls. (3) Socio-economic status has a significant impact on the physical activity of children and adolescents. (4) The influence of different socio-economic status indicators on the physical activity of children and adolescents varies by gender, school segment and region.





# HeartAge-HOPE (Healthy Living with Online suPport and Education): Design and content development of an intervention to support heart-healthy lifestyle behaviour change

<u>Other Artur Direito<sup>1</sup></u>, Associate Professor Robert Nolan<sup>2</sup>, Prof. E Shyong Tai<sup>1</sup> <sup>1</sup>National University of Singapore, Singapore, Singapore, <sup>2</sup>University of Toronto, Toronto, Canada

Disease prevention and management

#### Purpose:

Cardiovascular disease (CVD) is a global leading cause of mortality and disease burden. Despite the abundance of information on CVD risk factors and CVD risk calculators, most have modest understandability and lack provision of actionable information. There is a need to increase the understandability and actionability of CVD preventative interventions to improve their usefulness to individuals and augment the adoption of healthier lifestyles at population level. Here we describe the design and development of an evidence and theory-based digital health CVD preventative behaviour change intervention.

#### Methods:

Singapore HeartAge is an online screening tool adapted to the Singapore population to communicate CVD risk. A HeartAge score higher than chronological age will refer individuals to HOPE, a digital e-counselling platform aimed at supporting individuals adopting and maintaining heart-healthy lifestyle behaviours. HOPE (Healthy Living with Online suPport and Education) is a motivational interviewing- and cognitive behavioural therapy-based intervention to provide content tailored to individuals' CVD risk factors, readiness to change, and motivation level. It builds upon evidence and know-how of prior trials – REACH, CHF-CePPORT – and its design is guided by the Behaviour Change Wheel intervention development framework and component diagnostic tool COM-B.

#### Results:

Preliminary work established the feasibility of HeartAge for risk communication. The design and technical implementation of HOPE is ongoing. HOPE will be delivered over 24 weekly modules, each consisting of text-based content (e.g. self-help tips), interactive tools (e.g. linking a behaviour change goal to a salient personal priority), VideoScribe didactic animations, and a dramatic / immersive (i.e. 10 scripted episodes with fictional characters aimed at modelling, validating and reinforcing individuals' active role in lifestyle change), unscripted peer-discussions, or expert (e.g. nutritionist, physician) video.

#### Conclusions:

HOPE will be a comprehensive intervention targeting modifiable cardiovascular risk factors, including diet, physical activity, sedentary behaviour, stress management, medication adherence, and smoking. It will be a fully automated semipersonalised web-based intervention for cardiovascular disease prevention. Content for each individual will be selected via a predefined algorithm / schedule for 24 weeks dependent on baseline risk factor assessment (HeartAge) and characteristics (e.g. readiness to change).





# Test-retest reliability and criterion validity of self-report measures of workplace sitting time accumulation

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Many office workers sit at work for long uninterrupted periods, which confers health risks. Unlike for amount of workplace sitting time, few self-report measures regarding workers' sitting time accumulation at work have been evaluated. This study assessed the test-retest reliability and criterion validity of five self-report measures that may be suitable for this purpose.

Methods: Office workers (n=35, mean age=44 [SD=12] years, 79% female) completed an online questionnaire, both before and immediately after wearing the activPAL3TM for 7 days (24-h protocol, diary-reported work hours). They reported typical behaviour at work in the past week: percentage of sitting time accumulated in >/=30 minutes bouts (prolonged sitting %); number of breaks per hour of sitting (n breaks); longest period of sitting (longest bout sitting); number of different strategies used to breakup sitting time (n strategies); and, frequency of all strategies used per day (nx strategies). Correlations (Spearman's rho) were assessed for test-retest reliability and criterion validity, relative to the same measures derived from the activPAL3TM when possible, otherwise activPAL3TM work sitting upright transitions/h sitting which was criterion for n strategies and nx strategies. Absolute agreement was also tested when applicable.

Results: Test-retest correlations were acceptable for prolonged sitting % (rho=0.65, 95% CI=0.40-0.81), n strategies (rho=0.71, 0.49-0.84), nx strategies (rho=0.65, 0.40-0.81) and longest bout sitting (rho=0.43, 0.11-0.67) but not n breaks (rho=0.12, -0.23-0.44). Mean differences ranged from 1% to 14% of the initial test value. Validity correlations were strongest for prolonged sitting % (rho=0.58, 0.31-0.77) followed by n breaks and nx strategies (rho=0.44, 0.13-0.67 and rho=0.36, 0.03-0.62) and weaker and non-significant for longest bout sitting (rho=0.31, -0.03-0.58) and n strategies (rho=0.24, -0.10-0.53). Mean differences ranged from 13% to 52% of the activPAL3TM value.

Conclusions: Self-report sitting time accumulation measures had poor to acceptable test-retest reliability and criterion validity. Prolonged sitting % performed best overall and performed similarly to commonly used measures of workplace sitting time. This single-item question may be an appropriate option for workplace studies that cannot use monitoring.





# Follow-up of physical activity during pregnancy et after delivery in obese women

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Motivation and behavior change (SIG)

#### Purpose:

The purpose of this study was to follow patterns of physical activity (PA) associated in obese pregnant women and after delivery.

#### Methods:

This randomized study was conducted in obese pregnant women. Physical activity was measured using an accelerometer (The Actigraph, GT9X, Pensacola, FL, USA) during 1 week, between the 20 and 24th week of amenorrhea (T0), then between the 32 and the 34th week of amenorrhea (T1), and finally postpartum, between the 6th and the 8th week after birth (T2). A two level (time, subject) multilevel analysis was used. With time as a categorical variable, the development over time on sedentary (SED), light PA (LPA) and moderate to vigorous PA (MVPA) were modelled. Potential confounding variables were added to the model as they may influence PA.

#### **Results/findings**:

145 women participated to the experimentation. Table 1 shows SED, LPA and MVPA at T1 and the T2 follow-up measures. A significant decline was found for MVPA until postpartum. However, BMI (body mass index) and age were not significant predictors for more or less LPA and MVPA during pregnancy and postpartum.

|  | %SED         |               |    | %LPA         |                |    | %MVPA          |                |    |
|--|--------------|---------------|----|--------------|----------------|----|----------------|----------------|----|
|  | β (SE)       | 95%CI         | р  | β (SE)       | 95%CI          | р  | β (SE)         | 95%CI          | р  |
| Baseline PA  | 0.59 (0.05)  | 0.46 to 0.72  | ** | 0.61 (0.05)  | 0.48 to 0.74   | ** | 0.66 (0.04)    | 0.56 to 0.76   | ** |
| T1   | 1.89 (0.72)  | 0.03 to 3.75  | ** | -1.36 (0.69) | -2.70 to -0.02 | *  | -0.58 (0.15)   | -0.97 to -0.19 | ** |
| T2   | -0.62 (0.80) | -2.19 to 0.95 | ns | 1.56 (0.77)  | 0.05 to 3,07   | *  | -0.60 (0.17)   | -1.04 to -0.16 | ** |
| Age  | -0.01 (0.07) | -0.15 to 0.13 | ns | -0.01 (0.06) | -0.13 to 0.11  | ns | -0.002 (0.014) | -0.03 to 0.03  | ns |
| BMI  | 0.10 (0.07)  | 0.04 to 0.24  | *  | -0.10 (0.06) | -0.22 to 0.02  | ns | -0.006 (0.013) | -0.03 to 0.02  | ns |
| *· significant different at n<0.05· *· significant different at n<0.01 |              |               |    |              |                |    |                |                |    |

**Table 1:** Average change in physical activity levels and sedentary (%) across T1 and T2 in pregnant obese women

#### **Conclusions:**

Physical activity of women who were most active at the beginning of their pregnancy maintained their activity level better than those who were less active. This study reveals the importance of emphasizing physical activity to obese women before pregnancy.





# Do changes in the local food environment within new residential developments influence the diets of residents? Longitudinal results from RESIDE

<u>Ms. Alexia Bivoltsis</u><sup>1</sup>, Dr. Gina Trapp<sup>1, 2</sup>, Prof. Matthew Knuiman<sup>1</sup>, Dr. Paula Hooper<sup>1</sup>, Dr. Gina Ambrosini<sup>3</sup> <sup>1</sup>The University of Western Australia, Perth, Australia, <sup>2</sup>Telethon Kids Institute, Perth, Australia, <sup>3</sup>Department of Health, Perth, Australia

Policies and environments (SIG)

Introduction: There is a lack of clear evidence for a link between spatial exposure to the local food environment and diet, with most research being cross-sectional with mixed findings. Stronger evidence, from longitudinal studies, linking changes in the local food environment with changes in dietary outcomes is needed to inform urban design policies and planning regulations.

Objective: To examine how longitudinal changes in the local food environment within new suburban, residential developments influence changes in dietary intake, and to investigate the mediating effects of individual perceptions and behaviours on the relationship between the local food environment and dietary intake. Setting: Adults in Perth, Western Australia from the RESIDential Environments (RESIDE) Project (2004-2012).

Design: Self-reported data on socio-demographics, usual dietary intake, individual behaviours and perceptions of the local food environment were sourced from RESIDE at three time points (2004-2005, 2006-2007, 2011-2012). Spatial food environment exposure measures were generated relative to each participant's home address using the locations of food outlets at temporally matched time points. Changes in spatial exposure measures, individual behaviours and perceptions with changes in dietary outcomes were examined using fixed-effects, generalised linear models (n = 3,223 person-observations).

Results: An increase in the percentage of healthy food outlets around the home was significantly associated with an increase in healthy diet scores ( $\beta$  = 0.003; 95% CI 0.000, 0.006) and an increase in the distance from home to the nearest café or restaurant was significantly associated with an increase in diet quality scores ( $\beta$  = 0.243; 95% CI 0.006, 0.480). There was little evidence that individual behaviours mediated the relationship between spatial exposure to the local food environment and diet.

Conclusions: Policy and planning may influence dietary intakes by increasing the relative percentage of healthy food outlets around the home.





# Perceived and objective local food environment related to fruit and vegetable intakes among low-income older adults living in an urban area of Korea

<u>Miss Dongeun Lee<sup>1</sup></u>, Miss Narae Yang<sup>1</sup>, Miss Siyeong Yoo<sup>1</sup>, Miss Yeyeon Lee<sup>1</sup>, Prof. Kirang Kim<sup>1</sup> <sup>1</sup>Dankook University, Cheonan, South Korea

#### Policies and environments (SIG)

Purpose: Limited attention has been paid to relationship of local food environments with fruit and vegetable (FV) intakes in older adults with low income. The objective of this study was to identify how food environmental factors were related to FV intakes in low-income older adults residing in an urban area.

Methods: A cross-sectional study was conducted in 96 older adults aged 65 years or over residing in Seoul city. The perceived food environment factors were measured by face-to-face interviews, including food availability, accessibility, affordability, acceptability, accommodation. Geocoding of participants' homes and food stores was used to objectively assess food accessibility. The FV intakes were assessed by 24-hour dietary recall and food frequency questionnaires.

Results/findings: The mean intakes of FV were 73.8g/d and 296.6g/d and the proportion of older adults with less than 1 serving/d was 54.2% for fruits and 39.6% for vegetables. The perceived food environmental factors were not significantly related to fruit intakes but related to frequency of vegetable intakes. The median distances to fresh FV were 1.31km and the long distance was not related to fruit intakes but positively related to high vegetable intakes (p=0.016) which was unexpected findings. After adjusting for confounding factors, GIS-based accessibility measure was not related to FV intakes but perceived low food affordability was related to low intakes of vegetables (OR=10.8, 95% CI=1.6-73.4) and perceived low food accessibility was related to high intakes of vegetables (OR=0.1, 95% CI=0.01-0.4).Urban older adults with perceived low food accessibility generally purchased vegetables in traditional markets (88.2%) away from their home rather than food stores (11.8%) close to home (p-value=0.004).

Conclusions: The perceived low food affordability measure had a significant and greater effect on low vegetable intakes than geographical accessibility measure for low-income older adults in urban areas of Korea. Further studies using more representative samples are required to build an evidence regarding the appropriateness and robustness of food environment measures related to healthy food intakes under different local circumstances.





# Assessing the impact of active workstations on user experience and cognition: A pilot study

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#### Implementation and scalability (SIG)

Purpose: One of the most commonly reported barriers to physical activity (PA) is perceived lack of time. This barrier can be overcome if individuals are able to be active while doing tasks they would otherwise have done while sedentary. One way to achieve this aim is by using activity-permissive workstations (APWs) such as treadmill desks and cycle desks, which enable users to move and work simultaneously. Our aim in this multi-study series is to fill gaps in understanding how different forms of low-intensity PA (i.e., walking, easy cycling) affect health and cognitive performance tasks that are of interest to a wide-range of institutions. Documenting previously untested work-related enhancements from low-intensity activity could encourage workplaces to adopt active workstations, leading to significant public health benefits. In order to assess scalability, the first phase of this pilot study was investigating participant reactions toward APWs.

Methods: This experiment utilized a between-subjects design to assess reactions to different workstations. Participants were randomly assigned to one of three experimental conditions (i.e. treadmill desk [n = 9], cycle desk [n = 15], or seated desk [n = 20]). At each of the three workstations, participants completed a cognitive battery as well as a survey of their experiences using their assigned workstation.

Results: Forty-four participants (57% female; mean age 19.8 years) completed the user-experience survey. Participants responded favorably to both types of APWs, with stronger preferences for the treadmill over the cycle; 84% of treadmill users felt the workstation was enjoyable (73% for cycle), while 89% of treadmill users said the workstation was comfortable (73% of cycle). 67% of participants said they would use the treadmill workstation if it was available to them (40% for cycle).

Conclusions: Phase 1 results demonstrate that there is enough interest and enjoyment when using APWs, particularly treadmills, to warrant further investigation into the physiological, psychological, and cognitive impacts of these workstations. In the next phase of this project, we will address gaps in understanding of the impact of APWs on measure of cognition.





# Physical activity of Malaysian 4-year-old children and its relationship with parents' electronic screen use patterns

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

#### Purpose

This cross-sectional study aimed to assess objectively-measured physical activity of 4-year-old preschool children in Malaysia and its relationships to parents` electronic screen use patterns.

#### Methods

A total of 82 four-year-old children (mean age  $4.3 \pm 0.4$  years) from 24 kindergartens in Kuala Lumpur, Selangor and Negeri Sembilan states in Malaysia participated in this study. Smartphone use was examined using a parent questionnaire which included eight questions on the frequency of using electronic screen device or smartphone by parents during times with children. Physical activity was measured using Actigraph GT3X+ accelerometer worn from Monday to Friday at the right hip of children. Children were required to have at least one 24-hour period of wear time for inclusion in the data analysis.

#### Results

Children spent an average of  $160.4 \pm 53.8$  minutes daily in physical activity, with the boys being significantly more active ( $173.2 \pm 57.6$  minutes) than the girls ( $147.5 \pm 47$  minutes). More than half (57.3%) of the children achieved moderate- to vigorous-intensity physical activity recommendation of at least 60 minutes or more per day. More than one-third of the parents reported that they used an electronic media device to calm down their children (35%) and to keep their children busy while they get things done (34%) on most days or every day. Most parents (34-39%) reported using a smartphone (to make calls, text messages, check email, watch a video) on most days or every day during meals, playtime and walks with their children. Smartphone was 'never' used during bedtime routine and travel time with children by 41% and 42% of the parents, respectively. There was no relationship between frequency of screen use with the amount of time children spent in light, moderate or vigorous physical activity.

#### Conclusions

Despite high reported frequency of screen use, parents' screen use was not correlated with physical activity of this sample of preschool children. Future studies should examine peer influence and school environment as other potential determinants of physical activity among preschool children.





# Busier parents are more likely to eat fast food: findings from the American Time Use Study

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#### Socio-economic inequalities (SIG)

Purpose: Doing multiple activities throughout the course of a day may influence decisions to eat fast food. No studies to date have linked the number of activities to food choices in a naturalistic environment. We tested the associations between the total number of daily activities and fast food consumption among US parents, parents in poverty, and single parents.

Methods: Using cross-sectional data from the 2006-08 and 2014-16 American Time Use Surveys, we evaluated differences in the odds of fast food consumption by daily activity quartiles (n= 23840 parents). Parents reported whether they ate fast food in the last seven days (y/n). Daily activity questions ask about whether the parent engaged in certain tasks (e.g. caring for children or commuting). Activity quartiles were defined by counts of activities during the day. We ran balanced repeated replication bootstrapped logistic regression models adjusted for sociodemographics, living in a rural area, and reporting time use on a weekend and/or on a day when they worked. All models accounted for complex survey design.

Results: Parents in highest activity quartile engaged in >35 activities per day on average; the parents in the lowest quartile engaged in 1.3).

Conclusions: A higher number of daily activities is associated with fast food consumption in US parents, especially for parents in poverty. Future studies should evaluate underlying mechanisms that may explain this relationship such as cognitive load, stress response, or food access. Time burdens like doing a higher number of activities throughout the course of the day should also be considered when trying to reach parents to promote healthy eating.





# Comparison of online versus in-person addition of child feeding content to an existing nutrition education curriculum in the prevention of child obesity

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### Children and families (SIG)

Purpose: Most family-centered, childhood obesity prevention programs focus on children's nutritional intake or parental feeding behavior, not both. Existing programs are labor intensive, making large-scale implementation difficult. This study addressed these issues by combining a widely-used nutrition education curriculum, Eating Smart Ÿ Being Active (ESBA), with materials from a validated, child feeding program (Strategies for Effective Eating Development) that promotes responsive feeding--Food, Feeding, and Your Family (FFYF). Two approaches were compared: adding FFYF in-class videos and activities to ESBA and providing the same videos and parallel activities through a smart-phone app.

Methods:493 caregivers in the Expanded Food and Nutrition Education Program (89% mothers) with children aged 2- to 8-years old in Colorado and Washington were randomly assigned to three groups: control (ESBA only), in-class (ESBA + FFYF), and app (ESBA + online FFYF). Program retention was 70% (final n=345). Attendance and online activity were tracked. English and Spanish versions were developed; 58% attended a Spanish program. Validated assessments measured feeding knowledge, practices, styles, and efficacy one week before and one week after the program.

Results: Multi-level analyses showed that caregivers in both FFYF conditions (compared to controls) were more likely to: demonstrate knowledge about how many servings it takes for children to accept a new food, report offering their child new foods, report involving their child in food preparation, show higher responsiveness in feeding, report greater understanding of child roles during eating (WA only), and show greater endorsement of best practice feeding strategies (WA only). Caregivers in English classes were less likely to report indifferent feeding and pressure to eat. Parenting efficacy and mealtime structure increased significantly for all groups. Few differences between the online and in-class conditions were found.

Conclusions: Both online and in-class FFYF resulted in positive effects on feeding knowledge, practices, styles, and efficacy, although FFYF worked better for English speaking caregivers in reducing negative feeding behaviors. ESBA positively impacted mealtime structure and feeding efficacy. Adding FFYF online or in-class had a positive effect on feeding behaviors expected to reduce risk for childhood obesity.





# Increases in cardiorespiratory fitness associate adiposity status in adolescents: results from the Chinese CHAMPS study

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Policies and environments (SIG)

#### Purpose:

Intervention has favorable effects on body adiposity, cardiorespiratory function (CRF), and physical activity (PA) in adolescents. This study investigated whether the intervention exhibited similar effects on adolescents of different adiposity status in a school-based PA intervention.

#### Methods:

The Chinese CHAMPS study was an 8-month intervention aimed at maximizing opportunities for moderate and vigorous PA (MVPA) in middle school students (12.58 ± 0.53 years).Participants (n=143) were randomly assigned to receive afterschool PA program (ASP, 180 minutes MVPA per week), school physical education intervention (SPE, 210 minutes MVPA per week), or both ASP+SPE(300 minutes MVPA per week). Based on the delivered MVPA dose, study participants were grouped into high- (ASP+SPE) and low-dose (ASP or SPE) groups. Study participants were also split into high- and low-adiposity status groups based on their body fat percentage (%BF) at baseline. CRF was assessed by the 20-meter shuttle run, and %BF was assessed by bioelectrical impedance analyzer at baseline and posttest. Regression analysis was used to test the effects of MVPA dose on the changes in CRF and %BF and moderating effect of baseline adiposity status, the models were adjusted for age, gender, puberty status, parent education, family income, and baseline measure of the outcome variable.

#### Results:

There were significant main effects of MVPA dose for changes in CRF ( $\beta$ =12.770, p<0.010) and %BF ( $\beta$ =-1.614, p = 0.010) after adjusting the covariates. Baseline adiposity status significantly moderated the association between MVPA dose and changes in CRF (interaction:  $\beta$ =9.182, p=0.042), participants in the high-adiposity group who underwent high-dose intervention had a greater CRF improvement (31.40±14.11 laps) than their low-adiposity status peers (26.55±14.13 laps). Adiposity status did not moderate the effect of MVPA dose on the change in adiposity (interaction:  $\beta$ =-1.937, p=0.124).

#### Conclusions:

Maximizing MVPA opportunities has favorable effects on CRF and body adiposity in Chinese adolescents. Further, a higher intervention MVPA dose exhibited greater effects on adolescents with high-adiposity status in CRF.





# Accuracy of inclinometer functions of accelerometers worn on different body locations to assess posture and motion

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

#### Background

The inclinometer functions of accelerometers might be able to accurately assess seated, standing and ambulatory postures.

#### Objectives

The primary aim of this paper was to examine the validity of the built-in inclinometer functions of the two activity monitors, ActiGraph GT3X+ (AG) and activPAL (AP), at assessing seated, standing and ambulatory postures, when AG are worn on the wrists, the waists, the thighs and the ankles, and AP on the thighs, in comparison to directly observed data.

#### Methods:

24 adults, 10 men, 14 women, body mass index (BMI) of 25.62 ±5.45 kg/m2, height of 170.56 centimetres, body mass of 74.80 kilograms, wore AG on 8 body sites, AP on 2 body sites whilst performing 5 seated, 1 standing, 2 ambulatory activities in the laboratory, for 4 minutes per posture, whilst being directly observed. Seated postures involved a range of leg angles, eg. fidgeting whilst seated, seated with legs outstretched. The accuracy of the inclinometer functions of the AG and AP was assessed by equivalence testing, effect sizes, and percentage agreement.

#### Results:

Only thigh-worn AG was statistically equivalent to direct observation for assessing seated postures, with agreement percentage with direct observation of 89% (95% CI: 84%, 93%) for all seated postures. Wrist-worn AG was the worst wear site for assessing sitting: 25% (95% CI: 22%-28%). AP (standing: 89%, 95% CI: 88%-91%; walking: 95%, 95% CI: 95%-96%) was better than AG (60%, 95% CI: 52%-68%; 89%, 95% CI: 85%-92%) at assessing standing and walking postures.

#### Conclusion

Only the inclinometer functions of thigh-worn AG were able to correctly assess various seated postures as sitting. The inclinometer functions of AG worn the wrists, the hips, the ankles, and thigh-worn AG did not correctly assess seated postures as sitting.





Caregivers' perception on the behavioural determinants that shape fruit and vegetable consumption in children (6months to 5years old) in the Nuffield Medical Area, Suva: A qualitative study

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Children and families (SIG)

Key Words: Fruits and Vegetables, Caregivers, Children, Behavioral determinants.

Purpose: Despite the health benefits of fruit and vegetable intake, studies showed that most of the world's population including children eat less than the recommended intake. This paper aimed to assess the perception of caregivers regarding the behavioral determinants of F&V consumption in children (6 months- 5 years old) in the Nuffield Medical Area, Suva.

Methods: A qualitative study design, through the use of Focus Group discussions (FDGs) for caregivers was utilized. Study population were caregivers (n=24) of children aged 6 months to 5 years who attended clinics in the Nuffield Medical Area, Suva. Based on the research questions, as aligned to the Conceptual Framework from the Pro Children Project, caregiver's perceptions were thematically analyzed. The framework identified Personal Factors, Social Environment, Physical Environment and Cultural factors as determinants of fruits and vegetable consumption in children.

Results: Demographic distribution of participants were as follows, more than 50% were from 20-39years old and mothers of the children, while (13%) were 50-59years old and grandmothers. More than 50% had two children while 33% had only one child. Majority of the participants were married while (21%) were single parent. As aligned to the conceptual framework, under the theme Personal factor, the sub themes Preference and Self-efficacy and skills were identified which found that Neophobia and picky/fussy eating behavior; Cognitive and Behavioral skills to be behavioral determinants that influence F&V consumption of children.

Conclusions: Caregivers reported neophobia as a determinant in F&V consumption, as their children avoid certain novel fruits and vegetables or simply reject familiar ones. Self-efficacy and skills is a key concept in Social cognitive theory (SCT) and reflects the perceived confidence in the ability to engage in a particular behavior. Caregivers feel that children do not ask but rather consume whatever is offered or available at home. Modifying the home food and school environment through activities that engage both caregivers, teachers and children can increase fruits and vegetables intake. Furthermore, future research is needed to understand the SCT behavior of peer and siblings influence on F&V consumption in children considering the local context.





# A health and wellbeing profile of Nordic Walking participants in the United Kingdom

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#### Disease prevention and management

Purpose: Nordic Walking is an increasingly popular form of all-body exercise with good evidence of effectiveness for improving cardiorespiratory fitness. The use of poles makes it a suitable activity for individuals with musculoskeletal problems or other conditions that may restrict weight-bearing exercise. Furthermore, elements integral to Nordic Walking such as group interaction, outdoor exposure and skill development are recognised contributors to psychological wellbeing. This study examined the health and wellbeing profile of Nordic Walkers in the United Kingdom and explored factors associated with wellbeing.

Methods: A health and wellbeing questionnaire was distributed via British Nordic Walking communication channels to adult Nordic Walkers in the United Kingdom. Self-report measures included health, disability and pain status (UK Census), wellbeing (Warwick Edinburgh Mental Wellbeing Scale), group cohesion (Group Cohesiveness Scale) and nature connectedness (Nature Relatedness Scale).

Results: A total of 411 participants completed the questionnaire (84.4% female) with a mean age of 61.1 ± 9.9 years. The proportion of the sample reporting a limiting disability/illness (25%) was higher than documented in national statistics for the general adult population (18%) as was the percentage reporting chronic pain (47% versus 34% in the general population). Overall wellbeing scores were higher among Nordic Walkers (53.1 ± 8.1) than the general population (50.1) although they were significantly lower among those reporting disability (50.5) and chronic pain (51.8). Three factors had small independent associations with wellbeing scores. Group cohesion ( $\beta$  = 0.18; p = 0.001) and nature relatedness ( $\beta$  = 0.13; p = 0.011) were positively related to wellbeing and pain scores ( $\beta$  = -0.15; p = 0.003) were negatively related.

Conclusion: Nordic Walking is a suitable activity for individuals with limiting disabilities or chronic pain and is associated with high levels of psychological wellbeing. Higher levels of group cohesion and nature relatedness were associated with increased wellbeing.





# Health education programs designed for inactive older adults are effective at reducing sedentary time in the elderly

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#### Ageing (SIG)

Purpose: More than 20% of the population is currently 65 years old or older in Japan. In older people, decreased physical activity and increased sedentary time generally result in poor health outcomes. While some elderly individuals do venture out and participate positively in community activities, many others stay home engaged in minimal physical activities. The aim of this study was to clarify whether older people who usually have an inactive lifestyle could significantly decrease sedentary time after 10 months of physical activity in a health promotion program.

Methods: The health promotion program included 51 participants (mean age,  $70.8 \pm 4.3$  years); all of them provided written informed consent. The college conducting the elderly program provided lessons about health and 60 minutes of exercise every 2 weeks for 10 months. The participants completed the International Physical Activity Questionnaire, and then they were divided into two groups based upon their normal community activity levels, the conducted volunteer activities group (CV group) or did not conduct activities group (NC group). Paired t-tests were used to compare the baseline and final measurements for each group. Nonpaired t-tests were used to compare the CV group.

Results: The data for 42 participants were analyzed, and the sedentary time for the participants' in the NC group at baseline was found to be significantly increased compared with the CV group. However, at the end of the program, the NC group sedentary time had significantly decreased from the baseline, while no significant changes in the CV group were observed. Moreover, no significant changes were found in the other physical activity indexes.

Conclusions: The CV group exhibited a more substantial increase in physical activity than the NC group. However, the health promotion program had significantly reduced the sedentary time of the NC group; while not significantly affecting the sedentary time of the CV group. Thus, this type of health promotion program provided the most benefit to the typically inactive elderly participants.





# Association between physical activity and soil transmitted helminth infections, stunting, and anaemia among schoolchildren in marginalized areas, Port Elisabeth, South Africa

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#### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Children from low and middle income countries (LMICs) with micronutrient deficiencies have increased mortality risk, poor growth and high soil-transmitted helminth (STH) infections[1]. Undernutrition, especially stunting (height for age z-score < -2 SD (HAZ))—leads to increased risk of obesity in adulthood [1] in communities transitioning to a westernized lifestyle. This can cause overweight and undernutrition at the same time, creating a public health burden. The purpose of this study was to determine the association between physical activity behavior, nutritional and socioeconomic status and the prevalence of STH and anemia in male and females.

Methods: In 2019, data of 1 300 primary schoolchildren (6-12 years) from four public schools located in marginalized areas were collected in Port Elizabeth (South Africa) as part of the baseline assessment of the KaziAfya study. Nutritional status was determined by anthropometry of children including height. Stunting was defined according to WHO growth reference [2]. The Kato-Katz thick smear technique was used assessing STH infections in stool samples. Objective moderate-to-vigorous physical activity (MVPA) was measured with ActiGraph GT3X+ accelerometer. Socioeconomic status (SES) was assessed through questionnaires completed by caregivers. Multiple linear regression analysis were used to determine associations with physical activity.

Results: A complete dataset was available for 536 children. The prevalence of stunting was 7.3% (N=39). 74.3% (N=398) children reached MVPA  $\ge$  60 min. Higher PA was observed in children with higher STH infections (p=ns), lower HAZ (p=ns) and lower hemoglobin levels (p=ns). Multivariate analysis indicated higher MVPA in boys (aOR=0.166, 95% CI 0.102-0.273, p<0.001), younger children ( $\beta$ = -0.031, p=ns) and lower SES ( $\beta$ = -0.031, p=ns). Conclusions: Children's health and physical activity capacity is of great interest. A high prevalence of children with MVPA> 60 min/day was found. Further observations show that stunting and anemia are negatively and STH positively associated with PA, although not significant. Therefore, further research is needed to understand the relationship of PA and health related risk factors. 1. De Lucia Rolfe, E., et al., Associations of stunting in early childhood with cardiometabolic risk factors in adulthood. PLOS ONE, 2018. 13(4): p. e0192196. 2. de Onis, M., Development of a WHO growth reference for school-aged children and adolescents. Bulletin of the World Health Organization, 2007. 85(09): p. 660-667.





# Commuting to school preferences among Czech adolescents

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#### Early care and education (SIG)

#### Purpose

Lack of day-to-day physical activity (PA) can significantly negatively affect human health. To achieve health benefits, adolescents have to be physically active and meet PA guidelines. One of the 'simple and natural' ways of increasing the volume of PA is active commuting to school (AC). In order to study the perceived social norms among Czech adolescents we investigated how adolescents perceive the level of AC among their classmates, what are their commuting to school preferences and perceived commuting preferences of their parents.

#### Methods

Data was collected in 2018 as a baseline measurement of the 'Social Norms Intervention for Active Adolescents (SONIAA)' project using a web-based questionnaire (1586 students; age 11, 15; 48% girls).

#### Results

Focusing on travel to school, overwhelming majority (74%) of the Czech adolescents prefer active commuting to school (walking) over commuting by car. Much less adolescents (52%) think that their parents prefer active commuting over commuting by car. Most of Czech adolescents (64%) commute actively almost every day. Despite of this, less than half of the respondents believe that most of their classmates are going to school almost every day. The students, who believe that most of their classmates commute to school actively, have significantly higher chance of regularly using AC. Less than half of are able to accurately assess the current situation and indicate that most of their classmates go to school actively in four to five days a week.

#### Conclusions

Our results show that most of the Czech adolescents misperceive norms in AC of their peers. Thus, we can conclude that there is a potential to targeted interventions using social norms approach aiming to increase the level of AC in Czech adolescents.





# Obesity prevention in early care and education: A comparison of licensing regulations across Canadian Provinces and Territories

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#### Early care and education (SIG)

Purpose: Childhood obesity is a major public health issue in Canada. In light of research demonstrating that children establish lifestyle habits early on, there is particular interest in preventing weight gain by shaping nutrition, physical activity, and screen time behaviors in early childhood. Early Care and Education (ECE) settings, such as daycare centers and homes, represent an important point of intervention for obesity prevention efforts. While previous studies have examined ECE regulations related to obesity prevention in the United States, an understanding of these regulations in the context of the Canadian legislative landscape is lacking. Thus, the purpose of this paper was to compare ECE licensing regulations for each of the thirteen Canadian provinces/territories to evidence-based, obesity prevention standards.

Methods: Two authors reviewed existing ECE regulations for each of the thirteen provinces/territories and examined whether the regulatory text supported 20 evidence-based obesity prevention standards related to nutrition, physical activity, and screen time. Provinces/territories were evaluated on the strength of regulatory language for each standard (i.e., fully, partially, or not addressed).

Results/findings: The majority (n=9) of provinces/territories required providers to follow Canada's Food Guide, but only one had regulations for specific foods or beverages (e.g., restricting sugary beverages). Many provinces/territories partially addressed standards related to maintaining written menus (n=11) and making drinking water available to children (n=9), but the strength of these regulations was weak. Most provinces/territories required physical activity (n=12) and outdoor play (n=11) opportunities to be provided daily, but only two included a minimum time requirement. Only two provinces included any screen time standards.

Conclusions: Canadian provinces/territories have insufficient obesity prevention regulations in ECE settings. With few exceptions, most provinces/territories included few standards related to nutrition and physical activity and only two provinces included standards related to screen time. Furthermore, many of the provinces/territories only partially addressed standards and thus they may be less effective and enforceable. Given the high proportion of Canadian children in ECE settings and the large amount of time they spend at these facilities, revising provincial/territorial regulations to incorporate more evidence-based obesity prevention standards may be a promising strategy to prevent obesity among the youngest Canadians.




## Steps for change: A systematic review of financial incentives for physical activity in older adults

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### Ageing (SIG)

Purpose: Older adult physical inactivity is a global public health problem associated with chronic disease, falls and injuries, and declining physical, mental, and social health. Novel, effective, and scalable strategies are needed to combat physical inactivity. Behavioural economics posits that people are more likely to engage in behaviours that provide short- rather than long-term benefits. Offering financial incentives for the uptake and adherence to physical activity provides tangible short-term benefits and may be more motivating than the inherent long-term health benefits. It remains unclear, however, whether financial incentives are effective for increasing physical activity among older adults.

Methods. We conducted a systematic search of 10 academic databases to identify randomized controlled trials that used financial incentives to promote physical activity in older adults. Two reviewers (NW, EA) independently screened 1094 articles for eligibility: titles and abstracts followed by full text. Discrepancies were resolved by consultation and a third reviewer (DM) when needed. Data from eligible studies were extracted onto an electronic form consistent with the PRISMA Statement.

Results. Five studies published between 2008-2017 met eligibility criteria; four were conducted in the United States and one in Canada. These included 309 participants total, 70% female, and 92% white. Financial incentive intervention duration ranged from 4-16 weeks, and rewards ranged from approximately \$10-\$30 per week. Three studies reported significant increases in physical activity; these provided assured financial rewards that encouraged gradual increases in physical activity over time. Two of these studies measured the proportion of days that step goals were achieved, while one tracked daily aerobic minutes. Two other studies found no change in physical activity following intervention with financial rewards. Three studies included a post-intervention follow-up (range: 4-12 weeks) and found physical activity levels declined after financial rewards were withdrawn.

Conclusions. Modest financial rewards have potential to promote short-term uptake of physical activity in older adults. Future studies are needed to study more diverse populations, determine how to promote long-term physical activity adherence once financial rewards are removed, and test the acceptability and effectiveness of financial losses.





## The translation of evidence-based nutrition practices into daily routines in centre-based childcare: Childcare providers' perspectives

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### Early care and education (SIG)

Purpose: Public health effort has been directed at centre-based childcare as an early education and care (EEC) setting to promote healthy food-related behaviours in young children. Children's dietary food intake and food choices have been significantly influenced by expert-led interventions targeting food provision and nutrition practices in centres. However, in the real-world setting, these results have not been replicated when implemented by childcare providers and nutrition best practice not always well translated into routines. Childcare providers' perspectives on this are unknown. This study investigates the factors mitigating or enabling the translation of evidence-based nutrition practice into everyday routines in centre-based childcare for children aged 2-5 years from childcare providers' perspective.

Methods: Semi-structured qualitative interviews were conducted with cooks (n=12), directors (n=13) and influential decision-makers (n=7) from centre-based childcare services (n=33) in South Australia. Using the Ecological Model of Health Behaviour as the theoretical framework, and informed by grounded theory, data was analysed thematically.

Findings: The most powerful enabler was the National Quality Standard (NQS) which drove nutrition-related decisions, beliefs and practices and influenced the food, social and information environments. This and having a designated cook was central to translation. Limitations of the NQS, however, constrained nutrition practices with policy actions too broad to operationalise, dissonance when the objectives for healthy eating intersected with the salutogenic approach of the NQS and an absence of pre-requisite professional development and nationally consistent resources. The role of the cook was also vulnerable to outsourcing because of escalating allergies, changing family food preferences and a lack of nutrition education and support. In childcare, nutrition best practice is enacted from goodwill and the positive practices seen are under threat.

Conclusions: There is an urgency to prioritise nutrition within the EEC policy environment and establish relevant system-level support, training and strategies. An understanding of influencing factors from childcare providers would strengthen childcare settings as public health solutions. Ensuring healthy food provision and learning environments for lifelong, healthy eating habits is a worthy investment in our children.





## Preconception, pregnancy and postpartum interventions with a culinary education: A Systematic Review

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<sup>1</sup>University of Newcastle, Newcastle, Australia, <sup>2</sup>University of Michigan, Michigan, United States, <sup>3</sup>Queen's University Belfast, Belfast, United Kingdom

Disease prevention and management

#### Purpose:

To systemically synthesise current literature on the impact of interventions with a culinary education component for women and their partners during pre-conception, pregnancy or post-partum, on parental cooking skill efficacy, nutrition knowledge, parent/child diet quality or health outcomes.

#### Methods:

Eleven electronic databases were searched for experimental design studies published from 2003 to October 2019. The search strategy was limited to experimental study designs, that included cooking/culinary education as a standalone intervention or as part of a multicomponent intervention during preconception ( $\leq$ 24 months prior to conception), pregnancy or the postpartum period ( $\leq$ 5 years) on parental cooking skill efficacy, nutrition knowledge, parent/child diet quality or health outcomes. Two reviewers assessed study eligibility and methodological quality using the American Dietetic Association Quality Criteria Checklist for Primary Research. Key study characteristics and outcomes were extracted by one reviewer and checked by a second reviewer.

#### Results:

Of 6922 articles identified from the search, 30 experimental design studies (12 randomised controlled trials [RCTs]) were included. The recruited population samples included pregnant women (n=6 studies), post-partum (n=11 studies) and post-partum parents/caregivers (n=13 studies). There were no studies conducted during the preconception period. Seven studies were standalone cooking/culinary education interventions. Most included studies reported improvements in parental and child dietary intake (n=18 studies), parental nutrition knowledge and attitudes (n=11 studies), parental and child eating behaviour (n=4 studies), parental cooking skills and confidence (n=8 studies) and parental and child health outcomes (n=15 studies). However, 18 of 30 studies did not reported a power calculation for the study sample size, 32% of studies had no control group and 18 of 30 studies did not follow-up participants beyond post-intervention.

#### Conclusions:

More evidence is needed from RCTs that include cooking/culinary education as the primary intervention focus, and with long-term follow-up. High quality evidence will be important for determining effectiveness of cooking intervention in pregnancy on cooking confidence and skills, dietary intake, nutrition knowledge and health outcomes.





## The impact of an Early Childhood Educator initiative on Canadian preschool children's physical activity

#### Miss Jaime Barratt<sup>1</sup>

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### Early care and education (SIG)

Purpose: Early childhood educators (ECEs) have a direct influence on preschoolers' physical activity (PA) (Wilk et al., 2018). This study investigated the effectiveness of a Municipal ECE initiative, "Supporting, Encouraging, and Engaging Children in Safe and Active Wellbeing" (SEESAW), on children's PA levels. This study makes a unique contribution to existing health promotion strategies in ECE settings.

Methods: A convergent mixed-methods design explored the effectiveness of SEESAW, collecting data prior to SEESAW implementation in October 2018, and again four months later in February 2019. Three ECEs participated in semi-structured interviews and their PA was measured using questionnaires (IPAQ Long Form). Twelve Preschoolers' PA was measured using direct observation (OSRAC-P). Interview transcripts were thematically analyzed and a paired-samples t-test explored the differences in educators' and children's PA. Pearson r correlation determined significant relationships between children's PA intensities and independent variables associated with SEESAW (e.g., educator prompts). A simple linear regression explored the linear relationships between predictor variables.

Results: Interview analysis revealed five themes related to PA: Practices, beliefs, knowledge, barriers, and facilitators. The most prominent barrier reported is the lack of training and education surrounding PA for ECEs. SEESAW increased educators' use of resources, and belief of their role in facilitating PA. Their PA remained high between October and February (>3,000 METs). Children's standing behaviours decreased between October (M= 11.92, SD= 8.53) and February (M=3.92, SD=8.53), t(11)= 3.25, p=.008, while gross motor behaviours increased between October (M=3.17, SD=13.87) and February (M=12.00, SD=13.87), t(11)= -2.20, p=.050. No relationship was found between educator prompts and children's PA, and dramatic play was found to predict sedentary behaviour.

Conclusions: The positive impact SEESAW had on ECEs beliefs and practices and children's gross motor behaviours has implications for future implementation, but dramatic play activities should be altered to encourage less sedentary behaviour. The lack of relationship found between educator prompts and children's PA calls for the implementation of SEESAW as a formal intervention to further investigate its' effectiveness.





## Validity and reliability of the Activinsights Band with older adults

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### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Participation in physical activity for at least 30 min/day, and limiting sedentary time, are recommended for older adults. To monitor sedentary, light, and moderate intensity physical activity objectively, devices such as the GENEActiv, that record raw accelerations, have been used. The processing of data from these devices preclude them from practical use as field-based intervention tools. The Activinsights Band has been designed to fill this gap. This study evaluates the Activinsights Band, assessing its ability to discriminate sedentary, and active behaviours, and to examine the reliability and validity as a pragmatic field-based intervention tool.

Methods: Using a test/re-test design, 20 community-dwelling older adults (80-87 years) participated in two laboratory sessions, one-week apart. Participants completed activities of daily living for a duration of four minutes, including light gardening, sweeping, reading a book, comfortable walking, laying down, washing dishes, brisk walking, watching television, unpacking groceries, and computer work. A portable gas analyser was used to measure energy expenditure for each activity, and participants wore a GENEActiv accelerometer and an Activinsights band on each wrist during the activities. Heart rate data were also collected.

Results: ANOVA (activities by time), ICC and Pearson's correlations demonstrated that both devices were able to discriminate between sedentary (below 1.5 MET) and moderate activity behaviours (greater than 3 METs), including activities of daily living such as gardening, sweeping, doing the dishes, and brisk walking. ICC demonstrated reliability across the two sessions (0.46-0.93), except for watching television for both devices, and reading and laying down for the Activinsights Bands. Pearson's correlations between objective measures and devices, and between devices, for each activity were significant (p<0.01) for the non-sedentary behaviours.

Conclusions: The Activinsights Band discriminates between sedentary and active behaviours and has potential to be an effective and pragmatic health promotion tool for practitioners seeking to monitor physical activity behaviours of older adults. Research is on-going to describe the translation of current data to seven-day habitual activity behaviour and provide critical evidence for the utility of the Activinsights Bands as a health promotion intervention tool.





## Inequalities in physical activity among Korean cancer survivors: Data from the Korean National Health and Nutrition Examination Survey 2014 - 2017

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### Cancer prevention and management (SIG)

Purpose: Cancer survivors benefit from physical activity in regard to short- and long-term physical and psychological health. However, health inequalities exist based on sociodemographic factors which can be mediated by health behavior. The purpose of the study was to explore inequalities in physical activity levels among Korean cancer survivors according to sociodemographic variables.

Methods: Data from the annual, nation-wide, cross-sectional survey in Korea, the Korean National Health and Nutrition Examination Survey, conducted between 2014 – 2017 were used. Of 31,207 participants who completed the survey, data from 901 cancer survivors were analyzed. Leisure-time physical activity levels and sedentary behavior were assessed using a self-reported questionnaire and calculated as total minutes spent per week. Sociodemographic information was obtained by a face-to-face interview, including age, sex, region, marital status, income, and employment status. Complex sample general linear model was used to examine between-group differences in physical activity according to sociodemographic factors.

Results: Total minutes of physical activity and sedentary behavior in Korean cancer survivors were  $86\pm9$  and  $478\pm8$  min/week, respectively. Significant differences in physical activity were found for age ( $\leq40$ years:  $135\pm27$  vs.  $\geq70$ years:  $31\pm8$ ; p<.05), sex (female:  $59\pm8$  vs. male:  $119\pm17$ ; p<.05), education (college:  $181\pm23$  vs. elementary school:  $25\pm6$ ; p<.05), income (very high:  $183\pm29$  vs. very low:  $27\pm7$ ; p<.05), and employment (employed:  $182\pm36$  vs. unemployed/temporary:  $48\pm14$ ; p<.05). No significant differences were found for region. Sedentary behavior did not differ according to sociodemographic factors except education (college:  $501\pm16$  vs. high school:  $454\pm15$ ; p<.05).

Conclusions: Inequalities in physical activity among Korean cancer survivors were found which may partly explain inequalities in health. Our findings suggest that physical activity promotion should be targeted at older, female, less educated, lower income, and unemployed Korean cancer survivors. Ultimately, it would help address inequalities in physical activity as a mediator of health outcomes in Korean cancer survivors.





## The influence of different pedagogical approaches on 5-6-year-old children's moderate-to-vigorous physical activity levels during physical education lessons

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<sup>1</sup>Liverpool John Moores University, LIVERPOOL, United Kingdom

### Children and families (SIG)

Purpose: Moderate-to-vigorous physical activity (MVPA) in children is an important target for Physical Education (PE) programmes globally. Movement competency (MC) has been found to be positively associated with MVPA and recently pedagogical approaches for PE have been underpinned by theories of motor learning in an effort to promote the development of children's movement competence. An important consideration in the development these new PE curriculums is the maintenance of high levels of MVPA to support children's long-term health and wellbeing. Therefore, the aim of this study was to compare MVPA within linear and nonlinear pedagogical approaches to current PE practice.

Methods: Participants (n=165, 53.3% female,5-6yrs) were recruited from nine primary schools within the SAMPLE-PE randomised controlled trial. Schools were randomly allocated to one of three conditions: linear Pedagogy, nonlinear pedagogy or control. Nonlinear and linear pedagogy intervention schools received a PE curriculum delivered by trained coaches over 15 weeks, while control schools followed usual practice. Children's MVPA was measured during 3 PE lessons (1 every 5 weeks) using an ActiGraph GT9X accelerometer worn on their nondominant wrist. Differences between conditions for children's MVPA were analysed using multilevel model analysis. A binomial regression was performed to evaluate whether the pedagogical approaches predicted spending 50% of more of the lesson in MVPA. Models accounted for covariates (i.e., sex, ethnicity, deprivation index, teacher and lesson duration).

Results: There were no significant group effect of control, linear and nonlinear pedagogy conditions in MVPA, in the percentage of time children spent in MVPA and in the proportion of children meeting the  $\geq$ 50% MVPA PE lesson guideline. Children spent on average 29.3% (95%CI:7.2-51.7%), 37.6% (95%CI:30.5-59.9%) and 34.5% (95%CI:14.17-54.8) of the lesson in MVPA in control, nonlinear pedagogy and linear pedagogy respectively. Furthermore, only 3.7%, 14.0% and 9.6% of children within the respective control, linear and nonlinear pedagogy conditions spent  $\geq$ 50% of their PE lesson time in MVPA.

Conclusions: Linear and nonlinear pedagogical approaches in PE do not negatively impact on MVPA compared to usual practice. Nevertheless, practitioners may need to refine these pedagogical approaches to improve MVPA alongside MC.





## Sleep duration and physical behaviours throughout the lifespan and their relation to health outcomes in different age groups

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Ageing (SIG)

Purpose: To describe how sleep duration and common everyday physical behaviours change throughout the lifespan and how they relate to wellbeing and health outcomes within different age groups.

Methods: The Norwegian HUNT study is a population-based cohort study carried out in the Nord-Trøndelag County in Norway. The HUNT Study comprises four surveys carried out in 1984-1986 (HUNT1), 1995-1997 (HUNT2), 2006-2008 (HUNT3), and 2017-2019 (HUNT4). In HUNT4, sleep duration and physical behaviours were measured for 7 days by two accelerometers attached to the skin on the right thigh and low back. By utilising state-of-the-art machine-learning techniques, a classification model was developed to detect sleep duration and time with sitting, standing, walking, running, cycling and lying down. The overall accuracy of the classification model is >95%. Information on lifestyle and health-related factors were collected by questionnaires and a clinical examination.

Results/findings: About 8,100 adolescents and 55,000 adults participated in HUNT4. Objective recordings of sleep duration and physical behaviours were obtained from ~6,800 adolescents (84%) and ~32,000 adults (58%). Data analyses are currently ongoing and detailed results about the association between sleep duration, physical behaviours and health outcomes will be presented at ISBNPA 2020. However, preliminary results indicate that from age 13 to 40 years, daily sitting time is ~8 hours thereafter increasing by ~0.5 hours/day per 10 years up to ~11 hours/day in the age group 90 years and above. Time with standing and walking shows a curvilinear association with age, e.g., adolescents walk ~110 min/day, increasing to 150 min/day among middle-aged adults, and thereafter decreasing steadily to ~50 min/day in +90 years. As expected, time with running and cycling is highest among adolescents (~10 min/day) and decreasing steadily with age. Overall, inter-individual differences were large for all behaviours.

Conclusions: The data from the HUNT Study allow us to characterise how common everyday physical behaviours and sleep duration changes throughout the lifespan and how it relates to wellbeing and health outcomes.





## Dietary and lifestyle habits and their association with nutritional status of adolescent girls in Pakistan

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Motivation and behavior change (SIG)

Dietary and lifestyle habits and their association with nutritional status of adolescent girls in Pakistan Abstract

Purpose: Non-Communicable Diseases (NCDs) are a growing cause of concern globally. Several NCDs can be prevented if healthy lifestyle and dietary habits are adopted earlier in life. The aim of this study was, therefore, to find out the dietary and lifestyle habits and their association with nutritional status of adolescent girls in Pakistan.

Methods: A cross-sectional analytical study was carried out amongst 470 adolescent girls, selected through purposive sampling technique.

Results: Most (56.8%) of the girls had poor nutritional status. 42% of the adolescents were regularly skipping meals. Breakfast was the most skipped meal (39.6%). Snacking (47%) and cola drinks (51.7%) consumption was common. Only 10.4% were meeting daily requirement of water. Chicken was most popular meat as 79.6% girls preferred it over other meats. Whereas, 47% girls consumed fish in winters only, eggs were consumed regularly by 84.9% girls. Only 35.5% adolescent girls consumed fruits daily. Although 81.5% girls reported consuming milk daily, only 9% of the girls met recommended servings. Early adolescents (78.2%) were more physically active than mid (53.7%) and late adolescents (44.8%). Health status, education level and age were significantly associated (p < 0.05) with BMI. 69% girls who had health issues in the past 6 months had poor nutritional status. 66.7% of girls in early adolescence had poor nutritional status. Although PA was not significantly associated with BMI, its association with age was significant (p < 0.05) as early adolescent girls (78.2%) were found to be more physically active than middle (61%) and late (63%) adolescents.

Conclusions: Adolescent girls mostly had unhealthy lifestyle and dietary habits; which is likely to affect their health in future. Healthy behavior with emphasis on healthy eating habits and inclusion of physical activity in daily routine should be emphasized to overcome possible health challenges in form of NCDs later in life.





## What to eat after play? Food choice and availability in Irish and UK recreational centres for children: A qualitative investigation.

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**Children and families (SIG)** 

#### Purpose:

Preventing childhood obesity can be challenging when limited food options, both nutritiously and choice. This novel study used a multi-strand qualitative exploration to investigate food choice in recreational centres -such as soft play areas and leisure facilities- on the Island of Ireland.

#### Methods:

A series of case-study interviews with recreational centre managers and catering staff, and a combination of focus groups and interviews with parents explored their experiences of the healthiness and food choice available to children in recreational centres. This included currently available food choices, perspectives of encouraging healthier eating and maintaining sustainable business practices. Finally, parents discussed their reactions to three real-life food choice scenarios to investigate decision-making when eating outside the home. Inductive thematic analysis was used.

### Results:

Recreational managers and catering staff focused on two main themes; "Promoting healthiness as a business" and "Challenges and opportunities". They described consumer's move towards healthier choices and external influences on healthy eating but how they as businesses' were more focused on operational activities and physical health than food. Business' identified difficulties in maintaining fresh food and competition from external business as deterrents but seen small and easy-to-implement changes as achievable and desired to improve the healthiness of their offerings.

The parental data developed into three themes; "Food choices", "how to influence healthy eating" and "dealing with common food scenarios". Parents described their general disappointment in healthy food availability and how this encouraged them to purchase food outside the centre. Parents identified multiple influences that encouraged unhealthy eating and suggested using picnic baskets and improved placement of healthier food, to empower healthier choices by children. When real-life scenarios were used, compromising with children and complying with social norms of other parents were important factors influencing food choice decisions.

### Conclusions:

Parents and staff identified potential growth and demand for healthier options, with small and easy-to-implement changes proposed. However, both groups identified that the wider environment of business operations, advertising and children's desires generated barriers that needed to be overcome to increase the healthiness of food, while nourishing business sustainability and growth.





## Evaluating reach, effectiveness, and cost of a digitally-delivered weight management program for rural primary care patients

#### Ms. Gwenndolyn Porter<sup>1</sup>, Dr. Paul Estabrooks<sup>1</sup>

<sup>1</sup>University of Nebraska Medical Center, Omaha, United States

### Implementation and scalability (SIG)

Purpose: We examined the utility and cost of different physician referral strategies for improving reach, retention, and 6-month effectiveness of an evidence-based, digitally-delivered, 12-month weight loss program in a rural area.

Methods: Five primary care physicians were randomly assigned a sequence of 4 referral strategies for a commercial, evidence-based, digital weight loss program: point of care (POC) with active telephone follow-up (ATF); POC, no ATF; population health registry-derived letter with ATF; and letter, no ATF. Referred patients who expressed interest completed a telephone screening. Eligible and enrolled patients received a Bluetooth-enabled home scale, which provided data to document intervention effectiveness. Implementation costs were tracked for referral and program delivery activities.

Results: Physicians made 573 of a potential 991 referrals over 16 weeks. Ninety-eight patients (60% female; 94% Caucasian—representative of the region), enrolled in the program. Letter referrals reached a significantly higher proportion of patients than POC (100% vs 17%) and yielded more participants (12% vs 8%, p<.05). Patients receiving ATF were significantly more likely to be screened (47% vs 7%; p<.05) and enroll (15% vs 7%, p<.05) when compared to those without ATF. Total recruitment costs were \$6,192; cost per enrolled patient was highest for letter with ATF (\$91) but was similar among other referral conditions (range \$47-\$55). Similar to historic data for the program, 44 of 98 enrolled participants did not engage in the program after enrollment. Engagement and weight loss did not significantly differ among referral strategies. Mean weight loss was 6.9±10.5lbs with 43% and 30% of participants losing 3% and 5% or more of their initial body weight, respectively. Implementation costs were \$29,500. Cost per participant achieving 3% and 5% weight loss was \$1282 and \$1843, respectively.

Conclusions: Population health management approaches with active follow-up may not be cost-efficient for clinical settings. Digital weight-loss programs, when delivered in rural settings without a large population to benefit from scalability, may be just as costly as intensive, in-person programs.





## Mental health professionals' practices in recommending more physical activity and less sedentary behaviour can be improved if their own physical activity is increased: findings of an intervention trial

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### Motivation and behavior change (SIG)

#### Purpose:

We hypothesised that mental health professionals would be more likely to promote more physical activity (PA) and less sedentary behaviour (SB) among their clients, if they themselves are more active. In this context, we investigated the effects of engaging mental health professionals in an intervention to increase PA and reduce SB on their attitudes towards and practices in recommending more PA and less SB to their clients.

### Methods:

We used a mixed-methods study design comprising of four weeks long pre-post intervention trial and focus group discussions. The study was conducted in two Orygen headspace centres. The intervention consisted of a group meeting where participants received consultations on how to increase their PA and reduce SB, weekly reminders, and an information booklet. The information booklet contained low-cost strategies for increasing PA and reducing SB in leisure, home, work, and transport domains. We collected information at baseline and follow-up using Exercise in Mental Health Illness Questionnaire and GENEActiv accelerometer. Two focus group discussions were conducted after the completion of quantitative data collection. The focus group discussions were audio-recorded, transcribed, and thematically analysed.

### Results:

17 mental health professionals participated in the study (mean  $\pm$  standard deviation of age = 37.9  $\pm$  9.8 years). We found that participants who increased their PA from baseline to follow up recommended more PA and less SB to their clients more often than those who did not increase their PA. No significant difference between the two groups were found in general beliefs and perceived barriers towards recommending more PA and less SB to their clients. In the focus group discussions participants stated that the strategies to increase PA and reduce SB that were recommended during the intervention were helpful and easy to implement, and that they are inclined to recommending PA to their clients.

### Conclusion:

These results show good feasibility and acceptability of the intervention aimed at increasing PA and reducing SB among mental health professionals. The intervention may also have a positive impact on the practices of mental health professionals towards recommending more PA and less SB to their clients.





## Parent empowerment predicts healthier weight-related parenting practices among low-income parents: The impetus for targeting empowerment as a mechanism of change

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Children and families (SIG)

PURPOSE: Parent empowerment - in the context of children's health - is defined as having the resources, skills and knowledge required to promote health behaviors. According to empowerment theory, higher parent empowerment to support child health may be a critical mechanism of change in family interventions to prevent childhood obesity. This study is the first to examine relationships between parent empowerment and weight-related parenting.

METHODS: This cross-sectional study used data from the Communities for Healthy Living program, a childhood obesity prevention intervention implemented in 16 Greater Boston Head Start programs. Parents (n=920, 833 mothers, 87 fathers) completed a survey with validated measures of empowerment and food, physical activity, sleep and media parenting. Domains of parent empowerment were measured, including critical awareness (i.e., awareness of situational factors affecting child health), resource empowerment (i.e., knowledge of and ability to access resources to support health), and relational empowerment (i.e., ability to leverage relationships with health professionals to support health). Relationships between parent empowerment and parenting were tested using multivariate linear regression, controlling for parent gender, age, educational attainment, race, ethnicity, program, intervention status, and measurement year. Separate models were run for each parenting outcome; all covariates and empowerment constructs were included in each model.

RESULTS: Parents reporting higher critical awareness (b=-0.11,95%CI=-0.20, -0.03) adopted more supportive food parenting practices. Parents with higher critical awareness (b=0.24,95%CI=0.17,0.32; b=-0.20, 95%CI=-0.29,-0.11) and resource empowerment (b=0.28,95%CI=0.20,0.37; b=-0.16,95%CI=-0.26,-0.05) reported greater use of sleep routines and less use of media in the child's sleep environment. Parents reporting higher critical awareness (b=0.08,95%CI=0.00,0.15), resource empowerment (b=0.21,95%CI=0.12,0.30) and relational empowerment (b=0.16,95%CI=0.09,0.23) utilized more supportive physical activity parenting practices.

CONCLUSIONS: Parent empowerment was linked with healthier weight-related parenting practices in this sample. The application of empowerment theory in family-based childhood obesity prevention interventions in general and targeting parent empowerment as a mechanism of change in particular, warrants greater attention.





## Cumulative effect of sugar-sweetened beverage intake throughout childhood on early adolescent adiposity: A birth cohort study

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### Disease prevention and management

Purpose: While research supports an association of sugar-sweetened beverage (SSB) consumption with adiposity among children, one critical gap is understanding the cumulative effect of SSB consumption throughout childhood on future health. Thus, the objective of this study was to estimate the causal effect of SSB intake throughout childhood on mean BMI z-score in early adolescence. Because most guidelines recommend that SSBs should be restricted, we estimated what would happen to adiposity if all children consumed 0 servings/day of SSBs, versus >0 servings, throughout childhood. Our approach has key advantages over previous studies through the use of inverse probability weighting (IPW), a method which can be used in observational studies to validly estimate the cumulative effects of exposures which vary over time and may affect, and be affected by, confounders that also vary over time.

Methods: We analyzed data from Project Viva, a prospective cohort of 2128 mother-child dyads in Massachusetts. Daily servings of child SSBs (soda and fruit drinks) were reported by parents annually from ages 7 to 11. BMI z-score was assessed in early adolescence (mean age=12.9 years). We estimated the effects of maintaining SSB intake at 0 versus >0 servings/day from ages 7-11 on BMI z-score in early adolescence using IPW of marginal structural models (MSM). Confounders and selection factors for censoring that change over time (physical activity, TV, sleep, and fast food) were adjusted for using stabilized weights, while baseline covariates (race, sex, breastfeeding, diet quality at year 7, BMI at year 7, and maternal pre-pregnancy BMI) were included directly in the MSM.

Results/findings: Our baseline sample included 578 children with age 7 exposure measurements (52% female; 72% non-Hispanic White), with 34% of children consuming 0 SSB servings/day. By the end of follow-up, 240 participants remained uncensored. The estimated difference in mean BMI z-score in early adolescence associated with maintaining SSB consumption at 0 versus >0 servings/day was -0.11 (95%CI: -0.50, 0.23).

Conclusions: Our point estimate suggests that children should avoid drinking SSBs throughout childhood to prevent against weight gain, but estimates were imprecise due to small sample sizes and may still be subject to unmeasured confounding.





# Using agent-based modeling to understand the impact of community interventions on obesity rates among 2- to 5- year old special supplemental nutrition program for Women, Infants, and Children (WIC) participants

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Children and families (SIG)

Purpose: Nutrition and physical activity programs aimed at reducing childhood obesity in high-risk communities have often been uncoordinated, making it difficult to use traditional evaluation methods. It is often unclear which communities can serve as "controls" and if observed effects are attributable to one intervention or synergy between several interventions targeting the same communities. We used a dynamic simulation modeling method of agent-based modeling (ABM) to evaluate the impact of community interventions in Los Angeles County (LAC) on childhood obesity rates among low-income 2- to 5- year olds participating in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC).

Methods: An ABM was developed to simulate the impact of nine micro- (targeting individuals directly) and macro-(community and policy) level interventions on health behaviors and childhood obesity rates among WIC participants in LAC. The ABM includes simulated individuals (agents) who are initialized at age 2 with specific diet, physical activity, and past breastfeeding behaviors (e.g., sugar sweetened beverage intake, park use, and breastfeeding in the first six months of life or longer) and BMI z-scores (BMIz). Initial behaviors and BMIz distributions were based on data collected from WIC participants in LAC in 2008. In the model, the micro- and macro-level strategies affect BMI z-score through their potential effect on the child's behaviors over time. Model parameters reflecting the impacts of each intervention on behaviors were based on peer-reviewed literature. Agents were followed until age 5 as their BMIz and behaviors incrementally evolve. Simulated experiments were conducted to identify the individual and collective impacts of micro- and macro-level strategies on BMIz. We examined differences in model outputs for a status quo scenario (no intervention) and for each intervention implemented separately and in combination.

Results: We will present health behavior and BMIz trajectories among WIC participants for the status quo scenario, scenarios in which each intervention is implemented separately, and scenarios with combinations of interventions.

Conclusions: Dynamic modeling techniques like ABM are promising evaluation tools to examine the impact of multiple interventions on childhood obesity in a community setting.





## Can adding greenery to an urban environment increase walking? A virtual reality pilot study

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### Policies and environments (SIG)

Purpose: Population-level increases in physical activity (PA) can greatly reduce the impact of cancer and other chronic disease. Although some built-environment features (e.g., sidewalks, parks, etc.) show consistent associations with PA, there is scant causal evidence that specific environmental changes increase PA. In this study the research team utilized a novel immersive virtual reality (VR) simulation to experimentally assess the impact of various environmental modifications on PA producing much-needed causal data.

Methods: Participants were randomly assigned to experience one of two virtual urban environments: the control condition (n=24) and the greenery-enhanced version (n=7) where participants saw additional street trees, planters, etc. Participants were fitted with a VR headset and backpack computer to enable them to move freely. They were then given a five-minute acclimation period after which they could walk throughout the virtual environment for up to 30 minutes. Afterwards, the subjects completed a survey about their experience.

Results: Thirty-one participants (55% female; mean age 18.9 years) completed the walking task and all survey measures. Participants responded favorably to both the equipment and the VR environment created for this study: 94% felt equipment was comfortable; 97% felt safe when using the simulation, and 90% felt relaxed. Only 3% of participants reported experiencing significant discomfort during the study. 74% of the participants felt immersed in the simulation. No significant differences on any of the constructs assessed were identified based on sex, height, or handedness (90% right-handed). On average participants stayed in the greenery-enhanced simulation longer (19.7 minutes compared to 18.8 minutes); however, a larger sample is needed to draw definitive conclusions. The results of participant experiences demonstrate that our protocol is a feasible and acceptable way to determine whether environmental changes can cause increases in walking.

Conclusions: In this project, we established an innovative model to quantify the causal impact of environment change on PA, overcoming limitations that hinder adoption of effective population-level strategies to increase PA. This novel approach will provide a valuable way for scientists, policy-makers, and planners to identify which environment changes increase PA.





## 'Sometimes I think I have an ab' – A case study evaluating the impact of a physical activity intervention in a West Midlands (UK) primary school.

Miss Rachel Black, Mr. Irfan Khawaja, Mr. Craig Newton

<sup>1</sup>Birmingham City University, Birmingham, United Kingdom

### Policies and environments (SIG)

#### Purpose:

Children in UK primary schools are under enormous pressure to fulfil the requirements of the government imposed Standardised Assessment Tasks (SATs), which are taken when children are in their final year (10-11 years old). Consequently, many schools impose timetables that marginalise subjects such as Physical Education (PE) in order to prioritise literacy and numeracy. This is particularly concerning in the current obesity epidemic, where 1 in 3 children are reported to be obese when they leave primary school (NHS digital, 2019). In deprived areas, this is particularly acute, with twice the number of obese children than in the least deprived areas (NHS digital, 2019). Children's participation in physical activity is also a concern, with 53.2% of children failing to reach government physical activity recommendations (Sport England, 2019). Again, this figure is higher in families who are in a low-socioeconomic bracket. One school in the West Midlands has challenged the notion that physical activity should be marginalised in favour of literacy and numeracy by introducing a culture of fitness and health.

#### Methods:

One school in a deprived area of the West Midlands was selected as the case study school, due to its application of a physical activity intervention aimed at positively changing the school culture and ethos. A qualitative methodology to the study was employed, and data collected using focus groups (year 5 and 6 children), semi-structured interviews (teachers) and observations within the school environment.

#### Results/ findings:

The results found that students and teachers provided overwhelming support for the intervention. Emergent themes of 'ongoing improvement', 'culture change' and 'interpellation' were applied to the data.

### Conclusion:

The findings of this study will hopefully encourage other primary schools to consider increasing the amount of physical activity in the primary school day. As shown in the case study school, a positive change to a school's culture can be beneficial not only to health and wellbeing, but also in relation to test results.





## The mysterious case of the disappearing pilot study: A review of pilot studies presented at the ISBNPA conferences 2009-2017

<u>Ms. Lauren von Klinggraeff<sup>1</sup></u>, Dr. Sarah Burkart<sup>1</sup>, Ms. Alexis Jones<sup>1</sup>, Mr. Ethan Hunt<sup>1</sup>, Dr. Bridget Armstrong<sup>1</sup>, Dr. R. Glenn Weaver<sup>1</sup>, Dr. Michael Beets<sup>1</sup>

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### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

Purpose: Identify characteristics of pilot studies presented at the International Society of Behavioral Nutrition and Physical Activity (ISBNPA) annual meeting and examine study aspects associated with publication to shed light on potential publication biases in pilot studies.

Methods: Official booklets containing the abstracts presented at ISBNPA for 2009-2010 and 2012-2017 were obtained. No booklet for 2011 was available. Conference booklets were uploaded into NVivo and systematically searched using the keywords "pilot," "feasibility," "preliminary," or "exploratory" to identify all pilot studies examining a behavioral intervention. Behavioral interventions were defined as studies designed to test the feasibility of a behavioral intervention and/or provide evidence of a preliminary effect(s). Mechanistic studies conducted in laboratory or clinical settings as well as measurement scale, tool, or device development studies were excluded. The title, full text, and authors of each abstract were used to search PubMed/Medline, authors' curriculum vitae, ResearchGate, and Google Scholar to identify if the abstract had been published. Publications were matched to ISBNPA abstracts if the publication reported identical intervention components including duration, location, target population and sample size. Pilot study abstracts were coded for sample size, methodology, statistical significance, and institutional affiliation.

Results: Of the 6,046 abstracts presented, 327 (5.4%) were pilots. In 2009, 2.5% of all abstracts presented were pilot behavioral interventions; this rate increased to 7.2% in 2017. The number of total abstracts increased by 70% from 2009 to 2017 (607 to 1,034) while pilot abstracts increased by 393% (15 to 74). Slightly more than half (55.7%) of all identified pilot behavioral intervention abstracts were matched with publications. Factors coded in pilot study abstracts are currently being analyzed and results will be presented.

Conclusion: The proportion of pilot behavioral interventions that go unpublished is notable, suggesting publication bias with those that eventually appear in the peer-reviewed literature.





## Parents in Child Nutrition Informing Community (PICNIC): Learnings from peer educators sharing infant nutrition and feeding information.

#### Mr. Richard Ball<sup>1, 2</sup>

<sup>1</sup>Mid North Coast Local Health District, Port Macquarie, Australia, <sup>2</sup>University of Newcastle, Newcastle, Australia

### Children and families (SIG)

New parents form strong social connections with parents of infants of a similar age. The internet, parenting peer groups and family provide new parents the majority of nutrition and child feeding information, influencing beliefs in comparison with health professionals. Peer education provides a means of penetrating these new parent networks to influence feeding practices and infant nutrition. The PICNIC study investigates the influence of peer education on future dietary patterns, food related behaviour and the risk of preventable disease. The aim of this presentation is to describe the experiences of rural New South Wales parents in their role as peer educators disseminating nutrition and child feeding information to friends and family.

New parents (n=172) with an infant aged 0-2 years have enrolled as peer educators over 20 months. Participants have received peer educator training in infant/child feeding and nutrition to on-share with new parent peers and family, supported by evidence-based, project-specific website and social media content. Peer educators are engaged as co-researchers in this participatory action research, providing insight into the lived experiences and input into the ongoing evolution of the PICNIC model over 12 months. Preliminary qualitative analysis has been conducted on data gathered in the first action research cycle from focus groups, individual interviews, participant correspondence and online contribution.

First-level content analysis resulted in generation of three main themes

- (i) food-related experience (personal and as a parent),
- (ii) experiences with being a PICNIC project peer educator and

(iii) input into PICNIC implementation, research component, intervention content and resource distribution. The preliminary findings from the first action research cycle illuminate the participant journey and are contributing to the ongoing modification and shaping of aspects of the PICNIC project model. This is expected to improve parental efficacy and child feeding practices of peer educators and their recipients. This presentation will describe processes, early qualitative findings and quantitative evaluation plan of the PICNIC peer education dissemination model, an avenue to widely distribute tailored, evidence-based information. The findings and implementation processes will be of interest to health professionals aiming to evaluate community and population level health promotion and preventative health interventions.





## Embedding physical activity promotion within the health system – practice, opportunities and barriers

<u>Ms. Kate Purcell<sup>1</sup></u>, Prof. Catherine Sherrington<sup>1</sup>, Associate Professor Anne Tiedemann<sup>1</sup>, Dr. Leanne Hassett<sup>1</sup>, Ms. Kerry West<sup>1</sup> <sup>1</sup>The University of Sydney, Camperdown Sydney, Australia

Other

#### Purpose

Physical activity has been identified as a best buy in public health. Health professionals providing tailored advice and referral to physical activity opportunities is a promising approach to promoting greater physical activity. This may be particularly beneficial for high- risk groups such as people with disabilities and older adults who generally have the lowest physical activity participation.

The PROPOSE study (Professional Referral to Physical Activity, Sport and Exercise) aims to enhance health professional promotion of physical activity and referral to appropriate community exercise opportunities. The present survey of health professionals was undertaken in order to design the intervention for the PROPOSE study. This survey aimed to identify current practice, knowledge, attitudes and barriers to physical activity promotion by health professionals within clinical settings.

#### Methods

Health professionals from metropolitan hospitals in Sydney, Australia were invited to participate. Participants completed a paper-based survey that included questions about their current practice, knowledge, attitudes and barriers in physical activity promotion to people aged 50+ and/or people of any age with physical disabilities.

### Results

Sixty-nine participants (62, 90% physiotherapists, 41, 59% female) were recruited from nine metropolitan hospitals between July and December 2019. Most reported discussing physical activity with their clients (47, 68% reported doing this often/frequently with clients who could be more active), providing tailored advice about increasing physical activity (38, 55%) and setting physical activity goals (38, 55%). Participants reported being unlikely to: attend structured exercise opportunities with a client (59, 85% report never or rarely doing this); contact providers of exercise opportunities (51, 74%); or assess physical activity using a questionnaire or activity monitor (43, 62%). The most common barrier reported was client access to transport (48, 70%). Most participants (48, 70%) were interested in learning more about promoting physical activity to their clients.

#### Conclusion

Surveyed health professionals reported some promotion of physical activity to older people and people with disabilities in clinical practice, with room for improvement and interest in learning more.





## Exposure to fast food and sweetened drink marketing at community sports clubs in Australia

<u>Ms. Jia Ying Ooi<sup>1,2,3</sup></u>, Prof. John Wiggers<sup>1,2,3</sup>, Dr. Melanie Kingsland<sup>1,2,3</sup>, Mr. Christophe Lecathelinais<sup>2</sup>, Ms. Jennifer Tindall<sup>2</sup>, Ms. Tameka McFadyen<sup>1,2,3</sup>, Prof. Bosco Rowland<sup>5</sup>, Dr. Shauna Sherker<sup>1</sup>, Mr. Allan Murphy<sup>4</sup>, Ms. Rachael Heaton<sup>4</sup>, Associate Professor Luke Wolfenden<sup>1,2,3</sup>

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### Policies and environments (SIG)

Purpose: To examine the extent of fast food and sweetened drink marketing in community sports clubs in Australia.

Methods: A cross-sectional study was conducted in 39 non-elite soccer, AFL, rugby league and rugby union community sports clubs in the Hunter New-England region of New South Wales (NSW) to examine fast food and sweetened drink marketing. One-day observations were undertaken by trained research assistants on a weekend game day when junior sports teams were active, between April and May 2015. The name of the company and positioning of fast food and sweetened drink industry marketing (any visible advertisement, promotion or sponsorship in their surroundings were recorded.

Results/findings: Ten of the 39 clubs (26%) had some form of fast food and/or sweetened drink advertisement or promotion: 7 fast food only; 2 sweetened drinks only; 1 both. Fast food marketing was more common in rugby league and union clubs (n=7, p=0.05), and in clubs located in more regional areas (n=6, p<0.01). There were no significant differences in the prevalence of sweetened drinks marketing by club code, size or remoteness. Fast food companies' advertisements were most commonly found on players' jerseys and players' accessories (n=10), while banners were the most popular position for sweetened drink companies' advertisements (n=2).

Conclusions: Findings suggest that food and beverage marketing in this setting is common, particularly in regional sporting clubs. Efforts to replace these types of sponsorships in community sporting clubs should be prioritized by policy makers and public health practitioners. However, consideration needs to be given while bearing in mind community sporting club reliance on sponsorship revenue. The provision of tools for clubs to develop healthy sponsorship policies, as well as monetary incentives to support clubs have previously been recommended and should be more strongly endorsed.





## Community gardens and their effects on diet, health, psychosocial and community outcomes: a systematic review

<u>Dr. Clare Hume</u><sup>1</sup>, Dr. Jessica Grieger<sup>2, 3</sup>, Ms. Anna Kalamkarian<sup>1</sup>, Associate Professor Lisa Smithers<sup>1, 3</sup> <sup>1</sup>School of Public Health, University of Adelaide, Adelaide, Australia, <sup>2</sup>Adelaide Medical School, University of Adelaide, Adelaide, Australia, <sup>3</sup>Robinson Research Institute, University of Adelaide, Adelaide, Australia

Policies and environments (SIG)

Purpose: This work aimed to critically appraise the evidence for effects of community gardens on food consumption, physical and psychosocial health outcomes, and community sentiment.

Methods: Databases searched were PubMed, Web of Science, PsycInfo, Academic Search Complete and CAB Abstracts, from database inception until May 2019. The titles and abstracts of all identified articles were examined by at least two reviewers using Rayyan software. All potentially eligible studies identified were assessed for inclusion according to Population, Intervention, Comparator, Outcome (PICO) inclusion criteria. Outcomes were categorised into 1) Health (e.g. diet, physical activity, physical health measures); 2) Psychosocial (e.g. mental health issues, quality of life, social isolation); and 3) Community (e.g. social cohesion).

Results: This review describes quantitative evidence from 47 studies (46 observational; 1 RCT) involving n=13-1916 participants. The most commonly examined outcome was fruit and vegetable intake, overall diet, nutrients or nutrition knowledge (k = 19 studies). Thirteen studies included health related outcomes, 11 studies on psychosocial aspects and seven on community-related outcomes of gardeners.

In general, the results suggest that users of community gardens consume slightly more fruit and vegetables and perceived themselves as having good to excellent health compared to non-users of community gardens. They were also observed as having lower odds of hypertension and overweight/obesity; however, this evidence was inconsistent. Users of community gardens had more social contact and higher indicators of wellbeing than comparators; they tended to rate neighbourhood aesthetics and neighbourhood attachment more highly and have higher civic participation than other members of their communities.

Conclusions: On average, users of community gardens tend to consume more fruit and vegetables, are healthier and participate in civic settings more frequently than non-users. However, the evidence is predominantly from small observational studies that involve selected populations and have poor (often no) adjustment for confounding, and are therefore at risk of bias.





## Racial differences in proportion meeting physical activity, sleep, and screentime guidelines during the school year and summer months: Findings from a natural experiment

<u>Mr. Ethan Hunt<sup>1</sup></u>, Ms. Lauren von Klinggraeff<sup>1</sup>, Ms. Alexis Jones<sup>1</sup>, Dr. Sarah Burkart<sup>1</sup>, Mr. Rodrick Dugger<sup>1</sup>, Dr. Bridget Armstrong<sup>1</sup>, Dr. Michael W. Beets<sup>1</sup>, Dr. Gabrielle Turner-McGrievy<sup>1</sup>, Dr. R.G Weaver<sup>1</sup> <sup>1</sup>University of South Carolina, Columbia, United States

Policies and environments (SIG)

Introduction: This study evaluated the proportion of children meeting moderate-to-vigorous physical activity (MVPA—>60 minutes/day), sleep (9-12 hours/night), and screen-time (<2 hours/day) guidelines during summer vacation and the school year.

Methods: Children (n=268, grades=K-4, 51.3% female, 59.0% Black) attending three schools (i.e., one year-round=92, two traditional=169) participated. MVPA and sleep (via Fitbit), and screen-time (via parent-proxy report) were collected during school and summer vacation. Mixed effects linear regressions estimated the proportion of children meeting MVPA, sleep, and screen-time guidelines during summer vacation and school by race (i.e., non-Hispanic Black vs. non-Hispanic White).

Results: During school, more White children met MVPA, sleep, and screen-time guidelines compared to Black children: 50.1% vs 38.4% (difference=11.7% 95CI=5.5%,17.9%), 18.3% vs 9.6% (difference=9.4% 95CI= 3.8%,14.1%), and 69.1% vs 55.3% (difference=13.8% 95CI=3.6%,24.0%), respectively. During summer, the proportion of Black children meeting MVPA and screen-time guidelines declined by 6.2% (95CI=-8.7%, -3.7%) and 21.4% (95CI= -25.8%, -16.9%) while the proportion meeting sleep guidelines increased by 17.2% (95CI=14.1%, 20.3%). White children declined screen-time guideline adherence (-19.4%, 95CI= -24.9%, -14.0%) and increased sleep guidelines (-6.2%, 95CI=-10.2%, -2.3%) and increases in meeting sleep guidelines during summer were greater for Black children.

Conclusions: In this sample few children met sleep and MVPA guidelines. Summer vacation brought on decreases in the percent of children meeting screen-time guidelines. However, summer vacation represented a time when relatively more children met sleep guidelines. Summer was detrimental to Black, but not White, children's MVPA.





## Evaluation of the physical activity intervention of the CReActivity project – a mixed method approach

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### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

#### Purpose:

To present a detailed evaluation of the CreActivity intervention from various perspectives using a mixed method process evaluation. Intervention effects are examined and insights for future intervention planning are described. Aim of the CReActivity project was to promote physical activity of sixth-grade girls by supporting the basic psychological needs (BPN) autonomy, competence and relatedness in physical education (PE) and to identify mediating and moderating constructs of physical activity behaviour change.

#### Methods:

482 female sixth-graders (aged 9 to 14) of 33 classes participated in the cluster randomized controlled trial. Randomization took place on the school level. Participants provided questionnaire data(BPNsupport and satisfaction in PE)and device-based PA data at baseline, post-intervention and follow up. Group differences (IG vs. CG) were tested with structural equation modeling, accounting for school clustering. During the 16-week intervention period, trained teacherscarried outthe intervention programme, which was subject to an evaluation by systematic observations of PE lessons with a modified SOFIT protocol. Data from semi-structured interviews with 8 teachers and 10 focus groups with 41 students were thematically coded. Qualitative and quantitative data were incorporated in a mixed method convergence matrix.

#### Findings:

Results of the systematic observations indicate that the IG teachers provided a stronger BPN support than the CG teachers did. However, the qualitative interviews suggested that the BPN support was not delivered as consistently as expected by the IG teachers. Quantitative data supported the subjective impressions since there were no significant differences in BPN support and satisfaction between IG and CG. The intervention did not affect the MVPA levels of students significantly. Qualitative data identified structural and methodological barriers of the intervention.

#### Conclusions:

Implementation issues undesirably affected the intervention effect, since CG teachers were not controlled in promoting BPN. Further adaption of measurement instruments and intervention components is necessary to improve statistical and methodological power. The study highlights the importance of high-qualitative process-evaluation in order to evaluate the quality of the intervention and its outcomes.





## Examining the readability and usefulness of ICAN Chef program materials

#### Dr. Stephanie Rogus

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#### Policies and environments (SIG)

Purpose: The ICAN Chef program was created by staff of the Ideas for Cooking and Nutrition program, a Cooperative Extension Service (CES) program funded by USDA's EFNEP and SNAP-Ed grants at New Mexico State University. The program's aim is to facilitate the use of the foods provided in Commodity Supplemental Food Program (CSFP) boxes and to provide healthy eating and living tips to encourage healthy lifestyles. This study evaluated the readability and usefulness of materials provided in boxes as part of the program. The evaluation will facilitate program acceptance into the SNAP-Ed Toolkit, which will allow CES programs across the US to utilize the materials.

Methods: This qualitative study used a purposive recruitment strategy to conduct eight one-hour focus groups with four to six participants each at senior centers and food pantries across New Mexico. Participants were CSFP recipients. Focus groups were video and audio recorded, transcribed, and coded, with coding cross-checked by coders to establish reliability.

Results/findings: Participants generally agreed that the materials were easy to read, visually appealing, and the information on the materials would be useful in helping them use the foods in their box. A few participants noted that the font size could be larger and that the amount of text could be reduced for better understanding and to better appeal to recipients. Participants liked the recipes on the materials except when they did not prefer the featured food item. Most participants could summarize one of the healthy living tips on the materials, suggesting that the messages were easily understood by seniors.

Conclusions: Senior recipients of ICAN Chef materials in CSFP boxes found the materials appealing and easy to read, made minor suggestions for improving the materials, and understood the tips provided. Results of this study will facilitate improvement of the materials and submission for acceptance into the SNAP-Ed Toolkit. The next phase of this research will evaluate the program's impact on food item use and nutrition knowledge of recipients.





## Use of artificial intelligence by Big Food Industries to influence customer behaviours: A review of industry documents

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### Policies and environments (SIG)

Purpose: Poor diet is the leading risk factor for the global burden of disease. 'Big Food' corporations employ a large range of tactics to influence customers preferences, tastes and purchases. Big Food is likely capitalising on emerging technologies such as the internet-of-things (IoT), big data and artificial intelligence (AI) to influence customers in new ways. This study aims to review the literature on how Big Food are exploiting emerging technologies to influence customers.

Methods: A grey literature search of Google search engine was conducted to identify the top ten global food company websites. The websites were searched using a combination of terms related to i) the food companies, ii) emerging technologies and artificial intelligence, and iii) customer behaviours, and by reading all relevant documents on industry websites. Documents that described the use of AI by the food industry to influence customer behaviours were included. Literatures that focus on other uses of AI, such as improved product efficiency or production, were excluded.

Results: Big Food companies were found to use AI for a wide range of purposes, including: highly targeted digital advertising, personalised pricing, and pre-ordering from vending machines, personalised chats with company bots that are tailored to the customers using social media activities, customisation of menus and promotions based on customer preferences and the weather outside, optimisation of products and vending machine placement, as well as customised shopper interaction with digital ordering services. We also found an indication that Big Food companies may be purchasing technology companies to better embed the use of emerging digital technologies within their everyday processes and practices.

Conclusions: Big Food companies are using AI and related digital technologies to influence customer preferences and behaviours in ways that are more engaging and interactive than ever before. It is essential to monitor this trend of development continuously and better understand the impact of this type of commercial influence on population diets and health.





## Understanding the barriers of children's independent mobility: a qualitative study using nominal group technique

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**Children and families (SIG)** 

#### Purpose

Independent mobility (IM), knowns as the freedom of children to move around in their neighbourhood without adult supervision, has been found to favourably relate to psychosocial, cognitive and developmental health. This qualitative study aimed to identify the barriers perceived by parents regarding granting IM for their children using nominal group technique.

#### Methods

Four nominal groups were conducted among 19 parents (2 fathers and 17 mothers) aged 32 to 50 years, whose children participated in a cross-sectional study investigating children's IM and physical activity in Hong Kong. The parents responded to the question "What do you think are the barriers that refrain you to allow your child to travel to school, shops and other destinations, or play outdoors in your neighbourhood, on his or her own or with friends, but without adult accompaniment?" Factors were prioritized in order of their importance ranked by the parents.

#### Results

Ten unique factors were identified as the most important barriers for parents to grant their children IM, with "safety" the only barrier identified among all the four groups. "Perceived independence/capability of the child" and "negative peer influence" were generated in three groups. "Allowance by parents", "complexity of transportation", and "distance between home and school" were only identified among the group of parents from high social economic status. The other factors identified included "injury", "routine of daily activities", "over protection from parents", and "unacquaintance of their child's peers".

#### Conclusions

Safety was one of the most importance barriers refraining parents granting IM for their children who live in an ultradense metropolis. The findings may be helpful for informing interventions targeting parents in order to increase children's IM.





## Labelling completeness and sodium content of packaged foods and beverages in Kenya

<u>Dr. Rhoda Ndanuko<sup>1,2,3</sup></u>, Mr. Alex Kibet<sup>4</sup>, Ms. Daisy Coyle<sup>1,2</sup>, Prof. Judith Kimiywe<sup>4</sup>, Prof. Bruce Neal<sup>1,2,3</sup>, Prof. David Raubenheimer<sup>3</sup>, Prof. Stephen Simpson<sup>3</sup>, Associate Professor Jason Wu<sup>1,2</sup>

<sup>1</sup>The George Institute for Global Health, Sydney, Australia, <sup>2</sup>University of New South Wales, Sydney, Australia, <sup>3</sup>University of Sydney, Sydney, Australia, <sup>4</sup>Kenyatta University, Nairobi, Kenya

### Policies and environments (SIG)

Purpose: Diet-related non-communicable diseases are emerging as the leading cause of mortality and morbidity in Africa. The rise in chronic diseases is strongly linked to changing structural factors such as urbanization, leading to increased consumption of packaged foods that are often high in salt. The World Health Organization has a global target of 30% reduction in salt intake by 2025. Nutrition labelling of packaged food products enables transparency and helps to inform customers. The aim of this study was to estimate the proportion of packaged foods in Kenya displaying nutrition information and describe levels of sodium.

Methods: Data collection was carried in June/July 2019 from one store each of five large chain supermarkets in Nairobi, Kenya. A smartphone application was used to take photographs and capture product information for all packaged foods including barcodes, product name, ingredients list and the nutritional information panel (NIP). The products were categorised into food groups and food categories in accordance with the Global Food Monitoring categorization system.

Results: Overall, 6,007 unique packaged products were identified in the supermarkets, and 39% of the products carried a label with sodium content on the NIP. Food categories with the highest average sodium content were herbs and spices (including table salt) (mean±SD, 8260±6005mg/100g), sauces (2756±3719mg/100g), desserts (1505±2997mg/100g), soup (1308±2060mg/100g), noodles (1022±2038mg/100g), and cheese (732±298mg/100g). In these categories, the sodium content was displayed in 11% (herbs and spices), 66% (sauces), 27% (desserts), 89% (soup), 87% (noodles) and 28% (cheese) of the products. The sodium content was highly variable within food categories. For instance, within the sauces category, the sodium content ranged from 8mg/100g to 23437mg/100g.

Conclusions: Only about one third of packaged products in Kenya appears to carry nutrient information labelling for sodium. Levels of sodium are high in specific food categories and vast differences within food categories indicate the potential for reformulation. These findings have important implications for policy interventions including better enforcement of labelling regulations and setting sodium reformulation targets in Kenya.





"Always dirty, smelly, wet or broken": are poorly maintained facilities adversely affecting physical activity experiences for rangatahi (young people) in secondary schools?

### Mr. Jack Lane

<sup>1</sup>Sport New Zealand, Wellington, New Zealand

Motivation and behavior change (SIG)

#### Purpose

Active NZ research shows participation in physical activity declines between ages 15-17 (mid-late secondary school years). This 'drop off' means rangatahi are engaging in fewer hours per week, doing fewer activities, and reducing weekly participation. Physical activity can positively contribute to physical, social and cognitive domains - high quality experiences have the potential to augment benefits and increase the likelihood of long-term engagement and understanding of the value of being physically active. The purpose was to better understand experiences to identify potential levers for interventions which improve the quality of physical activity for rangatahi within a secondary school context in Aotearoa, New Zealand.

#### Methods

Data were collected via an online survey circulated to 58 secondary schools in Aotearoa, between August 2019 – November 2019. We examined data from 8327 rangatahi (aged 11-18). Self-reported satisfaction across several items were used to understand various aspects of experience. Net Promoter Score (NPS) were used as an overall key metric. NPS measures the likelihood that an individual would recommend an activity to another person. Regression analyses were used to determine the relationship between specific aspects of experience and likelihood to recommend physical activity provision at school.

### Results

NPS were very low (-28), indicating a poor overall experience. Across all items of satisfaction, Rangatahi were least satisfied with their school 'having clean and well-maintained facilities' (23% very/extremely satisfied). Almost a third (32%) of rangatahi reported 'cleanliness and maintenance of facilities' as the factor they would most like to see improved at school. This is a significantly greater concern for high-decile (37%), than low-decile schools (22%) and males (34%), rather than females (30%).

#### Conclusion

Rangatahi are generally dissatisfied with physical activity experiences at secondary school. Results show particular issues with cleanliness and maintenance of facilities, which suggests a key-focus point for improvement. Research frequently focuses on individual factors (e.g. confidence), which is crucial, however these results signify the importance of considering broader aspects of experience, including the physical environment. Results indicate the importance of targeted school-led interventions aimed at improving physical activity experiences for rangatahi.





# Reducing obesity and improving lifestyle behaviors among socioeconomically disadvantaged children in the United States (USA): Findings from the Healthy Kids & Families Study

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Children and families (SIG)

Purpose: Childhood obesity continues to increase among socioeconomically disadvantaged communities in the USA. Low-cost interventions that can be implemented in these communities are needed.

Methods: Using a quasi-experimental design, this study tested the impact of the Healthy Kids & Families intervention, a theory-based, low-intensity, parent-focused, community health worker-delivered intervention to improve children's weight, healthy eating and physical activity. The intervention targeted the child's social and physical home environment through parental knowledge, beliefs and skills for managing child obesogenic behaviors and use of supportive community resources. Its delivery format consisted of 4 home-based behavioral counseling sessions, 4 telephone follow ups and quarterly newsletters, over 24 months. The control condition was a positive parenting intervention with a similar delivery format. Parent and child (K-4th grade) dyads (n=247) were recruited through schools in socioeconomically disadvantaged neighborhoods in Worcester, MA. The primary outcome was change in child BMI z-score at 24 months. Secondary outcomes included parent BMI and parent and child diet and physical activity, measured via surveys (adapted scales from the Beverage Intake Questionnaire, the Youth Risk Behavioral Survey, the Beverage and Snack Questionnaire2, the Physical Activity Questionnaire Elementary School, selected items from the Massachusetts Parent Child Longitudinal Cohort Survey; and investigator-developed surveys). Ten individual behaviors and number of positive behavior changes made were assessed. Intent-to-treat analysis included descriptive statistics and generalized linear mixed models, with adjustments for age, gender, race/ethnicity and parental education.

Results: The retention rate at 24 months was 74%. Compared to the control condition, the Healthy Kids & Families intervention had a greater reduction in children's BMI z-score at 24 months ( $\beta$ =-0.18, 95%CI: -1.92 - -0.36; p=0.057) and a greater number of positive behavioral changes among children ( $\beta$ =0.57, 95%CI: 0.08 – 1.06; p=0.02). There were no significant findings for parents.

Conclusion: A low-intensity community-based intervention targeting childhood obesity shows promise for facilitating lifestyle changes among elementary school children living in socioeconomically disadvantaged communities.





## Physical activity and health research monitoring: global, regional, and national trends and patterns since 1950

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Other

Purpose: Local, regional and global scientific production and research capacity in the area of physical activity and health-PAH have been identified as strategies for improving public health policies and programs. An unequal distribution of research productivity worldwide was described by the Global Observatory for Physical Activity-GoPA! (ISPAH Council). As part of GoPA! periodic global research monitoring, the aim of this study is to quantify temporal trends and main characteristics of PAH related research worldwide from 1950 to 2019.

Methods: Following PRISMA guidelines, a systematic review of the literature using searches in PubMed, SCOPUS and ISI Web of Knowledge databases was conducted in June 2017 and is currently being updated to include 2017-2019. The search terms used were "physical activity" (title or abstract) and each country name in English (title, abstract, text or affiliation). Standardized methodology is used to determine the number of articles for the 218 world countries. The principal outcome variable is PAH publications per 100,000 inhabitants by country. Descriptive analyses and time-trend analysis of publication rate by decade overall, for each country, and stratified by WHO region, and World Bank income categories will be conducted. Statistical analyses will be performed in STATA version 16.0

Results/findings: Results from the search up to 2016 retrieved 500,777 articles of which 69,165 were duplicates, leaving 431,612 eligible articles. The review of the search results for years 2017, 2018 and 2019 is work in progress at the moment (29/02/2020). After reviewing inclusion and exclusion criteria up to 2016, at least 18,906 were selected for data extraction. Preliminary results show that 99% of the world countries have at least one publication in the area and the Americas and Europe regions have most of the PAH related articles.

Conclusion: This study will contribute with new knowledge about PAH research characteristics at local, regional and global levels, and can support to the development of prevention strategies to reduce chronic non- communicable diseases particularly in countries with the largest data gaps.





## Can food consumption of individuals be assessed using data on household-level grocery purchases in families with children?

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## Children and families (SIG)

Purpose: The present study explored the relative validity of grocery purchase data as an indicator of individual-level food consumption in families with children.

Methods: A major Finnish retail chain issued us with the grocery purchases (in volume) of consenting loyalty card holders over the past year. The participants reported the number of children (0-17-year-olds) living in the same household. The participating card holders' individual-level food consumption during the past month was assessed using a 52-item electronic food frequency questionnaire (FFQ). The consumption frequencies of vegetables; legumes; fruits; rye bread; white bread; fish; red meat; white meat; skimmed milk; fat spreads; sugar-sweetened beverages; and sweets were selected for further analysis as these food items were considered to broadly reflect the overall quality of diet. We calculated the percentages of participants classified into the same; same or adjacent; and opposite fifths using the FFQ and purchase data.

Results: Our subsample of families with children consisted of 3714 participants (31% of the whole sample of loyalty card holders). Participants' mean age was 41.1 years (SD 8.2 years), and 70% of them were females. The proportion of participants classified into the same; same or adjacent; and opposite fifths ranged between 22–50%; 57–72%; and 1.4–7.8%, respectively. Regarding sweets consumption, 72% of the participants were classified into the same or adjacent and 1.4% into the opposite fifths, and the respective percentages were 67% and 1.5% for fish consumption. The two methods differed the most in terms of bread consumption: 60% and 59% of the participants were classified into the same or same or adjacent and 7.8% and 6.8% into the opposite fifths of white bread and rye bread consumption, respectively.

Conclusions: Most of the participants were classified into the same or adjacent fifths using grocery purchase data and FFQ. This finding suggests that grocery purchase data can be used to rank participants according to their individual food consumption regardless of the fact that in our subsample, the grocery purchases may have been consumed not only by the participants but also by their children other family members.





## Kick-Smart: Promoting academic achievement, fitness and well-being in primary school-aged children.

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### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

#### Purpose

To determine the feasibility and efficacy of a 12-session (6-week) martial arts-based intervention (Kick-Smart). The intervention aims to address the current high levels of physical inactivity among children, decline of mathematics performance in Australian Schools, and current trends in the area of well-being, with mental health issues (e.g. anxiety and depression) representing one of the largest burdens of disease among adolescents. The intervention meets both Mathematics and Health & Physical Education learning outcomes for upper primary school students.

#### Methods

Kick-Smart was conducted at one school in Newcastle, Australia from July-September 2019; and involved primary school children 9-11yrs (n= 46;  $10 \pm 1.0$ yr; Female = 23, Male = 23) who were randomised into control (n=25) or treatment (n=21) conditions. Kick-Smart included various aerobic and muscular fitness exercises, and techniques from a range of martial arts including Karate and Pankration, lasting 40-45 minutes. Each session concluded with a discussion on ethical development concepts. Participants attended 2 sessions/week for 6 weeks. Outcomes included: physical fitness (Standing Broad Jump Test, 20m Repeated Shuttle Run Test, 90° Push-up test), and academic achievement (One Minute Basic Number Fact Test [OMBNFT]), Process evaluation measures were used to assess program feasibility. Linear mixed models were fitted and Cohen's D effect sizes were calculated.

### Results/findings

Significant group-by-time effects favouring the Kick-Smart group for muscular fitness (90° Push-Up Test [p<.0001]), and Academic Achievement (OMBNFT-Addition [p=.000]), while OMBNFT-Multiplication approached significance (p=0.055). Process evaluation results show a recruitment rate of 92% with 46 out of 50 students returning signed consent forms to participate in the study. From the 46 participants, 44 students completed baseline assessments and follow-up assessments (96% retention). All twelve sessions were delivered as intended by members of the research team. Student attendance rates were 85.66% (indicating high levels of adherence). Student evaluation surveys rated highly in all areas: enjoyment ( $\bar{x}$ =4.1), perceived benefits ( $\bar{x}$ =4.4), and future plans ( $\bar{x}$ =4.0).

#### Conclusions

Preliminary findings indicate that Kick-Smart is effective for improving fitness and mathematics outcomes and is feasible for delivery in primary schools. Building further support for effectiveness of Kick-Smart via a larger RCT in varied locations and school settings is recommended.





## Managerial perspectives on staff taking opportunities for short bouts of regular physical activity during the work day to break up sitting time

<u>Associate Professor Elaine Hargreaves</u><sup>1</sup>, Associate Professor Sally Shaw<sup>1</sup>, Dr. Meredith Peddie<sup>1</sup> <sup>1</sup>University of Otago, Dunedin, New Zealand

### Policies and environments (SIG)

Purpose: Occupational sedentary time is a known health risk, therefore situating health initiatives within the workplace to reduce sedentary time is pragmatic. Participating in regular short (2 min) bouts of physical activity after 30 min of prolonged sitting has shown to benefit health in lab-based studies. This initiative has yet to be evaluated in a real-world setting. Workplace initiatives are generally focused at the individual level, yet evidence shows that if the surrounding workplace culture does not support healthy work practices this presents a major barrier to employees participating and will impact intervention effectiveness. To inform the development of a workplace intervention, this study explored the workplace culture around taking physical activity opportunities from the perspective of staff employed in management roles and strategies they might implement to facilitate a supportive culture.

Methods: Twelve (N=7 women) University staff employed in mid- and senior-level management roles, identified through purposeful sampling, participated in a semi-structured interview. Participants were asked their views on employees taking short activity opportunities, their role in encouraging employees to take those opportunities; situations where it would be difficult/easy to be active and University support. Based within a constructivist methodology, an inductive thematic analysis was undertaken.

Results: Participants were unanimous in explaining they, and University management, were supportive of the provision of activity opportunities for employees and employees taking those opportunities. This came with the caveat that guidelines/boundaries were required to sustain work productivity and limit distraction. Participants perceived their role was to support and encourage, achieving this verbally in weekly team meetings. The responsibility to act remained with the employee. Workplace role models and educating stakeholders that employees can be away from their desk briefly were important to facilitate a supportive culture.

Conclusions: University management are supportive of employees engaging in short bouts of activity during the work day to break up sitting time. The challenge is manifesting a culture that is supportive not directive and will sustain work productivity. Results will inform strategy development to create the supportive workplace culture necessary to enhance effectiveness of workplace health interventions.





## Leisure-time physical activity among Chinese college students in Germany and China in the context of acculturation

## Dr. Kahar Abula<sup>1</sup>, Dr. Kahar Abula<sup>1</sup>

<sup>1</sup>University of Potsdam, Potsdam, Germany

### Motivation and behavior change (SIG)

Purpose: Individuals from different cultures are subject to the socio-cultural influences, resulting in cultureassociated differences in the predictors of participation in physical activity. Understanding the cultural influence on international students' participation in physical activity may help us to develop more effective intervention programs for health promotion.

Methods: Taking the Theory of Planned Behavior as a framework, the present study aims to investigate the psychosocial mechanisms through which Chinese international students' cultural experiences in Germany are translated into physical activity behaviors. Specifically, a mediation and a moderation model were proposed. In the mediation model, acculturation was hypothesized to affect an individual's intention to partake in physical activity through attitude, social norm and perceived behavioral control. In the moderation model, the moderation effects of cultural value orientation (individualism/collectivism) on the association between socio-cognitive variables of perceived behavioral control, subjective norm, attitude and the physical activity intention will be examined.





## Exploring children's physical activity in an urban environment using an agentbased model

<u>Dr. Jonatan Almagor<sup>1</sup></u>, Dr. Anne Martin<sup>1</sup>, Dr. Paul McCrorie<sup>1</sup>, Prof. Rich Mitchell<sup>1</sup> <sup>1</sup>MRC/CSO Social and Public Health Sciences Unit, University of Glasgow, Glasgow, United Kingdom

### Assessment and Methodologies in Behavioral Nutrition and Physical Activity

#### Purpose:

We present an agent-based model (ABM) that explores how changes to outdoor play, school-based activities and active travel affect children's physical activity (PA). Unique to this model is the ability to represent the complexity of multiple interdependent levels including built and social environment, individual characteristics, constraints of time/space, and policy measures, which influence PA.

#### Methods:

The ABM generates a synthetic population of agents representing 9-11-year-olds residing in the city of Glasgow, characterised by socio-economic demographics consistent with census data. The urban environment is represented by geospatial data layers, including land use, houses, schools and street networks. Agents follow a daily schedule: attending school, formal sport, outdoor play and meeting with friends. Agents' decisions regarding the location of an activity and travel mode are affected by land use availability, accessibility, crime levels and street walkability. As agents engage in activities, they accumulate minutes of moderate-to-vigorous PA (MVPA). To define the proportion of time spent in MVPA per activity and location we used real PA data of children tracked in the SPACES project. We simulate a reference scenario where agents engage weekly in: outdoor play three times; one physical education lesson in school; and two recesses per school day. Active travel reflects patterns observed in the population. We then create scenarios where outdoor play is increased, active sessions are added in school, and active travel is imposed on all agents. Model outcomes include the distribution of average minutes of MVPA per day across the city.

#### Results/findings

At the population level, MVPA performed during school and active travel compose of more than 50% of daily MVPA. In a scenario where all agents are actively traveling to school the prevalence of agents achieving <= 60 minutes of MVPA per day reduces by half compared to the reference scenario; while adding active sessions in school and increasing outdoor play after school reduce prevalence by 75% and 40% respectively.

#### Conclusions:

ABM can be used to explore various scenarios of PA behaviour and estimate possible outcomes of interventions. Therfore, they should be incorporated more into PA research.




# Changes in foods served in family childcare homes after provider intervention: Results of the Healthy Start / Comienzos Sanos study.

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#### Early care and education (SIG)

Purpose: Family childcare homes (FCCH) are an important setting in which to promote healthy eating and PA. This presentation examines changes foods served in FCCH from baseline to immediately after the intervention completion.

Methods: Healthy Start/Comienzos Sanos (HS/CS) is a cluster randomized trial evaluating a FCCH intervention to improve food and PA environments and the diets and PA of children aged 2-5 years. Written materials, videos and support coaching were tailored to meet the needs of family childcare providers (FCCP). Two-day observations of all meals/ snacks were conducted in 120 FCCH measuring types of foods served using the Environment and Policy Assessment and Observation (EPAO) tool at baseline (BL) and month 8 (M8). Foods served were grouped into 12 EPAO nutrition subscores such that higher scores indicate more healthy food (or fewer unhealthy foods) and averaged for the overall score. ANOVA models were constructed with BL – M8 EPAO change scores as the dependent variables, experimental group as the independent variable.

Results: Of the 119 FCCP enrolled (100% female, 72% Hispanic, 16% Black, mean age 48.4 years, 11% no high school education) and 87 completing M8 follow-up; no differences in demographics or EPAO scores were found between groups at baseline. The intervention group EPAO score (overall) at M8 increased (0.11) from baseline compared with the control group (-0.10, p<0.01). Also, dark green orange and yellow vegetables increased for the intervention group (0.26) compared with the control group (-0.66, p<0.05). High sodium/high fat foods scores also improved significantly (0.37) compared with the control group (-0.16, p<0.05,). M8 score differences by experimental group adjusted for baseline showed similar results.

Conclusion: The HS/ CS intervention improved foods served with intervention FCCPs making greater improvements in foods served compared with the control FCCPs. including improvements in the overall EPAO score, dark green, orange and yellow vegetables and high sodium/high fat foods scores. Measures of the food environment can be useful measures of FCCP-focused interventions change. Multi-level interventions in FCCH can be helpful in improving nutrition practices of FCCP.





# A 15-year follow up study on long-term adherence to health behaviour recommendations in women diagnosed with breast cancer

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Motivation and behavior change (SIG)

#### Purpose

Cancer diagnosis may be a cue for health behavior change; however, limited evidence exists on whether such changes are maintained long-term. This study investigated the impact of a cancer diagnosis on health behavior changes over the long-term survivorship period among breast cancer (BC) survivors.

#### Methods

Data were from the Australian Longitudinal Study on Women's Health (ALSWH). BC survivors (n=153) were identified and health behaviours were assessed in five survivorship period: <=3 years (n=93), 3-6 years (n=140), 6-9 years (n=135), 9-12 year (n=123) and 12-15 years (n=46) since diagnosis. Pre-diagnosis (baseline) assessment of health behaviors was undertaken at ALSWH wave 3 (2001). Physical activity (PA), fruit intake, and Body Mass Index (BMI) (collected using survey questions) from waves 3-8 and vegetables and nutrients intake (collected using an FFQ) from waves 3 and 7. Mixed effect models were used to examine the association between time since diagnosis and health behavior changes.

#### Results

Compared to pre-diagnosis, BC survivors were significantly more physically active (>=600 MET minutes/week; 50.8% to 63.3%; p=0.02) and consumed more fruit (>=2 serves/day; 57.4% to 66.4%; p=0.01) in the recent survivorship period. BC survivors were less likely to be classified in the healthy weight range following their cancer diagnosis (42.6% to 32.2%; p<0.01). Whole-vegetable intake did not change, however, the intake of non-starchy vegetables significantly increased from pre-diagnosis (LS mean=89.1 g/day) to post-diagnosis, 6-9 years (LS mean=137.1 g/day) and 9-12 years (LS mean=120.8g/day). There were no significant changes in the total intake of fiber, carotenoids, calcium, fat, saturated fat, vitamin C or vitamin E observed, with the exception of increased total energy intake (p=0.012).

#### Conclusions

BC survivors report initial positive changes to PA and fruit consumption following their diagnosis, but these changes were not maintained into long-term survivorship. Limited dietary changes were reported by women and BMI scores increased over the survivorship period. BC survivors may benefit from additional advice and support to make healthy lifestyle choices throughout survivorship.





# Alcohol consumption positively predicts aortic stiffness among college-aged men and women

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Disease prevention and management

PURPOSE: To determine if alcohol consumption is associated with aortic stiffness in college-aged men and women.

METHODS: A cross-sectional analysis of young men and women was performed within a University campus setting in the USA to determine if daily alcohol consumption was correlated with indices of arterial stiffness. To determine regular dietary intake, the National Institute of Health's Dietary History Questionnaire-II (DHQ-II) with portion sizes was used, assessing dietary habits over the past year. The primary outcome of this study was aortic stiffness as determined by carotid-femoral Pulse Wave Velocity (cfPWV). Dietary correlations were assessed via univariate linear regression, and forward selection multiple linear regression was employed to verify results identified in univariate linear regression. Statistical analyses were conducted with SAS 9.4.

RESULTS/FINDINGS: Subjects in this study included 50 college-aged ( $21.48\pm0.29$  years) men and women (n=50, 70% female) that ranged from normal weight to obese (Body Mass Index, BMI= $25.41\pm1.09$  kg/m2). The mean aortic stiffness, as determined by cfPWV, was  $5.93\pm0.10$  meters/second. Daily dietary habits among these college students included a mean caloric intake of 1,849.44 $\pm$ 138.21 calories per day ( $46.2\pm1.0\%$  carbohydrates,  $34.5\pm0.9\%$  fat, and  $16.0\pm0.5\%$  protein). Regular alcohol consumption included 13.94 $\pm$ 3.82 grams per day, and alcohol consumption had a positive correlation with cfPWV (R2=0.102, P=0.024). Furthermore, alcohol consumption accounted for an average  $5.25\pm1.02\%$  of daily calories for our sample of college students, and the percentage of energy from alcohol had a slightly stronger positive correlation with cfPWV (R2=0.118, P=0.015). Percentage of total energy from alcohol, but not regular alcohol consumption as reported in grams, prevailed in forward selection multiple linear regression (R2=0.118, P=0.02) and was the strongest dietary predictor of cfPWV among college-aged individuals.

CONCLUSIONS: Among college-aged men and women, where alcohol consumption is generally increased, alcohol consumption and total percent energy from alcohol predict aortic stiffness. Additionally, the total percent energy from alcohol may be the strongest nutritional predictor of aortic stiffness among college-aged individuals.





# Australian public and service policy review of infant feeding in early childhood education and care: implications and strategies to improve practice environment

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Policies and environments (SIG)

#### Purpose

Early childhood and care (ECEC) settings are an important context for short-term and long-term health with to the increased attendance and duration spent in these environments. Despite the WHO Global Strategy for infant and young child feeding policy guidance for the handling, preparation and feeding of infant foods - expressed breastmilk, infant formula and complementary foods, evidence suggests that policies and knowledge of childcare providers to support feeding environments are often inadequate. The purpose of this study was to investigate inclusion of infant and young child feeding in the early childhood education and care (ECEC) National Quality Framework legislation in Australia at the public and service levels to develop an understanding of policy translation, accuracy and inclusion as per national and international infant and young child feeding guidelines.

#### Methods

A content analysis of Australian National Quality Framework documents and qualitative inductive and deductive analysis of service nutrition policies using key tenets of Social Cognitive Theory as a lens was undertaken from 19 services in areas stratified by regional, metro, high/low socioeconomic ratings in Queensland from 2013-2016.

#### Results

Qualitative analysis of key Australian ECEC public policy documents and 28 service policies from home- and centrebased care services impacting over 1500 children revealed a general invisibility of infants and specifically, infant and young child feeding in the national quality standards. Emergent themes included: curriculum and pedagogy, values, supportive environments and working partnerships with parents.

#### Conclusions

Legislation requires policies to provide the basis for health, safety and support for infant and young child feeding. Lack of practice examples and invisibility of infant feeding in both public and service policies increase health and safety risks, with ambiguity placing increased emphasis on educator translation to practice. Inclusion of separate infant and young child feeding policies in services is an opportunity to rectify current gaps towards increasing bestpractice outcomes and infant health and safety in ECEC.





# Understanding enablers of and barriers to sports participation in Taiwanese children and adolescents

#### Miss Ssu Yu Yeh<sup>1</sup>, Dr. Khan Asaduzzaman<sup>2</sup>, Dr. Uddin Riaz<sup>2,3</sup>, Prof. Ching Lin Wu<sup>1</sup>

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#### Motivation and behavior change (SIG)

Purpose: The aim of this study was to explore enablers of and barriers to sports participation of Taiwanese children and adolescents, and examine whether there were differences in their responses by weight status (underweight, healthy weight, and overweight) or school type (elementary, junior, and senior high school) they attended.

Methods: Data for this study were extracted from a cross-sectional survey of students aged 11-18 years, selected from elementary and high schools in late 2018. Students were asked questions about their reasons to or not to participate in sports. The final analytical sample size was 27,779 students (47.7% girls, mean age= 14.5±2.26 years).

Results: For enablers of sports participation, "parental support" was the mostly cited enabler for elementary (overweight: 42.6%, healthy: 39.4%, and underweight: 44.7%) and junior school attendees (overweight: 31.3%, healthy: 26.6%, and underweight: 25.1%) across all weight-status groups, and junior school attendees who were underweight (22.7%). "Health benefit" was the main enabler for senior school attendees who were in overweight (22.0%) or healthy weight (21.8%) group. "Sense of fulfillment", "social relationship", "time", and "place" were also reported as enablers by the study participants across different weight status and school type. For barriers to sports participation, "lack of time" was the mostly cited reason irrespective of weight status or school type. The second mostly cited barrier in the overweight and healthy weight groups was "lack of parental support" (overweight: 14.7%, healthy: 15.7%), "lack of sense of fulfillment" (overweight: 12.8%, healthy: 13.1%), and "lack of place" (overweight: 12.9%, healthy: 12.9%), respectively, for elementary, junior, senior high school attendees.

Conclusions: Enablers of and barriers to sports participation differed by weight status and school type among children and adolescents in Taiwan. Age and weight-specific strategies are needed to promote sports in Taiwanese children and adolescents.





# Which teachers complete school-based physical activity professional learning? Evidence from the iPLAY study.

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<sup>1</sup>Australian Catholic University, North Sydney, Australia, <sup>2</sup>University of Newcastle, Newcastle, Australia

#### Implementation and scalability (SIG)

#### Purpose:

School-based physical activity interventions can improve children's cardiorespiratory fitness. However, to be effective interventions must sufficiently engage participants in order to complete the intervention. iPLAY is a teacher professional learning program, designed to improve teacher's confidence and competence in conducting high-quality physical education and school sport. iPLAY is delivered to teachers in a blended learning format: teachers complete a series of online modules and receive a small amount of face-to-face training and support. We investigated the characteristics of teachers most likely to complete all course components.

#### Methods:

Prior to beginning the intervention, teachers were invited to complete a short questionnaire on their demographics, teaching confidence in physical education and other subjects, internet self-efficacy, and physical activity behaviour. We limited our analysis to only teachers scheduled to have complete the training by January 2020. We used logistic regression to examine which characteristics predicted teacher completion, with cluster robust standard errors to account for within-school clustering.

#### Results:

A total of 688 teachers provided baseline questionnaire data and began the program, of which 425 (61.8%) completed all components. In multivariate analysis, teachers who reported confidence in their ability to teach physical education and school sport (odds ratio = 1.09; 1.03-1.15), and those with higher levels of job satisfaction [OR = 1.03; 1.00 - 1.07) were move likely to complete. Interestingly, internet self-efficacy was negatively associated with completion (OR = 0.96; 0.93-1.00). There were no differences in terms of number of years teaching, specialist physical education accreditation, teacher physical activity levels, or perceived teaching ability for non-physical education subjects.

#### Conclusion:

Our findings suggest that intervention support should be targeted at those who have low levels of confidence in their ability to teach physical education and those who are dissatisfied with their job. Encouragingly, teachers' physical activity levels did not predict completion of the course, suggesting that it is not simply 'sporty' teachers who engage with school-based physical activity teacher professional learning interventions.





# Changes in fathers' Body Mass Index, sleep, physical activity and diet from prebirth to and 6- and 12-months following birth: Comparing first-time and experienced fathers

<u>Dr. Brian Lo<sup>1</sup></u>, Mr. Augustine Kang<sup>2</sup>, Dr. Xinting Yu<sup>3</sup>, Prof. Sebastien Hanuese<sup>4</sup>, Dr. Elsie Taveras<sup>5</sup>, Prof. Susan Redline<sup>3, 6, 7</sup>, Professor Kirsten Davison<sup>1</sup>

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Children and families (SIG)

#### Purpose:

While research has examined pre to postnatal changes in women's weight status, sleep and physical activity (PA), much less is known about changes in fathers' weight and weight-related behaviors following the birth of a child. This study examined changes in fathers' body mass index (BMI), sleep, PA and diet from prebirth to 6- and 12-months following birth and differences in these changes for first-time versus experienced fathers.

#### Methods:

Participants included 224 fathers (mean age 35 years, 62% white) from the Rise & SHINE cohort. Men self-reported height and weight, night-time sleep duration, PA, fruits and vegetables consumption, and fast-food consumption one month prior to birth (N=224), 6- months (N=170) and 12-months following birth (N=152). Linear mixed models and generalized estimating equations were used to examine changes in fathers' BMI and health behaviors. An interaction term between first-time father status and timepoint was used to test the moderating role of being a first-time versus experienced father. Covariates included fathers' age, education and race/ethnicity.

#### Results:

Fathers reported significantly higher BMI (+0.17;95%CI=+0.03,+0.31;p=0.016) and lower sleep duration (-0.21;95%CI=-0.38,-0.04;p=0.016) at 6 months following birth; no differences were observed between 6- and 12-months following birth. While no changes in fast-food consumption were observed from prebirth to 6 months following birth, fathers were significantly more likely to consume fast food at 12 months compared to 6 months following birth (OR:1.94;95%CI=1.09,3.46;p=0.025). Changes in vegetables consumption were limited to experienced fathers who were less likely to consume vegetables daily at 12 months following birth compared to 6 months (OR:0.51;95%CI=0.27,0.95;p=0.035). Fathers' fruit consumption and PA remained stable over time.

#### Conclusions:

Six months following birth may be an important point of intervention for fathers to promote a return to prebirth BMI and sleep levels and prevent declines in diet quality, which occur at a time when infants are transitioning to complementary foods.





# Neighborhood environment and quality of life of Nigerian older adults: Do physical activity levels moderate the relationships?

<u>Dr. Adewale Oyeyemi<sup>1</sup></u>, Mr. Sanda Kolo<sup>1</sup>, Prof. Adetoyeje Oyeyemi<sup>1</sup>, Prof. Babatunji Omotara<sup>1</sup>, Dr. Adamu A. Rufai<sup>1</sup>, Prof. Shuaibu Yahaya<sup>1</sup>, Prof. James Sallis<sup>2,3</sup>

<sup>1</sup>University of Maiduguri, Maiduguri, Nigeria, <sup>2</sup>University of California, San Diego, United States, <sup>3</sup>Australian Catholic University, Melbourne, Australia

### Ageing (SIG)

Purpose: Understanding the neighborhood environmental influence on older adults' quality of life and physical activity is important for effective global public health action on promoting healthy and successful ageing. Yet, the interrelationships between neighborhood environment attributes, quality of life and physical activity have not been studied among older adults in sub-Saharan Africa where the largest population of older people will reside in the coming decades. The aims of the present study were to (1) investigate the direct associations of perceived neighborhood environment attributes with quality of life of Nigerian older adults, and to (2) examine the moderating effects of physical activity on the associations between neighborhood environment attributes and quality of life.

Methods: The participants were 353 older adults (mean age= 68.9±9.1 years) randomly selected from 5 high- and low- income communities in Maiduguri, Nigeria. Quality of life, perceived attributes of the neighborhood environments and physical activity were self-reported using valid and reliable questionnaires. Multinomial linear regression analyses were used to examine the direct associations between neighborhood environmental attributes and each of four domains of quality of life (physical health, psychological health, social relationships and environmental health), as well as the moderating effects of physical activity.

Results: Traffic safety, aesthetics, land-use diversity, residential density, street connectivity and 'overall walkability' were positively related to both or either social relationships and environmental health quality of life among those meeting physical activity guidelines. In contrast, aesthetics, traffic safety and 'overall walkability' were negatively related to psychological health quality of life among those not meeting physical activity guidelines.

Conclusions: Being physically active moderates the association of neighborhood environments with QoL among Nigerian older adults. Designing age-friendly communities to promote physical activity may be needed to improve the QoL among older adults in Nigeria and help prepare the Nigerian society for the predicted increase in the older adult population.





# The provisional efficacy of a teacher delivered, curriculum-based high-intensity interval training program for young adolescents

<u>Associate Professor Nigel Harris<sup>1</sup></u>, Dr. Isaac Warbrick<sup>1</sup>, Dr. Denise Atkins<sup>1</sup>, Associate Professor Scott Duncan<sup>1</sup>, Associate Professor Alain Vandal<sup>1,2</sup>, Associate Professor Lindsay Plank<sup>2</sup>, Prof. David Lubans<sup>3</sup>

<sup>1</sup>Auckland University of Technology, Auckland, New Zealand, <sup>2</sup>University of Auckland, Auckland, New Zealand, <sup>3</sup>University of Newcastle, Newcastle, Australia

#### Implementation and scalability (SIG)

Purpose: The primary aim of this study was to address feasibility issues (previously reported) for a definitive clusterrandomised trial of a high-intensity interval training (HIIT) programme in the school physical education curriculum. In so doing, provisional efficacy results were obtained and are reported here.

Methods: Two schools (students 11-13 years) volunteered to participate; one each from low and high socioeconomic areas. Two class groups within each school were randomised to either intervention (N=55), or control (N=31) over one school term (~9 weeks). Intervention class teachers participated in professional development instructing them how to deliver twice-weekly, brief HIIT sessions to their class groups, within usual class time. Teachers also received a set of heart rate monitors for recording, and displaying target heart rate, and instructional resources. The control classes continued with their usual physical education curriculum. Intervention effects were estimated for a range of health and fitness outcomes using linear and generalised linear mixed models.

Results: For the primary outcome measure, aerobic fitness, the between group difference overall was not significant (p=0.796), although the intervention group experienced a significant increase (3.1 laps, p=0.032) whereas the control group reduced by 1.4 laps (p=0.759). Strength improvement was significantly greater for the intervention group in modified pull-ups compared to control (p=





# Thirst of campus: How can tap water be the healthy and sustainable alternative to sugar-sweetened beverages?

#### Ms. Meagan Wang<sup>1</sup>, Dr. Wendelin Slusser<sup>1</sup>

<sup>1</sup>University of California, Los Angeles, Los Angeles, United States

#### Motivation and behavior change (SIG)

#### Purpose:

While there is considerable literature on sugar-sweetened beverage consumption among children and adolescents, current research does not paint a clear picture of beverage choices among college students and working adults. Few studies have researched the qualitative aspects of beverage consumption in this demographic population. There is a gap in understanding the motivations for and barriers to consuming more tap water and less sugar-sweetened beverages. This study will begin to fill this gap by investigating student and staff beverage choices at a large urban university, with the objectives of (a) understanding the barriers/facilitators to making healthy and sustainable beverage choices; and (b) identifying potential solutions to promoting healthier beverage consumption.

#### Methods:

This study used focus groups and brief questionnaires. Focus groups allowed us to qualitatively explore attitudes toward beverage choices and preferences, and various health messages. They also allowed us to engage community stakeholders in the campus' initiative to promote a healthy environment. Students were recruited through email invitations that were distributed through academic departmental listservs. Staff were recruited with the assistance of the Staff Assembly. Additionally, flyers were posted throughout the campus. Students were eligible if they were enrolled full-time, while staff had to have worked full-time at the university for at least one year. 307 people responded to the invitation; of these, 290 were eligible and 81 participated. A total of nine focus groups were conducted (28 staff members and 53 students), with students living on-campus (3), students living off-campus (3), and staff members (3).

#### **Results**:

Our thematic analysis will provide insights into the barriers/facilitators to making healthy beverage choices, the factors that influence beverage choice, and the solutions to promoting healthy beverage consumption on a large urban campus. Using a community-engaged research approach, this study will use these findings to inform the development of strategies for promoting healthy behaviors among college students and staff.

#### Conclusions:

Gaining an in-depth understanding of beverage perception, choice and consumption habits among students and staff will provide valuable insights into effective strategies for promoting a healthier beverage environment in educational settings.





# The longitudinal relationship between early-life screen viewing and 24-hour movement behaviours – findings from a multi-ethnic birth cohort study

<u>Miss Bozhi Chen<sup>1</sup></u>, Dr. Jonathan Y. Bernard<sup>2,3</sup>, Ms. Natarajan Padmapriya<sup>1,4</sup>, Miss Yilin Ning<sup>5,6</sup>, Dr. Shirong Cai<sup>3,4</sup>, Dr. Carla Lança<sup>7</sup>, Prof. Kok Hian Tan<sup>8,9</sup>, Dr. Fabian Yap<sup>9,10,11</sup>, Prof. Yap-Seng Chong<sup>3,4</sup>, Prof. Lynette Shek<sup>4,12,13</sup>, Prof. Keith M. Godfrey<sup>14,15</sup>, Prof. Seang Mei Saw<sup>1</sup>, Dr. Shiao-Yng Chan<sup>3,4</sup>, Prof. Johan G. Eriksson<sup>3,4,16,17</sup>, Dr. Chuen Seng Tan<sup>1</sup>, Dr. Falk Müller-Riemenschneider<sup>1,18</sup>

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### Children and families (SIG)

Purpose Screen viewing is a sedentary behaviour reported to interfere with sleep and physical activity. However, few longitudinal studies have examined such associations in preschool children and none have accounted for compositional nature of these behaviours. To address these evidence gaps, we investigated the associations of total and device-specific screen viewing time (SVT) at ages 2-3 years with accelerometer-measured 24-hour movement behaviours, including sleep, sedentary behaviour (SB), light physical activity (LPA) and moderate-to-vigorous physical activity (MVPA) at age 5.5 years.

Methods Growing Up in Singapore Towards healthy Outcomes (GUSTO) is a mother-offspring cohort study; children's daily total and device-specific SVT (television, handheld devices and computers) were reported by parents at ages 2-3. Movement behaviours over 7 consecutive days were measured at age 5.5 using wrist-worn accelerometers. We examined the associations of SVT with movement behaviours using Dirichlet regression that accounts for the compositional nature of such behaviours.

Results/findings Total SVT age 2-3 was significantly associated with movement behaviours in relation to SB at age 5.5 (sleep: p =0.008, LPA and MVPA: p





# Ecological momentary assessment of parent feeding practises among toddlers with fussy eating

<u>Ms. Brittany Markides<sup>1</sup></u>, Dr. Rachel Laws<sup>1</sup>, Associate Professor Kylie Hesketh<sup>1</sup>, Prof. Elizabeth Denney-Wilson<sup>2,3</sup>, Prof. Ralph Maddison<sup>1</sup>, Prof. Karen Campbell<sup>1</sup>

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### Children and families (SIG)

Purpose: The transition from infancy to toddlerhood heralds rapid developmental, behavioural, and physiological changes, including increased food fussy behaviours. Food fussiness is associated with nonresponsive parent feeding practices, such as persuasive and instrumental feeding, which may reinforce fussy eating behaviours and are associated with lower intakes of vegetables and fruit, higher intakes of noncore foods, and suboptimal growth trajectories. Previous research investigating parent feeding practices in the context of fussy eating have used cross-sectional or longitudinal designs, which assess feeding practices as static characteristics. However, a growing body of evidence suggests that parents' feeding practices vary over the day and across a week. The aim of this study is to identify the contextual and temporal factors influencing the feeding practices of parents of toddlers with fussy eating.

Methods: This study will involve repeated data using a smartphone-based ecological momentary assessment. Outcome measures include parent feeding practices (i.e. pressure, indulgent feeding, food as a reward, meal structure, modelling), children's eating behaviours (i.e. fussy eating, intake of vegetables, noncore foods, sugar-sweetened beverages), meal environment, parents' momentary cognitions (i.e. affect, stress, self-efficacy), and sleep quality. Over seven days, parents will complete EMA questionnaires up to four times per day. Multilevel regression models will assess within- and between-subject effects.

Results and discussion: It is anticipated that the findings will contribute to our understanding of how momentary factors influence parents' feeding behaviours in the context of fussy eating and inform the development of interventions that support healthy feeding practices in this population.





# A child-centred school lunchtime physical activity intervention: Consulting and implementing the children's voice.

<u>Mr. Irfan Khawaja<sup>1, 2</sup></u>, Dr. Lorayne Woodfield<sup>1</sup>, Dr. Peter Collins<sup>3</sup>, Prof. Alan Nevill<sup>3</sup>, Dr. Adam Benkwitz<sup>1</sup> <sup>1</sup>Newman University, Birmingham, United Kingdom, <sup>2</sup>Birmingham City University, Birmingham, United Kingdom, <sup>3</sup>University of Wolverhampton, Wolverhampton, United Kingdom

### Children and families (SIG)

Purpose: The school environment has implemented successful physical activity (PA) interventions promoting children's PA behaviours. The study will use mixed-methods to assess the effects of a lunchtime PA intervention programme on children's moderate-vigorous PA (MVPA). Heart rate (HR) monitors measured children's PA intensity and duration, whilst focus groups assessed the effectiveness of the PA intervention.

Methods: Participants were 60 9-13 year olds attending a West Midlands (UK) school. Participants wore HR monitors measuring intensity and duration of PA throughout the school day which consisted of three main time periods: lesson time (including registration/assembly), morning break time and lunchtime. A sub-sample of children participated in focus groups to evaluate the success of the lunchtime PA programme. A thematic approach was used to analyse focus group data.

Results/Findings: Mean MVPA for non-intervention days was 35.5 minutes, and for intervention days MVPA was 43.7 minutes, 8.2 minutes higher than non-intervention days. There were 5 children (9.1%) who met the 60 minute PA guidelines on non-intervention days, and 10 children (18.2%) who met the guidelines on intervention days. Analysis exploring the difference in mean daily MVPA according to each lunchtime PA showed children engaging in football, dodgeball and table-tennis activities showed significantly greater amounts of MVPA (p < 0.01) compared with non-intervention days. Additionally, dodgeball intervention days showed children to engage in greatest MVPA (17.6 minutes), and showed the largest difference in MVPA minutes (p < 0.01). Emergent themes from focus groups evaluating the PA intervention were time, improve fitness/skill, fun, enjoyment, challenge and motivation. "It makes lunchtime more interesting"; "It makes me want to be more active"; "Enjoyed having a challenge".

Conclusions: This intervention revealed both genders and key stages to show reductions in sedentary behaviour (SB) and light PA (LPA), and greater moderate PA (MPA), vigorous PA (VPA) and MVPA on intervention days compared with non-intervention days. In practice, this informs the need for PA interventions to be designed in consultation with children to increase levels of children's MVPA, and the school lunchtime period is a key window to implementing PA interventions. Future research could explore PA interventions according to seasonality further promoting PA.





# Evaluating the effectiveness of a population-level telephone support service for improving health risk behaviours in people with a mental health condition: a randomised controlled trial

<u>Miss Grace Hanly</u><sup>1</sup>, Prof. Jenny Bowman<sup>1</sup>, Dr. Kate Bartlem<sup>1</sup>, Dr. Libby Campbell<sup>1</sup> <sup>1</sup>University of Newcastle, Newcastle, Australia

#### Disease prevention and management

Purpose: People with a mental health condition experience higher morbidity and mortality rates of chronic physical health conditions, are more likely to be overweight or obese, and engage in higher rates of health risk behaviours, including poor nutrition, and physical inactivity. To date, research evaluating telephone support services for reducing health risk behaviours other than smoking cessation in people with a mental health condition has been largely limited to small intervention trials. This paper will report the conduct of a trial underway to evaluate the effectiveness of an existing population-level telephone support service in reducing these health risk behaviours in people with a mental health condition.

Methods: A randomised controlled trial is being conducted with clients of multiple community mental health services in New South Wales (NSW), Australia with a range of mental health diagnoses. Study data is collected via computer-assisted telephone interview (CATI) at baseline and follow-up at 6 months post-recruitment. After baseline data collection, participants are randomly allocated to receive either a self-help information pack (control), or the information pack and an active referral to the NSW Get Healthy Information and Coaching Service (intervention): a free, population-level telephone coaching service to support clients to improve nutrition, increase physical activity, or reduce alcohol consumption. Primary outcomes include fruit and vegetable consumption, physical activity (SIMPAQ), and attempts to change these behaviours over the past six months. Secondary outcomes include change in weight, waist circumference, Body Mass Index (BMI), psychological distress (Kessler-6), quality of life (AQoL4D), and client-reported interest and confidence to change health risk behaviours. Process outcomes such as intervention uptake, and completion will be assessed using data collected by the service.

Results: Ninety-four participants have been recruited to the study to February 2020, allocated in a 4:1 ratio to Intervention and Control conditions, with recruitment continuing to June 2020

Conclusions: The results of this study will provide valuable evidence as to the potential or otherwise of an existing population-level, telephone-based support service to deliver preventive care for chronic disease to this vulnerable population.





# The preliminary efficacy of the "SitLess with MS" intervention on sedentary behaviour outcomes, MS-related symptoms and physical performance in adults with multiple sclerosis

**Dr. Golnoush Mehrabani<sup>1</sup>**, Dr. Saeideh Aminian<sup>1</sup>, Ms. Sarah Norton<sup>1</sup>, Prof. Robert W. Motl<sup>2</sup>, Prof. Patricia J. Manns<sup>1</sup> <sup>1</sup>University of Alberta, Edmonton, Canada, <sup>2</sup>University of Alabama, Birmingham, United States

Motivation and behavior change (SIG)

Background: People with multiple sclerosis (MS) are less physically active and sit more than healthy peers, and this might contribute toward worse symptoms, function, and quality of life (QOL). There is merit in focusing on whole day activity for improving outcomes in MS.

Objective: We examined the preliminary efficacy of a novel intervention called "SitLess with MS" that focuses on sitting less and moving more during the day on activity behaviour outcomes, MS-related symptoms and physical performance in MS.

Methods: The "SitLess with MS" intervention utilized a single group repeated measures design. The intervention was internet-based and designed using behavioural strategies and principles from social cognitive theory. Persons with MS with mild-to-moderate disability were recruited from Edmonton, Canada, through collaboration with MS Society of Alberta and the MS Clinic at the University of Alberta. Participants attended 3 measurement sessions including pre-intervention (baseline), post-intervention (Week 15) and follow-up (Week 22). At all 3 measurement points, activity behaviour was measured by the ActivPAL3TM and MS-related symptoms including fatigue, depression, anxiety, pain, sleep quality and cognitive impairment, QOL and physical performance were assessed. An unstructured linear mixed effect model was used to estimate change over time per outcome.

Results: Forty-one people with MS with an average age of  $50\pm10.3$  years and 14 years since MS diagnosis participated. From pre-to-post intervention, participants significantly reduced total sedentary time (effect size: 0.34) and the number of long (> 30 minutes) bouts of sedentary time (effect size: 0.39). Fatigue, depression, anxiety, sleep, total pain, QOL, gait speed, walking endurance and function improved significantly from baseline to immediate post-intervention. The largest effect size was observed for depression (0.79), followed by fatigue and anxiety with the effect sizes of 0.63 and 0.55, respectively. There was no significant change in cognition. (P < 0.05).

Conclusion: The results suggest a positive effect of a new activity behaviour change intervention on sedentary behaviour outcomes and QOL in MS. This strategy of reducing sitting and increasing light-intensity activities such as slow walking may be an important step towards promoting activity levels in MS



# **X-CHANGE ABSTRACT BOOK**





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## Welcome to XChange

Research on behavioral nutrition and physical activity is in "fast-forward" mode. We selected more than 1000 abstracts for ISBNPA 2020. But, if these works aren't presented, only the authors and the abstracts committee would know about the excellent research you are all doing. This wealth of knowledge deserves to be showcased and discussed with the ISBNPA community; reading the 300 words in the abstract book will not do justice to your work.

As a result, ISBNPA's Executive Committee has decided to invest heavily in the ISBNPA XChange: a platform offering the best solution available to showcase, discover, network, and #dare2share your research with the ISBNPA community

As an international society, including members from around the globe, we organized a program with live sessions running from June 15th to June 25th, 2020. Within this period, we had three live keynote speakers, 14 live symposia, 10 live questions and answers (Q&A) sessions of 10-15 pre-recorded presentations, offline Q&A sessions, discussion boards, and plenty of social engagement activities.

Welcome to XChange - - From Antonio Palmeira, ISBNPA Executive Director

Welcome to XChange - - From Maria Giné Garriga, ISBNPA XChange Chair









# Keynotes



THE EVOLVING ROLE OF DATA SCIENCE IN BEHAVIOURAL RESEARCH

**Tom Stewart** 

Keynote Presentation

Research Fellow and statistical advisor at the Human Potential Centre, located at AUT University, New Zealand. His research is broadly based in public health, with a focus on physical activity epidemiology, understanding the environmental determinants of health, and finding preventative solutions for reducing the prevalence of chronic disease.

Tom is passionate about all things data, including teaching statistical methods and incorporating data science methodologies into his work. His recent interests include combining big data and machine learning to tackle a range of public health research challenges – particularly the assessment of human behaviour.



# HELPING KIDS ON THE AUTISM SPECTRUM THRIVE: A VISION FOR WHOLE CHILD NUTRITION AND WELLNESS CARE

**Rachel Blaine** 

Keynote Presentation

Dr. Rachel Blaine, D.Sc., M.P.H., R.D. is an Associate Professor of Nutrition & Dietetics at California State University, Long Beach, where she also serves as Director of a training program for registered dietitian nutritionists. As a parent of a child on the autism spectrum and practicing registered dietitian, Rachel uses her personal and professional experiences to inform her research. She is currently working to identify barriers and facilitators to nutrition and healthy lifestyle care for autistic children, with a focus on supporting parents and clinicians. Rachel holds a Bachelor of Science in Clinical Nutrition from UC Davis, a Master of Public Health from UCLA, and a doctorate in Public Health Nutrition from the Harvard T.H. Chan School of Public Health. She is active on her campus as an Autism Ally and in 2019 received the Early Academic Career Excellence Award from her university for outstanding achievements in research, teaching, and service. She lives in Orange County and enjoys going to the beach with her two kids and her husband.







#### **Keynote Presentation**

Joseph F. Coughlin, PhD is Director of the Massachusetts Institute of Technology AgeLab. He teaches in MIT's Department of Urban Studies & Planning and the Sloan School's Advanced Management Program. Coughlin conducts research on the impact of global demographic change and technology trends on consumer behavior and business strategy. He advises a wide variety of global firms in financial services, healthcare, leisure and travel, luxury goods, real estate, retail, technology, and transportation. Coughlin has served on advisory boards for firms such as Bell Canada, British Telecom, Daimler, Fidelity Investments and Sanofi-Aventis. He was appointed by President George W. Bush to the White House Advisory Committee on Aging and by Governor Charlie Baker to the Governor's Council on Aging in Massachusetts where he co-chaired the Innovation & Technology Subcommittee. A Behavioral Sciences Fellow of the Gerontological Society of America and a Fellow of Switzerland's World Demographics & Ageing Forum, Coughlin is a Senior Contributor to Forbes and writes regularly for MarketWatch and the Wall Street Journal. He was named by Fast Company Magazine as one the '100 Most Creative in Business' and by the Wall Street Journal as inventing the future of retirement. Recently, Coughlin was recognized as one of 15 World Minds by the Zurich-based World Minds, a select community of global leaders in science, arts and business. His recent book, The Longevity Economy: Inside the World's Fastest Growing, Most Misunderstood Market (Public Affairs, 2017), is one of CEO READ's Business Bestsellers. Follow him on Twitter @josephcoughlin





# Ageing (SIG)



# Active plus intervention, physical activity and cognition: Investigating the effectiveness of a physical activity program on cognitive functioning in elderly people suffering from a broad range of chronic illnesses

<u>Miss Esmee Volders</u><sup>1</sup>, Prof. Renate de Groot<sup>1,2</sup>, Prof. Catherine Bolman<sup>1</sup>, Prof. Lilian Lechner<sup>1</sup> <sup>1</sup>Open University of the Netherlands, Heerlen, Netherlands, <sup>2</sup>Maastricht University, Maastricht, Netherlands

#### Pre-recorded Presentation

Purpose: Physical activity (PA) seems to positively influence cognitive functioning (CF). However, elderly people with chronic illness(es) (ECI) often do not meet PA guidelines. PA programs for the elderly exist, but these are not easily accessible to ECI. Also, the beneficial effects of these PA programs on CF have never been specifically tested in ECI. Hence, this RCT tests whether Active-Plus, a proven effective PA intervention, is able to improve CF of ECI or to slow down cognitive decline.

Methods: ECI ( $\geq$ 65 years) with at least one chronic condition are recruited from 7 municipalities. Comparable neighborhoods within a municipality were randomly allocated to the intervention (N=276) or waiting list control group (N=347). Baseline and follow-up measurements after 6 and 12 months assess objectively measured MVPA min/week, and four CF domains: Learning (RVTL; number of correct words recalled trial 5 – trial 1), inhibition (SST; Stop Signal Reaction Time), shifting (TMT; time part B – part A), processing speed (LDST; number of correct iterations in 60s). Multilevel linear regression analyses were conducted to assess intervention effects on CF on complete cases.

Results: After 12 months, 432 participants completed follow up (dropout =30.7%). Preliminary analyses show a significant intervention effect for shifting (B=674.93, p=.04). Participants in both conditions improved their scores over time for processing speed (B=0.04, p=.01) and shifting (B=-860.18, p<.001), however for learning the scores declined (B=0.04, p=.001). The difference in MVPA between start and 6 months was a significant predictor for processing speed (B=0.46, p=.01), where participants with an improved MVPA scored better on processing speed. However, no clear interventions effects on MVPA were found after 6 months.

Conclusions: The Active-Plus intervention was only able to significantly improve shifting in elderly with chronic illness(es), possibly because the intervention only had limited effects on MVPA in this specific group (contrary to previous studies). More in depth analyses will be presented.



# Impact of urban blue infrastructures on health in older adults

<u>Prof. Sebastien Chastin<sup>1,2</sup></u>, Ms. Niamh Smith<sup>1</sup>, Mr. Michalis Georgiou<sup>1</sup>, Dr. Zoe Tieges<sup>1</sup> <sup>1</sup>School of Health and Life Science, Glasgow Caledonian University, Glasgow, United Kingdom, <sup>2</sup>Ghent University, Ghent, Belgium

#### Symposium Recording

Purpose: Blue spaces, including waterways such as river and canals are part of the fabric of most cities in the world, with 50% of the global population living within 3 km of Urban Waterways by 2050. Rapid urbanization together with ageing of the population and climate change mean that cities world-wide are faced with increased challenges that affect the health and wellbeing of their older adult citizens and increase the burden of ageing related conditions. "Blue Care" is a programme of research aimed at understanding how urban blue infrastructure can be used for cobenefits between older adults physical and mental health and the environment.

Methods: "Blue Care" is a mixed method research programme that include systematic reviews of the impact of urban blue space on health of older adults, big data analysis of the impact of the regeneration of blue space on physical and mental health of older adults and development of a "blue gym" intervention programme using environmental conservation as a mean to increase physical activity combined with cognitive loading.

Results: The systematic reviews and big data analysis show that there is a clear association between mortality risk, feeling of wellbeing and improvement in cognitive function for those living near or spending time near urban blue infrastructure. They indicate that pathways between exposure to urban blue space and health are potentially physical activity, access to healthier environment and mental restorative properties of blue spaces. There is a potential to use blue spaces as a modality of intervention combining physical activity and cognitive training to boost cognitive function.

Conclusions: There is good evidence that engaging with or living near blue space in urban area increase feeling of wellbeing and is associated with better physical and mental health. The mechanism and how this can be harnessed to fight chronic diseases and in particular cognitive decline amongst older adults is not yet fully understood.



# Physical activity and sedentary behaviour recommendations for older adults while hospitalised with an acute medical illness: Findings from an International Delphi survey

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#### Pre-recorded Presentation

Purpose: Immobility is major contributor to poor outcomes for older people during hospitalisation with an acute medical illness. As there is no specific mobility guidance for this population, this study aimed to generate draft physical activity and sedentary behaviour recommendations for older adults' during hospitalisation for an acute medical illness.

Methods: A 4-Round online Delphi consensus process was conducted. International researchers, multidisciplinary clinicians, academics from national activity guideline development teams, and patients were invited to participate. Responses to Round 1 open-ended questions were collated before participants rated the importance of items using a Likert scale (1-9) over Rounds 2-3. Consensus was defined a priori as:  $\geq$ 70% of respondents rating an item as "critical" (score  $\geq$ 7) and  $\leq$ 15% of respondents rating an item as "not important" (score  $\leq$ 3). Round 4 provided the opportunity for comments on draft recommendations.

Results: 49 participants from nine countries were invited to each Round; response rates were 94%, 88%, 81% and 71% from Rounds 1-4 respectively. 43 items from Rounds 2 and 3 were incorporated into 29 draft statements under the themes of PA (e.g. "some PA is better than no activity"), SB (e.g. "older adults should aim to minimise long periods of SB while hospitalised"), people (e.g. "when encouraging PA and minimising SB, people should be culturally responsive and mindful of older adults' physical and mental capabilities") and organisational factors (e.g. "opportunities for PA and minimising SB should be incorporated into the daily care of older adults with a focus on function, independence and activities of daily living"). There was consensus that three of the six WHO guidelines for older adults remain applicable when hospitalised with an acute medial illness, two are "not applicable" and consensus was not reached on activity bout duration.

Conclusions: These world-first consensus-based statements from expert and stakeholder consultation provide the starting point for recommendations to address PA and SB for older adults hospitalised with an acute medical illness. Further consultation and evidence review will enable final recommendations to be developed with examples to improve their specificity and translation to clinical practice.



# Diurnal pattern of sedentary behavior and physical function in older women: Evidence from the Objective Physical Activity and Cardiovascular Health (OPACH) substudy of the Women's Health Initiative

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Pre-recorded Presentation

Purpose: Summary measures of sedentary behavior (SB), e.g., daily sedentary minutes, are linked to negative health in older adults. By leveraging minute-level accelerometry, can we derive clusters of diurnal timing of SB that further elucidate SB-health associations?

Methods: 6204 OPACH participants (79±7 years) wore accelerometers for 4-7 days, yielding 41,356 days with >600 minutes/day of data. Participants were followed for up to 6 years with annual physical functioning (PF) assessments. We conducted novel 2-phase clustering: phase I longitudinal k-means clustering classified 41,356 person-days into 4 diurnal SB patterns; phase II hierarchical clustering classified participants using phase I patterns. We used mixed models to evaluate SB cluster and longitudinal PF, adjusting for demographics, BMI, moderate-vigorous-physical activity (MVPA), comorbidities, and sedentary minutes. Effect modification by MVPA was evaluated via likelihood ratio tests.

Results: At baseline, sample means (SD) were 28.1 (5.7) kg/m2 for BMI, 597 (103) minutes/day for SB, 50 (34) minutes/day for MVPA, and 69 (26) score for PF. Mean PF decline was 2.2 units/year (SE=0.07). Four diurnal SB clusters were identified: high-SB-throughout-the-day (c1, n=2239); moderate-SB-with-lower-morning-SB (c2, n= 1536); moderate SB-with-higher-morning-SB (c3, n= 1137); low-SB-throughout-the-day (c4, n=1292). C1 was less healthy (high BMI, low MVPA, more comorbidities) than c2-c4. SB and PF associations differed by baseline MVPA (p < 0.001); across all clusters, lower vs higher MVPA had worse baseline PF (c1-c4 means 70 -75 low MVPA vs 78.5 - 81.6 high MVPA) and higher decline (PF slopes 2.2 – 3 low MVPA vs 1.6 to 2.1 high MVPA). Paradoxically, the c2-low-MVPA group, had higher baseline PF, yet the steepest PF decline (p < 0.04, vs c1,c4). These effects were mitigated by higher baseline MVPA.

Conclusions: In older women, diurnal SB pattern was associated with differential rates of PF decline. Diurnal timing of SB, independent of total sedentary time, may offer new insights into SB-associated healthy aging.



# Inequalities in travel behaviour by frailty status: A study comparing older adults' travel modes in metropolitan, suburban, and rural areas of Japan

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#### Pre-recorded Presentation

Purpose: Frail older adults tend to be disadvantaged in travel behaviours. However, it is unclear to what extent inequalities in travel behaviours by frailty status differ by localities. We examined differences in travel behaviours by frailty status in metropolitan, suburban, and rural areas of Japan.

Methods: This study included 9104 older adults (73.5 ± 5.7 years; 51% women) living in metropolitan (n=5032; 22% frail), suburban (n=2853; 14% frail), and rural areas (n=1219; 15% frail) of Japan. Participants reported whether they walked, used a car as a driver, or used a car as a passenger once per week or more. Frailty status (non-frailty and frailty) was assessed by a standardised questionnaire. Logistic regression analysis examined the differences in travel behaviours by frailty status in three localities.

Results: The prevalence of walking, car driving, and being a car passenger was 79%, 47%, and 17% among non-frail participants, and 67%, 29%, and 20% among frail participants, respectively. Relative to non-frail participants, frail participants had a significantly lower odds ratio (OR) of walking (metropolitan: OR=0.47 [95%CI: 0.40, 0.55]; suburban: OR=0.38 [0.30, 0.47]; rural: OR=0.57 [0.40, 0.80]) and driving a car (metropolitan: OR=0.54 [0.46, 0.65]; suburban: OR=0.46 [0.35, 0.61]; rural: OR=0.33 [0.22, 0.49]). Frail participants were more likely to be a car passenger in suburban (OR=1.73 [1.32, 2.25]) and in rural areas (OR=1.61 [1.10, 2.35]) but not in metropolitan areas (OR=1.08 [0.87, 1.33]).

Conclusions: We found that frail older adults were less likely to walk and drive a car, but more likely to be a car passenger than non-frail older adults, and the inequalities differed by locality. Reliance on cars driven by someone else was more pronounced for frail participants in suburban and rural areas than those in metropolitan areas. Our findings suggest that frail older adults in suburban and rural areas are more disadvantaged in travel options than those in metropolitan areas and would benefit from diverse transport services (e.g. ride share, on-demand transport).



# Change in diet quality and 15-year healthcare costs in the mid-age cohort of the Australian longitudinal study on women's health

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Pre-recorded Presentation

Purpose:

No studies have examined associations between change in diet quality over time and healthcare costs. Our aims were to investigate the relationships between baseline diet quality, and change in diet quality over time, with 15-year cumulative healthcare service use and costs.

Methods:

The Australian Recommended Food Score (ARFS) was measured in 2001 (n=9377) and 2013 (n=7415 both timepoints) for the 1946-51 cohort of the nationally representative Australian Longitudinal Study on Women's Health. Fifteen-year (2001-2015) data on healthcare services/costs were obtained from Medicare (Australia's universal healthcare cover).

Part i: To investigate relationships between baseline diet quality and 15-year cumulative services/costs were reported by baseline ARFS quintiles within BMI category.

Part ii: To investigate the relationship between change in diet quality and healthcare costs, by categories of diet quality 'worsened' (ARFS decrease  $\leq$ -4 points), 'remained stable' (-3 $\leq$ change in ARFS $\leq$ 3 points) or 'improved' (ARFS increase  $\geq$ 4 points). Analyses were conducted using linear regression modelling, adjusting for geographical area and socioeconomic status.

Results/findings:

Part i: Healthy weight women with the highest diet quality at baseline had fewer healthcare services over 15 years compared to women with the lowest diet quality, although overweight/obese women incurred higher gap (out-of-pocket) costs (p<0.05). Among all mid-aged women, having a greater variety of vegetables was inversely associated with total services and costs over 15 years. For every 1-point increase in ARFS vegetable subscale (equivalent to one extra type of vegetable per week), healthy weight women had 3.4 (95%CI 1.2-5.6) fewer services and incurred \$267 (\$103-430) fewer charges, while overweight/obese women had 3.3 (1.0-5.5) fewer services and incurred \$241 (\$80-403) less charges (p<0.05). Higher ARFS dairy and fruit subscales were associated with higher services and costs (p<0.05).

Part ii: Women whose diet quality remained stable or improved over 12 years had fewer services compared to those whose diet quality worsened (p<0.05).

#### Conclusions:

Higher diet quality is associated with fewer Medicare healthcare services among healthy weight mid-aged women.



# Replacing sedentary behavior with light physical activity in the homes of older adults: pilot randomized controlled trial

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#### Pre-recorded Presentation

PURPOSE: Older adults spend approximately 65-80% of waking hours in sedentary behavior (SB) with most sedentary pursuits occurring in the home. Replacing SB time with physical activity (PA) is linked to better geriatric-related health outcomes but reported effectiveness of interventions are limited. The primary purpose of this study was to determine the effectiveness of using a seated elliptical pedaling device (SED) to replace SB with PA in the homes of older adults. A secondary purpose was to determine the intervention effects on physical function.

METHODS: Twenty-six older adults were randomized into an 8-week home-based SB intervention group (EG) or a control group (CG). Baseline and follow-up assessments for PA and SB were performed using self-report and hip-worn accelerometers. A Short Physical Performance Battery (SPPB) was used to assess physical functioning. The intervention group progressively increased pedaling duration goals from 30 minutes per day to 60 minute per day. Both intention-to-treat and per-protocol analyses using mixed models were performed.

RESULTS: Twenty-one older adults (14 females;  $76.9 \pm 6.7$  years) completed baseline and 8-week follow-up. At baseline, participants spent approximately 78% of waking hours in SB and lower-extremity functional limitations ranged from moderate to minimal (SPPB range: 5-12). In the per-protocol analysis, participants that remained in the EG (n=8) were able to meet their goals with 7 of 8 reporting 80% adherence or better. There was a significant group by time interaction effect for daily SB (p=0.002) and LPA (p=0.002) indicating the effectiveness of the intervention to reduce daily SB and increase LPA. Specifically, individuals in the EG experienced a 9.6% reduction in daily SB which translated to a 9.2% increase in daily LPA across the 8-week period. No significant intervention effect was identified for physical function with most measures having small effect sizes.

CONCLUSIONS: A SED appears to be an effective and practical approach to reduce SB in the homes of this small sample of older adults. Future studies should explore more intensive behavioral change strategies to improve adherence and examine other geriatric-related health outcomes in a larger sample size.



# An artificially intelligent virtual health coach for older adults' physical activity and diet

<u>Assoc Prof Carol Maher<sup>1</sup></u>, Dr. Courtney Davis<sup>1</sup>, Dr Rachel Curtis<sup>1</sup>, Dr. Karen Murphy<sup>1</sup> <sup>1</sup>University of South Australia, Adelaide, Australia

Pre-recorded Presentation

Purpose: Most adults are insufficiently active and have poor diet quality, contributing to the global epidemic of chronic disease. Assisting people to successfully modify their lifestyle involves many behaviour change strategies (e.g. education, goal-setting, cues, feedback, overcoming setbacks) ideally over a sustained period. Traditionally, such support is provided by health professionals, who are in high demand and are expensive, limiting their availability. Advances in technology mean such personalised support may now be provided using artificial intelligence, with promise for scalability. This study focused on evaluating a 12-week lifestyle modification program for older adults using an artificially intelligent health coach.

Methods: The program was developed using IBM Watson virtual assistant software, which is capable of natural language processing (i.e. users are able to converse with the coach using their own free text, rather than multiplechoice). The artificially-intelligent virtual health coach, Paola, was accessed via Slack software and used in conjunction with a custom website and Garmin wearable. Paola guided participants through an introductory goalsetting session, prompted participants to complete a weekly check-in with goal revision, and was available 24/7 to answer questions. A total of 31 inactive community-dwelling adults aged 45-75 years participated in a pre-post study to evaluate feasibility and preliminary efficacy for changing physical activity and diet at 0, 6 and 12 weeks. Secondary outcomes were weight, waist-circumference and blood pressure.

Results: Feasibility of recruitment (recruitment was saturated in 3 weeks), and retention (90% at 12 weeks) was confirmed. From 0-12 weeks, physical activity increased by a mean 110 weekly minutes (95% CI 2 to 218) and diet quality scores increased by 5·7 points (on a 14 point scale; 95% CI 4·2 to 7·3). Participants lost an average 1·3kg (95% CI -0·1 to -2·5kg) and 2·1cm in waist circumference (95% CI -3·5 to -0·7cm).

Conclusions: These positive results support the need for ongoing research effort in this area, both for our program, but also more generally. There is vast scope for artificial intelligence technology to deliver personalised health services, particularly in areas that have traditionally been underserviced (e.g. primary and secondary prevention) due to health budget constraints.



# Weight loss maintenance: is it possible for mid-older participants with chronic disease?

<u>Ms. Bronwyn McGill<sup>1</sup></u>, Prof. Philayrath Phongsavan<sup>1</sup>, Prof. Adrian Bauman<sup>1</sup>, Dr. Anne Grunseit<sup>1</sup>, Dr. Blythe O'Hara<sup>1</sup> <sup>1</sup>Prevention Research Collaboration, Sydney School of Public Health, University of Sydney, Camperdown, Australia

#### Pre-recorded Presentation

Purpose: Australian private health insurance members with obesity-related chronic disease successfully lose weight during an 18-week behavioural lifestyle program addressing healthy eating and physical activity. An evidence-based, extended-contact maintenance-phase using behaviour change strategies, was added to address the challenge of maintaining weight-loss. Research of real-world weight-loss maintenance programs in this setting and of weight change patterns is sparse. We investigated a) the impact of 6-and 12-months of participation in the maintenance phase on anthropometric and lifestyle risk behaviours, and b) weight-change patterns to identify sub-groups who may benefit from service modification.

Methods: Participants (n=490) provided demographic and weight-related information at six time-points to 12months. Pre-post telephone surveys conducted at maintenance-phase baseline, 6- and 12-months with a sub-sample of participants (n=101) collected lifestyle risk behaviour information. We used generalised linear mixed models for repeated measures to determine the program effect on weight-loss and lifestyle risk behaviours. We also examined trends in weight-loss maintenance over the first 12-months.

Results/findings: After initially losing on average 9.1kg (p<0.001), maintenance-phase participants regained 0.9kg (p<0.001) at 6-months and 1.3kg (p<0.001) at 12-months. Weight-loss maintenance was achieved by 76% of participants at 3-months and 62% at 6-months, stabilising at 55% and 56% at 9 (OR=0.22, 95%CI 0.12-0.39, p<0.001) and 12 months (OR=0.08, 95%CI 0.04-0.17, p<0.001) respectively. Greater initial weight-loss was associated with weight-loss maintenance at 12 months (5-9.9%: OR=2.65, 95% CI 0.99-7.07, p=0.018;  $\geq$ 10%: OR=27.70 95% CI 6.60-116.23, p<0.001). Participants <55 years demonstrated consistent weight-loss maintenance over this time but the odds for successful weight-loss maintenance for those  $\geq$ 55 years continued to decrease over time. At maintenance-baseline, 68.3% of participants had sufficient physical activity for health; 61.4% and 19.8% met recommended fruit and vegetable consumption respectively. Lifestyle risk behaviours were maintained; aside from vegetable consumption which increased by 0.4 serves/day (p=0.009) at 12-months.

Conclusions: Weight loss maintenance is undisputedly challenging; so too is sustaining lifestyle behaviours necessary to manage weight. A program extending support strategies for maintaining weight-related behaviour can successfully support these changes in some participants over 12-months. There is a potentially important opportunity for targeted intervention at 6-9 months, particularly in mid-older participants.



# Yoga for healthy ageing and fall prevention: uptake, impact, sustainability and future directions

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Pre-recorded Presentation

#### Purpose

Yoga is a physical activity that appeals to many older people, however yoga-based research involving older people is scarce. Our previous research demonstrates a positive impact of yoga on balance and mobility (Youkhana et al, 2015), showing yoga has potential as a fall prevention strategy, yet its validity for preventing falls has not been tested. Our research is investigating the role of yoga for promoting healthy ageing and preventing falls in people aged 60+.

#### Methods

We surveyed older people's perceptions of a yoga program scenario compared with their perceptions of two other fall prevention program scenarios: Tai Chi and Otago home-based Exercise Programme. We also conducted a pilot RCT (n=54, mean age 68) to determine the impact of a 12-week yoga program on balance and mobility among community-dwellers aged 60+. We recently obtained NHMRC funding and commenced the first international trial to determine the effectiveness and cost-effectiveness of yoga on falls (primary outcome) in people aged 60+.

#### Results

Our survey (n=235, mean age 69) showed that a yoga-based program was perceived to be as attractive and relevant as Tai Chi and the Otago Programme. In our pilot RCT (n=54, mean age 68) the yoga intervention led to significant improvements in all measures of balance and mobility, which have previously been associated with an increased risk of falling. The yoga program was appealing, with 83% average class attendance, and safe, with no serious adverse events. Importantly, the seniors' yoga classes that were commenced for our pilot trial, are still run today, on a fee for attendance basis, seven years after trial completion, demonstrating sustainability. Recruitment has commenced for our NHMRC-funded trial of yoga with fall rates as the primary outcome (44/560 randomised so far).

#### Conclusion

Yoga is positively perceived by older people. Our research shows that yoga significantly improves balance and mobility, is well received and safe to participate. Research to measure the effect of yoga on falls in older age is warranted and the first trial internationally is currently underway in Sydney.



# The effect of Active Plus, a computer-tailored physical activity intervention, on physical activity of elderly people with chronic illness(es) – a cluster randomized controlled trial

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#### Pre-recorded Presentation

Purpose: Increasing physical activity (PA) is often beneficial for people with chronic illness (ECI), but adherence to PA guidelines is low. PA programs for ECI exist. However, these are often not easily accessible to them. Computer-tailored PA interventions can reach large populations with little resources or demands for the population. Active Plus is a proven effective computer-tailored PA intervention for the general elderly population focusing on PA in daily life. This RCT tests whether Active Plus is also able to improve PA of ECI, both objectively assessed and self-reported.

Methods: ECI ( $\geq$ 65 years) with at least one chronic condition were recruited from 7 municipalities. Comparable neighborhoods within a municipality were randomly allocated to the intervention (N=260) or waiting list control group (N=325). Active Plus participants received three computer-tailored PA advice. Baseline and follow up measurements after 6 and 12 months assess objectively measured LPA and MVPA min/week, and self-report MVPA min/week on common types of PA (household, walking, cycling, gardening, DIY, sports). Multilevel linear regression analyses were conducted.

Results: After 12 months, 432 participants completed follow up (dropout=26%). Preliminary analyses showed the intervention improved self-reported walking (B=66.9, 95%CI=5.1;128.7, p=.034) and cycling (B=70.0, 95%CI=17.2;122.9, p=.009) at six months, and DIY behavior (B=96.9.0, 95%CI=7.28;186.5, p=.034) after 12 months. Additionally, the intervention increased objectively measured MVPA (B=28.8, 95%CI=0.35;57.2, p=.047) and LPA (B=102.1, 95%CI=4.3;199.8, p=.041) after 12 months for ECI with a higher BMI.

Conclusions: The Active Plus intervention improved self-reported walking and cycling at six months. These are two very common types of PA in daily life which were targeted in the intervention. No overall intervention effects on objectively measured PA were found, although persons with a higher BMI benefitted from the intervention. Active Plus is perhaps not sufficient enough for the general ECI population on its own, and blended care is advised.



# Digitally supported dietary counseling increases protein intake in community dwelling older adults: subgroup-analysis of the VITAMIN RCT.

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Pre-recorded Presentation

Purpose: For prevention of sarcopenia and functional decline in community dwelling older adults, a higher daily protein intake is needed in addition to increased exercise. A new e-health strategy for dietary counseling was used with the aim to increase total daily protein intake to optimal levels (minimal 1.2 g/kg/day, optimal 1.5 g/kg/day) through use of regular food products.

Methods: The VITAMIN (VITal AMsterdam older adults IN the city) RCT included 245 community dwelling older adults (age  $\geq$  55y): control, exercise, and exercise plus dietary counseling (protein) group. The dietary counseling intervention was based on behavior change and personalization was offered by a dietitian coach, by use of face-to-face contacts and videoconferencing during a 6-month intervention. Dietary intake was measured by a 3d dietary record at baseline, after 6-month intervention and 12-month follow-up. The primary outcome was average daily protein intake (g/kg/day). Sub-group analysis and secondary outcomes included daily protein distribution, sources, product groups. A Linear Mixed Models (LMM) of repeated measures was performed with STATA v13.

Results: Mean age of the 224 subjects was 72.0(6.5) years, a BMI of 26.0(4.2) and 71% were female. The LMM showed a significant effect of time and time\*group (p<0.001). The dietary counseling group showed higher protein intake than either control (1.41 vs 1.13 g/kg/day;  $\beta$  +0.32; p<0.001) or exercise group (1.41 vs 1.11 g/kg/day;  $\beta$  +0.33; p<0.001) after 6-month intervention and 12-month follow-up (1.24 vs 1.05;  $\beta$  +0.23; p<0.001 | 1.24 vs 1.07  $\beta$  +0.19; p<0.001). Additional analysis revealed the higher protein intake was fully accounted for by animal protein intake.

Conclusions: This study shows digitally supported dietary counseling improves protein intake sufficiently in community dwelling older adults with use of regular food products. Protein intake increase by personalized counseling with e-health is a promising strategy for dietitians with the upcoming rising ageing population. Keywords: Ageing, Behavior change, Nutrition, Physical Functioning, Sarcopenia.



# Recruiting older people to physical activity programs: analysis of a novel approach used in the Coaching for Healthy Ageing (CHAnGE) trial

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#### Pre-recorded Presentation

Purpose: Recruitment into physical activity programs can be difficult and as such, challenges and successes in recruitment strategies should be explored in process evaluations of clinical trials. The CHAnGE trial, is a 2-arm cluster RCT of healthy ageing, targeting recruitment of established community groups in a metropolitan (Sydney) and regional (Orange) location in Australia. Groups of participants were randomised to receive either a physical activity behavioural intervention or a nutrition intervention. This study summarises the recruitment approach and highlights key effective aspects and barriers.

Methods: Community groups e.g. service, social, sports, religious, retirement villages were approached and if agreeable, a talk on healthy ageing was provided by research physiotherapist at their regular meetings. In order to engage with possible participants with different values we took a holistic approach and spoke about healthy ageing rather than fall prevention or physical activity alone. At the end of the talk, group members were invited to participate in the 12-month trial, with expressions of interest recorded and followed up later to confirm interest and eligibility.

Results: Six hundred and six participants were recruited (mean age 72 (SD 7.3), 426 (70%) females) from 72 community groups between September 2015 and September 2018. Forty-two groups participated in Sydney (306 participants, representing 48% of those attending group presentations) and 30 groups in Orange (300 participants, 44% of those attending presentations). Recruited groups ranged in size from 4 to 17 participants.

The successful aspects of the approach include the emphasis on healthy ageing broadly at group presentations. Spending time talking individually with potential participants after the presentation was also important. The participation of many community groups at the regional site indicates that future studies should consider sites in regional locations as older people there seem open to research.

One challenge with this recruitment approach was the required delay in randomising participants until all within each cluster had completed baseline measures.

Trial results will be explored to determine if group-based recruitment influenced people being active together.

Conclusions: Direct approaches to community-based groups is a useful way to recruit older people to health coaching interventions within regional and urban centres.



# Physiotherapist-prescribed physical activity after fall-related lower limb fracture: dose, adherence and physical activity outcomes from the RESTORE randomised controlled trial

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Pre-recorded Presentation

Purpose: To describe the dose prescribed, adherence and effect on physical activity (secondary outcomes) of a physiotherapist-prescribed physical activity program for people after fall-related lower limb or pelvic fracture.

Design: Randomised controlled trial.

Participants: 336 community-dwellers aged 60+ who had completed usual care for a fall-related fracture in the past two years. The intervention group received 10 physiotherapist home visits and 5 telephone calls, to teach individualised weight-bearing strength and balance exercises, discuss fall prevention strategies and encourage physical activity.

Measures: Exercise dose was recorded by the physiotherapists, adherence was reported by participants and physical activity outcomes were collected with IPEQ and stage of motivational readiness for change questionnaires. Analyses: Descriptive statistics summarised dose and adherence. Regression models compared groups at 12-months after adjusting for baseline values of the outcome.

Results: Intervention group participants were prescribed an average of 6.4 (SD 1.2, n=160) home exercises and agreed to exercise 4.5 times per week (SD 2.1, n=160). By the end of trial 69% of those prescribed a home program were still regularly exercising and completed an average of 71% (SD 30%, n=110) of the prescribed exercise repetitions. There were potentially important between-group differences at 12 months in self-reported home exercise (0.39 hours/week more exercise in the intervention group after adjusting for baseline, 95% CI 0.02 to 0.77, p = 0.04, n=284), in planned activities including walking (1.46 hours/week more in the intervention group after adjusting for baseline, 95% CI 0.42 to 2.50, p = 0.006, n=283) and in stage of readiness for change ordinal scale (OR 1.66, 95%CI 1.09 to 2.55, p =0.019, n=283). There was little difference in overall physical activity (2.09 hours/week more in the intervention group after adjusting for baseline, 95%. CI -1.44 to 5.62, p = 0.245, n=282).

Conclusions: There were potentially important benefits on home exercise and planned physical activity from this physiotherapist-prescribed physical activity program for people after fall-related lower limb or pelvic fractures.


# The effectiveness and complexity of interventions targeting sedentary behaviour across the lifespan: A systematic review and meta-analysis

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#### Pre-recorded Presentation

Purpose: Accumulating evidence suggests that sedentary behaviour (SB) is associated with poor health outcomes, even after adjustment for physical activity (PA) levels. SB at any age may have significant consequences for health and well-being. Therefore, the need to develop behaviour-specific, multicomponent, complex interventions that incorporate effective strategies to reduce SB are essential in addressing this novel risk factor.

Methods: A systematic review and meta-analysis was conducted investigating the impact of interventions targeting sedentary behaviour across the lifespan. Six databases were searched and two review authors independently screened studies for eligibility, completed data extraction and assessed the risk of bias and complexity of each of the included studies.

Results: A total of 78 adult interventions and 83 interventions in children were included. A total of five studies conducted in community-dwelling older adults (three randomised controlled trials) were included in the metaanalyses. The overall risk of bias of these five studies was low. Results on sedentary behaviour were inconclusive due to heterogeneity (-19.61mins/day; 95% CI -66.88, 27.67; n=381; p=0.42; I2=89%). The majority of these five studies relied on education and psychological approaches.

The findings of the overall review demonstrated that interventions may induce relevant reductions in daily sedentary time; however, the heterogeneity in reported outcomes, intervention components and control arms (no intervention/alternative intervention) prevented us from drawing more firmer conclusions from the evidence provided. The complexity assessment also suggested that interventions may be complex to address the challenges of a complex system, but a higher complexity score is not necessarily associated with better outcomes in terms of sustained long-term changes.

Conclusions: Future interventions studies should apply more rigorous methods to improve research quality; considering larger sample sizes, randomised controlled designs and valid and reliable measures of SB.



# Efficacy of a computer-tailored web-based physical activity intervention using Fitbits for older adults: A randomised controlled trial

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#### Pre-recorded Presentation

Purpose: Preliminary evidence suggests that web-based interventions with tailored advice and Fitbits may be well suited for older adults.

Methods: This study aimed to test the effectiveness of 'Active for Life,' a 12-week complex web-based physical activity intervention for older adults. The intervention includes 6 modules of computer-tailored physical activity advice, an action planning tool and an exercise library. A total of 243 participants were randomly assigned to one of three trial arms: 1) tailoring+ Fitbit, 2) tailoring only, or 3) wait-list control. The tailored advice was based on either participants' Fitbit data (tailoring+ Fitbit) or self-reported physical activity (tailoring only). The Active Australia Survey was used to assess total physical activity (total PA) and moderate to vigorous physical activity (MVPA) at baseline and week 12. Intention-to-treat linear mixed model analyses were used to test for group differences on changes in total PA and MVPA.

Results: The 12-week assessment was completed by 166 participants (32% attrition). All 6 modules were completed by 69% of tailoring+ Fitbit participants and 58% of tailoring only participants. The tailoring+ Fitbit participants increased their weekly minutes of total PA from 154.64 (103.80-205.47) to 332.20 (249.59-414.81), the tailoring only participants from 170.62 (127.53-213.72) to 322.47 (246.39-398.55) and the control from 147.95 (100.13-195.76) to 342.25 (263.77-420.73). The tailoring+ Fitbit participants' increase in total PA did not significantly differ to the tailoring only (p=.67) or control (p=.78) participants. The tailoring+ Fitbit participants increased their weekly minutes of MVPA from 57.83 (30.54-85.11) to 156.02 (106.33-205.72), the tailoring only from 58.02 (34.89-81.15) to 86.68 (40.81-132.54) and the control from 49.74 (24.08-75.40) to 81.32 (33.98-128.67). The tailoring+ Fitbit participants increased their MVPA significantly more than the tailoring only (p=.04) and control (p=.05) participants.

Conclusions: A complex computer-tailored web-based physical activity intervention with Fitbits for older adults increased MVPA compared to the intervention without Fitbits and a wait-list control.



# Design and components of the SITLESS intervention and objective daily sedentary and physical activity time in European older adults

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### Pre-recorded Presentation

Purpose: The SITLESS study aimed to design and assess a complex intervention to reduce sedentary behaviour (SB) and increase physical activity (PA) in community-dwelling older adults. Both behaviours are important determinants of health in older adults. We aimed to describe the design of the SITLESS intervention and the baseline composition of objectively measured SB and PA in older adults, and to assess socio-demographic and functional correlates of engaging in higher levels of SB in participants of a multi-center study including four European countries. We will provide preliminary results of its effect on health and function, due to be analysed in February 2020.

Methods: The SITLESS intervention was designed combining existing PA programmes with self-management strategies (outcome expectations, self-monitoring, goal setting on PA and SB and social support) that address individual, social and environmental factors. 1360 community-dwelling older adults from the SITLESS study (61.8% women; 75.3±6.3 years) completed a self-reported SB questionnaire and wore an ActiGraph accelerometer for seven days. Accelerometer-determined compositional descriptive statistics were calculated. A fixed effects regression analysis was conducted to assess the socio-demographic (country, age, sex, civil status, education and medications) and functional (BMI, and gait speed) correlates.

Results: Older adults spent 80.5% of waking time in SB, 17.8% in light-intensity PA (LPA), and 1.7% in moderate to vigorous PA (MVPA). Watching television and reading accounted for 47.2% of waking time. Older age, being a man, single, taking more medications, being obese and overweight, and having a slower gait speed were statistically significant correlates of more sedentary time.

Conclusions: Our sample showed a high proportion of daily sedentary time. With an ever ageing European population this study justifies the need to develop and evaluate interventions to reduce sitting time with non-sitting activities, especially during television viewing. The distribution of context-specific sedentary activities by country and sex showed minor differences.



# Promoting Food Literacy in older adults – Participatory development of the intervention "GUSTO" in Germany

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Poster

### Purpose

Food Literacy (FL) as a component of Health Literacy (HL) is the ability to organize one's everyday nutrition in a selfdetermined, responsible, and enjoyable way. In the context of an aging population and an increasing life expectancy, the challenge of aging healthy is growing. The aim of the project "Enjoyable aging – Municipality-based improvement of FL in older adults (GUSTO)" is an improvement in HL and in particular FL of persons aged 65 or above. The intervention includes a group programme with peer-moderated self-reliant working groups of older adults. This group programme was developed in a participatory process with the target group.

### Methods

A literature search on the nutritional situation of older adults was conducted. The results were compared with the Dutch "self perceived food literacy scale" by Poelman et al. (2018) and the "nutritional competence scheme for basic education" of FL by the German Federal Centre for Nutrition (2019). From this data, different topics for the focus group discussions were deduced and discussed with the participants. Six guided focus group discussions were realized with the help of practice partners in different institutions for older adults in six municipalities. The answers of the participants were summarized and clustered.

### Results/findings

Overall, 44 people aged between 62 and 88 years (mean age:  $73.1 \pm 6.1$  years) participated in the focus group discussions. 22.7 % were men. The focus group discussions revealed resources and barriers concerning FL as well as contents of nutrition among older adults. With regard to the FL of persons aged 65 or above, the discussions revealed that the appraisal of information, due to the large amount and equivocality of information, and its practical use are difficult. The desired topics, for example best-before date, use of food waste and herbs and spices, were added to the intervention.

### Conclusion

The participatory proceeding is important to develop an intervention that is adjusted to the needs of the target group. The close collaboration with the practice partners in the municipalities ensured the successful implementation of the focus group discussions and an effective acquisition of older adults.



# Investigating the relationships between lifestyle physical activity and diet on vascular health among older adults

Dr. Catherine Elliot<sup>1</sup>, Dr. Michael Hamlin<sup>1</sup>, Ms. Hannah Hill<sup>1</sup>

<sup>1</sup>Lincoln University, Christchurch, New Zealand

Poster

#### Purpose

This research aimed to investigate how behaviours of lifestyle physical activity (LPA) and diet predict and correlate with vascular health in older adults using the gold standard measure of pulse wave velocity (PWV).

#### Methods

This cross-sectional study analysed 83 adults aged 64-91 years (M=78±6.44) residing in independent living communities. Dietary questions were taken from the Harvard disease risk tool. The Yale physical activity survey allowed the calculation of metabolic equivalents of task (METmins). PWV was collected using a non-invasive device (applanation tonometry).

A hierarchical regression was calculated whereby covariates of taking blood pressure medication (BPM) and age (both known to affect PWV) were controlled in model 1 and diet and METmins were added into model 2. Pearson correlations were then calculated to determine individual correlations with PWV by subgroups of sex and age.

### Results

The model 1 regression (R2=.29; F(2,79)=16.00, p<.001) indicated that covariates of BPM and age accounted for 29% (p $\leq$ .000) of the variance in PWV, but when diet and METmins were added in model 2 (R2=.31; F(4,77)=8.56, p<.001) they only contributed 2% more (non-significant change, p=.35) to the prediction of PWV. Healthier arteries in males correlated significantly with higher METmins (r=-.54, p=.004) and younger participants (r=.40, p=.027). Healthier arteries in females correlated significantly with younger participants (r=.49, p=.000), no BPM (r=.36, p=.002), and higher METmins (r=-.25, p=.029). Among 64-78 year olds, healthier arteries were correlated with no BPM (r=.35, p=.011), and healthier diets (r=-.26, p=.046), but not with METmins. Alternatively, 79-91 year-olds showed healthier arteries correlated with higher METmins (r=-.36, p=.012), but not with diet.

### Conclusions

After controlling for age and BPM (model 1) in the regression, diet and METmins (model 2) were unable to significantly contribute to the prediction of arterial stiffness in older adults. Both males and females showed correlations between healthier arteries and higher METmins, but not between arterial health and diet, suggesting LPA is more correlated to arterial health than diet. Those aged 64-78 had healthy arteries in correlation with a healthy diet, whereas 79-91 year olds had healthy arteries in correlation with higher METmins.



# Can fitness tests be used to predict the vascular health of physically active older adults?

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Poster

#### Purpose

There is an increased risk of cardiovascular diseases among older adults. This research aimed to determine which fitness tests could predict the vascular health of older adults using the gold standard pulse wave velocity (PWV) (applanation tonometry).

#### Methods

This cross-sectional study analysed 81 physically active adults (n=57 females) aged 64-91 (M=78±6.42) residing in independent living communities. A four-component fitness test included the 4-stage balance test (balance and falling assessment), six-minute walk test (SMWT) (aerobic exercise capacity), 30-second sit-to-stand test (postural hypotension and falling assessment), and the grip strength test (upper body strength) along with a PWV measurement. A regression use the four fitness tests as predictors of PWV for all participants. Pearson correlations then analysed these variables by subgroups of sex and age.

### Results

When including all 81 participants, the four-component fitness test significantly accounted for 20% of the variance in PWV (R2=.20; F(4,76)=4.70, p=.002) among older adults. Of the four components, higher sit-to-stand scores correlated with having healthy arteries ( $\beta$ =-.27, p=.027), but higher grip strength scores correlated with having unhealthy arteries ( $\beta$ =.23, p=.036). Neither the SMWT nor the balance test significantly contributed to the regression model.

Pearson correlations indicated for men that better balance correlated significantly with healthy arteries (r=-.47, p=.011). For women, higher sit-to-stand scores (r=-.43, p  $\leq$ .001) and better balance (r=-.23, p=.045) correlated significantly with healthy arteries. Among 70-79 year olds, higher sit-to-stand scores (r=-.41, p =.002) and better balance (r=-.32, p=.014) correlated significantly with healthy arteries. Among 80-89 year olds, higher SMWT (r=-.40, p =.024) correlated significantly with healthy arteries.

### Conclusions

The four-component fitness test did significantly predict arterial stiffness in older adults, but grip strength scores were unexpectedly negatively related to healthy arteries whereas sit-to-stand was positively related. In most groups, better balance and higher sit-to-stand scores were correlated to healthy arteries which was somewhat surprising. Finally, older participants were the only subgroup which showed a correlation between healthier arteries and higher SMWT scores. Given the SMWT is an aerobic exercise capacity assessment, it is surprising it did not correlate stronger to PWV.





# Assessment and Methodologies in Behavioral Nutrition and Physical Activity



# Temporal Physical Activity Patterns, Integrating Physical Activity Intensity and Timing, are Associated with Health

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### **Pre-recorded Presentation**

Purpose: Patterns of physical activity (PA) frequency and intensity have been linked to obesity and chronic disease. Integration of the specific timing, intensity, and sequence of PA in a day, to create temporal PA patterns has not been attempted, despite the potential relationship with health outcomes, and is the purpose of this research.

Methods: Objectively measured PA accelerometry data from 1,627 non-pregnant US adults 20-65 years with one random valid PA day collected in the cross-sectional National Health and Nutrition Examination Survey 2003-2006 was used to pattern absolute PA intensity and time of activity using data-driven methods. Clusters representing temporal PA patterns were created using modified dynamic time warping coupled with kernel-k means clustering algorithm. Multivariate regression models controlling for potential confounders, adjusted for multiple comparisons and the complex survey design determined associations between temporal PA pattern clusters and body mass index (BMI), waist circumference (WC), fasting plasma glucose, hemoglobin A1c, triglyceride, HDL-C, total-cholesterol, systolic and diastolic blood pressure and categories obesity, type 2 diabetes, and metabolic syndrome (p<0.05/6).

Results: A cluster representing a temporal PA pattern with the highest average intensity peaking at 11:00 and tapering off throughout the day was associated with significantly lower BMI (p<0.0001), WC (p<0.0001) and 65% lower odds of obesity compared to a cluster with lower average PA intensity peaking at 12:00 and tapering off (95% CI: 0.21, 0.47) and a cluster with the lowest average PA intensity with no distinct activity peaks (95% CI: 0.17, 0.43). Another cluster representing a temporal PA pattern with high average PA intensity peaking at 19:00 was associated with significantly lower BMI (p=0.0003), WC (p=0.001) and 60% lower odds of obesity compared to a cluster with lower average PA intensity peaking at 12:00 and tapering off (95% CI: 0.20, 0.74) and a cluster with the lowest average PA intensity peaking at 12:00 and tapering off (95% CI: 0.20, 0.74) and a cluster with the lowest average PA intensity and no distinct activity peaks (95% CI: 0.18, 0.59).

Conclusion: Temporal PA patterns are associated with differences in U.S. adult health status indicators. This study novelly demonstrates that integrating time and intensity to temporal PA patterns differentiates health outcomes and holds promise for future interventions and potential guidelines.



# Temporal Dietary Patterns, Integrating Energy Amount and Timing, are Associated with Health

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#### **Pre-recorded Presentation**

Purpose: The distribution of energy intake and amount of energy consumed in a 24 hour period, or temporal dietary pattern, was previously developed using data-driven methods and associated with dietary quality. A pattern of three moderate-energy eating events spaced from morning to evening had the highest dietary quality compared with other patterns. This study determined the relationship of temporal dietary patterns with health outcomes.

Methods: The first-day 24-hour dietary recall data from 1,627 non-pregnant adults 20-65 years in the cross-sectional National Health and Nutrition Examination Survey, 2003-2006, determined the amount of energy intake (kcal), time of intake (min), and sequence of intake throughout the 24-hour day. Modified dynamic time warping, coupled with kernel k-means algorithm, clustered participants into four groups representing distinct temporal dietary patterns. Outcomes body mass index, waist circumference, fasting plasma glucose, hemoglobin A1c, triglyceride, HDL-C, total cholesterol, systolic and diastolic blood pressure, categories for obesity, type 2 diabetes, and metabolic syndrome were constructed from measures from the examination. Multivariate regression models evaluated the relationship of temporal dietary patterns and each outcome, controlling for potential confounders, energy misreporting, and adjusting for multiple comparisons and complex survey design (p<0.05/6).

Results: The temporal dietary pattern cluster with similar average energy intake at three main eating occasions from 8:00 to 23:00 including peaks averaging 175 kcal at 9:00, 13:00, and 19:00, had statistically significant and clinically meaningfully lower body mass index (p<0.0001) and waist circumference (p<0.0001) and 75% lower odds of obesity compared to three other clusters representing patterns with much higher average peak energy of 500 kcal at 13:00 (OR: 4.41; 95% CI: 2.48, 7.86), 530 kcal at 18:00 (OR: 5.32; 95% CI: 2.80, 10.14), and 550 kcal at 20:00 (OR: 6.72; 95%CI: 3.91, 11.58).

Conclusion: Temporal dietary patterns differentiate clusters by body mass index, waist circumference, and odds of obesity among U.S. adults, providing unique evidence of the importance of timing of dietary intake throughout a day to health and supporting previous findings of higher dietary quality among those with similar temporal dietary patterns. Temporal dietary patterns hold promise for the development of future interventions and dietary guidance.



# Criterion Validity of the Fitbit Charge 2 to Measure Physical Activity and Sedentary Behaviour in Overweight and Obese Adults

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#### Pre-recorded Presentation

Wearable fitness trackers have increased in popularity and could motivate individuals to live healthier lifestyles. However, the validity of wearable fitness trackers has not yet been established in an overweight population. This study aims to determine the criterion validity of the Fitbit Charge 2 in measuring physical activity (PA) and sedentary behaviour in an overweight/obese population under free-living conditions. Fifty-nine (age: M=48, SD=11 years, female: 69%) overweight/obese adults (BMI: M= 34, SD =4 kg/m2), concurrently wore a Fitbit Charge 2 tracker and an ActiGraph GT3X+ accelerometer for 8 days. Data sets were aligned so that only the same waking wear periods were included in the analysis and time spent (min/day) in sedentary time and moderate-to-vigorous physical activity (MVPA) were estimated using standard cut-points for GT3X+ and proprietary algorithms for the Charge 2. Paired t- tests and mean absolute percentage errors (MAPE) were used to examine differences and measurement errors in estimates between the two devices. Pearson and Spearman correlations and Bland-Altman (BA) plots were used to evaluate the association and potential systematic bias between the Fitbit and GT3X+. The results reflected that in comparison to the GT3X+, the Charge 2 recorded a significantly higher amount of time spent in sedentary behaviour, but had a low MAPE (mean difference [MD] = 33 min/day, p = 0.006, MAPE = 7%), whereas a relatively large MAPE was apparent for time spent in MVPA (MD = 16 min/day, p = 0.004, MAPE = 64%). The Charge 2 underestimated time spent in light PA (MD = -30 min/day, p = 0.001, MAPE = -9%) compared to the GT3X+. Despite the high degree of correlation between the two devices for step count (r=0.94, p<0.111), the Charge 2 recorded around 2000 more steps per day (p<0.001) than the GT3X+. In overweight adults, the Charge 2 overestimated time spent in sedentary behaviour, MVPA and step count compared to the GT3X+, but underestimated time spent in light PA. In this population, the Charge 2 demonstrates mostly good agreement with the GT3X+ and may be a useful tool for self-monitoring of activity.



# Is it Physical Activity or Green Space that Impacts Adolescent's Mood? – An Ambulatory Assessment Study.

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#### Pre-recorded Presentation

Purpose: Contextual factors have a critical impact on human behavior and mental health, with ambulatory assessment as the state-of-the-art approach to collect data on all three components: Through combining accelerometer-measured physical activity (PA), e-diaries on smartphones to assess mood in real-time, and geolocation-tracking, ambulatory assessment allows to investigate within-person processes in human's everyday life.

The within-person relationship between PA and mood has been investigated in several ambulatory assessment studies, but results are inconsistent. This might be due to a neglect of contextual factors. Thus, we tested if PA and green space (GS), a well-researched contextual factor, show distinct effects or confound each other in predicting mood.

Methods: Within the URGENCY study (https://www.zi-mannheim.de/en/research/research/associations/pez.html), adolescents (N = 141, 42.5% female, mean age = 15.07; BMI = 20.4) wore accelerometers for seven consecutive days. Additionally, they responded on average six times per day to mood-questionnaires on GPS-triggered smartphone-diaries during everyday life. We calculated the percentage of GS within 100m2 around the participants geolocation (using ArcGIS), parameterized GS and PA across different time frames prior to the e-diary prompts, and applied multilevel model analyses (using SPSS) to test for within-subject effects of PA and GS on mood.

Results: If using separate models for PA or GS predicting mood dimensions, both PA and GS were positively associated with affective valence (both p <. 01) and energetic arousal (both p <. 05), but calmness was only negatively impacted by PA (p <. 05). However, entering both PA and GS simultaneously into the models changed the results for affective valence, which was only associated with GS (p <. 05). No interaction effects were found between PA and GS.

Conclusion: PA and GS show distinct effects on adolescents' mood in everyday life: Only GS enhances affective valence, both GS and PA increase energetic arousal, but only PA decreases calmness. If replicated, these results can guide interventions using PA and GS to regulate adolescents' mood. Moreover, they may explain inconsistent findings from within-person studies, suggesting that future studies should not only measure PA, but also include contextual factors.



# Associations between parent report and accelerometer-measured physical activity and sedentary time in children: Ecological momentary assessment study

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Pre-recorded Presentation

PURPOSE: The use of mobile ecological momentary assessment (EMA) has not been investigated as a measure of young children's physical activity (PA) and sedentary behavior (SB) when reported by a child's parent. Our purpose was to examine the associations between parent EMA-report of child PA and SB and accelerometer-measured sedentary time (ST), light PA (LPA), and moderate-vigorous PA (MVPA), and whether these associations differed by day of week, sex, and season.

METHODS: 140 children (aged 6.4±0.8 years;47% girls) wore an accelerometer for 8 days to measure ST, LPA, and MVPA. Parent report of child PA and SB was measured via multiple daily signal contingent EMA surveys. Accelerometer data was matched to the time period occurring before parent EMA-report of child PA and SB. Generalized estimating equations with interaction-term analyses assessed whether the relationship between parent-EMA report of child PA and SB and accelerometer-measured ST, LPA and MVPA differed by day of the week, sex and season.

RESULTS: Parent EMA-report of child PA and SB was strongly associated with accelerometer-measured ST, LPA, and MVPA. Parent EMA-report of child PA was stronger during weekend than weekdays for accelerometer-measured ST (P = .001) and LPA (P = < .001). For parent EMA-report of child SB, strong associations were observed for accelerometer-measured ST (P = < .001), LPA (P = .005) and MVPA (P = .008). Sex-interaction results indicated the association between parent reported child PA via EMA and accelerometer-measured MVPA was stronger for boys than girls (P = .02). The association between parent EMA-report of child PA and SB and accelerometer-measured ST and PA was similar across seasons (all P > .1).

CONCLUSIONS: When accelerometry-based methods are not feasible in epidemiological research and in contexts where the parent is able to spend more proximate time observing the child's PA and SB, parent EMA-report might be a superior method for measuring PA and SB in young children relative to child self-report methods -given EMA's strong associations with accelerometer-measured PA and ST.



# Assessing the school neighbourhood built environment: Modification of an environmental audit tool and protocol (MAPS Global-SN)

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#### Pre-recorded Presentation

#### Purpose

Active transport to school contributes towards adolescents' daily physical activity and can be influenced by school neighbourhood built environment (SN-BE) characteristics. SN-BE assessment typically involves micro-scale (i.e., environmental audits) or macro-scale (Geographic Information Systems (GIS)) tools. However, existing environmental audits are time/resource-intensive and not specific to school neighbourhoods, while GIS databases are not generally purposed to include micro-scale data. This study evaluated the inter-rater reliability and feasibility of using a modified audit tool and protocol (Microscale Audit of Pedestrian Streetscapes Global–School Neighbourhood (MAPS Global-SN)) to assess the SN-BE of secondary schools. Correlations between MAPS Global-SN and GIS measures of the SN-BE were also examined.

### Methods

MAPS Global-SN audit (adapted from the original MAPS Global audit) and GIS spatial analysis (intersection density, residential density, land use mix, walkability) was conducted within a 0.5 km street-network buffer-zone around all twelve secondary schools in Dunedin, New Zealand. Based on investigator and expert consultation, MAPS Global-SN included eight modifications to both auditing processes and items. Inter-rater reliability data was collected from two independent auditors across two schools. Intraclass correlation coefficient (ICC) was calculated for nine MAPS Global-SN overall sub-scales and scores. The feasibility of a condensed audit protocol (auditing one side of each street segment in the neighbourhood, compared to both sides) was also assessed. Data were analysed using Pearson's Product Moment Correlations and Spearman's Rank Correlation Coefficient.

### Results

Overall, all assessed sub-scales and scores showed "good" to "excellent" inter-rater reliability (ICCs=0.60-0.99). When considering the condensed audit protocol, significant positive correlations were identified between odd and even sides of each street segment for five of eight assessed sub-scales and scores (r=0.68 to r=0.98; all p<0.05). Only one of the overall MAPS Global-SN sub-scales was positively correlated with school-level GIS measures of intersection density, residential density and walkability (r=0.64 to r=0.75; all p<0.05).

### Conclusions

MAPS Global-SN and condensed protocol may be a feasible alternative to micro-scale SN-BE assessment, by simplifying data collection and time/resource commitments. Macro-scale GIS analysis should complement MAPS Global-SN. Future studies should establish the reliability of MAPS Global-SN internationally and assess the SN-BE in relation to active transport to school.



# A Single Summative Global Score of Disordered Eating Attitudes and Behaviors: findings from Project EAT

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### **Pre-recorded Presentation**

Purpose: Interrelated disordered eating attitudes and behaviors may exist on a single dimension. In this study, we examine the appropriateness of creating a global score from five disordered eating attitudes and behaviors, examine the track the fit over time, and examine its convergent validity.

Methods: Five disordered eating attitudes and behaviors were assessed among 1492 participants in a longitudinal cohort (Project EAT, age 11 to 18 at 1998-1999). The appropriateness of creating a global score was examined by confirmatory factor analysis. To examine whether the individual variables functioned differently in relation to the overall latent construct across time, two models were compared: one requiring indicator-level factor loadings to remain equivalent across three-time points (baseline [EAT-I], five-year follow-up [EAT-II], and 15-year follow-up [EAT-IV]), and the second allowing the factor loadings to vary over time. Convergent validity of the global score was examined by Pearson correlation with body satisfaction, self-esteem, depressive symptoms, and BMI. The correlation was compared across three time-points (EAT-I, II, and IV).

Results: The use of five disordered eating attitudes and behaviors in creating a global score was supported by the goodness of fit indices for a single factor structure (standardized loadings: 0.60-0.87, 0.67-0.89, 0.59-0.77 at EAT-I, II, and IV respectively), which were consistent over time. As expected, the global score negatively correlated with body satisfaction, self-esteem, and positively correlated with depressive symptoms and BMI over time (all p < 0.01).

Conclusions: The five disordered eating attitudes and behaviors can be viewed on a single dimension. The five-point global score of disordered eating attitudes and behaviors is a stable analysis tool to measure the severity of disordered eating attitudes and behaviors in population-based studies.



# The development and reliability of a video coding scheme for categorising freeliving physical activity in 8–16 yr old children.

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#### Pre-recorded Presentation

Purpose: Machine learning may improve accelerometer-measured physical activity but most studies rely on laboratory data to develop ground truth measures. Studies of free-living activity are hampered by the difficulty of categorising these data. Wearable cameras can provide objective free-living ground-truth data, but there is limited literature that describes the methodological approaches used to classify the copious amount of visual data. The aim of this study is to describe the development of a coding scheme for analysing free-living physical activity video data.

Methods: GoPro videos were obtained as part of a validation of 24-hour movement behaviours in 137 children wearing wrist, hip, lower back and thigh accelerometers. Videos were imported into Noldus Observer XT. A standardized coding protocol was developed based on general movement patterns and refined through group discussion. Inter-rater reliability of second-by-second video coding was established using an iterative cycle of blind-coding (relative to other coders) followed by discussion, with all disagreements resolved by group consensus. This yielded a set of videos with criterion codes from which additional coders could be trained.

Results: Every second of video was assigned to one of 23 movement codes. Behaviour codes included lying, sitting, standing, walking, and running and whether one or both arms were engaged. Other behaviour codes included shuffling/crouching, bending, whole body physical activity, stair ascending/descending, cycling (indoor), cycling (outdoor), inactive transport (on feet), inactive transport (sitting), and swimming. Transitional movements were also coded (e.g., standing to sitting, sitting to standing, lying to standing, and standing to lying). Visual cues in the video were used to inform classification (i.e., knee, leg, and hip positions, position of hands, directional movements, and movements in relation to other objects/people in the video). Images were classified as "undefined" when the camera lens was obstructed. Two researchers independently annotated a random subsample of 30 minutes of video for each child. Inter-rater reliability was assessed using the Kappa statistic.

Conclusions: The methodological processes used in the current study can inform future studies that use wearable cameras in a free-living environment.



# How do people interpret self-report sedentary behaviour questionnaires? A think-aloud study

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Pre-recorded Presentation

Purpose: Sedentary behaviour – i.e. any waking activity that expends fewer than 1.5METs/min while seated or lying down – has emerged as a health risk factor, largely independently of physical activity. This has inspired considerable research to understand, predict, or change sedentary behaviour patterns. Much of this research has been based on self-reported sitting time. Yet, little is known about how participants interpret self-report sedentary behaviour items. Erroneous interpretations, for example, may generate unreliable or inaccurate data. 'Think aloud' methods, whereby participants narrate their thoughts as they complete a task, can provide insight into how people interpret questionnaires, and how they mentally represent the concepts under study.

Methods: 25 UK office workers 'thought aloud' as they completed 38 items from 9 sedentary behaviour questionnaires (e.g. Workplace Sitting Breaks Questionnaire, Multi-Context Sitting Time Questionnaire), as systematically selected from a pool of 30 questionnaires. Verbatim transcripts were analysed using Thematic Analysis, undertaken by three coders, to identify potential problems experienced when completing the questionnaires.

Results: Three themes emerged: interpretation problems; errors and biases in formulating responses; and motivational and affective responses to questionnaire completion. Interpretation problems included instances of uncertain interpretations, inconsistent interpretations of similar items, and interpretations that deviated from the intended meaning. Participants typically mentally encoded time spent sitting according to concurrent activities (e.g. commuting) and translating these events into a sitting time metric was effortful and prone to error. Several participants expressed surprise at their high estimated sedentary time, which appeared to motivate them to reduce their sitting.

Conclusions: Participants typically did not mentally represent sitting as 'sitting', which can cause problems when people self-generate sitting time estimates. Domain-specific items, which assess time spent in discrete seated activities, may be less burdensome and less prone to error and bias than items that require direct reflection on sitting itself. Self-reporting sitting time can have 'mere measurement effects', enhancing motivation to reduce sitting time. While this may be problematic for prospective studies that assume test-retest validity, it raises the possibility that self-reporting sitting may offer a promising sedentary-reduction intervention technique.



# Transiting from army to civilian life: understanding the drivers of weight change in young adult men

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#### Pre-recorded Presentation

Purpose A higher prevalence of obesity in men compared to women, particularly amongst those 18 to 40 years of age, has been observed in Singapore. We hypothesized that poor adaptation during the transition from obligatory military training to civilian life in our young men may contribute to weight gain and sought to understand the underlying drivers.

Methods In-depth interviews were conducted with 26 healthy, normal weight young men, who completed military service the previous year. The interviews were guided by the health belief model to elicit perceived factors influencing weight change during the transition period, and barriers and motivators in weight management. Data was collected and cross-checked by two researchers who analysed using the thematic analysis approach.

Results The participants generally perceived themselves to be less fit and healthy compared to being in army and felt that changes in their physical activity levels and eating behaviors were contributing to their perceived weight gain. They, however do not have immediate concerns about their weight changes, citing that effects were reversible or only observed later in life.

While most were aware of the benefits of regular physical activity, benefits of healthy eating were less mentioned. Many do not view these lifestyle behaviors as current life priorities, citing reasons such as a lack of time, poor fit into current lifestyle or having little self-motivation. Other barriers included peer influence on food choices and a lack of common leisure time to exercise with peers. Motivators for these lifestyle behaviors were mostly intrinsic, including interest in a particular sport, making a personal choice and having personal fitness goals. The need to compensate for the lack of physical activity or unhealthy food consumption through healthy eating was also mentioned. Extrinsic motivators were related to peer influence, accessibility to sports facilities and healthy food options and monetary incentives.

Conclusions There remains a need to educate our young men, particularly correcting their misconceptions about lifestyle, weight and health. A healthy environment and appropriate incentives would be important to facilitate lifestyle changes in these men, who are at risk of weight gain during this transition phase.



# Correlates of weight loss maintenance: a systematic review of weight control registries

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Pre-recorded Presentation

Purpose: Several countries established weight control registries, with the aim of identifying the main sociodemographic, psychological and behavioral characteristics of individuals successful at weight loss maintenance in their contexts. The purpose of this study is to identify and systematically synthesize the correlates of the magnitude of weight loss maintenance (WLM) in successful weight loss maintainers.

Methods: A comprehensive search of peer-reviewed articles was conducted in three electronic databases: PubMed, Web of Science and SCOPUS (all articles published until November 2018). Searches included various combinations of the following terms: weight loss maintenance, weight control registry, national weight control registry, Portuguese, Greek, Finnish, German. Studies were selected for this review if the sample included participants of weight control registries. The MOOSE guidelines were used to extract relevant information. The methodological quality of the studies was assessed using the Effective Public Health Practice Project – Quality Assessment Tool for Quantitative Studies. All associations identified through Pearson and Spearman correlations were considered. In some specific cases, linear and multiple regressions, odds-ratio/relative risk and X2 (with post-hoc tests) were also considered.

Results: The search yielded 159 potentially relevant studies after title and abstract screening. After full-text screening, 52 articles met the eligible criteria and were included. Thirty sociodemographic, behavioral and psychological correlates of the magnitude of WLM were identified across 16 studies. Age was the only sociodemographic variable showing an association (negative) with the magnitude of WLM. Physical activity was the most frequently studied correlate (k=5) with all of the studies reporting a positive association with the magnitude of WLM. Energy intake and fat intake were identified as negative correlates (k=3), contrary to protein intake (k=1). General (k=3) and internal eating disinhibition (k=2) were identified as psychological negative correlates.

Conclusions: Behavioral and psychological factors seem to play a key role for maintaining weight loss, contrary to sociodemographic variables. Systematically identifying and summarizing the sociodemographic, behavioral and psychological correlates of the magnitude of WLM in successful weight loss maintainers can contribute to inform future obesity prevention and treatment initiatives towards better long-term outcomes.



# Co-producing a physical activity programme for women with previous gestational diabetes using a secret Facebook group

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Pre-recorded Presentation

Co-production is reliant on consensus between participants, but in-person meetings and workshops are nearimpossible for time-constrained and hard-to-reach groups. An innovative new method of consensus-gathering was needed to further understand physical inactivity and how to intervene in a time-constrained group. A lay advisory group meeting resulted in the decision to hold a workshop over a secret Facebook group with participants to develop a theory of change and theory of action.

Purpose: To test the feasibility using a secret Facebook group to co-produce an intervention with a time-constrained group, women with previous gestational diabetes.

Methods: The researchers created a secret Facebook group with content that sequentially progressed to develop a programme theory. We evaluated the feasibility and acceptability of the group by analysing Facebook analytics and a post-workshop survey. The researcher posted 1-2 times per day for 14 days. Messages and content were typically posted between 15:30 and 17:30 GMT, as suggested by the lay advisor group as mothers will be returning from work and may have a short break before dinnertime.

Results: Twenty-one participants took part. In total, 521 comments were provided in response to 18 posts of polls, video, text or photos (average = 28.9 comments per post). The total word count of participant comments was 21,142 words. The workshop was viewed positively, with 20 of 21 participants saying they liked the workshop somewhat or a great deal, and felt the group was a safe and open environment to share opinions. When asked if they would take part in something like this again, 15 of 21 said "Yes". Participants mentioned the format was convenient to fit into their day; it allowed them to reflect on their own experiences; and how they liked helping research progress. The six participants who didn't reply "yes" said it was still difficult finding time and it depended on what else was going on.

Conclusion: Using a secret Facebook group to develop a physical activity interventions proves to be a feasible and acceptable method. This holds significant potential for a diverse group of hard-to-reach groups who could benefit from this method of co-production.



# A conceptual framework for modelling safe walking and cycling routes to secondary schools

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#### Pre-recorded Presentation

Background: Safe route to school interventions aiming to encourage walking and/or cycling to school are promising strategies to increase adolescent rates of active transport to school. Multiple factors influence whether adolescents walk and/or cycle to school. This article presents a comprehensive conceptual framework for modelling safe walking and cycling routes to secondary school.

Methods: The framework has been developed based on the existing relevant frameworks including: a) the ecological models which account for individual, social, environmental and policy factors as well as traffic and personal safety considerations; b) the Five E's framework of transport planning which includes engineering, education, enforcement, encouragement, and evaluation components; and c) travel mode choice framework for school travel consisting of urban form, mediating and moderating factors.

Findings: The proposed framework takes into account the key components of the existing relevant frameworks and shows how they are interconnected with each other for modelling safe walking and cycling routes to secondary schools. The framework identifies that built environment features (land use mix, walking/cycling infrastructure, neighborhood aesthetics, and accessibility to local facilities) and traffic safety factors (traffic volume and speed, streetlights, safe road crossings, and quality of roadway surface) need to be considered when modelling safe walking and cycling routes to secondary schools.

Conclusions: The framework suggests that modelling of safe school routes should focus on addressing the built environment features and traffic safety concerns. The framework needs to be tested using actual data in different geographical settings. Modelled routes should be evaluated prior to implementation using local data and ideally also incorporating feedback from stakeholders and future users. To be effective, modelling and creation of safe routes to secondary schools should be complemented by other interventions including education, enforcement, and encouragement to minimise perceived active transport-related traffic and personal safety concerns of adolescents and their parents. Future research should utilise multiple tools for assessing the school route built environment features including Geographic Information Systems and environmental scans.



# Gender differences in the accuracy of dietary assessment methods to measure energy intake in adults: a systematic review

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#### Pre-recorded Presentation

Purpose: In order to inform the interpretation of nutrition data and targeting of interventions, it is important to understand whether there are gender differences in the reporting of dietary intake. The objective of this review was to explore differences by gender in self-reported energy intake compared to a reference measure of total energy expenditure.

Methods: Six electronic databases were systematically searched for published original research articles between 1980 and October 2019. Studies were included if they were conducted in general adult populations and included a measure for both women and men of self-reported energy intake, and total energy expenditure from doubly-labelled water (DLW). Two authors independently screened studies and conducted a quality appraisal of the included studies using standardised tools. Data was extracted on study characteristics, including the dietary intake assessment method used.

Results: From the database searches, 2,166 studies were identified, of which 30 met the inclusion criteria. The studies collectively included information on 4,387 individuals (n women=2,371) and the majority (n=27) were conducted in high-income countries. Sixteen of the studies were evaluated as being of a high quality in reference to the selection of participants, comparability of study groups, intervention methods and outcome descriptions. The included studies used a variety of self-reported energy intake assessment methods, including 24-hour multiple-pass diet recalls (n=13), weighed food records (n=10), food frequency questionnaires (n=9), food diaries (n=6) and diet history questionnaires (n=3). When compared to energy expenditure measured by DLW, energy intake was underestimated in all but one study for women and in all but two studies for men. Underestimation of energy intake ranged from 600-7,708 kJ/day and 430-5,600 kJ/day for women and men, respectively.

Conclusion: This systematic review has identified substantial underestimation of energy intake for women and men across a range of dietary assessment methods. As a next step, a meta-analysis will be conducted to quantify the degree of underestimation which will assist in evaluating the relationship of gender with diet and disease outcomes.



Active transport to school correlates in the objective and perceived school neighbourhood built environment for urban and rural areas in Otago, New Zealand

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#### Pre-recorded Presentation

Background: Built environment correlates of adolescents' active transport to school (ATS) have been extensively studied in urban areas whereas limited evidence exists for rural areas. School neighbourhood built environment (SN-BE) features may differ across urbanization settings and warrant further investigation. This study investigated correlations between school-level rates of ATS, objectively measured SN-BE features and adolescents' perceptions of safety along the route to school among New Zealand adolescents living in different urbanization settings and within 4 km of their school (considered a reasonable cycling distance).

Methods: Adolescents (n=1260; 43.6% male; 15.2±1.4 years) were recruited from 23 (out of 27) secondary schools located in large (n=11), medium (n=3) and small urban areas (n=4) and rural settlements (n=5) in the Otago region, New Zealand. Adolescents completed an online survey about their school travel and perceptions of safety. Responses were aggregated to present school-level averages. Home-to-school distance and SN-BE features (intersection density, residential density, mixed land use) were measured using GIS over 0.5 km and 1 km buffers. Walkability index was calculated for each school.

Results: On average, 38.1% of adolescents used ATS (range: 27.8%-43.9%). School-level ATS rates were negatively correlated with SN-BE intersection density (0.5 km and 1 km buffers: r=-0.610; r =-0.589), residential density (r=-0.620; r=-0.604) and walkability index (r=-0.697; r=-0.642) (all p<0.01), whereas weak but significant positive correlation was found with mixed land use (r=0.095; r= 0.070; both p<0.05). School-level ATS rates were negatively correlated with adolescents' concerns about safety of walking or cycling to school (walking: r=-0.763; cycling: r=-0.785), high traffic volume (r=-0.826) and presence of dangerous intersections (r=-0.751) along the school route. Adolescents' perceptions of the presence/absence of footpaths and cycle paths along the school route were not significantly correlated with school-level ATS rates.

Conclusion: When assessed across different urbanization settings and among adolescents living within 4 km of their school, lower rates of school-level ATS were negatively related to SN-BE intersection density, residential density and walkability, and adolescents' concerns about safety of walking/cycling to school, particularly in relation to traffic safety. Future ATS interventions should focus on SN-BE features and minimise adolescents' traffic safety related concerns.



# The course of fatigue and physical activity from discharge up to 5-7 years post stroke rehabilitation and the role of activity pacing behaviour: A longitudinal mixed-methods study.

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**Pre-recorded Presentation** 

Purposes: The course of fatigue and physical activity (PA) from discharge up to 5-7 years post stroke rehabilitation may be influenced by activity pacing behaviour (how people divide their energy and PA during the day). This study aims (1) to explore how people after stroke perceive their course of fatigue and PA post rehabilitation and (2) to explore participants' experience of activity pacing behaviour, and its barriers and facilitators.

Methods: People after stroke (N=303) were followed from 3-6 weeks before discharge (T0) to 14 (T1), 33 (T2) and 52 (T3) weeks after rehabilitation in the longitudinal cohort study Rehabilitation, Sports and Active lifestyle (ReSpAct1.0). Latent Class analyses were used to characterize diversity in the course of fatigue and PA (trajectories from T0-T3), based on questionnaire data. Based on these trajectories and participants' characteristics (gender and age), a heterogeneous subsample of the ReSpAct1.0 study (N=20) will be invited, around 5-7 years post stroke rehabilitation, to fill in a short questionnaire and to participate in a semi-structured interview on how they experience their course of fatigue and PA, and on their activity pacing behaviour. The qualitative data will be combined with individual fatigue and PA trajectories and data on activity pacing behaviour into a longitudinal mixed-methods study. Audiotapes of the interviews will be transcribed verbatim. Both a thematic inductive and a deductive analysis (based on the Behaviour Change Wheel Taxonomy, centred on activity pacing behaviour) will be performed.

Results: Three fatigue trajectories were identified: (1) stable high (N=163), (2) stable low (N=41) and (3) recovery (N=2). Three PA trajectories were identified: (1) moderately active (N=196), (2) active (N=35) and (3) strongly improved PA (N=4). Further results will be presented during ISBNPA2020.

Discussion: We found a large diversity in fatigue and PA trajectories post stroke rehabilitation (T0-T3). Further findings of this study will provide a deeper understanding of the diversity in fatigue in people after stroke and the role of activity pacing behaviour to obtain/maintain a physically active lifestyle.



# ActivPAL measured activity levels of adults with acquired brain injury and validity of a wrist-worn Fitbit to measure steps and sedentary behaviour

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Pre-recorded Presentation

#### Purpose

This study focused on measuring activity levels of adults with acquired brain injury [ABI]. Currently, there is lack of objective measurement of physical activity [PA] and sedentary behaviour in adults with ABI. The study also aimed to validate the Fitbit for measuring steps and sedentary behaviour in adults with ABI.

#### Methods

In this observational study, adults with ABI wore a Fitbit (wrist) and an activPAL (thigh) during a laboratory session (one hour) and free-living (7 days). Steps (both settings), and stepping and sedentary time (minutes; free-living) were calculated for both devices. Sedentary time included wake and sleep-time, as Fitbit data were only available in 24-hour summaries. Correlation (Spearman) and Bland-Altman analyses were used to examine the validity of the Fitbit compared to the activPAL.

### Results/findings

Twelve adults (7 male; 46(±13) years) with ABI (11(±12) years since injury) participated. ActivPAL data showed they were awake for  $15(\pm 2)$  h/day, spent 60% of the day sitting, 29% standing and 11% stepping (7218 steps/day), all participants stepped ≥150 min/week, and approximately 95 min/day were spent in stepping bouts of <10 minutes. Fitbit steps correlated strongly with the activPAL for both settings (rho>0.90; p<0.01). Fitbit overestimated steps in the laboratory (mean difference [MD]: 13 steps, 95% Limits of Agreement [LoA]: -124-151) and underestimated steps in free living (MD: -214 steps/day, LoA: -3812-3384). Fitbit sedentary time was poorly correlated with the activPAL (rho: 0.03), overestimating by 273 min/day (LoA:-77-623).

### Conclusions

Participants in this study spent most of their waking hours sedentary, but spent a considerable proportion in standing and stepping activities. However, only one participant met the PA guidelines of the WHO, and the majority of stepping time was in bouts <10 minutes. The Fitbit classifies this time as sedentary, which may have caused the poor correlation with the activPAL. The results of this study suggest that the Fitbit provides a valid measure for steps in this population but sedentary time should be interpreted with caution.



# No bouts about it: Comparing time spent walking in 10min bouts with total walking time

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Pre-recorded Presentation

Purpose: Physical activity is commonly measured as time spent in bouts of at least 10 minutes, however each minute of physical activity (PA) achieved per day is now considered to be beneficial for health by breaking up sitting time, changing posture and adding to daily PA minutes. This study compared the difference in the self-reported total time spent walking in a week to time spent walking in 10 minute bouts over the same 7 day period through a university population sample.

Methods: A census-style, online survey was used to collect PA data from staff and students at The University of Sydney. One measure, from the validated Active Australia Survey (AAS) reports walking in bouts of 10min or more over seven-days, the second measure reports total estimated time spent walking over the seven day period. Data from n= 4582 was analysed and a paired t-test was performed to determine any difference between the mean time participants reported to walk in 10 min bouts and the mean total time they reported to walk over the same 7 day period.

Results/findings: Our finding suggests very strong evidence that more walking was done in short bursts of less than 10 minute bouts. Over a seven day period, participants engaged in a mean of 352 minutes of walking in total compared with 235 minutes of walking in 10 minute bouts. When comparing the reported minutes of walking in either 10min bouts or total minutes, there was a significant 117min/week difference (p<0.001).

Conclusion: Significantly more walking is done in short bursts across a week. Walking in this way contributed to an extra 16min/day of physical activity which is beneficial for health even when completed in bouts less than 10 minutes. Measuring total walking minutes rather than only in bouts of at least 10 minutes may provide a more useful estimate to monitor population trends and evaluate PA interventions.



# Using automated wearable cameras with 24-hour in to capture diet in adolescents

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#### Pre-recorded Presentation

Purpose: Understanding sources of measurement error in self-reports of diet is important for advancing methods. Wearable cameras are an emerging method of observing dietary intake in natural environments. The aims of this study were to compare energy and nutrient intakes from 24-hour recalls with and without inclusion of foods from images collected using automated cameras in adolescents.

Methods: Adolescents 13-17 years (n 168) living in Dunedin, New Zealand were recruited to take part in research investigating pre-bedtime behaviours and sleep between January 2018 and May 2019. Adolescents wore a Brinno TLC120 camera from 5pm until bedtime for three evenings set to capture an image every 15 seconds. An interviewer administered 24-hour recall was completed on the day following the third evening of wear. Foods not reported in the recall were identified in the images. Nutrient intakes (energy, macronutrients, potassium, calcium, iron, beta-carotene, vitamins A, B6, B12, C) from the 24-hour recall were calculated before and after inclusion of foods identified from images.

Results: 51 boys and 68 girls wore the camera and completed a 24-hr recall the following day. Nearly 40% of participants forgot to report at least one food or beverage for the evening of the 24-hour recall. Most commonly these were biscuits, cakes and muffins (14%) and sweetened beverages (14%) followed by bread, vegetables and bread-based dishes (5%) (e.g. pizza and sandwiches). Energy intake was 5% greater with inclusion of images for boys (mean difference: 530 kJ; 95% CI: 101, 958) and 3% greater for girls (mean difference: 230 kJ; 95% CI: 107, 352).

Conclusions: Although only worn after 5pm and capturing an image every 15 seconds the use of an automated camera with 24-hr diet recalls modestly increased estimates of energy and other nutrients. Baked snacks and sweetened beverages were most often forgotten or excluded in the dietary recall.



# Development and testing of a new nutrition knowledge survey for Australian children ages 8-12: the CNK-AU

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#### Pre-recorded Presentation

Purpose: Poor dietary habits are established in childhood and often persist into adulthood. As higher levels of nutrition knowledge has been found to be related to healthier eating patterns, there is a pressing need to enhance children's nutrition knowledge in Australia. However, interventions concerned with nutrition knowledge improvement need appropriate measurement tools to test their effectiveness. Unfortunately, few reliable and valid measurement tools exist and the aim of the current study was to develop and test a nutrition knowledge questionnaire for Australian children.

Methods: A team of nutrition and education experts developed a nutrition knowledge questionnaire for Australian children aged 8-12 years (the CNK-AU), based on an existing validated Belgian survey. The questions were translated and adapted to align with Australian culture and national dietary recommendations. The CNK-AU was test for content-, internal- and external validity among primary school children aged 8 to 12.

Results: The new tool consists of eight nutrition-related topics (i.e. healthy choices, AGHE serves, balanced meals, portion sizes, food safety, -groups, -functions and -sources). Year 5/6 students at a primary school in Newcastle, Australia were recruited and completed the nutrition knowledge survey twice; at baseline (T0: n=186, age=10.9, SD=0.76, 56% female) and after one week (T1: n=94, age=10.9, SD=0.76, 53% female). Teachers were asked not to teach any nutrition during the study. It was possible to pair 94 of the participants with their results on the T0 CNK-AU, as the remaining participants were sorted into the intervention arm of a simultaneous nutrition education program. Content was validated in a previous pre-test, item-analyses found varied item difficulty and discrimination, the internal reliability was low to moderate for all categories and the total score. A test-retest showed all (except 'AGHE serves') categories and total score of T0 and T1 to be significantly correlated ( $\Delta M=0.646$ , r=0.756,p<0.001), confirming the test-retest validity of the survey.

Conclusions: Using the item analysis results, future studies should establish a shorter version of the CNK-AU and in addition test the CNK-AU on a younger population. The test-retest shows the CNK-AU is reliable but indicated AGHE serves as a gap in the children's knowledge.



# Comparison of a photoplethysmography-based wearable device and a researchgrade accelerometer with polysomnography in youth

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### Pre-recorded Presentation

Purpose: To compare sleep metrics produced by the Fitbit Charge 3 (Fitbit) and Actigraph GT9X accelerometer (Actigraph) to polysomnography (PSG) in youth.

Methods: Participants included thirty-nine youth (age=9.5±3.4 years, BMI%tile=71.4±30.4, 40% male, 61% Black) referred by their physician for an overnight sleep study due to snoring, restless sleep, or enlarged tonsils. Fitbit and Actigraph were worn on the non-dominant wrist and recorded data concurrently with PSG. Fitbit and Actigraph sleep metrics including total sleep time (TST), sleep efficiency (SE), wake after sleep onset (WASO), sleep onset, and sleep offset were extracted from Fitabase and Actilife with the Sadeh algorithm, respectively, while sleep technologists scored PSG data. Bland-Altman plots assessed agreement between devices and PSG.

Results: 77% of youth were diagnosed with obstructive sleep apnea, 8% with elevated periodic limb movement, and 15% with no sleep-related diagnosis. Compared to PSG, Fitbit overestimated TST by 0.9 min (absolute mean bias=27.9 min), while Actigraph underestimated TST by 29.4 min (absolute mean bias=34.4 min). Fitbit overestimated SE by 2.8% (absolute mean bias=5.8%) and Actigraph underestimated SE by 13.1% (absolute mean bias=13.6%). Fitbit overestimated WASO by 1.2 min (absolute mean bias=23.7 min) and Actigraph underestimated by 49.9 min (absolute mean bias=49.9 min) compared to PSG. Both Fitbit and Actigraph underestimated sleep onset by 5.5 (absolute mean bias=11.8 min) and 9.8 min (absolute mean bias=14.0 min), respectively. Both Fitbit and Actigraph overestimated sleep offset by 7.0 min (absolute mean bias=14.0 min) and 10 min (absolute mean bias=12.9 min). Linear regression indicated statistically significant trends with Fitbit and Actigraph underestimating at lower values for all sleep metrics except SE.

Conclusions: Fitbit provided comparable sleep estimates to Actigraph when compared to PSG. These data provide initial support for the use of consumer devices as an alternative to research-grade accelerometers to measure sleep in youth. Validation studies are needed in healthy youth, over several nights, and in free-living settings.



# Movement behaviors, executive function and associated factors in preschoolers

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#### Pre-recorded Presentation

Purpose: To analyze the association between moderate physical activity, sedentary behavior, executive function, Beta waves, motor competence, cardiorespiratory fitness, age and sex in preschool children.

Methods: 107 preschool children, of both sex (51,4% female), 4,4 ± 0,78 years-old, from João Pessoa-PB, Brazil, were analyzed. The executive function was assessed by Go/No Go (Early Years Toolbox). To analyze the Beta waves of the prefrontal cortex, a portable eletrocefalogram with four channels (Muse Interaxon®, Toronto, Ontario, Canada) was used. Brainwave activity was recorded using a smartphone app for one minute (opened eyes) and the Beta wave of channel AF7 was considered. Physical activity and sedentary time were assessed by accelerometers (Actigraph®, WGTX3), used during seven consecutive days and considered the time in minutes/day for each behavior. Motor competence was measured by the product of tasks that represent three domains (locomotor, stability and manipulative). The sum of the Z-scores of each task was calculated. Cardiorespiratory fitness was measured by the 20m Shuttle run test, adapted for children from three to five years old, and the number of completed laps was considered. Age and sex were parents-reported. To analyze the possible associations between the variables, a Machine Learning Network Analysis was used. Three Centrality indicators were used (Betweenness, Closeness and Strength). The analyzes were done in Jasp statistic software.

Results: Executive function was positively associated with cardiorespiratory fitness (r = 0.250) and age (r = 0.318), and weak and negatively associated with moderate physical activity (r = -0.117). The Centrality values showed that sex had higher values of Betweenness, Closeness and Strength, but age and fitness also presented higher values of Closeness and Strength.

Conclusion: Older children with higher cardiorespiratory fitness have greater executive function.



# The Multiple Food Test: A New Online Tool to Measure Food Choices

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Pre-recorded Presentation

Purpose: Measuring food choices in health and nutrition research is challenging. Given the trend that more and more research is conducted online, there is a strong need for reliable and valid measures that can be efficiently used in online research. Therefore, we developed the Multiple Food Test as a tool for measuring food choices in online and laboratory settings.

Methods: The Multiple Food Test is a picture-based selection task consisting of 18 trails. In each trial, participants see four food items (ranging from 1 = unhealthy to 4 = very healthy) and are asked to indicate which of the depicted foods they would choose to eat. Across all 18 trails a mean is computed that informs about the healthiness of choices. In three studies we examined the validity and reliability of the Multiple Food Test. In Study 1 (N = 425), the relationship between choices in the Multiple Food Test and health- and eating-related variables was assessed. Study 2 (N = 201) tested the validity of the Multiple Food Test via assessing its relationship to existing scales to measure related constructs. In Study 3 (N = 40), it was tested whether choices in the Multiple Food Test can predict real choice behavior.

Results: Study 1 revealed that healthier choices in the Multiple Food Test are related to viewing health as a changeable construct (p < .05), eating healthily more often (p < .01), viewing a healthy diet as more important (p < .01), and holding a stronger health versus taste motive (p < .001). In Study 2, positive relationships with self-control (p < .05) and habitual fruit (p < .001) and vegetable consumption (p < .05) were found. Study 3 showed that choices in the Multiple Food Test predict real food choice behaviour (p < .001).

Conclusions: The Multiple Food Test offers new opportunities to study variables or to evaluate interventions that influence food choices and eating behavior. Furthermore, it can be easily adjusted to cultural eating differences. Because the Multiple Food Test is nearly language free it can also be used to study children's food choices.



# Comparison of weight measures in Butterfly Girls, an obesity intervention trial for African American girls

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Pre-recorded Presentation

Purpose: Obesity prevalence is greater in 6-11 year old girls than Non-Hispanic black (NHB) girls. Risk factors include unhealthy eating and home media use. This study examined the association of diet diversity and body weight change in NHB girls and media use patterns. Examining these associations is highly innovative given the controversial evidence of diet diversity on child growth with limited knowledge in NHB girls.

Methods: 8-10 year old NHB girls enrolled in a 6-month 3-group randomized controlled trial (intervention (I), comparison (C), wait-list control (WLC)) were observed over 3 timepoints: baseline, post 1 (3 mo), post 2 (6 mo). Height, weight, and 2 dietary recalls (Nutrient Data System for Research) were collected at each timepoint (weekday/weekend). Body mass index was expressed as Z-scores (BMIZ) using CDC methods. Diet diversity was estimated from the recalls using serving counts of items within each food group (fruit, dairy (full fat (ff), not ff), vegetable, whole grain, protein/nuts, added sugars/candy) according to 2 methods: counts within food group, Simpson-Index (SI: proportion relative to number of foods within the group). Time child spent using media (TSM (hours/week)) (e.g., TV, videogames) was obtained via parent survey. Dietary and media variables were weighted by weekend/weekday. Mixed models tested the association of BMIZ with diet diversity measures, controlling for covariates (education, free/reduced lunch, day, randomization group and its interaction with age), with random intercept and slope. Models were tested with and without TSM and its interaction with diet. Results/findings: Child BMIZ at baseline was  $0.73\pm1.29$ . In the I group, SI for dairy (not ff) was lowest at post 2 ( $0.24\pm0.26$ ) compared to baseline ( $0.31\pm0.28$ ) and post1 ( $0.30\pm0.27$ ) (P= 0.04). In mixed models, TSM predicted higher BMIZ (beta=0.04 (Standard Error=0.01)) (P<0.03) irrespective of the diet measure. None of its interactions with diet measures were significant. Diet counts and SI were not associated with change in BMIZ.

Conclusions: Dietary diversity in NHB girls was not associated with BMIZ. Findings are significant, suggesting that higher diet diversity does not equate with weight change among NHB girls, warranting preventive strategies that focus more on media use.



# Development of My Eating Journal as A Tool to Improve Healthy Eating on Elementary School Children

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Poster

Purpose: Food diary is often used to track eating habits and dietary behavior change. This study aimed to develop a food diary called My Eating Journal as a guidance tool for elementary students to eat diverse food groups and its recommended portion according to Balanced Nutrition Guidelines.

Methods: Subjects were 9-11 years old children from elementary schools in Bogor, Indonesia. The study used quasi experimental design and was divided into two stages. The first stage was to create a prototype (consist of food list and food frequency graph) and test for media acceptance level (content, attractiveness, easiness to use). The second stage was to validate the ability of My Eating Journal to improve eating habit. Subjects (n = 35) were asked to fill My Eating Journal every day for four weeks at school under teacher supervision. Data of knowledge, attitude, and practice related to Balanced Nutrition Guidelines were collected at baseline and post-intervention. At the end of week-4, consumption frequency for each food groups during intervention were assessed. Data were then analyzed using paired sample t-test.

Results: The results showed that My Eating Journal are accepted by majority (85,7%) of subjects. Most of the subjects (87,6%) have no difficulty in converting their eating frequency of each food group from the food list into food graph. There is no significance differences in knowledge and practice between baseline and post-intervention, but subjects' attitude is significantly increased (p = 0,029). Almost half of the subjects (49,1%) are lacking on vegetable consumption (2,2 ± 1,3 times/day). There is no change on eating habit observed throughout the four weeks of filling in My Eating Journal.

Conclusions: My Eating Journal can be easily used by elementary school students to assess their eating habits. The increase of attitude shows that there is a possibility of dietary behavior improvement if the parents provide vegetables and other healthy foods.



# Development of a planning tool to prevent obesity in childhood and youth

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#### <u>Poster</u>

#### Purpose

Systematic and theory-based planning is an essential criterion for a successful intervention as well as for its sustainable continuity. Studies have shown that overweight prevention programs for children are of an unsystematic and non-evidence-based planning quality. The development of high-quality programs to prevent childhood obesity is very complex and needs effort in time and personnel. Thus, it is hardly possible to perform a systematic and target-group-specific project planning in professional life of health promoters. Aim of the project 'WEPI' is to develop an evidence-based and user-oriented planning tool to support and optimize the planning process of prevention programs for obesity in childhood and youth.

#### Methods

A Systematic Literature Review (SLR) was conducted in the databases PubMed, LIVIVO and Cochrane to identify existing tools for planning prevention and health promotion. Furthermore, expert interviews were carried out in schools and communities. The first functions of the WEPI planning tool were developed and optimized in focus groups with future user.

### Results

The SLR revealed 628 hits of which 56 full texts were considered for further analysis. The four most comprehensive and evidence-based planning tools were chosen for a detailed comparison of the planning steps and context requirements. Components of planning were identified. Besides clarifying the experts meaning of planning and identifying difficulties in the planning process, the interviews also revealed the need for supporting a systematic planning process. Results were aggregated in the development of the WEPI planning tool. First functions were tested in focus groups and an optimized version of the WEPI planning tool can be presented. Subsequently the tool will be converted into a web-based application and tested in schools and communities.

### Conclusions

The WEPI planning tool supports the development of evidence-based prevention planning and contributes to the standardisation and quality assurance of interventions as the planning process becomes transparent and comparable. The participative development of the tool and the subsequent transfer into a web-based application allows meeting the needs and the conditions of the user. The project is supported by the Federal Ministry of Health, Germany.



# Validation of multi-pass 24-hour dietary recall and food frequency questionnaire by weighed food record in urban Ethiopian women and children

**Dr. Amare Worku Tadesse<sup>1</sup>**, Prof. Yemane Berhane<sup>1</sup> <sup>1</sup>Addis Continental Institute of Public Health, Addis Ababa, Ethiopia

Poster

Background: Evaluation and validation of reliable methods of quantifying an individual's nutrient intakes are important to identify groups at risk of nutrient deficiencies and develop nutritional interventions aimed at reducing undernutrition in specific population group. We examined the relative validity of a multi-pass 24-hour recall and a 7-day recall food frequency questionnaire (FFQ) with volumetric portion size estimation, compared to Weighted Food Record (WFR) in Ethiopian adult women and children.

Methods: Food consumption data were collected for randomly selected women of reproductive age (n=15) and children aged 6-59 months (n=19) from two sub-districts in urban Ethiopia using WFR followed by multipass 24-hour recall and FFQ on the following day. Portion sizes were estimated using photographs of cooking/ serving utensils, including reference objects to maximize accuracy. Wilcoxon's signed rank test was used to test difference in the median nutrient intakes between "test" dietary methods (24-hour recall and FFQ) and "reference" method (WFR). Agreement with weighed food records was conducted primarily by Bland-Altman analysis. Cohen's weighted k statistic was calculated to measure the inter-method (between 24-hour recall & WFR and between FFQ & WFR) classification agreement.

Results: Bland-Altman analysis showed FFQ marginally underestimated energy and vitamin A in women, protein and vitamin A in children while marginally overestimating iron in both groups. It also revealed 24-hour recall marginally overestimated energy in women, and protein and vitamin A in children. No significant differences between the test and reference methods were found for the median daily intakes of each nutrient among women and children. There was moderate to good agreement ( $\kappa 0.41$ -0.80) between test and reference methods for iron and protein, and good to excellent agreement ( $\kappa 0.61$ -1.00) for energy and vitamin A among women and children.

Conclusion: Dietary assessment using 24-hour recall and FFQ with volumetric portion size estimation revealed comparable estimates of dietary intake with WFR in adult women and children. This study supports the use of 24-hour recall and FFQ as an acceptable method for assessing dietary intake in adult women and children.



# Daily 24-h time-use profiles vary with different work patterns

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#### Poster

Purpose: Shift workers experience significant disruption in their circadian rhythm due to variable periods of sleep which may impact their physical activity and sedentary behaviour. The purpose of this study was to determine whether daily 24-hour time-use compositions vary with different work patterns.

Methods: 257 employees in the New Zealand aviation industry (47.0% Male; 34.2% aged 35 to 49 years; 66.1% European) wore Axivity AX3 accelerometers on the thigh and lower back for seven days (168 hours) and completed a sleep log diary. Daily estimates of time spent sleeping, sedentary, standing, walking and running were derived from accelerometer data and converted to ilr coordinates. Days were categorised according to the type of workday: 1) personal day, 2) standard workday, 3) morning shift, 4) day shift, 5) evening shift, and 6) night shift. Daily compositions for these workdays were compared using compositional MANOVA, with participant ID specified as an error term to account for repeated measures (daily 24-h compositions). Subsequently, a multivariate multiple comparison test (Hotelling-Lawley's T2-test with bonferroni adjustment) was used to determine which workdays significantly differed.

Results: Results of the compositional MANOVA indicated a significant difference in the daily compositions of various shifts (p < 0.001), with differences observed in all movement variables. Personal days included relatively more time spent running (mean 1.36 min/day) than other days. Workdays with night shifts were characterised by relatively less time sleeping (mean 307 min/day) and more time sedentary (mean 767 min/day) than other days. Subsequent pairwise comparisons indicated that: personal day compositions were different from all shift workdays (p < 0.05), but not standard workdays; all types of shift workdays were different from standard workdays (p < 0.05); workdays with night shifts were different from all other types of workdays p < 0.05); whereas, workdays with day, evening and morning shifts had comparable compositions (p > 0.05).

Conclusions: 24-h compositions of behaviour are dependent on the type of workday. Further studies exploring the optimal time-use profile in working populations should take into consideration daily work patterns.



# Evaluation and comparison of laboratory-based and free-living activity recognition models for preschool-aged children under free-living conditions

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Symposium Recording

Machine learning activity recognition models provide researchers with alternative activity metrics in addition to intensity. However, existing algorithms for preschool children have been trained on data from laboratory-based activity trials and their performance has not been investigated under free-living conditions.

Purpose: To evaluate the accuracy of laboratory trained hip and wrist Random Forest (RF) classifiers for automatic recognition of five activity classes: sedentary, light household activities and games, moderate-to-vigorous sports and games, walking, and running in preschool children under free-living conditions. In addition, the performance of the laboratory trained models was benchmarked against models trained on free-living data.

Methods: 31 children  $(4.0 \pm 0.9 \text{ yrs})$  were video recorded using a GoPro during a 20-minute unstructured active play session. Participants wore an ActiGraph GT3X+ on their right hip and non-dominant wrist. A bespoke two-stage direct observation scheme was used to continuously code ground truth activity class, and to identify which movement behaviours contributed to misclassification errors, the specific activity types occurring within each class. Twenty-one of the children were randomly selected to train free-living RF classifiers for the hip and wrist. Performance of the laboratory and free-living classifiers was subsequently assessed in the hold-out ten children by calculating overall recognition accuracy, kappa statistics, and generating confusion matrices summarising class level accuracy.

Results: Accuracy for the hip and wrist laboratory trained RF classifiers was 67.5% ( $\kappa = 0.42$ ) and 56.9% ( $\kappa = 0.32$ ) respectively. In comparison, accuracy for the free-living trained hip and wrist RF classifiers was 83.1% ( $\kappa = 0.70$ ) and 79.7% ( $\kappa = 0.64$ ), respectively. The free-living RF classifiers provided substantial improvement for classification of sedentary (5.6% - 11.3%), light household activities and games (10.2% - 26.7%), walking (43.5% - 65.0%) and running (16.6% - 22.2%).

Conclusions: Laboratory trained activity recognition models for preschool aged children do not perform well when implemented in new data collected under true free-living conditions. In contrast, classifiers trained on free living data perform well. These findings support the view that machine learning activity recognition models be trained under free-living conditions.


# Activity classification models for children: how well do lab-developed models generalise to free-living conditions?

<u>Dr. Tom Stewart</u><sup>1</sup>, Dr. Anantha Narayanan<sup>1</sup>, Dr. Lisa Mackay<sup>1</sup>, Associate Professor Scott Duncan<sup>1</sup> <sup>1</sup>Auckland University of Technology, Auckland, New Zealand

#### Symposium Recording

Purpose: Classification of activity behaviours using raw accelerometer data is becoming more prominent. Almost all activity classification algorithms are developed using data collected in controlled laboratory environments which may not be generalisable to free-living settings. This study examined how machine learning models trained on laboratory data performed in free-living settings, and how the accuracy changed when the models were retrained with additional free-living data.

Methods: In a lab setting 40 children (19 males, aged  $10.1 \pm 1.7$  years) were equipped with two Axivity AX3 accelerometers worn on their thigh and lower back. They performed a series of activities (e.g., sitting, standing, walking, running, lying) that were captured by video camera (criterion measure). Fifteen new children (10 male, aged  $10.0 \pm 2.6$ ) wore the same two accelerometers and a small wearable video camera that captured their free-living movement behaviours.

Using the lab dataset, a random forest was trained to classify each activity using several features of the accelerometer data (e.g. axis means). After this model was evaluated in the lab setting, it was used to predict activity type in the free-living dataset. As a last step, the model was retrained with both the lab and free-living data together, and the accuracy was estimated using leave-one-subject-out-cross validation.

Results: The accuracy of the lab-trained model was 97.8% (95% CI: 97.6–98), kappa  $\kappa$  = 0.98. This dropped to 92% (91.6–92.5),  $\kappa$  = 0.88, when applied to the free-living data. Retraining the model with additional free-living data improved the free-living accuracy to 97.2% (97–97.4),  $\kappa$  = 0.96.

Conclusions: Activity classification models developed in a laboratory setting showed a  $\sim 6\%$  reduction in accuracy (10% reduction in  $\kappa$ ) when applied in a free living setting. Accuracy improved when models were retrained with additional free-living data. Future studies should include free-living data when developing classification models to ensure their generalisability.



# Can free-living activity classification models developed in healthy adults be used in a dialysis patient population?

<u>Ms Rosemary Walmsley</u><sup>1</sup>, Dr. Khizr Nawab<sup>1,2</sup>, Dr. Derrick Bennett<sup>1</sup>, Associate Professor Will Herrington<sup>1,2</sup>, Dr. Aiden Doherty<sup>1,2</sup>

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Symposium Recording

Purpose: Machine learned (ML) models developed to classify activity behaviours from raw accelerometer data in free-living were shown to be accurate (82.7%, kappa  $\kappa$ =0.74) and demonstrated epidemiological utility in over 90,000 UK Biobank participants. However, it is unknown how well these ML models generalise to inactive diseased populations. We therefore examined if ML models trained on free-living data from healthy adults could be used in a dialysis patient population.

Methods: 153 healthy UK adults were asked to wear an Axivity AX3 accelerometer on the dominant wrist for 24 hours and a Vicon Autographer wearable camera to capture their free-living movement behaviours. In a separate study, 25 adults with end-stage kidney disease on maintenance dialysis were asked to undergo the same accelerometer and wearable camera protocol. Camera data was labelled by trained annotators into four classes: sedentary behaviour, light tasks, moderate activity, and walking.

Random Forest models were trained to classify activity type from 132 time and frequency domain features for each 30 second epoch, with a Hidden Markov model used to smooth predictions. The models developed in healthy adults were then applied to data from dialysis patients. Models were then retrained using dialysis patients' data only. Finally, models were retrained with a mix of healthy and dialysis patient data together.

Results: When the model trained in healthy adults was applied to dialysis patients, accuracy was 74.3% ( $\kappa$ =0.16). When trained in dialysis patients only, models achieved accuracy of 72.5% ( $\kappa$ =0.19). When trained in healthy adults and dialysis patients, models achieved accuracy of 74.4% ( $\kappa$ =0.15) on dialysis patients only.

Conclusions: Activity classification models developed in a healthy population achieved substantially lower accuracy and kappa statistics when applied to a highly inactive dialysis population. While retraining with data from dialysis patients improved the kappa statistics, classification performance remained much lower than in the healthy population. Future studies should be aware of population-specific challenges in machine-learned activity classification, and where possible collect relevant training and validation data in the disease populations of interest.



# An overview of school garden interventions and their effects on behavior

<u>Dr. Wayne Cotton<sup>1</sup></u>, Dr. Louisa Peralta<sup>1</sup>, Dr. Thea Werkhoven<sup>1</sup>, Dr. Dean Dudley<sup>2</sup> <sup>1</sup>University of Sydney, Australia, Sydney, Australia, <sup>2</sup>Macquarie University, Macquarie, Australia

Symposium Recording

Purpose: The purpose of this study was to perform a systematic review and meta-analysis of randomized controlled, quasi-experimental, cluster controlled trials and controlled comparison studies, that have examined the impact of school-based teaching interventions on healthy eating outcomes of elementary school children through the use of experiential learning approaches (e.g., school gardens).

Methods: The systematic literature search was conducted using a range of electronic databases (A + Education; The Cochrane Central Register of Controlled Trials (CENTRAL); ERIC; Journals@Ovid; MEDLINE; ProQuest Central; PsycINFO; and SAGE Health Sciences Full-Text Collection) from 1990 to 31<sup>st</sup> October 2018. The review was limited to studies published in English that utilized experiential learning pedagogies in order to influence at least one of the following four healthy eating outcomes: 1) reduced food consumption or energy intake; 2) increased fruit and vegetable consumption or preference; 3) reduced sugar consumption or preference (not from whole fruit); and 4) increased nutritional knowledge.

Results: Experiential-learning approaches were used in 14 studies to improve fruit and vegetable consumption or preference in elementary school children. Initial results suggest that these studies proved to be very effective with over 75% of these types of studies yielding statistical significance at p < .05 or better. Of the 11 effect sizes that were calculated, 45% had a large effect and the remaining 55% had a small effect.

Conclusions: Given the increased overcrowding of the elementary school curriculum, a meta-analysis of this scope is able to provide key stakeholders with the best evidence of where teaching resources should be focused. It is also clear that whilst teachers are capable of making substantial improvements in elementary school student nutritional outcomes using school gardens, the value of teacher professional development (PD) in this area is not widely understood, due to poor reporting. Future research should consider the role teacher PD is having on these outcomes.



# The TX Sprouts Project and its effect on obesity, diet, and physical activity

#### Dr. Jaimie Davis<sup>1</sup>, <u>Dr. Fiona Asigbee<sup>1</sup></u>

<sup>1</sup>The University of Texas at Austin, Austin, United States

Symposium Recording

Purpose: This study aims to examine the effects of TX Sprouts, a one-year school-based gardening, nutrition, and cooking cluster randomized trial, on dietary intake, physical activity, and obesity and metabolic outcomes.

Methods: Sixteen schools were randomly assigned to TX Sprouts intervention (n=8 schools) or to delayed intervention (n=8 schools) over three years (2016-2019). The intervention arm received: formation/training of Garden Leadership Committees, a 0.25-acre outdoor teaching garden, and 18 gardening, nutrition, and cooking lessons, taught during school year. The delayed intervention was implemented after 1 year of follow-up. Outcomes collected on each child included height, weight, waist circumference, body composition via bioelectrical impedance, blood pressure, and dietary intake via screener. A subsample was measured for glucose, HbA1C, and 24-hour dietary recalls. Physical activity (PA) was measured via accelerometers.Mixed effects linear regression models, accounting for the cluster effect, will be used to analyze change outcomes between intervention and control groups. Linear mixed modeling was used to assess differences in PA on garden and non-garden days.

Results: Of the 4,239 eligible students, 3,137 consented and provided baseline anthropometric measures. Approximately 34% of children successfully completed an optional fasting blood draw and 24% completed two dietary recalls at baseline. Average age of children was 9.2 years and 47% were female. Approximately 66% were Hispanic and 69% received free and reduced breakfast/lunch. Forty-six percent had overweight or obesity. Accelerometer preliminary data showed that when compared to non-garden days, on garden days students demonstrated greater MVPA ( $\beta$ =2.96, p<0.001) and a reduction in SED ( $\beta$ = -9.21, p<0.0001). Post intervention data collection was completed in June of 2019 and data cleaning and analyses is underway and the intent to treat analyses will be completed by the end of the year.

Conclusions: Garden lesson could have a substantial impact on children's PA. This is the first large, clusterrandomized trial to examine effects of a school-based garden, nutrition, and cooking program on obesity and metabolic outcomes in primarily low-income Hispanic children.



# Sustainability via Active Garden Education (SAGE): An early look at physical activity-related outcomes

#### Dr. Rebecca Lee<sup>1</sup>, Ms. Bin Suh<sup>1</sup>, Dr. Jacob Szeszulski<sup>2</sup>

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Symposium Recording

Purpose: Early care and education centers (ECEC) educate most young children (3 to 5 y) in the USA and aim to provide children opportunities to meet daily physical activity (PA) policy recommendations. Sustainability via Active Garden Education (SAGE) used a multi-level intervention strategy to promote ECEC PA in children and their families. This study aimed to evaluate the impact of SAGE on children's moderate-to-vigorous PA (MVPA).

Methods: SAGE was a randomized controlled trial implemented in 26 ECEC including 12-lessons repeated in 2 weekly, 60-minute sessions over 12 weeks. SAGE used the plant lifecycle as a metaphor for human development; included physically active songs, games, and garden exploration offered as part of regular ECEC programming. Parents also received weekly newsletters linked to the curriculum to promote PA at home. Actigraph accelerometers measured children's MVPA for 7 days at pre-test and post-test. Parents completed surveys assessing parenting practices and home PA resources.

Results: SAGE was delivered with high fidelity (82-97% program components). Most children (N=173, 49% female, 77% Hispanic, M(SD)=52.5±4.5 months) attended ECECs within in high proportion Hispanic neighborhoods (>30%). MVPA for a subsample (n=35) of children participating in SAGE increased from  $69.1\pm14.7$  minutes/day to  $73.4\pm23.2$  minutes/day and control children MVPA increased from  $58.2\pm19.0$  minutes/day to  $79.2\pm25$  minutes/day over the 12 weeks. Parents (92.4% female; M=32.1\pm8.0 years; 74% completed high school) reported reducing their promotion of screen time (p=.004). Parents across the sample reported fewer home PA resources (M= $3.53\pm2.43$  v.  $2.67\pm2.60$ , p=.09) from pre-test to post-test.

Conclusions: SAGE was easily implemented in ECEC and received well by parents. Simple strategies were effective at reaching parents. Initial results demonstrated the potential for changes in child MVPA, and parenting practices may have improved. Easy-to-implement and fun ECEC strategies should continue to be explored to promote early child MVPA.





# Motivation and Behavior Change (SIG)



"Someone's got my back": Older people's experience of health coaching to promote physical activity and falls prevention in the Coaching for Healthy Ageing (CHAnGE) trial

<u>Dr. Abby Haynes</u><sup>1</sup>, Ms. Geraldine Wallbank<sup>1</sup>, Associate Professor Anne Tiedemann<sup>1</sup>, Prof. Cathie Sherrington<sup>1</sup> <sup>1</sup>University of Sydney, School of Public Health, Sydney, Australia

#### Pre-recorded Presentation

Purpose: The CHAnGE trial is evaluating the impact on physical activity (PA) and falls of an innovative intervention combining health coaching and activity monitors with a fall risk assessment among people aged 60+. The purpose of the current study was to better understand participants' experiences of the intervention.

Methods: CHAnGE trial participants received a home visit and fortnightly telephone-based health coaching from a physiotherapist, involving flexible goal-setting, and provision of an activity monitor. Participants for this qualitative study were purposively recruited from the CHAnGE trial for maximum variation in pre-trial PA levels and intervention engagement, and took part in semi-structured telephone interviews. Data were managed in NVivo 12 and analysed by two researchers: (a) inductively to identify key themes using the interpretive description approach, and (b) deductively to determine how the intervention components were functioning in relation to the underlying program theory. The coding frame was co-developed iteratively, and early analyses were workshopped with co-researchers to develop shared understandings of the data and increase interpretive rigor.

Results: We included 32 participants: 22 female (69%), age range 60-82. Most participants (29, 91%) found it highly motivating to receive direct feedback from an activity monitor which quantified progress towards tailored PA goals. The majority (28, 88%) felt that coaches increased their commitment to PA by providing accountability within the context of a mutually esteemed relationship. Qualities deemed most important in the coaches were: empathy and respect, gentle encouragement, professional expertise, friendliness, active listening, and reliability. Key structural characteristics included the regularity and duration of phone contact with a dedicated coach, and an early home visit. Together, these supported relationship-building between participants and coaches. Some participants internalised their coach's voice and described how the intervention had helped them "lock in" daily goals/activities.

Conclusion: Participants valued the synergistic interaction of flexible program plans/self-directed goals, selfmonitoring of progress and regular accountability, guidance and encouragement from experienced, socially-skilled coaches. The data strongly support the concept of 'therapeutic alliance' as a crucial mechanism in health coaching.



# Recruiting and retaining young adults: What can we learn from behavioural interventions targeting nutrition, physical activity and/or obesity?

Dr Megan Whatnall<sup>1</sup>, Mr. Thomas Sharkey<sup>1</sup>, Dr. Melinda Hutchesson<sup>1</sup>, Dr. Rebecca Haslam<sup>1</sup>, Mr. Aaron Bezzina<sup>1</sup>, Prof. Clare Collins<sup>1</sup>, <u>Dr. Lee Ashton<sup>1</sup></u>

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#### Pre-recorded Presentation

Purpose: Recruiting and retaining young adults (aged 17-35 years) in health research is a major challenge. The aim is to describe the strategies used to recruit and retain young adults in nutrition, physical activity and/or obesity intervention research, and the effectiveness of these strategies.

Methods: Six electronic databases were searched for RCTs published up to October 2018 that evaluated nutrition, physical activity and/or obesity interventions in young adults (17-35 years). Recruitment was considered effective if pre-determined goal sample size was met. Retention was considered effective if attrition was  $\leq 20\%$  for  $\leq 6$ -month follow-up or  $\leq 30\%$  for >6-month follow-up. Effectiveness of individual recruitment and retention methods were calculated as the number of times the method was used in a study with effective recruitment or retention divided by the total number of times the method was used in a study.

Results: From 18,779 manuscripts identified, 94 RCTs were included. Median recruitment duration was 90 days (range: 7 to 1095), with a median efficiency of 2.1 participants recruited per day (range: 0.04 to 33.6). Forty-seven studies (50%) reported recruitment details, and of these 37 (79%) achieved successful recruitment (i.e. met goal sample size). Twelve recruitment strategies were effective in >50% of studies, with the most effective being face-to-face (i.e. health service appointments) (11 of 11 effective or 100%), followed by email, predominantly bulk email to university students (14 of 15 effective or 93%) and newspaper advertisements (7 of 8 effective or 88%). Adequate retention was achieved in 59 studies (63%). Six retention strategies were effective in >50% of studies, with course credit the most effective (13 of 15 effective or 87%), followed by prize/prize draw (7 of 10 effective or 70%) and financial compensation (26 of 38 effective or 68%).

Conclusion: This is the largest review to date that has synthesised retention and recruitment rates of interventions targeting nutrition, physical activity or overweight/obesity in young adults. Among studies that reported recruitment and retention details, findings demonstrate most were successful in recruiting young adults (79% effective) but retaining this group was more challenging (63% effective). Greater efforts to retain young adults are required.



# A culturally tailored social network-based intervention promoting water consumption in Caribbean schools: A cluster randomized control trial

<u>Ms. Saskia Franken<sup>1, 2</sup></u>, Ms. Crystal Smit<sup>2</sup>, Dr. Rebecca de Leeuw<sup>2</sup>, Prof. Moniek Buijzen<sup>2</sup> <sup>1</sup>University of Aruba, Oranjestad, Aruba, <sup>2</sup>Radboud University, Nijmegen, Netherlands

Pre-recorded Presentation

Purpose: Sugar-sweetened beverage (SSB) consumption contributes to childhood obesity. Therefore, various intervention studies have been executed worldwide to promote water consumption of younger populations to prevent obesity. However, the Caribbean region, which has the highest average daily rates of SSB consumption, has received little research attention. Therefore, this study's objective was to test a culturally tailored intervention for children of the Caribbean island Aruba, based on a Western-European school-based social network intervention. We hypothesized that children who are exposed to the intervention will consume more water and less SSB, and have a higher intention to consume more water and less SSB compared to the control group. The study contributes to scientific knowledge in an understudied geographic area and contributes to the field of social network-based behavioral health interventions.

Methods: A school-based cluster randomized controlled trial design was deployed among 338 children (age M=11; girls 54%). Participating schools were randomly assigned to a treatment group (n=144) and control group (n=194). The tailored intervention lasted eight weeks and consisted of exposing children to peer influencers who were trained to promote water consumption. At pre-intervention, these influencers were selected through sociometric questions. At pre- and post-intervention, children self-reported their water and SSB consumption.

Results: Preliminary repeated-measures MANCOVA analyses show a significant multivariate interaction effect between time and treatment (V=.047, F(4, 300)=3.714, p=.006, p $\eta$ 2=.047). The univariate outcomes show significant interaction effects between condition and time for water consumption (F(1, 303)=5.334, p=.022, p $\eta$ 2=.017) and for SSB consumption intention (F(1, 303)=8.261, p=.004, p $\eta$ 2=.027) but not for SSB consumption and water consumption intention. However, the observed patterns did not hold in an additional regression analysis conducted to control for differences in consumption at pre-intervention measurement.

Conclusions: Findings indicate that after the culturally tailored social network-based health intervention children consumed more water and have a higher intent to consume less SSB. The patterns of the study are in line with previous research showing that with the power of social peer influence, healthy behaviors can be promoted successfully despite the heavily promoted SSB-brands. Further research is needed to explore the role of initial level of water and SSB consumption.



# Physical activity promotion: is something really always better than nothing?

<u>Dr. Alex Hamilton<sup>1</sup></u>, Mr. Hamish McEwen<sup>1</sup>, Mr. Neil Snowling<sup>1</sup>, Dr. Daniel Fujiwara<sup>2</sup>, Mr. Kieran Keohane<sup>2</sup>, Mr. Ithai van Emmerick<sup>2</sup>, Mr. Ali Ladak<sup>2</sup>, Dr. Justin Richards<sup>1,3,4</sup>

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#### Pre-recorded Presentation

Purpose: Increasing people's motivation to be active is a cornerstone of physical activity behaviour change. In world of limited resources, prevailing dogma is that 'it is always better to do something than nothing' in physical activity promotion. Our objective was to examine this assumption using econometric analyses of existing New Zealand physical activity data and to explore the implications that this has for physical activity and wellbeing promotion.

Methods: Using subjective wellbeing valuation, we derived wellbeing values from nationally representative Active NZ survey data (n=52,183). Subjective wellbeing valuation calculates the change in wellbeing associated with achieving a certain outcome and calculates the equivalent amount of income required to produce the same effect. A measure for weekly activity was used in combination with the level of agreement with the statement "I want to take part in physical activities" to derive the wellbeing value. Using adjusted analyses, we explored the relative wellbeing of people who are motivated to be physically active, but are inactive.

Results: Our results indicate that those who are motivated to be active but are inactive, have lower subjective wellbeing than those who are not motivated and inactive (\$-11,219).

Conclusion: Interventions that solely aim to motivate people to be active, in the absence of opportunities to be active in the way they want to be, could have a negative or negligible impact on subjective wellbeing. Indeed, these results challenge the view that in physical activity promotion it is always better to do something than nothing; call into question the notion that standalone improvements in motivation to be physically active constitute 'intervention success'; and re-enforce the need to take an integrated approach to promoting physical activity, particularly if the objective is to improve population wellbeing.



# "I'm not going to fall off the wagon now": participant experiences of a weight loss maintenance program

<u>Ms Bronwyn Mcgill<sup>1</sup></u>, Dr. Blythe O'Hara<sup>1</sup>, Prof. Philayrath Phongsavan<sup>1</sup>, Dr. Adrian Bauman<sup>1</sup>, Dr Anne Grunseit<sup>1</sup> <sup>1</sup>Prevention Research Collaboration, Sydney School of Public Health, University of Sydney, Camperdown, Australia

Pre-recorded Presentation

Purpose: Reports of participant experiences with weight-loss maintenance programs are sparse and their perceptions of the challenges of losing and maintaining weight are not well understood. This study explores how participants with chronic disease account for their engagement with an extended contact weight-loss maintenance program and what role the behaviour-change program plays in their ongoing weight management.

Methods: Qualitative telephone interviews were conducted with participants 6-months after starting a lifestylebased weight loss maintenance program, which followed an 18-week weight loss program. Interviews were audiorecorded and transcribed verbatim. Two researchers used a thematic inductive approach to identify common themes generated from interview content. Themes were checked against the data and interpretations refined in consultation with an independent researcher.

Results: Of 17 participants interviewed 9 were male, 16 had lost  $\geq$ 5% of body weight prior to starting the maintenance program, and 12 had maintained their weight loss after 6 months of program participation. Participants' accounts of the role of the program centred on how the program kept them 'on track' and helped them 'back on track'. The analysis generated four themes describing the means by which participants' ongoing weight management was shaped, namely: Personal Responsibility, Real-Life, Sense of Agency, and Self-regulation. Accounts of weight-loss management reflected a complex interplay between real life threats and a sense of personal responsibility, and the services offered by the program. The program's value was the capacity to enable reconciliation between personal responsibility for weight management and challenges posed by their real-life situations by supporting a sense of agency and self-regulation. In supporting agency and allowing self-regulation, the program was compatible with feeling personal responsibility for their ongoing weight management. Participants were able to enact the 'personal responsibility for health' discourse by picking and choosing from the services available as their weight management circumstances dictated.

Conclusions: Service providers of weight loss maintenance program can use these insights to better support individuals to overcome real-life threats and make positive health choices for ongoing weight management, as well as to inform and facilitate program monitoring and improvement.



# Sequential versus simultaneous introduction of nutrition and exercise during pregnancy: Which strategy improves intervention adherence?

**Dr. Taniya Nagpal<sup>1</sup>**, Dr. Harry Prapavessis<sup>1</sup>, Dr. Christina Campbell<sup>2</sup>, Dr. Barbra de Vrijer<sup>1</sup>, Dr. Michelle Mottola<sup>1</sup> <sup>1</sup>University of Western Ontario, London, Canada, <sup>2</sup>Iowa State University, Iowa, United States

#### Pre-recorded Presentation

Purpose: Nutrition and exercise interventions during pregnancy can improve maternal and fetal health outcomes. To increase the number of women who benefit from a nutrition and exercise intervention, effective strategies to improve program adherence need to be evaluated. Based on the theory of self-control and self-regulation, the purpose of the current study was to test and compare the effect of introducing nutrition and exercise sequentially versus simultaneously on program adherence among pregnant women.

Methods: Women were recruited at 12-18 weeks gestation and participated until 36 weeks gestation. Women were randomized into one of three interventions: nutrition and exercise introduced simultaneously (N+E), nutrition introduced first followed by exercise (N-First), exercise introduced first followed by nutrition (E-First). For the two sequential groups, the second intervention was added at 25 weeks gestation. Adherence was measured by scoring participants on a weekly basis for meeting the intervention goals (3 goals for nutrition, 3 goals for exercise). All adherence scores were converted to a percentage. An average percent-adherence score was calculated at the end of the intervention. Additionally, adherence was measured as dropout rate. An ANOVA analysis compared adherence scores and a Chi-Square analysis compared differences in dropout rate. Significance was accepted as p<0.05.

Results: Eighty-eight women were randomized, and sixty completed the intervention and were included in the adherence analysis (N+E=17; N-First=20; E-First=23). Average adherence in the E-First group ( $80.2\pm14.7\%$ ) was significantly higher (p=0.001, np2=0.21, observed power=0.93) than adherence in both N+E ( $60.9\pm17.9\%$ , p=0.001) and N-First ( $66.8\pm16.7\%$ ; p=0.028). Although trending towards favouring E-First, there was no significant difference in dropout rate (N+E=41\%, N-First=33\%, E-First=21\%; c2 (2, N=88) = 2.91, p=0.23, Cramer's V=0.18).

Conclusion: Sequential introduction of health interventions, including introducing exercise first followed by nutrition, can improve adherence to multiple behaviour change programs during pregnancy.



# Understanding, comparing and learning from early childhood obesity prevention interventions: A multimethod study

<u>Ms. Anna Lene Seidler<sup>1,2</sup></u>, Ms. Kylie E Hunter<sup>1,2</sup>, Ms. Brittany J Johnson<sup>2,3</sup>, Ms. Mahalakshmi Ekambareshwar<sup>2,4</sup>, Dr. Sarah Taki<sup>2,4,5</sup>, Ms. Chelsea E Mauch<sup>2,3</sup>, Dr. Seema Mihrshahi<sup>2,4</sup>, Prof. Lisa Askie<sup>1,2</sup>, Prof. Karen Campbell<sup>2,6</sup>, Prof. Lynne Daniels<sup>2,7</sup>, Prof. Rachael Taylor<sup>2,8</sup>, Prof. Li Ming Wen<sup>4,5</sup>, Dr. Rebecca Byrne<sup>2,6</sup>, Ms. Julie Lawrence<sup>8</sup>, Ms. Robyn Perlstein<sup>6</sup>, Ms. Karen Wardle<sup>5</sup>, Prof. Rebecca Golley<sup>2,3</sup>

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Pre-recorded Presentation

Purpose: Early obesity prevention interventions are complex and vary in effectiveness. We aimed to unpack interventions using novel frameworks, taxonomies, and experience from four landmark trials forming the EPOCH collaboration. The objectives were to:

- 1) Deconstruct interventions into their components.
- 2) Identify lessons and recommendations for intervention planning, delivery, evaluation and implementation.

#### Methods:

This multimethod study included four world-first RCTs aimed at preventing childhood obesity within the first two years of life. Firstly, interventions were deconstructed into their components, including target behaviours, delivery features and Behaviour Change Techniques (BCTs), using the TIDieR checklist and the BCT Taxonomy v1. Published and unpublished intervention resources for each trial were coded twice by independent coders, and results were tabulated and analysed. Secondly, semi-structured interviews were conducted with principal investigators and intervention facilitators. The interview guide was informed by the UK Medical Research Council development-evaluation-implementation process framework, and inductive thematic analysis was used to draw out themes.

#### **Results:**

All trials commenced in the first six months of life, included a component related to lifestyle, and had the primary goal of preventing overweight and obesity. Each trial targeted 10 to 14 obesity-related behaviours, such as bottle-feeding, introducing solids, parent response to hunger cues, and limiting screen time. Key variations in delivery features related to intensity, delivery mode and tailoring. Across the four trials, 35(38%) of the possible 93 unique BCTs were coded. BCTs used across interventions included ones related to goals and planning, social support and consequences. More than 19(54%) of the BCTS were identified in only one or two of the trials. Qualitative interview content was coded into themes related to the planning, delivery, evaluation and implementation. Key recommendations from the interviews include the importance of collaboration with a range of stakeholders and consideration of implementation throughout the whole study process.

#### Conclusions:





The innovative combination of frameworks, taxonomies and interviews used in this multimethod study is a major step forward in understanding complex early obesity prevention interventions. A global trials registry is being established through the TOPCHILD collaboration to quantitatively explore the key components of these complex interventions that are associated with effectiveness.



# Parental perspectives on negotiations over diet and physical activity: how do we involve parents in adolescent health interventions?

<u>Ms. Sarah Shaw<sup>1, 2</sup></u>, Ms. Sara Correia Simao<sup>1, 2</sup>, Ms. Sarah Jenner<sup>1, 2</sup>, Dr. Wendy Lawrence<sup>1, 2</sup>, Dr. Kathryn Woods-Townsend<sup>2, 3</sup>, Prof. Hazel Inskip<sup>1, 2</sup>, Prof. Janis Baird<sup>1, 2</sup>, Dr. Leanne Morrison<sup>4, 5</sup>, Prof. Mary Barker<sup>1, 2</sup>, Dr. Sofia Strömmer<sup>1, 2</sup>

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#### Pre-recorded Presentation

Purpose: Adolescence is often characterised by unhealthy behaviours such as a high intake of energy-dense, nutrientpoor food and low physical activity levels. During this time, adolescents' capacity to make their own decisions is increasing, however, parents remain influential in shaping many of their behaviours. This study aimed to explore parents' views of adolescent health behaviours and identify ways in which parental involvement can be successfully incorporated into interventions to support health behaviour changes in their adolescents.

Methods: Twenty-four parents of adolescents participated in semi-structured qualitative interviews to understand their perspectives on adolescent health behaviours. Data were analysed using inductive thematic analysis.

Results: Six themes were identified which described parents perspectives on their adolescents' health behaviours: (1)'My role in maintaining my adolescent's heath' describes the way parents run their households and control their adolescent; (2)'What I think about health' describes parents' past experiences and motivations for improving their own and their family's health; (3)'My adolescent wants...' describes parental perceptions of what their adolescent asks them for as well as factors that will make them more likely to engage in healthier behaviours; (4)'Things outside my control that affect my adolescent's health' describes changing exposure to external factors that are having increasing influence on adolescents' health behaviours as they age; (5)'Negotiating control' describes the changing dynamics between parents and their adolescents. (6)'What parents think could help support adolescent health' describes parents' to be involved.

Conclusions: Qualitative approaches provide a deeper understanding of parental perceptions of family life and their adolescents' values and priorities. Parents are aware that they are role models to their adolescents and feel responsible for guiding them towards healthy behaviours. However, parents recognise that with their adolescents' growing independence other factors are becoming influential in their lives and often push against engaging with healthy behaviours. Finding ways to incorporate parental support into health behaviour change interventions targeting adolescents, in a manner that is acceptable to adolescents, has the potential to improve the engagement levels with and effectiveness of such interventions.



# Active Women over 50 online information and support to promote physical activity behaviour change: a feasibility pilot randomised trial

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Pre-recorded Presentation

Purpose: Participation in physical activity is sub-optimal in women in their middle and older age. This trial aims to establish the acceptability and feasibility of Active Women over 50, a program comprising online information, telephone health coaching and email or SMS support to promote physical activity behaviour change among women aged 50 years and over.

Methods: Participants were community-dwelling women aged 50+, randomised to: 1) receive the Active Women over 50 program; or 2) wait-list control. Active Women over 50 is a 3-month physical activity behaviour change program informed by the COM-B model of behaviour change and consisting of access to a website, one telephone health coaching session and 8 email or 24 SMS messages. Outcomes were feasibility measures (study methods, intervention uptake), intervention efficacy (number of daily steps), and acceptability (proportion of participants who would recommend participation in the study to another person like themselves post 3 months).

Results: Sixty-two eligible participants (mean age 59.3, SD7.1; 47(76%) working; 44(71%) had participated in regular structured physical activity when younger) completed baseline measures and were randomised (intervention n=28, control n=34) between May and September, 2019. Recruitment was predominantly by email (n=27,48%), word of mouth (n=10,18%) and social media (n=10,18%). Mean baseline physical activity was 7459(SD=2424) daily steps. One participant did not access the intervention, 27(96%) participants accessed telephone health coaching, 15(54%) opted to receive email messages and 12(43%) SMS messages.

Google Analytics recorded 128 sessions of Active Women over 50 website usage and 640 pages viewed over 3 months. Users accessed the website via desktop computers, mobile devices and tablets, spending on average 5:48mins/session, and viewing 5 webpages/session. The most frequently viewed pages were the home page (22%), "how to be active" page (14%) and "getting started" page (12%).

Conclusions: Women aged 50+ are motivated to participate in a program offering online information, regular messaging and tailored health coaching to increase their physical activity. The high recruitment rate, uptake of health coaching, and engagement with the website suggest the program could be tested in a fully powered RCT, with the potential to be directly scalable and implemented at a population level.



# Protocol for a randomised controlled trial to lower occupation-related sedentary behaviour in South African office workers

#### Prof. Philippe Gradidge<sup>1</sup>, Ms. Merling Phaswana<sup>1</sup>

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Pre-recorded Presentation

Objective: Office workers spend most of their workday being sedentary and this increases the risk of cardiometabolic diseases. Sedentary behaviour can be accumulated during and outside of occupation-related domains. The aim of this study is to determine the effectiveness of sit-stand desks and healthy messages on interrupting sitting time whilst at work in order to improve the cardiometabolic health profiles of office-bound workers.

Methods: We will conduct a randomised controlled trial with post-intervention focus groups. Participants will be recruited at an information management company in Johannesburg, South Africa and randomly assigned to one of two groups, a sit-stand group ( $n \ge 30$ ) or a control group (n = 30) for comparison. Both groups will be followed for 12 months in total. The intervention for the sit-stand group will include the introduction of a collapsible wooden desk stand placed on top of the participants' existing workstation, with healthy messages sent weekly to the participants to motivate a change in sedentary behaviour.

Results/findings: All participants will be screened and assessed at baseline, 3-, 6- and 12-months for behavioural (diet, physical activity, smoking/vaping, alcohol consumption), anthropometric (waist and body mass index), cardiometabolic disease risk and sleep parameters. Focus groups will take place post-intervention to determine the perceptions of participants towards using interventions to reduce sitting time during work hours.

Conclusion: There is an urgent need to address sedentary behaviour in the workplace. The findings from this study have the potential to inform future work-based interventions in office bound workers and is particularly important in sub-Saharan African and other low- and middle-income regions where evidence is extremely limited.



# Perceptions of Meat Reducers and Implications for Social Norm-based Interventions to Reduce Meat Consumption.

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Pre-recorded Presentation

Background & Purpose: Current levels of meat intake are detrimental to human and planetary health. As such, effective strategies to reduce meat intake in favour of more sustainable protein sources are needed. Social normbased messages, which detail that most people have reduced their meat intake, may be promising in promoting meat reduction, given the effectiveness of social-norm based messages in promoting healthy dietary changes (Cruwys et al., 2015). To be effective, social-norm based messages need to refer to a desirable and aspirational norm-referent group (e.g. Berger & Rand, 2008). Currently it is unclear how people who have reduced their meat (meat reducers) are perceived. For the first time, this research examined the perceptions of meat reducers compared to vegetarians and habitual meat consumers (pre-registered on OSF).

Methods: Two online surveys were used. Survey 1 used a free association task, whereby 366 UK-based participants (M: 42.6  $\pm$  14.5 years; 47% male) listed the thoughts they most associated with meat reducers. Participants also rated the valence (positivity or negativity, 3-point scale) of these associations. Survey 2 used an experimental between-subjects design to assess participants' [n = 420 (university students n = 206; university staff n = 214), M: 30.8  $\pm$  12.14 years; 26% male] personality trait impressions of a hypothetical person described as either a meat reducer, vegetarian, or habitual meat consumer.

Results: Survey 1: The most common and important traits people associated with meat reducers were healthy, ecofriendly, conscious, animal lovers, and thoughtful. Analysis of variance on the valence scores showed that meat reducers were perceived significantly more positively compared to habitual meat consumers (p<.001,  $\eta p2=.153$ ). Survey 2: Meat reducers were rated as significantly more environmentally friendly, animal loving, health conscious, intelligent, and open-minded compared to habitual meat consumers (p<.05). No other trait ratings (e.g. likeability, attractiveness) significantly differed between meat reducers and habitual meat eaters.

Conclusions: Results from these two studies confirm that meat-reducers are perceived positively amongst UK adults. These innovative findings will inform the development of social norm-based interventions to reduce meat intake.



# Assessing the feasibility of Stand Up for Health - A programme designed to reduce sedentary behaviour in contact centres

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Pre-recorded Presentation

Purpose: Sedentary behaviour has been linked to reduced mental and physical health, as well as lower job satisfaction and productivity. Contact centres have been identified as workplaces with high levels of sedentary behaviour, and it is reported that one in four members of staff regularly experience musculoskeletal problems. Stand Up for Health (SUH) is a workplace intervention developed based on the socio-ecological model to target sedentary behaviour in contact centres. The NIHR funded study has the following aims-

Aim 1: Test the acceptability and feasibility of implementing the Stand Up for Health intervention in contact centres Aim 2: Assess the feasibility of using a cluster randomised controlled trial study design

Aim 3: Scope the feasibility of a future health economic evaluation of Stand Up for Health

Method: This feasibility study uses a cluster randomised stepped wedge design to assess data collection methods and procure preliminary estimates of effectiveness for the following:

Primary outcome: Sedentary time in workplace, objectively measured using activPALs.

Secondary outcomes: Total sedentary behaviour, physical activity, mental wellbeing, work engagement and musculoskeletal health.

A process evaluation will be conducted to understand views and experiences of the SUH intervention activities, and implementation processes with a view to refining the theories of change.

Results: 11 contact centres from across the UK have been recruited and randomised. Intervention delivery has commenced in 5 centres consisting of the following elements to target the levels of the socio-ecological model:

- i. Workshops conducted at each centre to introduce equipment and activities, and also serve as a forum to elicit staff preferences and suggestions to reduce sedentary behaviour.
- ii. The SUH project team works with each contact centre to develop an action plan and theory of action, to create change at organisational, environmental, group and individual levels.

Conclusion: Contact centres present a complex work and research environment given the lack of autonomy among employees, shift patterns, and environmental and infrastructural constraints. This study will provide learnings on the implementation and acceptability of a novel, non-prescriptive programme to reduce work-place sedentary behaviour, and aid future implementation at a larger scale.



# The application of behaviour change theories and techniques in dietetic practice: a systematic review of randomised controlled trials

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Pre-recorded Presentation

Purpose: Theories and models of behaviour change can provide the theoretical underpinning for effective health interventions. The extent of their application in contemporary dietetic interventions has not been explored. This systematic review aimed to synthesise the evidence on the use of behaviour change theories and techniques in interventions delivered by dietitians in Primary Health Care (PHC) settings.

Methods: Medline, Cumulative Index to Nursing and Allied Health, PsycINFO, Embase, and Cochrane databases were searched for English language, randomised controlled trials up to August 2019. The review followed PRISMA guidelines and included studies of adults ( $\geq$  18 years) who received face-to-face nutrition care delivered by a dietitian in PHC settings. The interventions had to be underpinned by recognised behaviour change theories. Comparison groups received usual, minimal or no care. Interventions delivered in hospitals or via telephone only were excluded. Screening was conducted independently in duplicate and data were extracted regarding study population, intervention design, behaviour change technique content, primary outcome measures such as measurable changes in health behaviours or health outcomes, and their key findings. The quality of each study was assessed using the Cochrane Risk of Bias tool.

Results: Nineteen studies met the eligibility criteria, representing 5172 adults. Social cognitive theory was the behaviour change theory most commonly applied in interventions (n=15) with 11 of those studies having significant intervention effects. The trans-theoretical model, health belief model, self-determination theory, and ecological model were also identified within the included studies to underpin intervention design. Goal setting, problem-solving, social support, and self-monitoring were the most commonly reported techniques (n=15; n=14; n=11; n=11 respectively). Studies had a high or unclear risk of bias (n=10; n=9 respectively).

Conclusions: The extensive range of health conditions seen by dietitians, alongside the complexities of behaviour change, highlight the importance of embedding theory-based interventions in dietetic care. The explicit reporting of theories and techniques in published studies is strongly recommended. Findings from this review should inform future PHC practice and research.



# Adherence to a Movement Practice: Exploring the Lived Experience of Yoga, Gym Use, and Pro-Health Habits

#### Ms. Wendy Reynolds<sup>1</sup>

<sup>1</sup>AUT University, Auckland, New Zealand

Pre-recorded Presentation

#### Purpose

A primarily qualitative phenomenological doctoral study was designed to explore the topic of exercise adherence through the lens of the lived experience of a consistent movement practice. Movement practitioners (yoga n= 40; gym use n=8) self-selected as having a regular practice that they considered to be their primary modality of movement.

#### Methods

A unique feature of the study is that the research protocol does not specify a yoga or gym 'intervention', but instead collates data on participants' practice tenure, frequency, duration, intensity, and types of yoga practice / gym use (including a home practice), i.e. a lived or 'real world' experience of practice. Self-regulation within the context of health habits is explored via an online survey tool incorporating self-efficacy (with respect to diet and physical activity), overall activity levels (in addition to participants' primary movement practice) and a measure of interoceptive awareness to compare the internal felt landscape of yoga versus gym practitioners. The inclusion of heart rate variability (HRV) as a quantitative objective biomarker provides a gauge of allostatic (stress) load and an opportunity to consider how a movement practice may support pro-health habits mediated by HRV. Interpretative phenomenological analysis will uncover interview themes, to be triangulated against survey responses.

#### Findings

Data analysis is currently underway and due for completion by end April 2020. The aim is to present preliminary findings at the Conference, which would be the first public presentation.

#### Conclusions

The innovative research design aims to broaden the conversation, particularly within the yoga literature, beyond the traditional interventional approach considering yoga for specific clinical conditions, to an exploration of a yoga practice as experienced by practitioners. The use of HRV may offer insight regarding parasympathetic dominance and self-regulation (as it relates to health behavior). The wider lens, of adherence to a movement practice, hopes to uncover the experience of committed practitioners in order to better understand pro-health habits (exercise adherence and healthy lifestyle choices) and concepts that may be applied in behavior change research and public health.



# Proof of concept of the Goldilocks principle in Childcare workers

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#### Pre-recorded Presentation

#### Purpose

Childcare workers show a high prevalence of high BMI and low cardiorespiratory fitness, thus facing increased risk of health problems. According to childcare curricula, the preschool teachers should encourage children to be more physically active, given the importance of physical activity for children. Childcare workers should therefore act as role models by actively participating in playful physical activities together with the children. However, no studies have investigated if these activities, primarily aiming at the children, also increase physical activity of childcare workers to an extent that improves their cardiorespiratory fitness (i.e. intensities above 60 % of heart rate reserve (HRR)).Therefore, this study investigates if designed playful physical activities (Goldilocks activities) elicit physical activity of sufficient intensity to increase cardiorespiratory fitness in childcare workers.

#### Method

Goldilocks activities were designed on basis of studies investigating facilitators for physical activity in day care, and pilot trials conducted in Danish kindergartens. These pilot trials revealed several important contextual factors influencing whether the childcare workers' heart rate did, indeed, rise to more than 60 % HRR during playing activities with the children, as measured by heart rate monitors and accelerometers.

#### Results

Results from pilot trials indicate that regular pedagogical playing activities performed for 10-15 minutes by children and childcare workers do not lead to significant time (i.e. more than 1 min) at HRR >60 % in the workers. In contrast, the designated Goldilocks activities (i.e. performed for 10-15 minutes) resulted in 3-5 minutes at HRR >60 %. Hence, if childcare workers perform 3-4 Goldilocks activities daily, they could get sufficient time in high intensity physical activity to improve their cardiorespiratory fitness as a natural part of work. We will verify these pilot results in a proof of concept study among 30 childcare workers, and present results at the conference.

#### Conclusion

If designated Goldilocks activities engaging both children and childcare workers in physical activity induce sufficient time at high intensities to improve the childcare workers' cardiorespiratory fitness, the concept could have a large potential for increasing health among childcare workers, thus supporting sustainable work in this occupational sector.



# Purchase and consumption of snack foods and soft drinks during school journeys among adolescents in the Otago region, New Zealand

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#### **Pre-recorded Presentation**

Background: Active transport to school (ATS) provides an opportunity for physical activity for adolescents. However, some evidence suggests that ATS may be associated with an increased intake of unhealthy foods and drinks along the school route. This study compared the frequency of purchasing and consuming snack foods and soft drinks on the school journey in adolescents by mode of transport to school, neighbourhood level deprivation and weight status.

Methods: Adolescents (n=731; 53.5% females; 15.3±1.4 years) from 11 secondary schools in the Otago region, New Zealand, completed an online survey in 2018. Adolescents self-reported usual modes of transport to school and weekly frequency of purchasing and consuming snack foods and soft drinks on the way to/from school. Data were analysed by school transport (active/motorised/mixed), neighbourhood-level deprivation (New Zealand Deprivation Index; low (n=420; Quintiles 1+2), medium (n=158; Quintile 3) and high deprivation (n=117; Quintiles 4+5) and weight status (healthy weight vs. overweight/obese).

Results: Overall, 36.5% reported purchasing and consuming snack food and 26% soft drinks on at least one school trip (on average,  $0.91\pm1.73$  and  $0.66\pm1.50$  of 10 school trips/week, respectively). No significant differences were found by school transport mode. Adolescents from high deprivation neighbourhoods reported significantly higher frequency of snack food purchase and consumption compared to those from low deprived neighbourhoods ( $1.43\pm2.31$  vs  $0.76\pm1.52$  of 10 school trips/week; p=0.011). Soft drink purchase and consumption frequency was significantly higher among adolescents from high ( $1.23\pm2.26$  trips/week) compared with medium ( $0.64\pm1.58$  trips/week) and low ( $0.50\pm1.28$  trips/week) deprivation neighbourhoods (high vs medium: p=0.036; high vs low: p=0.002), and higher in overweight/obese versus healthy-weight adolescents ( $0.85\pm1.74$  vs  $0.57\pm1.50$  of 10 school trips/week; p=0.023).

Conclusions: The purchase and consumption of snack foods and soft drinks during adolescents' journey to/from school was not significantly different across the different modes of transport to school. Adolescents from more deprived neighbourhoods, and those who were overweight/obese were significantly more likely to report purchasing and consuming food and beverages from food outlets during the school journey compared to their counterparts. Future studies should examine whether adolescents living in more deprived areas are also more exposed to more unhealthy food outlets and advertising.



# Using self-determination theory to predict fitness center visits in previously inactive exercise initiates

Dr. Stephanie Hooker<sup>1</sup>, Ms. Christina Rush<sup>2</sup>, <u>Dr. Kevin Masters<sup>2</sup></u>, Ms. Christianne Biggane<sup>2</sup> <sup>1</sup>HealthPartners Institute, Minneapolis, United States, <sup>2</sup>University of Colorado Denver, Denver, United States

Pre-recorded Presentation

Purpose: Many adults join fitness centers to increase physical activity; yet, fitness center attendance decreases over time. Self-Determination Theory suggests that individuals who have their basic psychological needs satisfied become more autonomously motivated to attend a fitness center to engage in activity; this hypothesis has yet to be tested. This study examined whether basic psychological needs satisfaction and autonomous regulation are related to fitness center visits in previously inactive exercise initiates.

Methods: Using a 12-week longitudinal cohort study design, inactive adults (N=160) who were joining a fitness center completed measures of demographics, basic psychological needs satisfaction in exercise, and behavioral regulation in exercise at baseline and 4 weeks after starting their exercise programs. Fitness center visits were captured via membership card swipe; the total number of visits per week was calculated for each participant. Multilevel Poisson regression models were used to predict weekly fitness center visits.

Results: Overall, there was a significant decrease in the number of fitness center visits per week (b=-0.05, SE=0.01, p<.001; M=1.9 visits in week 1 and 0.9 visits in week 12). Those who had greater psychological needs satisfaction at baseline (p<.001) and who experienced greater increases in needs satisfaction in the first 4 weeks (p<.001) had more fitness center visits. Further, there was a significant interaction between change in needs satisfaction and time (p=.018). Those who saw greater increases in needs satisfaction had greater reductions in fitness center visits over time (Week 12 M=1.2 visits, 1.4 fewer visits than week 1), yet they remained higher than those who decreased in needs satisfaction over time (Week 12 M=0.5 visits, 0.3 fewer visits than week 1). The same pattern emerged for autonomous regulation.

Conclusions: Those who experience greater increases in needs satisfaction and autonomous regulation attend the fitness center more frequently, but may also experience a more rapid decline in fitness center visits over time. Future research is needed to clarify how changes in needs satisfaction and autonomous regulation are related to physical activity adoption.



# A healthier movement behavior profile is associated with body-congruent food choices through self-determined motivations to exercise and regulate eating

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#### Pre-recorded Presentation

Introduction: Physical activity (PA) has been identified as a facilitator of eating behavior regulation, in part through self-determined motivations to regulate exercise and eating behaviors. However, different patterns of PA and sedentary behaviors (e.g., sitting) appear to have distinct effects on several health outcomes and all-cause mortality, and might therefore be differently related to the way we regulate eating. Also, motivational spillover pathways linking PA and eating behavior have been previously supported. This study aimed to extend prior research by identifying different profiles of PA and sedentary time, and test whether these profiles explained internal eating markers through distinct motivational routes.

Methods: A total of 297 adults (age: 34.5±10.6yr; BMI: 23.2±3.4kg/m2) volunteered to participate in this study. Participants filled the International Physical Activity Questionnaire, Behavioral Regulation in Exercise Questionnaire, Regulation of Eating Behavior Scale, and Intuitive Eating Scale. Latent Profile Analysis and Preacher & Hayes Mediation Procedures were conducted.

Results: A 3-profiles model was retained as the best solution (++sitting/-PA, n = 89; ++PA/-sitting, n = 44; +PA/+sitting, n = 164). Participants in the ++PA/-Sitting profile showed higher self-determined motivations to exercise (ps<.001) and regulate eating (ps<0.05). No differences emerged in non-self-determined motivations and eating measures. Mediation analyses showed that participants in the ++PA/-Sitting profile (vs. ++Sitting/-PA) made more body-congruent food choices, partly through a serial mediation effect of self-determined motivations for exercise and eating (Estimate: 0.25 (0.07), 95%CI: 0.127-0.400). All analyses were adjusted for age, gender, and BMI.

Conclusions: Results extend prior evidence, showing that motivations underpinning exercise/eating have better quality when greater levels of PA are combined with lower sitting time, and by showing that self-determined motivations seem to partly mediate the effects of different patterns of PA and sedentary time accumulation on eating regulation. These findings have implications for future interventions, especially considering the important role of different patterns of movement behaviors and self-determined motivations on the regulation of health-related behaviors.



# Affective timelines across a beginner running session: a mixed-methods illustration of factors influencing how people feel during exercise

#### Dr. Katy Kennedy<sup>1</sup>

<sup>1</sup>University of Surrey, Guildford, United Kingdom

Pre-recorded Presentation

#### Purpose

Affective responses to exercise in laboratory studies predict future exercise behaviour, however there is little research on improving how people feel during real-life physical activity. Running is a simple, economical exercise with potential to improve public health. Beginner running groups are a popular way to start to run, providing an opportunity for examining behaviour change trajectories. The Running Commentary study aimed to investigate contextual factors influencing affective responses to exercise in adults joining beginner running groups.

#### Method

This was a longitudinal, mixed methods field study, using go-along interviews and follow-up online physical activity questionnaires (N=69, 13 UK groups). Participants joining beginner running groups were asked how they felt before, during and after a baseline run-walking session using the Feeling Scale (FS), a single-item 11-point bipolar scale. These results were plotted against session timepoint ('affective timelines') for individuals. Three distinct patterns of affective timeline were established using cluster analysis. Participants were also asked to articulate why they gave that particular score (qualitative data). Transcripts were thematically analysed. A mixed-methods analysis assembled example annotated affective timelines for three different patterns of affective responses for three individuals. FS scores were plotted against time, with relevant quotes from participants at each timepoint demonstrating factors influencing how participants felt.

#### Findings

Some findings were confirmatory of previous treadmill-based research, such as pre-exercise feelings, interpretation of physiological symptoms and a sense of achievement during and after running being important in how people felt during exercise. Some novel findings were: the concept of learning to run being a 'journey' or process, with ups and downs to accept, distraction from discomfort by talking to others, and social pressure or expectations around running faster than was comfortable contributing to people feeling worse during running.

#### Conclusions

These mixed-methods findings inform suggestions on improving training for beginner group leaders and future runwalk interventions. This novel method of annotating affective timelines provides a simple yet powerful illustration of affective changes during exercise, and demonstrate some of the factors which contribute to these affective responses to exercise.



# 'That's it, me pants are coming down. Me bra's falling out': the implications of discomfort for beginner runners' affective experiences of exercise

#### Dr. Katy Kennedy<sup>1</sup>

<sup>1</sup>University of Surrey, Guildford, United Kingdom

Pre-recorded Presentation

#### Purpose

How people feel during exercise may be related to their future physical activity behaviour. There is little research on the factors which might improve these affective responses to exercise, particularly for novices. This poster presents findings from a qualitative synthesis of two studies examining affective responses to exercise, specifically in beginner runners.

#### Methods

Running Commentary was a longitudinal, mixed methods field study, using go-along interviews (N=69, 13 UK beginner running groups). Participants were asked to rate how they felt and why during a run-walking session. WalkJogSmile was an online longitudinal diary study of participants (N=27) following a 9-week beginner running podcast. Participants gave qualitative feedback after running sessions and were interviewed post-study. A qualitative synthesis of results from both studies was conducted using the method of 'following the thread' after thematic analysis. One theme identified across studies is discussed here, namely 'discomfort'.

#### Results

Participants in both studies discussed discomfort, and being in discomfort influenced affective responses to exercise. Five subthemes were identified: clothing, bodily functions and needs, niggles and injuries, lungs and heart and effortful/effortless running. Running is a high intensity, high impact exercise, and this was reflected in the factors participants discussed affecting how they felt during exercise. Uncomfortable shoes, ill-fitting bras or trousers and inadequate pockets caused discomfort or irritation, and clothing was particularly important in extreme weather. Bodily functions and needs discussed by beginners included needing the toilet, digestive issues, hunger and thirst. Niggles and injuries were frequently described as causing discomfort or pain during/after running, and interfered with running enjoyment. Heart and lung-related sensations such as being breathless, having a stitch or feeling heart rate increases caused discomfort, but could also be interpreted positively or negatively. Participants often described running as a mental or physical struggle, reflecting the difficulty of beginners pacing. WalkJogSmile participants in later weeks expressed pleasure in effortless or 'automatic' running.

#### Conclusions

These results gave novel insights into factors related to affective responses to exercise in beginner runners. Applications include improved practical advice for beginner runners and improved practitioner training.



# "It's better together": Benefits of walking regularly with peers versus primarily alone in older adults.

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#### Pre-recorded Presentation

Purpose: Past research with older adults has highlighted the benefits of walking with peer groups, but not clarified how it compares to walking alone. We examined whether purposeful walking with peers (WP) at least once a week contributes to better behavioral and health outcomes in older adults than primarily walking alone (WA).

Methods: A prospective survey design was used. Participants aged 60 and older (N =136) were recruited at the start of a 16-week walking intervention from nine retirement villages in and around Perth, Western Australia. Participants who walked on average at least once a week in the final eight weeks of the intervention were included in the analysis (N =79; 66 Females, Mage (SD) = 77.73 (6.91).

Results: We found that autonomous motivation, walking self-efficacy, functional capacity, overall body fat, and physical activity behavior improved more in those who WP (i.e., either alone or with a partner), compared to those who WA, after controlling for whether participants lived alone/with others, and their health status.

Conclusion: Our results extend the current literature by providing longitudinal evidence for the added benefits of regular peer accompanied walking in older adults and highlight the importance of investing in peer-supported interventions. We recommend interventions that promote regular walks with supportive peers and provide the choice to do so as a group or with a partner. Further understanding of characteristics and behaviors of peers that are effective as walking partners or group leaders is needed.



# Motivation for volunteering in older peer walk leaders: A longitudinal qualitative investigation

<u>Miss Marlene Kritz<sup>1,2</sup></u>, Prof. Cecilie Thogersen-Ntoumani<sup>1,2</sup>, Prof. Barbara Mullan<sup>1</sup>, Dr. Afroditi Stathi<sup>2</sup>, Professor Nikos Ntoumanis<sup>1,2</sup>

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#### **Pre-recorded Presentation**

Purpose: Peer volunteers offer a cost-effective avenue for promoting physical activity in the older population. However, recruiting and retaining such volunteers is challenging, and there is a lack of understanding on the underlying processes that lead to program adherence. We, therefore, aimed to longitudinally examine factors that determine levels of adherence of older volunteer walk leaders to a 16-week walking intervention.

Methods: One male and ten female (Mdn Age = 75 years, Age range = 66 – 83 years) novice peer walk leaders were interviewed twice over four months, and data were analyzed using thematic analysis. We used a longitudinal multiple case study design, informed by self-determination theory, to track three motivational profiles: program dropouts, program completers, and program maintainers.

Results: The desire to help, optimism, leadership confidence, satisfaction of basic psychological needs, and autonomous motivation were key to adherence. Autonomous motivation to volunteer and altruistic desires facilitated the use of sustainable helping strategies, leading to psychological need satisfaction and a desire to continue as a volunteer. A focus on self-orientated motives to volunteer, the use of unsustainable helping strategies, and lack of psychological need satisfaction were barriers to adherence.

Conclusions: Our results highlight that the quality of motivation to volunteer may determine helping strategies and satisfaction of psychological needs among older walk leaders. Our findings can inform future older peer leader recruitment, training, and support to maximize their levels of adherence to physical activity programs.



# A Meta-analysis of self-determination theory-informed intervention studies in the health domain: Effects on motivation, health behavior, physical, and psychological health

Professor Nikos Ntoumanis<sup>1</sup>, Dr. Johan Ng<sup>2</sup>, Dr. Andrew Prestwich<sup>3</sup>, Dr. Eleanor Quested<sup>1</sup>, Dr. Jennie Hancox<sup>4</sup>, <u>Prof. Cecilie</u> <u>Thogersen-Ntoumani<sup>1</sup></u>, Prof. Edward Deci<sup>5</sup>, Prof. Richard Ryan<sup>6</sup>, Prof. Chris Lonsdale<sup>6</sup>, Prof. Geoffrey Williams<sup>5</sup> <sup>1</sup>Curtin University, Perth, Australia, <sup>2</sup>Chinese University of Hong Kong, Hong Kong, Hong Kong, <sup>3</sup>University of Leeds, Leeds, United

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#### Pre-recorded Presentation

Purpose: Ng et al. (2012) meta-analysis of applications of self-determination theory (SDT; Ryan & Deci, 2017) in the health domain included many non-experimental studies. A more recent meta-analysis by Gillison et al. (2019) of intervention studies in this area did not calculate changes in indices of physical or mental health. Advancing the SDT literature in the health domain, we present a meta-analysis of experimental studies that tested changes in at least one SDT variable and at least one health-behavior, physical-health outcome, or psychological-health outcome.

Methods: 73 studies (N=30,088) met our inclusion criteria and provided sufficient data for the purposes of the review. The behaviour change techniques (BCTs) and SDT-based need supportive techniques used in the studies were also coded. Risk of bias was assessed using an adapted version of the Cochrane Risk of Bias Tool. To test whether changes in SDT-related constructs engender changes in other SDT-related constructs, health behavior, physical health and psychological health, a set of meta-regressions were conducted. Sensitivity analyses were applied to examine the robustness of the synthesized results by removing outliers and by examining whether any of the BCTs were associated with the effect sizes from individual studies.

Results/findings: A random-effects meta-analytic model (using Stata, v. 15) showed that the interventions produced small-to-medium changes in most SDT constructs at the end of the intervention period, and in health behaviors at the end of the intervention period and at the follow-up. Small positive changes in physical and psychological health outcomes were also observed at the end of the interventions. Increases in need support and autonomous motivation (but not controlled motivation or amotivation) were associated with positive changes in health behavior.

Conclusions: Interventions in the health domain based on SDT produce modest (in the region of g= .30 to .60) but sustained increases in health behaviors and improvements in physical health, and short-term changes in psychological health. These effects are partly due to increases in self-endorsed motivation for change and support from social agents.



# The START Trial: A motivationally-embellished peer-led group-based walking intervention in the workplace

**Prof. Cecilie Thogersen-Ntoumani<sup>1</sup>**, Mr. Brendan Smith<sup>1</sup>, Dr. Joanna Nicholas<sup>1</sup>, Dr. Eleanor Quested<sup>1</sup>, Dr. Daniel Gucciardi<sup>1</sup>, Dr. Joanne McVeigh<sup>1</sup>, Dr. Sally Fenton<sup>2</sup>, Prof. Emmanuel Stamatakis<sup>3</sup>, Prof. Sharon Parker<sup>1</sup>, Prof. Nikos Ntoumanis<sup>1</sup> <sup>1</sup>Curtin University, Perth, Australia, <sup>2</sup>University of Birmingham, Birmingham, United Kingdom, <sup>3</sup>University of Sydney, Sydney, Australia

#### **Pre-recorded Presentation**

Purpose: There is a dearth of studies on how to train physically active employees to act as peer leaders and use motivationally supportive communication to promote physical activity in their physically inactive colleagues. We delivered and evaluated a self-determination theory-based, peer-led, workplace group walking intervention.

Methods: A 16-week pilot cluster randomized controlled trial with an enhanced (5 worksites; n=50 participants) and minimal treatment (3 worksites; n=47 participants) arms. All participants were given a Fitbit Zip and information on health benefits of walking. Enhanced treatment participants also had access to a mobile app incorporating behavior change techniques, were trained on principles of autonomous motivation, and had a peer leader trained in a motivationally supportive communication style. Feasibility measures (recruitment, drop-out rates, training and intervention acceptability) were estimated. Steps, minutes standing and sitting were measured using ActivPALs. Cardiometabolic risk factors (waist circumference and waist-to-height ratio) were assessed. Motivation to walk and well-being (affect at work, general psychological well-being) were measured using established questionnaires. All outcomes were assessed at baseline and post-intervention. Mixed modelling analyses, accounting for time and worksite clustering, were conducted.

Results: We evidenced strong feasibility of recruitment, retention, and assessment procedures, and high levels of acceptability. The evidence for preliminary efficacy was mixed. Markers of cardio-metabolic risk improved in the enhanced treatment only (Cohen's d=.10-.16). Autonomous motivation increased in both conditions. Significant improvements in time spent standing) and sitting were observed in the enhanced treatment condition, but none of the time × condition interaction effects for steps, standing, or sitting were significant. For well-being, none of the main or interaction effects were significant.

Conclusions: High baseline scores in steps across both conditions suggest the presence of reactivity as a result of receiving the activity tracker and could explain lack of treatment effects regarding step count. However, given that this was a pilot, the strong evidence for feasibility and the fact that improvements were in the expected direction, suggest that the trial has the potential to be tested at a larger scale.





# Cancer prevention and management (SIG)



# Perceptions on the acceptability of a tailored exercise and nutritional intervention for patients with ovarian cancer undergoing chemotherapy

Msc Stephanie Stelten<sup>1</sup>, Dr. Laurien Buffart<sup>1</sup>, Prof. Gemma Kenter<sup>1</sup>, Dr. Luc van Lonkhuijzen<sup>1</sup>, <u>Phd Meeke Hoedjes<sup>2</sup></u> <sup>1</sup>Amsterdam UMC, Amsterdam, Netherlands, <sup>2</sup>Tilburg University, Tilburg, Netherlands

Symposium Recording

#### Purpose:

The multicenter randomized controlled Physical Activity and Dietary intervention in OVArian cancer (PADOVA) trial assesses the effectiveness of a combined supervised moderate-to-high intensity exercise and nutritional intervention during chemotherapy. In addition, an extensive process evaluation is conducted to gain insight into how and why this intervention is (in)effective. The purpose of this presentation is to describe the results of semi-structured interviews that were conducted as part of this process evaluation to assess both intervention participants' and implementers' perceptions on the acceptability of the intervention.

#### Methods:

Semi-structured interviews are conducted among both intervention participants (i.e., 122 adult women with primary epithelial ovarian cancer who are scheduled to undergo first-line (neo)adjuvant chemotherapy) and implementers (i.e., oncology physical therapists and dieticians). The first 25% of participants and 18 intervention implementers (n=6 dieticians; n=12 physical therapists) are invited for semi-structured interviews conducted by a researcher. Interviews are transcribed verbatim, and data analysis is performed concurrently with data collection. Thematic analysis is conducted following the 6 steps by Braun & Clarke (2006), using Atlas.ti version 8.4.

#### Results:

Physical therapists reported that participants were able to adhere to the exercise protocol better than expected, although they did report the exercise protocol was not achievable for some participants because of physical complaints (e.g., knee complaints). Dieticians were generally satisfied with the dietary intervention protocol, although they stated that the protein intake goal was not always achievable. They suggested to adapt the number of dietary sessions to individual needs and preferences. Participants indicated that the intervention contributed to their recovery, and that they were surprised to experience their body to be stronger than expected. Reasons for not being able to adhere to the intervention were being too sick or too tired. Participants suggested the dietary intervention could be improved by offering face-to-face dietary counselling closer to home.

#### Conclusions:

These findings could be helpful in raising awareness about the acceptability and beneficial effects of participation in a combined tailored physical activity and dietary intervention in ovarian cancer patients undergoing chemotherapy.



# Bridging the gap between attitudes and action: Opportunities for supporting exercise counselling and referral to patients by the cancer care workforce

<u>Associate Professor Cristina Caperchione<sup>1</sup></u>, Prof. Jane Phillips<sup>1</sup>, Prof. Meera Agar<sup>1</sup>, Associate Professor Winston Liauw<sup>2,3</sup>, Dr. Carole Harris<sup>2,4</sup>, Mr. Paul Sharp<sup>1</sup>, Miss Elizabeth Marin<sup>1</sup>, Ms. Sue McCullough<sup>4</sup>

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#### Symposium Recording

Background: The majority of the cancer care workforce have favourable attitudes and opinions of exercise for cancer patients, and report that exercise is safe and beneficial, nevertheless, insufficient time and uncertainty of what to recommend are reported as common barriers to discussing and/or counselling their patients about exercise. The limited research about cancer care clinician's communication with their patients about exercise suggests that a timely discussion about regular exercise can be reassuring, informative and motivational for patients. The purpose of this research was to explore the perceived barriers and facilitators impacting on the cancer care workforce's capacity to implement exercise counselling and an exercise referral pathway for their patients.

Methods: A series of focus groups (N=7) were conducted with cancer care clinicians and practitioners (n=62) (i.e., oncologists, haematologists specializing in cancer, oncology nurses, physiotherapists, exercise physiologists, social workers and psychologists) working with cancer patients throughout Sydney, Australia. The focus group interviews were audio-recorded, transcribed, and analysed using thematic content analysis.

Results: Two overarching themes, and associated subthemes, emerged from the data: 1) Factors impacting the knowledge-to-action gap, highlights the challenges and barriers clinicians and practitioners face in implementing exercise counselling and a referral pathway, inclusive of the funding structure; current referral process (i.e., only available via general practitioner/Medicare); lack of exercise specific knowledge and education to confidently advice/counsel patients; limited access and opportunity for professional development/training specific to exercise for cancer care, and 2) Recommendations for a consistent and efficient way forward, describes an action-orientated exercise counselling and referral pathway approach, inclusive of an oncologist-initiated brief communication exchange; distribution of a variety of cancer-specific, tailored exercise resources for patients (e.g., videos, online, hard copy); access to exercise physiologists with cancer care expertise; initial exercise consultation prompted by exercise physiologist.

Conclusions: This study has identified important factors influencing exercise counselling and referral by the cancer care workforce and has presented potential approaches for incorporating exercise into usual cancer care. Future testing is required to determine feasibility and practicality of these approaches.



# Yoga, Aerobic walking and Stretching-Toning for cancer survivors: Participant experiences from a 12-week group exercise intervention (STAY Fit Trial)

#### Dr. Neha Gothe<sup>1</sup>

<sup>1</sup>University of Illinois at Urbana Champaign, Urbana, United States

Symposium Recording

Background: Across the cancer continuum, the importance and health benefits of exercise for cancer survivors are well documented. Health organizations recommend cancer survivors engage in up to 150 minutes/week of exercise however little is known about cancer survivors' experiences with and preferences for exercise programs. Purpose: The STAY Fit Trial is a three-armed randomized controlled trial comparing the effects of a 12-week yoga, aerobic walking and stretching-toning exercises on cognitive function among adult cancer survivors. This abstract presents participant experiences and preliminary data evaluating the feasibility of a group exercise program.

Methods: Sedentary cancer survivors between 30-70 years were invited to participate in the STAY Fit trial. Participants engaged in 150 minutes/week of exercise over 2 or 3 group sessions. After the 12-weeks, participants (N=51, males=5, mean age=54.36  $\pm$ 9.9) completed a program feedback and evaluation to determine perceived benefits of exercise, overall satisfaction and enjoyment with the program, and feedback regarding the suitability of the exercise sessions.

Results: Majority of the participants completed the program feedback and evaluations (42/51). Average attendance ranged between 68-80% and participants reported experiencing a variety of health benefits. These self-reported health benefits included physical outcomes such as improved fitness, flexibility, strength as well as psychological benefits such as improved focus, sleep, body image and reduced pain. On average participants reported being satisfied with the STAY Fit program (4.5/5) and there were no significant differences between the exercise groups. On average participants reported that the dose of exercise was "just right" and neither "too long" or "too short".

Conclusions: The exercise prescription of 150 minutes/week was well tolerated by the study participants. No program related adverse events were reported and participants perceived health benefits over the 12-weeks. Our findings have implications for designing and promoting exercise programs for this population across their lifespan. Exercise adherence can be a challenge for cancer survivors and future studies need to examine barriers to exercise experienced by cancer survivors to maximize adherence and therefore the benefits of exercise.



# Dietary patterns and adherence to the 2018 World Cancer Research Fund/American Institute for Cancer Research (WCRF/AICR) Cancer Prevention Recommendations in older adults living in Auckland, New Zealand

<u>Dr Kathryn Beck<sup>1</sup></u>, Ms. Karen Mumme<sup>1</sup>, Dr. Jamie de Seymour<sup>1</sup>, Dr. Pamela von Hurst<sup>1</sup>, Dr. Beatrix Jones<sup>2</sup>, Dr. Welma Stonehouse<sup>3</sup>, Dr. Cathryn Conlon<sup>1</sup>

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#### Pre-recorded Presentation

Purpose: Globally, the population is ageing and the prevalence of cancer is increasing. In 2018, the World Cancer Research Fund (WCRF) and American Institute for Cancer Research (AICR) published their third expert report on Diet, Nutrition, Physical Activity and Cancer. Subsequently, a standardised scoring system was developed to assess adherence to cancer prevention recommendations1. The aim of this study was to investigate data driven dietary patterns, adherence to WCRF/AICR recommendations and associations with socio-demographic factors in adults 65-74 years living in Auckland, New Zealand.

Methods: This cross-sectional study used community-dwelling participants from the Researching Eating, Activity and Cognitive Health (REACH) cohort. Participants completed a demographic questionnaire, validated 109-item food frequency questionnaire and International Physical Activity Questionnaire-Short Form. Weight, height and waist circumference were measured. A score for each participant was constructed using the WCRF/AICR recommendations1. Dietary patterns (DPs) were derived using principal component analysis (PCA). Associations between DPs, the WCRF/AICR score and sex, age, deprivation and living situation were investigated using linear regression analysis.

Results/findings: The mean±SD WCRF/AICR score of participants (n=367; 235 females) was  $4.29\pm1.08$  (possible score 7; higher score reflects adherence to recommendations). Two DPs explained 14% of the variance in dietary intake. The first DP 'healthy' was categorised by high intakes of vegetables, nuts and seeds, legumes, wholegrains, meat alternatives, fruit, fish, seafood and spices. The second DP 'Western' was categorised by processed meats, sauces and dressings, biscuits and cakes, fast food, confectionary, vegetable oils, cheese and beer. Higher adherence to the WCRF/AICR score was positively associated with a 'healthy' DP (r=0.51; p<0.001) and negatively associated with the 'Western' DP (r=-0.38; p<0.001). Females were more likely to follow the WCRF/AICR recommendations (p=0.001) and healthy DP (p<0.001), while the 'Western' DP was associated with being male (p<0.001), living with others (p=0.019) and younger age (p=0.027).

Conclusions: Scores on PCA-derived DPs were associated with adherence to WCRF/AICR recommendations. Participant sex was associated with both DPs and adherence to WCRF/AICR recommendations. Age and living situation were associated with the 'Western' DP. Socio-demographic factors should be considered in lifestyle interventions aimed at reducing cancer risk.

1Shams-White MM et al. Nutrients. 2019; 11(7).


# The effects of 16 weeks of Pilates intervention on psychological aspects of breast cancer women undergoing hormone therapy – MoveMama study

<u>Miss Leonessa Boing<sup>1,2</sup></u>, Ms. Tatiana do Bem Fretta<sup>1</sup>, Miss Francine Stein<sup>1</sup>, Miss Bruna Leite<sup>1</sup>, Prof. Alcyane Marinho<sup>1</sup>, Prof. Adriana Coutinho de Azevedo Guimarães<sup>1</sup>

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Pre-recorded Presentation

Purpose: Analyse the effects of Pilates method intervention on quality of life, sleep quality, fatigue, depressive symptoms and self-esteem in breast cancer women undergoing hormone therapy.

Methods: Randomized clinical trial including 35 breast cancer women undergoing hormone therapy from Oncology Research Center (CEPON) in the South of Brazil. These women were allocated in two groups: the intervention group (n=18) and the control group (n=17). The intervention group received 16 weeks of Pilates method, 2x week for 60 minutes the session, and the control group attended three group meetings with lectures about physical and mental health. The data collection occurred pre and post-intervention using a questionnaire, including the quality of life by European Organization for Research and Treatment of Cancer Quality of Life Questionnaire (EORTC-QLQ C30), the sleep quality by the Pittsburgh Sleep Quality Index, the fatigue by the Functional Assessment of Cancer Therapy-Fatigue (FACT-F), the depressive symptoms by the Beck Depression Inventory (BDI) and the self-esteem by the Rosenberg Self-Esteem Scale. For analysis, it was used the Anova Two way with repeated measures and Sydak test for comparison (p<0.05).

Results: After the 16 weeks of intervention the Pilates group showed better scores for the global status of quality of life (p<0.001), the physical function of QOL (p=0.006), decreased fatigue levels (p=0.014), and increased the self-esteem (p=0.011). The control group also presented better scores for the global status of quality of life (p=0.006). In the sleep quality and depressive symptoms, none of the groups demonstrated any significant improvement (p>0.05).

Conclusion: Pilates method is a viable and effective type of physical activity that can help improve the psychological aspects of breast cancer women undergoing hormone therapy. In addition, the control group demonstrated improvements in self-perception of global health, showing the importance of lectures and educational programs for these women. Programs regarding physical activity are very important in helping these women restore emotional and social well-being and must be implemented in all oncology facilities. (Clinical Trials - NCT03194997)



# Eating Behaviors and Dietary Quality in Childhood Acute Lymphoblastic Leukemia Survivors and Peer Controls

#### Dr. Marie Chradon<sup>1</sup>, Ms. Stefania Pinto<sup>2</sup>, Dr. David Janicke<sup>2</sup>

<sup>1</sup>Cincinnati Children's Hospital Medical Center, Cincinnati, United States, <sup>2</sup>University of Florida, Gainesville, United States

Pre-recorded Presentation

Background: Childhood acute lymphoblastic leukemia (ALL) survivors' increased risk for adverse health outcomes (e.g., cardiovascular problems, metabolic disease) could be mitigated through healthy lifestyle behaviors (e.g., balanced diet). Nonetheless, >70% of adult survivors do not meet survivorship dietary recommendations. ALL treatment may amplify risk for restricted dietary preferences and poor food intake self-regulation that ultimately contribute to survivors' suboptimal diets. This relationship has yet to be examined in research. This study aims to (1) characterize differences in picky eating, food intake self-regulation, and dietary quality between survivors and peer controls; and (2) examine the associations between these eating behaviors and dietary quality in survivors relative to peer controls.

Methods: Participants were 32 survivors (Mage =  $8.79 \pm 2.70$ ), 32 age-/sex-matched peer controls (Mage =  $8.59 \pm 2.64$ ), and their caregivers. Children's dietary quality (Healthy Eating Index-2015) was calculated from three 24-hour dietary recalls. Parents completed the Child Eating Behavior Questionnaire-Food Fussiness subscale and the Child Self-Regulation in Eating Questionnaire.

Results: Independent samples T-tests revealed survivors to exhibit significantly greater picky eating than peer controls but have comparable food intake self-regulation and dietary quality. Linear regressions showed survivors' increased picky eating related to worse overall dietary quality ( $\beta = -.39$ , p < .05, R2 = .15)but not food intake self-regulation ( $\beta = .11$ , p > .05, R2 = .01). Peer controls' poorer food intake self-regulation ( $\beta = .51$ , p < .01, R2 = .26), but not picky eating ( $\beta = -.35$ , p > .05, R2 = .09), related to worse dietary quality.

Conclusions: Survivors consumed comparably poor quality diets to peer controls. However, dietary quality is of particular concern for survivors given baseline risk for adverse health outcomes and survivors exhibited greater picky eating. Study results provide preliminary support for different eating behaviors contributing objectively poor dietary quality in children with and without an ALL history. If replicated longitudinally, these findings suggest that interventions to support optimal dietary quality in the context of childhood ALL may benefit from targeting picky eating rather than food intake self-regulation.



# Bladder cancer patient perspectives of vigorous intensity aerobic interval exercise prehabilitation prior to radical cystectomy: A qualitative study

Mr. Srijit Banerjee<sup>1</sup>, Dr. Kelly Semper<sup>2</sup>, Dr. Katy Skarparis<sup>3</sup>, Dr. Jenni Naisby<sup>4</sup>, Dr. Liane Lewis<sup>5</sup>, Dr. Gabriel Cucato<sup>4</sup>, Mr. Robert Mills<sup>1</sup>, Mr. Mark Rochester<sup>1</sup>, **Prof. John Saxton<sup>4</sup>** 

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#### Pre-recorded Presentation

Purpose: Pre-operative cardiopulmonary fitness is increasingly being recognised as an important factor influencing post-operative recovery outcomes in cancer patients. The aim of this study was to explore patient perspectives of pre-operative vigorous intensity aerobic interval exercise in bladder cancer patients awaiting radical cystectomy.

Methods: Patients (N=60) were randomised (1:1) to a supervised exercise or a standard treatment (only) control group shortly after decision to operate. Participants in the exercise group were offered supervised vigorous intensity aerobic interval exercise on a cycle ergometer (Monark 824E; Varberg, Sweden) twice-weekly, in addition to standard treatment. Focus groups involving a purposive convenience sample of 14 patients who had been randomised to the exercise arm (mean age  $\pm$  SD: 72.3  $\pm$  6.0 y) were undertaken after recovery from surgery in a hospital education department. Focus group transcripts were transcribed verbatim before two independent researchers read and analysed the transcripts using framework analysis.

Results/findings: Three themes emerged from the framework analysis which contextualise the perceptions and experiences of participants: (i) Motivational factors; (ii) Perceived benefits of participation; (iii) Perceptions of programme design. Important motivational factors for engaging in the exercise prehabilitation were: social support, previous exercise experience and objective measures of progression (reflecting physiological adaptations). Patients experienced physical, psychological, and psychosocial health benefits and enjoyed participation, however, challenges associated with travelling to the centre, the discomfort of cycle ergometer exercise and need for clear and concise information from healthcare providers to ensure adequate preparation for supervised exercise were highlighted.

Conclusions: This qualitative study provides new insights into the perspectives and experiences of patients with bladder cancer regarding participation in pre-operative vigorous intensity aerobic exercise. The exercise programme provided physical, psychological and social benefits. Supervised exercise, objective improvement, and peer and family support all contributed to motivation to engage with pre-operative high intensity aerobic interval exercise. Individuals may require further support after radical cystectomy to continue with exercise.



## Volunteer lifestyle coaching to support reduction of post- menopausal cancer risk factors – Participants responses

<u>Prof. Annie Anderson<sup>1</sup></u>, Ms. Martine Stead<sup>3</sup>, Miss Jennifer McKell<sup>3</sup>, Dr. Stephen Caswell<sup>1</sup>, Ms. Mary Allison<sup>2</sup>, Ms. Amy Hickman<sup>5</sup>, Prof. Shaun Treweek<sup>4</sup>

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#### Pre-recorded Presentation

Purpose The ActWELL RCT aims to test the effectiveness of a 12-month, volunteer coach delivered, weight management (diet and physical activity) programme in post-menopausal women with a BMI>25 kg/m2 attending routine breast cancer screening appointments.

The novel intervention incorporated increased motivation for weight management (by raising awareness of breast cancer risk within screening) combined with increased capability for lifestyle change (via a volunteer coach delivered personalised programme) and enhanced opportunities for greater physical activity (via local leisure centres). The programme was delivered in two individual, face to face sessions and 9 support calls by volunteer coaches (recruited and managed by the charity Breast Cancer Now).

We report results on participant responses to the acceptability of intervention components with specific reference to volunteer coaches.

Methods Following all data collection procedures intervention participants were invited to complete an anonymous exit questionnaire about the intervention components using 5- scale categorical responses (very helpful to very unhelpful) and to describe the most useful component of the intervention. In addition, qualitative interviews were undertaken by independent researchers and a thematic analysis was undertaken to explore intervention experiences.

Results Volunteer coaches (n=45) delivered 528 coaching sessions and 1940 support calls to 279 women allocated to the intervention group.

Exit questionnaires were returned by 167 (70%) of intervention participants who completed follow up measures. The coach visits were described as very helpful by 55% with a further 34% reporting these as helpful. Of the 10 components described as the most useful, the coach was most frequently cited (46%). Interview data from 24 women indicated that coaches were generally highly regarded. Four main areas were highlighted: the coach's personality or manner, ability to empathise, the support provided throughout the programme, and their ability to understand how to motivate change. In discussion on future changes to the programme many reported a desire for more frequent or extended coach contact.

Conclusions The use of volunteer coaches to deliver a weight management programme is viewed favourably by overweight and obese post-menopausal. women.



## Associations of Light Physical Activity, Moderate-to-Vigorous Physical Activity and Sedentary Behaviour with Quality of Life in Men on Androgen Deprivation Therapy (ADT) for Prostate Cancer: A Quantile Regression Analysis

<u>Assistant Professor Linda Trinh<sup>1</sup></u>, Dr. Shabbir M. H. Alibhai<sup>2,3</sup>, Dr. Nicole Culos-Reed<sup>4</sup>, Dr. Catherine M. Sabiston<sup>1</sup>, Dr. Jennifer M. Jones<sup>3,5</sup>, Dr. Dori E. Rosenberg<sup>6</sup>, Dr. Guy E. Faulkner<sup>7</sup>

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Pre-recorded Presentation

Purpose: Men on androgen deprivation therapy (ADT) for prostate cancer experience multiple side effects including reduced quality of life (QoL). No study to date has examined associations between movement behaviours (sedentary behaviour [SED], light physical activity [PA], moderate-to-vigorous physical activity [MVPA]) and QoL among men on ADT. The study objectives are to: a) estimate the prevalence of movement behaviour patterns; and b) determine associations of PA and SED with QoL in this population.

Methods: We conducted a pooled analysis of 106 men on ADT from baseline data of three existing North American intervention studies. Movement behaviour was assessed using ActiGraph accelerometers worn for 7 days. Self-reported QoL was assessed using the Functional Assessment of Cancer Therapy (FACT). Quantile regression was used to examine associations of QoL with light PA, MVPA, and SED at the 25th, 50th, and 75th QoL percentiles.

Results: Men on ADT had a Mage=72.2 $\pm$ 7.6 years, MBMI=27.8 $\pm$ 4.0 kg/m2, 40.6% had surgery, 80.2% received radiation, and 72.6% had localized prostate cancer. Men spent 71.5% of their total time sedentary (8.9 h/day), 32.9% (3.2 h/day) in light PA and 2.2% in MVPA (0.3 h/day). SED in at least 30 minute-bouts was inversely associated with functional well-being ( $\beta$ = -.003, p=.017) at the 50th percentile. Breaks in sedentary time were positively associated with physical well-being at the 75th percentile ( $\beta$ =.007, p=.003), and inversely associated with FACT-General at the 50th percentile ( $\beta$ = -.04, p=.005). Light PA was positively associated with FACT-Prostate at the 25th percentile ( $\beta$ =.011, p=.020), and with the Trial Outcome Index (TOI)-Prostate at the 75th percentile. MVPA in at least 10-minute bouts was inversely associated with TOI-Prostate ( $\beta$ = -.03, p=.026), emotional well-being ( $\beta$ = -.01, p=.034), and FACT-General ( $\beta$ = -.04, p=.034) at the 75th percentile.

Conclusions: Men on ADT are highly sedentary and engage in few MVPA minutes. Sedentary time, light PA, and MVPA were significantly associated with QoL outcomes, but varied across men reporting the poorest QoL compared to those in the highest QoL distributions. Light PA appears to be beneficial for QoL even among the poorest QoL distributions, suggesting the need to 'move more' after a prostate cancer diagnosis.



# Physical activity attitudes and discussion practices in oncology healthcare providers working with Kidney Cancer Survivors

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Pre-recorded Presentation

Purpose: The benefits of physical activity (PA) in kidney cancer survivors (KCS) include improvements in quality of life (QoL), fatigue, and physical functioning. However, only 26% of KCS are sufficiently physically active to accrue these benefits. Oncology healthcare providers (OHP) can play an important role in providing PA information and recommendations to KCS.

Methods: Using a cross-sectional study design, OHP were recruited through the Kidney Cancer Research Network of Canada. OHP included oncologists, nurses, and urologists, currently working with KCS in Canada. OHP completed a self-reported on-line survey addressing attitudes, knowledge, confidence and competence discussing PA to KCS and using the guidebook, as well as current PA discussion practices. A 47-item questionnaire was developed with openand close-ended questions addressing the study objectives. Data was analyzed using descriptive statistics, including frequencies and percentages of responses to determine trends in PA discussion for this population.

Results: OHP (n=13) were mainly oncologists (n= 8; 62%). OHP hold positive attitudes towards PA for KCS both during (n=12; 92%) and after (n=12, 100%) treatment. However, they lack PA knowledge for KCS (n=7; 54%) and lack familiarity of guidelines (n=9; 69%). OHP demonstrated low PA discussion practices (n= 7; 54% not discussing PA at all) and low discussion of the guidebook with KCS (n= 8; 62% not making any KCS aware of guidebook). Barriers for PA discussion included lack of time, lack of familiarity of the guidebook, lack of funding for patient referrals to community programs, remembering to discuss it, and major medical issues taking priority. Facilitators included having hard copies of the guidebook for easier access, being familiar with the guidebook, and a website to guide patients and nurses.

Conclusion: OHP are willing to consider PA discussion to KCS as they hold positive attitudes towards it, but there are major barriers to knowledge and time that should be considered in future interventions. Addressing these barriers will enable better PA discussion practices, which may increase PA behaviour among KCS for better quality of life and health outcomes.



## Motivational predictors of exercise and eating behaviors in cancer survivors: Preliminary data

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#### Pre-recorded Presentation

Purpose: The number of cancer survivors is expected to keep increasing in the next decades, due to medical advances. Therefore, lifelong health issues and quality of life represent a major concern for this population. Regular physical activity (PA) and a healthy dietary behaviors (HDB) are essential to improve cancer survivors' health and quality of life. However, most survivors do not meet behavioral guidelines. Motivation quality seems to be an important determinant of sustained behavior adherence. This study aimed to analyze motivational indicators, as per Self-Determination Theory, and their association with PA levels and HDB in cancer survivors, regardless of cancer type and disease stage.

Methods: A total of 91 cancer survivors (age:46.3±9.1yr; BMI:25.5±4.9kg/m2; time of diagnosis: 43.4±44.9 months) volunteered to participate in this cross-sectional study. Participants completed the International PA Questionnaire, the Behavioral Regulation for Exercise Questionnaire - 4, the Regulation of Eating Behavior Scale and some questions regarding their HDB based on World Cancer Research Fund guidelines. Multiple linear regression analyses were conducted.

Results: Insufficient levels of PA (i.e. below the recommended guidelines) of  $140.7\pm240.3 \text{ min/wk}$ , and a moderate to high frequency of HDB were found in this sample of cancer survivors. Integrated motivation was identified as the only significant predictor of PA ( $\beta = .301$ ; p = .004). HDB were positively predicted by intrinsic ( $\beta = .393$ ; p < .001) and external ( $\beta = .219$ ; p = .025) motivations to regulate eating, and negatively by amotivation to regulate eating ( $\beta = .305$ ; p = .004) and amotivation to exercise ( $\beta = -.302$ ; p = .002).

Conclusions: Preliminary findings suggest higher adherence to HDB compared to PA in this sample of cancer survivors. It further supports the role of more self-determined motivations on the adoption of healthy PA. Regarding HDB mixed findings were found (i.e. both extrinsic and intrinsic forms were associated with healthy diet). These findings have implications for future interventions and practice, especially considering the lower integration of PA services and specialists in standard care compared to diet services and professionals.



# Affective response to high-intensity interval exercise and moderate-intensity continuous exercise in female Cancer survivors

Miss Allyson Tabaczynski<sup>1</sup>, Dr. Catherine M. Sabiston<sup>1</sup>, Dr. Daniel Santa Mina<sup>1</sup>, Dr. Steven J. Petruzzello<sup>2</sup>, Dr. Linda Trinh<sup>1</sup> <sup>1</sup>University of Toronto, Toronto, Canada, <sup>2</sup>University of Illinois at Urbana-Champaign, Urbana, United States

#### Pre-recorded Presentation

Purpose: High-intensity interval exercise (HIIE) produces positive health outcomes for females with cancer. However, little is known regarding female cancer survivors' affective response to HIIE despite its positive association with future exercise participation. The purpose of this study was to compare affective response during (in-task) and following (post-task) HIIE and moderate-intensity continuous exercise (MICE) in female cancer survivors. Secondary outcomes included enjoyment, self-efficacy, and exercise intentions.

Methods: Following a baseline maximal graded exercise test, female cancer survivors performed 20-minutes of HIIE or MICE on separate occasions in a randomized and counterbalanced order. HIIE included 10, 60-second intervals at 125% of participants' ventilatory threshold (VT), interspersed with active rest (75% of VT). MICE was performed at 90% of participants' VT. Affective response was assessed before, during, and after exercise using the Feeling Scale, Felt Arousal Scale, and Activation Deactivation Adjective Checklist. Secondary outcomes were assessed post-exercise. Statistical analysis included condition by time repeated measures ANOVAs for affect and enjoyment measures. Paired t-tests compared differences in self-efficacy and intentions. Interpretation of results used effect size (Cohen's dz) with negative effect sizes suggesting results favoring HIIE.

Results: Participants (n=12), primarily breast cancer survivors (58.3%), had a mean age of  $51.2\pm9.3$  years, and were  $41.3\pm19.4$  months since diagnosis. In-task results indicated a large difference between conditions for affective arousal (dz= -0.72), but small differences in affective valence (dz= -0.21). Post-task affect elicited a small effect between HIIE and MICE conditions for all domains (Tension: dz= -0.31; Tiredness; dz= 0.09; Energy: dz=- 0.26; Calmness: dz= 0.25). Enjoyment (dz= -0.41), intentions (dz's= -0.23-0.38), and self-efficacy (dz's= 0.26-0.41) elicited a small effect between HIIE and MICE.

Conclusion: Preliminary evidence suggests female cancer survivors' affective responses to HIIE and MICE are comparable. To supplement established MICE strategies, interventionists may consider using HIIE given its ability to elicit positive psychological responses and improve health outcomes. Further research is needed to understand cancer-specific factors influencing the exercise-affect relationship.



# Prevalence of physical activity counselling and associations with behaviour among Nova Scotian breast, prostate, and colorectal cancer survivors

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Poster

Purpose: To report the prevalence of receiving physical activity counselling and any associations with physical activity behaviour among people living with and beyond breast, prostate, or colorectal cancer.

Methods: A stratified random sample of 2062 breast, prostate, and colorectal cancer survivors was identified by the Nova Scotia Cancer Registry and mailed a questionnaire assessing physical activity, weekday and weekend sedentary time, and having received physical activity advice. ANOVAs determined differences in continuous measures and Chi-squares categorical variables.

Results: 741 completed surveys were analysed. Overall, about 30% of participants indicated having received physical activity advice from oncologists (51%) and general practitioners (54%) most frequently. Breast cancer survivors were more likely to report receiving advice than prostate or colorectal cancer survivors (40% vs. 24% vs. 25%, p>.001). Overall, no significant differences were found for meeting recommended physical activity guidelines or weekday/weekend sitting time. Colorectal cancer survivors receiving physical activity advice were significantly more like to be meeting activity guidelines (p=.021). ANOVAs revealed an overall trend of more moderate physical activity minutes with receiving activity advice (p=.060). No significant differences were found among breast cancer survivors, while prostate cancer survivors receiving advice were less likely to be sedentary (p=.038). Among colorectal cancer survivors, those receiving advice reported more moderate-to-vigorous physical activity (p=.015), total physical activity (p=.029), and less sitting time (p=.041).

Conclusions: Less than one-third of surveyed people living with and beyond cancer reported receiving physical activity advice with no differences in physical activity behaviour or sitting time overall. Despite a higher proportion of breast cancer survivors reporting receiving advice compared to prostate and colorectal cancer survivors, subgroup analyses indicated stronger associations between activity behaviour and advice among colorectal cancer survivors. Interventions are needed to determine the whether these associations hold true.



## Developing CanBenefit: CANcer BEhavioural Nutrition and Exercise FeasIbility Trial

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#### Pre-recorded Presentation

Purpose: Older adults with intra-thoracic malignancy are often frail and unfit due to their cancer and co-morbidities. This may affect ability to tolerate or receive cancer treatments. Irrespective of whether they are eligible for treatment or are having best supportive care, these people experience poorer quality of life (QoL) than younger counterparts and other cancer groups. Evidence suggests that engaging lifestyle behaviours, such as physical activity (PA) and healthy diet, offer significant improvements in QoL among people with a cancer diagnosis before, during, and post-treatment. These behaviours may also positively impact treatment completion rates, which may improve survival rates. However, older, frailer lung cancer populations tend to be excluded from this type of research under the assumption they are too high a risk to participate. As such, there is very little existing research to inform an intervention among this population. Our aim was to assess the acceptability, usefulness, and practicality of delivering a tailored wellbeing programme for older adults with lung cancer before, during, and after cancer treatment.

Methods: People with lung cancer  $\geq$ 70 years of age, their informal carers, and Multidisciplinary Team (MDT) members were invited to participate in semi-structured interviews with the intention of determining acceptability, usefulness, and practicality of tailored wellbeing programme and specific feedback on individual components to be included. Participants were identified by a clinician in the clinic; informal carers were also invited to participate if they were interested. Topic guides were developed and used for all interviews.

Results: Thirteen interviews have been conducted and transcribed to date. Thematic coding is underway though preliminary assessment indicates patients, carers, and MDT members would welcome a holistic wellbeing programme designed to improve quality of life. Initial feedback on whom should deliver, what content should be, and how to frame the intervention included ensuring it was individually tailored, incremental, and focused on maintaining daily activities was incorporated into subsequent protocols. Remaining interviews will be completed by 30 November 2019.

Conclusions: Preliminary results from this study have highlighted important considerations and components in developing a tailored wellbeing programme for people with lung cancer.



Tailoring exercise and dietary interventions to comorbidities, disease and treatment related adverse effects of cancer: Explanation and application of the i3-S strategy

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**Pre-recorded Presentation** 

#### Purpose:

To optimize outcomes of exercise and dietary interventions, it is important that these interventions are specifically tailored to comorbidities, disease- and treatment-related adverse effects that patients with a specific type of cancer face. Tailoring such interventions is complex and requires adequate clinical reasoning by health professionals. The i3-S strategy may be useful to develop a framework to support these clinical decisions, particularly in understudied cancer populations such as ovarian cancer patients. The aim of this lecture is to describe the methodology of the i3-S strategy and its recent application in patients with ovarian cancer.

#### Methods:

The i3-S strategy includes four steps, via which relevant information on the specific disease is collected from literature, guidelines and expert meetings: 1) creation of an inventory of comorbidities and adverse effects of ovarian cancer and its treatment. 2) Extension of the inventory with contraindications and restrictions. 3) Extension with potential adaptations to the exercise and dietary intervention in ovarian cancer specific comorbidities and adverse effects. 4) Integration of information from previous steps into a framework by translating adverse effects to clinical parameters and symptoms to monitor during the intervention.

#### Results:

Step 1 and 2 led to the following ovarian cancer specific comorbidities and adverse effects, including disorders of the thyroid gland, ascites, gastro-intestinal symptoms (e.g. anorexia) and an abdominal wound after surgery. Strategies to adapt the exercise intervention (step 3) included monitoring of brady-/tachycardia and related symptoms as a consequence of disorders of the thyroid gland, adjusting exercise to a comfortable intensity or posture in case of discomfort due to ascites, and replacing eccentric exercises by isometric exercises to avoid pressure on the abdominal wound in the post-operative period. These strategies for adapting the intervention to ovarian cancer specific comorbidities and adverse effects were integrated into a framework (step 4).

#### Conclusions:

The i3-S strategy has been applied successfully to tailor exercise interventions to patients with breast or ovarian cancer and to tailor dietary interventions to patients with ovarian cancer. It provided clinical guidance to physiotherapists or exercise physiologists delivering exercise interventions to patients with cancer.



# The relationship between physical activity, alcohol use and obesity in African American church members

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Symposium Recording

Purpose: African Americans have the highest incidence and mortality from obesity-related cancers. While physical activity and minimizing alcohol intake are two important cancer prevention behaviors, physical activity is also a firmly established obesity prevention behavior. In Non-Hispanic Whites, low-to-moderate alcohol use has been negatively associated with obesity, though the limited research with African Americans indicates that any alcohol use is positively associated with obesity. The purpose of this study is to assess the relationship between alcohol intake and physical activity, and assess the association of both of these variables with Body Mass Index (BMI) in African Americans.

Methods: This is a secondary analysis using data from Project CHURCH, a cohort of African American churchgoing adults residing in the Houston area. Participants completed self-reported questionnaires, including measures on physical activity, alcohol intake, and BMI, along with demographic and other behavioral measures. Bivariate and multivariate analyses were conducted to assess the association between physical activity (minutes of per week), alcohol intake (drinks per week), and obesity (BMI), controlling for age, gender, education, income, employment, marital status, general health status, smoking, and dietary intake.

Results: The sample (N=1040) is mostly female, employed, and college graduates. Most reported meeting physical activity guidelines (74%) and low/moderate drinking (73%). There was a weak positive association between physical activity and alcohol use (Pearson's r= 0.15, p<.001), controlling for covariates. As expected, there was a significant inverse association between physical activity minutes/week and BMI (Beta= -0.001, p<0.001), though there was no statistically significant association between number of alcoholic drinks per week and BMI. There was no interaction between physical activity and alcohol use on BMI.

Conclusions: In this faith-based sample of African Americans, physical activity and alcohol use were positively associated, and physical activity and BMI were negatively associated, mirroring results with Non-Hispanic White samples. However, alcohol use and BMI were not significantly associated among African Americans. Cancer and obesity prevention interventions with this African American cohort should emphasize physical activity promotion while continuing to include messaging on minimizing alcohol intake.



## Adherence to multiple health behaviors in rural cancer survivors and associations with self-rated health

#### Dr. Scherezade Mama<sup>1, 2</sup>, Ms. Nishat Bhuiyan<sup>1</sup>, Dr. Kathryn Schmitz<sup>1, 2</sup>

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Symposium Recording

Purpose: This study explored multiple lifestyle behaviors in rural cancer survivors in central Pennsylvania to understand modifiable behavioral risk factors associated with health status and to identify target behaviors for future intervention efforts.

Methods: Cancer survivors in central Pennsylvania were recruited to the Partnering to Prevent and Control Cancer (PPCC) study via an academic-community partnership comprised of churches, cancer support groups, and other community organizations (e.g., YMCA, community centers). Participants completed a cross-sectional survey assessing healthy lifestyle behaviors, including physical activity, sitting time, fruit and vegetable intake, fat intake, and alcohol consumption, body mass index (BMI), self-rated health status, and sociodemographic characteristics. Logistic regression analyses were used to explore associations between adherence to health behavior guidelines and health status (poor/fair or good/excellent).

Results: Participants were in their mid-60s (M age=64.4 $\pm$ 12.2 years) and were mostly women (60.7%), college graduates (50.5%), and reported an annual household income  $\geq$ \$80,000 USD. Most were breast (22.8%) or prostate (20.5%) cancer survivors and had completed cancer treatment (90.3%) but were less than 5 years post-treatment (90.8%). Adherence to health behavior guidelines was highest for alcohol intake (91.3% reported low or no alcohol intake) and lowest for fruit and vegetable intake (10.5% reported <5 servings/day). Roughly 40% of cancer survivors reported engaging in  $\geq$ 150 minutes/day of moderate-or-greater intensity physical activity, and 29.6% were classified as healthy weight (BMI <25 kg/m2). Cancer survivors who met physical activity guidelines were more likely to self-report their health as good/excellent (OR=18.1, 95% CI: 4.1-80.3), and those who were classified as obese (BMI  $\geq$ 30 kg/m2) were less likely to report their health as good/excellent (OR=0.2, 95% CI: 0.1-0.8).

Conclusions: Adherence to multiple lifestyle behavior guidelines is low among rural cancer survivors. Rural cancer survivors who meet physical activity and healthy weight recommendations are more likely to report better health compared to those who do not adhere to guidelines for cancer survivors.



# A mixed-methods feasibility study to adapt the DPP with Samoan and Tongan church communities

<u>Dr. Courtney Pinard</u><sup>1</sup>, Dr. Sela Panapasa<sup>2</sup>, Dr. Ken Resnicow<sup>2</sup>, Ms. Hollyanne Fricke<sup>1</sup>, Dr. Amy Yaroch<sup>1</sup> <sup>1</sup>Gretchen Swanson Center for Nutrition, Omaha, United States, <sup>2</sup>University of Michigan, Ann Arbor, United States

Symposium Recording

Purpose: To determine baseline characteristics of a group of Samoan/Tongans in the U.S. at risk for Type 2 Diabetes Mellitus (T2DM) and identify specific barriers and cultural factors to addressing a culturally tailored Diabetes Prevention Program (DPP) for this population.

Methods: Paper-pencil surveys (N=47) assessing sociodemographics, acculturation, food insecurity, health (e.g., BMI, diagnosed conditions), and psychosocial variables (e.g., self-efficacy) were collected during pilot sessions of the DPP. Survey respondents also participated in focus groups (N=4) to gather in-depth feedback on attitudes towards curriculum, opportunities for tailoring, and barriers to achieving healthy weight.

Results: Participants were on average 42 years old, just over half female (57%), and identified as Samoan (65%) or Tongan (35%). Respondents reported being diagnosed with diabetes (43%), having high blood pressure (28%), and 98% had a BMI that was overweight/obese. The average household size was 8 individuals and 45% reported food insecurity. Under half of respondents reported being born in the U.S., and while majority reported speaking some English at home (72%), some reported poor/fair English proficiency (28%). Psychosocial findings were in the expected directions; internal locus of control and higher self-efficacy were related to lower BMI and food security (p's<.001). Those with higher English skill levels were more likely to be food secure (p<.001) and have lower BMIs (p<.001). Focus group results revealed that the Samoan/Tongan communities identify as an invisible minority group which a lack of culturally relevant programs to address rising concerns of obesity and chronic disease. Specific barriers identified included: traditional foods (e.g., recipe modifications); stress and lack of sleep (e.g., relying on "comfort" foods); body image (e.g., culture that values larger body size); lack of nutrition knowledge (e.g., especially with traditional foods).

Conclusions: This pilot is a first step towards developing culturally specific interventions for an often overlooked Samoan/Tongan population, which has a "ready-made" setting to conduct interventions (i.e., church-based). Findings help to identify the relevant historical, political, and structural contexts of this population needed for tailoring health behavior change programming.





# E-& mHealth (SIG)



## A healthy lifestyle app significantly improves some adolescents' and parents' health outcomes – A first look at the Aim2Be (version 1) app

<u>Dr. Louise C. Masse<sup>1,2</sup></u>, Ms. Janae Vlaar<sup>1</sup>, Ms. Yingyi Lin<sup>4</sup>, Ms. Janice Macdonald<sup>3</sup>, Ms. Jennifer Bradbury<sup>3</sup>, Dr. Tom Warshawski<sup>3</sup>

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#### Pre-recorded Presentation

Purpose: Mobile health interventions are increasingly utilized to support change in adolescents' health behaviours as this age group embraces technologies. However, there is need to develop innovative strategies to support engagement with such technologies. This study evaluated the extent to which Aim2Be version 1 supports adolescents and their parents to adopt healthy behaviours (dietary, physical activity (PA), sedentary behaviours) and whether the app influences the targeted mediators.

Methods: 632 families were invited to use Aim2Be for 4.5 months - a lifestyle behaviour modification app targeted at adolescents and their parents. Aim2Be aligns with current health recommendations; integrates theories and behavior change techniques known to support behaviour change (self-regulation from Self-Determination Theory and social environment from Social Cognitive Theory); uses gamified elements to promote engagement; adds social discussion and live health coach, and links living green with behaviour change. Assessments included adolescents' and parents' self-reports of PA, fruit and vegetable (F&V) consumption, and screen time as well as adolescents' mediators of behaviour change (self-efficacy and intrinsic motivation). Linear regressions, conducted in Stata (v.15), were used to assess changes. Relevant covariates were added (age, gender, socio-economic status, and total time in app measured with web-analytics).

Results: 294 and 312 Canadian adolescents (14.8yrs, 49% boys) and parents (46.3yrs, 66% mothers, 68% Caucasian), respectively utilized the Aim2Be app. Overall, changes in behaviours or mediators were more apparent when time in the app was accounted for. Adolescents who used the app ( $\geq$ 30 minutes) significantly increased F&V intake, reduced consumption of 100% fruit juices, and decreased screen time as well as increasing their intrinsic motivation and self-efficacy related to dietary behaviours. Parents who used the app ( $\geq$ 30 minutes) significantly increased F&V increased F&V intake and decreased consumption of sugar-sweetened beverages.

Discussion/conclusions: Evaluation of Aim2Be provided some initial support for the app in impacting some aspects of adolescents' and their parents' health behaviours and the mediators targeted. These initial findings were used to fine tune the Aim2Be app in preparation for the randomized control trial (e.g., integrating self-monitoring tools and increasing emphasis on PA).



## Ecological momentary assessment in physical activity and health behaviors among college students

**Dr. Yang Bai<sup>1</sup>**, Dr. William Copeland<sup>2</sup>, Ms. Zoe Adam<sup>2</sup>, Dr. Matthew Lerner<sup>2</sup>, Dr. Jim Hudziak<sup>2</sup> <sup>1</sup>University of Utah, Salt Lake City, United States, <sup>2</sup>University of Vermont, Burlington, United States

Pre-recorded Presentation

Purpose: The University of Vermont Wellness Environment (WE) program is a neuroscience-inspired behavioral change program to promote a healthy environment through classroom and residential halls. A customized application 'WE App' was developed to incentivize healthy behaviors such as exercise and meditation among college students. A 14-item survey was administered daily through the App to monitor wellness behaviors. The purpose of the study is to evaluate the association between self-reported exercise and other wellness behaviors from a large cohort of college students.

Method: A total of 668 WE and 596 non-WE participants who were college freshman and sophomores provided daily survey data. The average number of daily surveys completed per participant was 136 out of a possible 209 days from October 2017 to early May 2018. Generalized linear mixed models were used to estimate the association of exercise and other wellness and risk behaviors for both WE and non-WE students after controlling for gender, race, and academic year.

Results: Results revealed a significant association between higher engagement in exercise and better mood ( $\beta$ =0.1, p < .0001), shorter sleep duration ( $\beta$ =-0.05, p < .0001), higher consumption of fruit or vegetable ( $\beta$ =0.1, p < .0001), higher consumption of water ( $\beta$ =0.19, p < .0001), and less non-academic related screen time ( $\beta$ =-0.04, p < .0001). At baseline, compared to non-WE participants, WE participants had statistically significantly higher daily consumption of fruit and vegetables (p = .0006), more mindfulness practice (p < .0001); and lower prevalence of overall alcohol use (p < .0001), having a shot of liquor (p < .0001), using marijuana (p < .0001), smoking cigarettes (p < .0001), using illicit drugs (p = .005), and taking unprescribed pills (p = .0034).

Conclusion: These findings demonstrate favorable outcomes for using technology to track health and risk behaviors among college students. Exercise was positively associated with mood and a range of health behaviors and negatively associated with multiple types of substance use, suggesting that exercise may be an important target for health-promoting interventions among undergraduate students.



# Screen-based behaviors in Australian adolescents: Longitudinal trends from 2010 to 2014

<u>Mr. George Thomas<sup>1</sup></u>, Dr. Jason Bennie<sup>1</sup>, Dr. Katrien De Cocker<sup>1</sup>, Dr. Taren Sanders<sup>2</sup>, Prof. Stuart Biddle<sup>1</sup> <sup>1</sup>University of Southern Queensland, Springfield Central, Australia, <sup>2</sup>Australian Catholic University, North Sydney, Australia

Pre-recorded Presentation

Purpose: High levels of screen time (ST) can be detrimental to adolescent health. However, many Australian adolescents are currently exceeding national ST guidelines ( $\leq 2h/day$ ). Public health concerns may rise, especially now that technology is increasingly part of the adolescent landscape. However, there are few longitudinal studies on ST trends among Australian adolescents. Therefore, the purpose of this study was to examine longitudinal trends in total and domain-specific ST between 2010 and 2014 in Australian adolescents.

Methods: Data were derived from the Longitudinal Study of Australian Children (LSAC). In 2010, 2,179 children (49.7% boys;  $10.3 \pm 1.1$  years) completed a time-use diary, recording their main activities during waking hours. This was repeated with the same sample in 2012 ( $12.4 \pm 0.5$  years) and 2014 ( $14.4 \pm 0.5$  years). Data were analyzed for time spent in several screen-based activities, including TV-viewing, computer use (excluding games), electronic gaming, social networking and online communication. Repeated-measures ANCOVAs were performed to analyze trends in ST, controlling for sex, household income, maturational status, and waist circumference. Trends in ST were also analyzed by sex.

Results: Total ST significantly increased (+85.9min/day) between 2010 and 2014 (P < .001), and the prevalence of adolescents exceeding ST guidelines (>2h/day) increased markedly (2010; 59.5% - 2014; 75.3%), but differed by sex, with a larger increase in boys (2010-2012; +41.6 vs +22.7min/day). Electronic gaming increased in boys (2010-2014; +43.2min/day), and decreased in girls (-16.8min/day). In contrast, girls reported larger increases in TV-viewing (2012-2014; boys: +0.4, girls: +29.1min/day), computer use (excluding games) (2010-2012; boys: +24.8, girls: +34.3min/day) and time communicating online and social networking (2010-2012; boys: +4.3, girls: +15.2min/day).

Conclusions: The amount of time adolescents spend on screens increases as they age, although this differs by sex and ST domain. Findings suggest that future ST reduction interventions should mainly focus on computer use and electronic gaming in boys and TV-viewing and time spent communicating online and social networking for girls.



## TaylorActive – The effectiveness of web-based personally-tailored videos to increase physical activity: a randomised controlled trial

<u>Prof. Corneel Vandelanotte</u><sup>1</sup>, Dr. Camille E Short<sup>2</sup>, Prof. Ronald C Plotnikoff<sup>3</sup>, Dr. Amanda Rebar<sup>1</sup>, Dr. Stephanie Alley<sup>1</sup>, Dr. Stephanie Schoeppe<sup>1</sup>, Dr. Quyen To<sup>1</sup>, Prof. W Kerry Mummery<sup>4</sup>, Associate Professor Mitch J Duncan<sup>3</sup>

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#### **Pre-recorded Presentation**

Purpose: Web-based interventions that use computer-tailoring have shown to be effective, though people tend to 'skim' and 'scan' text on the Internet rather than thoroughly read it. The use of online videos is, however, popular and engaging. Therefore, the aim of this 3-group RCT was to examine whether using personally tailored videos in a web-based physical activity intervention is more effective compared to traditional personally-tailored text and a control group.

Methods: 501 Australians were randomised into: text-tailored, video-tailored, or control. The control group only received access to web-based physical activity articles. Over a 3-month period, the intervention groups additionally received access to 8 sessions of personalised and theory-based (constructs from TPB, SCT, SDT) physical activity advice based on responses to online surveys. Only the web-based delivery method (either personalised-text or personalised-video) differed between intervention groups. Intervention groups were also able to complete action plans. The primary outcome was a 7-day measure of physical activity using waist-worn Actigraphs. Secondary outcomes include self-reported physical activity, meeting activity recommendations, steps, sitting time and website engagement. Outcomes were assessed at baseline, 3-, and 9-months. Data were analysed using generalized linear mixed models with intention-to-treat using multiple imputation.

Results: Attrition was high with only 186 participants remaining at 9-months; 72% of participants were female, the average age was  $44(\pm 13)$ . Actigraph measured physical activity (min/wk) significantly increased for the control group (at 3-months: 1.23(1.03-1.41),p=0.02; at 9-months: 1.33(1.09-1.62),p<0.001) and for the text-tailored group (9-months: 1.22(1.01-1.47),p=0.04), though no between group differences were found. Likewise, few between group differences were observed for secondary outcomes. Text-tailored participants took more steps compared to video-tailored participants (3-months: 0.88(0.79-0.97),p=0.01), self-reported more physical activity compared to control (3-months: 1.73(1.30-2.30),p<0.01) and were more likely to meet activity recommendations compared to control (3-months: 2.17(1.06-4.45),p=0.03). Video-tailored participants spent more time on the website compared to text-tailored participants (90 vs. 77 minutes, p=0.02).

Discussion: The lack of an intervention effect is in contrast with pilot and other study outcomes. Possible explanations include applying a more rigorous methodology, ceiling effects in psychosocial correlates, or intervention content not being perceived as engaging. Process evaluation and mediation analyses will provide further insights.



## goFOOD[TM]: From Dietary Monitoring to Dietary Assessment

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Pre-recorded Presentation

#### Purpose

Diet monitoring and assessment is becoming increasingly crucial for individuals living with a diet-related disease or wanting to follow a healthy lifestyle, as well as healthcare professionals aiming to monitor or assess their patients' diet or the eating habits of populations. goFOODTM uses artificial intelligence algorithms, smartphones and embedded sensors for time- and cost-efficient dietary monitoring and assessment, with accuracy being the cornerstone of the entire research effort.

#### Methods

The goFOODTMLite app is designed and developed for visual data recording of eating habits. The app allows the recording of food/beverage images or videos and provides a diet log to the individual or healthcare professional. The acquired data are concurrently used to enhance an algorithmic pipeline implementing the automatic detection, recognition, segmentation and 3D reconstruction of food. The information about the type, segment and volume of food is used along with food composition databases, in order to estimate its calories and macronutrient content (carbohydrate, protein, fat). The goFOODTM app provides different versions that address the needs of both dietitians and the general population for real-time, cost-efficient, automatic dietary assessment. With the use of a video or two images goFOODTM outputs the meal's calories and macronutrient content in kcal and grams, while with the use of one image it outputs the nutrient content as a traffic-light system.

Android users need to capture two separate images or a video and to place a designated reference card beside their meal for proper size estimation. iPhone X users are able to simultaneously capture both images with one shutter click, since the app exploits the iPhone's two integrated cameras. No reference card is required in this case, as well as in the case of the single image input.

#### Results

goFOODTM supports 24 broad and 324 fine food categories. It is evaluated on the MADiMa2017 database, which contains 80 central-European dishes with known food categories, weight, volume and nutrient content. The average error percentage in volume estimation is in the order of 20%.

#### Conclusions

The goFOODTM versions address a variety of needs and exploit different technologies adjusting their functionalities for accuracy, simplicity or speed.



A composite activity-sleep behaviour index mediates the effect of a physical activity and sleep intervention on symptoms of stress and energy and fatigue of adults: mediation results of a pooled analysis of the REFRESH and SYNERGY mhealth interventions

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Pre-recorded Presentation

Purpose: Using pooled data from two randomized controlled trials (RCT) that applied the same intervention to improve physical activity and sleep behaviours, the purpose was to examine if a composite activity-sleep behaviour index (ASI) mediates the relationship between the intervention and symptoms of depression, anxiety, or stress, or quality of life in Australian adults.

Methods: REFRESH: Physically inactive adults (40–65 years) who reported poor sleep quality were recruited for a three-arm RCT (Physical Activity and Sleep Health (PAS; n=110), Sleep Health-Only (SO; n=110) or Wait-list Control (CON; n=55) groups). SYNERGY: Physically inactive adults (18–65 years) who reported poor sleep quality were recruited for a two-arm RCT ((PAS; n=80), or CON; n=80) groups). Assessments were conducted at baseline, 3 months (primary time-point), and 6 months. The PAS groups received a pedometer, and accessed a smartphone/tablet "app" using behaviour change strategies (e.g., self-monitoring, goal setting, action planning), with additional email/SMS support. Mental health outcomes were assessed using DASS-21, SF-12 and SF-36. The ASI score comprised self-reported moderate-to-vigorous-intensity physical activity, resistance training, sitting time, sleep duration, sleep efficiency and sleep quality. Data from the PAS and CON groups were pooled for mediation analysis (n=325), which was performed using SEM and the product-of-coefficients test, with bias-corrected confidence intervals (p<0.05).

Results/findings: At 3 months, compared with CON, the PAS group showed significant improvements in ASI scores, and also significant total effects on stress ((b, p-value) -1.27, p=0.041), and energy and fatigue (3.99, p=0.027); but not depression (-1.11, p=0.113), anxiety (-0.70, p=0.107), QOL-physical health (0.72, p=0.405), or QOL-mental health (2.15, p=0.058). At 3 months, improved ASI scores were associated with improvements in depression (-0.16, p=0.002), anxiety (-0.09, p=0.009), stress (-0.21, p<0.001), QOL-mental health (0.36, p<0.001), and energy and fatigue (0.55, p<0.001). Improved ASI scores mediated statistically significant proportions of the intervention effects on stress (57%) and energy and fatigue (48%). Associations at 6 months were attenuated but remained statistically significant and followed a similar pattern.

Conclusions: The intervention significantly improved overall physical activity and sleep behaviours in adults, and these improvements significantly mediated the intervention effect on stress and ratings of energy and fatigue.



## Animated narrative videos increase physical activity during active videogame play

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**Pre-recorded Presentation** 

Purpose: Active video games (AVGs) can increase physical activity (PA). Animated narrative videos possess unique immersive and motivational properties and have been found to increase PA via AVG play compared to no video condition. However, there is no evidence of whether that was due to narratives or simply adding an animated video. We investigated the effects of an animated narrative video (NV) vs. an animated non-narrative video (N-NV) on moderate-to-vigorous PA (MVPA) levels during AVG play.

Methods: We randomly assigned 22 children 8-12 years old without previous AVG experience, after consent/assent, anamnesis, and anthropometric assessment, to watch either an NV or N-NV (~11 minutes), after which we instructed them to play an AVG for as long as they wanted. We estimated the time spent (minutes) in MVPA levels from vector magnitude (VM) counts recorded during the AVG sessions with a hip worn-accelerometer. Afterwards, they reported their experience in narrative immersion via a questionnaire. We applied independent two-sample t-tests to compare groups, with Cohen's d to determine the effect size. We used Pearson correlation to test for associations.

Results: The NV and N-NV groups did not differ significantly (age:  $9.45\pm1.13$  vs.  $10.30\pm1.34$ , p=0.14; BMI%:  $41.95\pm24.97$  vs.  $57.23\pm36.16$ , p=0.28). The NV group had significantly higher narrative immersion (Cronbach's  $\alpha$ =0.62,  $3.50\pm0.55$  vs.  $2.91\pm0.59$ , p=0.03, d=1.03) and significantly higher PA levels than the N-NV group (VM:  $91.21\pm34.98$  vs.  $64.24\pm13.71$ , p=0.03, d=1.02; MVPA:  $20.11\pm13.75$  vs.  $7.85\pm5.83$ ; p=0.02; d=1.13). MVPA was positively correlated with narrative immersion (r=0.21; p=0.01).

Conclusions: We are the first to test the effect of a narrative vs. nonnarrative video to motivate children to engage in MVPA via AVG play. The addition of animated narrative videos resulted in higher narrative immersion and PA levels when compared to animated nonnarrative videos.



# Ecological Momentary Assessment Respondent Burden in a Child Nutrition and Physical Activity Study

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Pre-recorded Presentation

Purpose: Ecological momentary assessment (EMA) has become an increasingly popular survey methodology due to its strengths in capturing exposures and health-related behaviors (e.g., physical activity and dietary intake) that vary throughout the day. A concern is that multiple surveys administered many times a day could result in burden or panel conditioning that may deflate measure validity. The current study examines EMA survey burden and patterns of variation across days.

Methods: The Family Matters EMA study was administered to a diverse population of American, primarily lowincome families in a Midwest urban city (N=150). Primary caregivers (91% female) responded to a minimum of four daily surveys administered over the course of a week to understand characteristics of the home food environment. Caregiver daily survey burden and overall mental health (depressive symptoms, coping, and overall stress) was measured to assess difficulty in completing surveys that day. Time series analyses with conditional fixed effects regression modeled within-participant variation in survey burden.

Results: Average burden was  $1.2 \pm 1.1$  indicating overall low survey burden. Parents reporting higher burden were more likely to be born outside the United States (P=0.02) and to prefer speaking a language other than English inside the home (P=0.04). Across 1,392 survey days, participants reported no burden 25% of the time. Severe burden was rare (12% of days), affecting less than half of respondents (n=66). Burden did not increase as the study progressed, caregiver stress level and depressed mood were positively correlated with EMA burden (P=0.003 and P=0.009 respectively), and compliant days were less burdensome (P<0.001) and were predictive of lower next day burden (P=0.001). Parent survey burden was not different on weekends and weekdays (P=0.511).

Conclusions: EMA methodologies appear to be a reasonable design to assess how parent-level exposures relate to child dietary intake and physical activity throughout the day. Burden appeared transient in the current study which may indicate external factors, rather than the survey instruments, affected burden. Researchers should develop strategies to support foreign-born and non-English speaking participants to capture complete observation days. Multiple data collection methods (dietary recalls and accelerometry) may minimize potential missing data on non-compliant days.



## Using machine learning to categorize 0 to 12 monthsphysical activity levels in the NoHoW trial: Associations with motivational variables

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#### Pre-recorded Presentation

Purpose: Machine learning (ML) can be used to recognize activity patterns resulting from cross-sectional wearable data. Daily or weekly physical activity (PA) levels are made easily available from wearable tracking devices but longitudinal recognition of patterns, i.e., physical activity for sustained or discrete periods, remains a challenge, despite being the most critical PA variable to attain health benefits.

This study aims to use an ML procedure to identify long-term (12 months) PA levels in participants involved in a large weight regain prevention trial. To further explain the results, motivational variables known to be associated with sustained PA, were analyzed.

Methods: Data was gathered in the NoHoW trial conducted in Denmark, UK, and Portugal. After data cleaning, 1139 participants (68.7% Female, 44,0±11.9 y) were included in the analysis.

Minute-by-minute steps, heart rate, and PA level were gathered for 12 months, 24/7. Baseline and 12-month questionnaires assessed PA's Motivational Regulations (BREQ-3) and Basic Psychological Need Satisfaction (BPNS). A data hub stored all the information.

ML involved PCA and K-Means clustering procedures, using an unsupervised learning algorithm. Python was used to develop the ML code. Group comparison statistics looked for differences in the motivational variables.

Results: The algorithm and PCA identified two clusters, 453 Highest PA level (HPAL 39.8%) and 686 Lowest PA Level (LPAL; 60.2%). As expected, HPAL presented higher values of steps, distance and caloric expenditure, and lower heart rate (all p<.001). Autonomous motivation was higher in HPAL at 0 and 12-months, and BPNS was higher in this group at 12-months. External motivation and amotivation were higher in LPAL at 0 and 12 months (all p<.05). Autonomous motivation increased from 0-12 months in HPAL. Interestingly, autonomy decreased in this group for the same period (all p<.05).

Discussion: Efficient and scalable identification of longitudinal PA patterns remains a challenge. ML procedures, such as the one proposed in this study, are an innovative solution that, however, needs further validation. In this study, the association with motivational variables provided evidence that the unsupervised algorithm correctly identified participants' 0-12 months PA level. Deep-learning procedures are the next steps needed to move this line of research forward.



## Investigation of user-requirements to tailor a smartphone app integrated in primary child health care to promote a healthy diet and physical activity in priority populations

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#### Pre-recorded Presentation

Purpose: The effectiveness of a smartphone app (MINISTOP 1.0) targeting Swedish-speaking parents, with the aim to improve eating and physical activity behaviours in preschool aged children, was evaluated in 2015. Interest and requests for implementation of the app into primary child health care have since then been expressed. Prior to that, the app needs to be translated and tailored for priority populations such as families with a migrant background and/or low socioeconomic position to optimize accessibility. The aim of this study was to investigate user-requirements among parents and child health care nurses, in terms of content and technical features to tailor the app (MINISTOP 2.0) for priority populations.

Methods: Pilot studies over four months in the autumn of 2019, to pre-test the content of the MINISTOP 2.0 app were conducted at the primary child health care, Linköping, and included three semi-structured focus groups with Somali-, Arabic- and Swedish speaking parents (5 parents/group), and 14 one-on-one semi-structured interviews with nurses.

Results: Preliminary results can be summarized as follows. Parents requested strategies on how to handle difficult situations around eating and screen time. A common theme for all parent groups was the need for parental strategies in situations where a child is picky or refuses to eat. Nurses expressed that parents often are more worried about their child being underweight rather than overweight, especially in the Somali- and Arabic populations. Nurses also requested clear information on portion sizes and strategies to reduce parents' concerns about their child not eating enough.

Conclusion: Parents requested information and strategies on how to handle challenging eating situations, especially picky eating. This was independently confirmed by the nurses that requested concrete information on portion sizes and eating behaviours to reduce parental concerns.



## Development plan of a hybrid exergame to help children adopt long-term hearthealthy behaviors

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#### Pre-recorded Presentation

Purpose: Around 33% of New Zealand children are overweight and obese, and the majority deemed not to be meeting national physical activity guidelines. Exergames present a promising opportunity to get children sitting less and moving more. Previous studies report some short-term effects, while behavioral maintenance is yet to be achieved. In nutrition, artificial intelligence (AI) have been used to encourage behavior change through personalization of health messages to reduce boredom. Whereas, in the game industry, AI have shown to be highly effective in sustaining gameplay through promoting long-term engagement. Hence, we aim to develop and assess the efficacy of a novel hybrid exergame, incoporating AI using individualized data from the player's accelerometer and other game elements, to decrease sedentary behavior in children.

Methods: Using the expertise from the multidisciplinary team, behavioral analysis will be conducted through systematic reviews and qualitative interviews. Game motivation model, human-focused design and self-determination theories for game design will be explored using both qualitative interviews and quantitative group experiments. Prototype development will be based on results from behavioral analysis. Iterative qualitative user testing of the prototype through cognitive interviews will be carried out before the efficacy trial. An RCT will be performed, comparing the intervention group to a wait-list control group. Up to 100 children (10 to 12 year old), generally healthy, but not meeting the physical activity guidelines, will be recruited. Baseline and follow-up measurements will access physical activity using 7-day actigraphy/motion sensors. Validated questionnaires examining behavioral change theories will also be carried out.

Discussion: The expectation is that from the behavioral analysis, algorithms for AI will be developed, that would promote long-term engagement. From the efficacy study, the within game and app log data will be able to help explore behavioral changes among children, and improve on the algorithms used to learn children's behavior and interaction with the game. It is anticipated that the findings will contribute in helping to elucidate the evidence and theories by which AI in games can help sustain positive behavior changes in children, leading to a decrease in childhood obesity.



# Can personalised mobile technology increase physical activity and healthy diet? A systematic review and meta-analysis

**Ms. Huong Ly Tong<sup>1</sup>**, Ms. Kim Phuong Dao<sup>1</sup>, Ms. Sandrine Chan Moi Fat<sup>2</sup>, Ms. Holly Gehringer<sup>1</sup>, Dr. Liliana Laranjo<sup>1</sup> <sup>1</sup>Australian Institute of Health Innovation, Macquarie University, North Ryde, Australia, <sup>2</sup>Department of Biomedical Sciences, Macquarie University, North Ryde, Australia

#### Pre-recorded Presentation

Purpose: Today's sensor and mobile applications, and advances in artificial intelligence can revolutionise behaviour change science by providing personalised support to users. This review aimed to assess the effects of personalised mobile technologies on physical activity and diet.

Methods: We searched five databases until 2020, using terms related to mobile technologies, personalisation and lifestyle behaviour. Two independent researchers screened and included RCTs that assessed a personalised mobile app or tracker for physical activity or diet. Study quality was assessed using Cochrane's risk of bias tool. A random effects meta-analysis was conducted for dietary and physical activity outcomes. The cause of any observed statistical heterogeneity was explored using meta-regression. This systematic review is compliant with the PRISMA statement.

Results: Eleven studies describing ten unique interventions were included in the meta-analysis (n=2093, 50.2% women). The average study duration was 14 weeks. Four studies had at least three out of five categories assessed as low risk of bias. Five interventions targeted physical activity, two targeted diet, and three targeted both. Retention rate varied between 40% and 100%.

The most common personalised features were the content of behaviour recommendation, goal setting and feedback. All interventions except two collected behaviour data for personalisation. Two interventions collected demographic information, and only one collected user preference. Four interventions used system-captured data for personalisation, four used user-reported data, and two used both.

The meta-analysis showed a moderate, positive effect on physical activity and diet (SDM 0.727, 95% CI 0.362 to 1.093). Intervention that used system-captured data for personalisation had higher effectiveness than those that used user-reported data or both (p=0.0041). Additionally, interventions with higher retention rate also showed higher effectiveness (p=0.04).

Conclusion: This review extends the existing literature on personalised mobile interventions for physical activity and diet, by identifying factors associated with higher effectiveness, namely the use of system-captured data for personalisation and high retention rate. Mobile technologies can capture large amount of data continuously and increase retention by reducing reporting burden on users; and thus, should be explored in future research.



# Nothing about them, without them. The participatory development of an adolescent health promotion chatbot

<u>Miss Laura Maenhout<sup>1</sup></u>, Miss Carmen Peuters<sup>1</sup>, Dr. Sofie Compernolle<sup>1</sup>, Dr. Ann DeSmet<sup>2</sup>, Prof. Geert Crombez<sup>1</sup>, Prof. Greet Cardon<sup>1</sup>

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Pre-recorded Presentation

#### Purpose

Early adolescence is an important period for (mental) health promotion. mHealth interventions offer great opportunities; but disadvantages are the small response rate and low engagement to such interventions, especially among vulnerable groups. Studies show that the inclusion of social support increases participants' engagement. This study aims to explore whether a chatbot is useful for that purpose. This presentation describes the iterative, participatory development of a chatbot complementing a self-regulation app (MOV-E-STAR) to motivate adolescents (12-15y) to adopt a healthy lifestyle.

#### Methods

The development of the MOV-E-STAR chatbot follows the five steps of the mHealth Development and Evaluation Framework: 1) conceptualization; 2) formative research; 3) pre testing; 4) pilot testing; and, 5) qualitative research for intervention refinement. In the formative stage, relevant messages (n=319) were retrieved from a free and anonymous online helpline for children and adolescents in Flanders (Belgium) to examine how adolescents ask questions about the included health domains. In addition, six focus groups were conducted to identify preferences for the input and design of the chatbot. Data were analysed using thematic analysis in Nvivo. After inserting all input into Dialogflow, the chatbot was pre-tested by a small group of adolescents (n=6).

A prototype of the chatbot will be pilot tested, followed by a process evaluation with interviews. Results of the pilot study will be available at the time of the conference.

#### Results

Adolescents in the focus groups expressed that they preferred a colourful Messenger/Whatsapp design, that the chatbot should have a human side, that answers from the chatbot should not be too long and must be formulated in a positive way, that answers could be supplemented with emojis, that referrals to websites should immediately lead to clear information, and that the chatbot should have options to personalize.

#### Conclusions

Developing an mHealth intervention is an iterative process, in which repetitive testing with the target group and stakeholders is required. Further development will be informed by adolescents' feedback on their experience of the prototype intervention. Based upon their input, the intervention will be further optimised.



## Promoting physical activity in Girl Scouts through video-based leader wellness training

#### Associate Professor Sara Rosenkranz<sup>1, 2</sup>, Ms. Katheryne Kimmel<sup>1, 2</sup>, Professor Richard Rosenkranz<sup>1, 2</sup>

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#### Pre-recorded Presentation

Purpose: Girl Scouts troop settings have been shown to be viable for increasing opportunities for wellnesspromoting behaviors in girls. However, troop meetings are often highly sedentary, with minimal physical activity or healthful snack options. Thus, as part of an overall wellness-promotion intervention, the present study seeks to evaluate preliminary effectiveness of an online, video-based Girl Scouts troop leader wellness training intervention on troop meeting opportunities for physical activity.

Methods: A wait-list randomized control trial included eight Girl Scout troops (n=60 girls) that received the wellness video-based intervention (n=4 troops, 40 girls) or a wait-list control condition (n=4 troops, 20 girls). The intervention troops received 12 weekly training videos. The 12 videos (3-5min in length) each targeted a specific facet of wellness (fruit and vegetable availability, water availability, physical activity and sedentary time, and non-digital social connections): designed to assist leaders in identifying areas for improvement; provided approaches to overcoming common barriers; and supported leaders in setting individual goals for troop meetings. Meeting opportunities for physical activity and healthful snack provision were collected at baseline and following the 12-week intervention through objective assessment via Actical accelerometer (physical activity counts, moderate-to-vigorous physical activity (MVPA), steps), leader self-report, and direct observation by research staff.

Results/Findings: Objective physical activity results from 8 troops indicate that there was a significant condition by time interaction for MVPA (F=204.8, p<0.001). Intervention troops increased from 4.0% time in MVPA (95%CI: 3.64; 4.36%) to 11.2% (95%CI: 10.59; 11.81%). Wait-listed control troops decreased from 5.5% time in MVPA (95%CI: 4.94; 6.06%) to 3.0% (95%CI: 2.51; 3.49%). Similar interactions were observed for total accelerometer counts (F=184.9, p<0.001) and steps (F=388.3, p<0.001) during troop meetings.

Conclusions: Initial results from this online, video-based intervention appear promising for improving physical activity within the Girl Scouts troop meeting context. Future analyses from this study will include additional troops and indicators of opportunities for other wellness behaviors.



# Parent acceptability of an ehealth intervention to improve childcare lunchbox contents using an existing childcare parent communication app

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#### Pre-recorded Presentation

Purpose: Interventions delivered via ehealth represent a promising approach to improving dietary intake among children and adults. However, to our knowledge, no studies have investigated the acceptability of the use of ehealth apps to support parent packing of healthy lunchboxes in childcare settings. The purpose of the study is to describe the parent reported acceptability of an intervention to decrease packing of discretionary foods in child lunchboxes, delivered via an existing childcare-parent communication app.

Methods: An eleven week intervention was delivered to seventeen childcare services (eight intervention, nine controls) in the Hunter New England region of NSW, Australia as part of a randomised controlled trial. Eleven brief messages were sent to parents from the intervention services (one message per week) via push notifications delivered through an existing childcare parent communication app. Messages aimed to address known parent barriers to packing healthy lunchbox foods and were developed using the Behaviour Change Wheel framework. Consenting parents from the intervention arm were invited to participate in a seventy-five-item online survey, including questions to determine acceptability and self-reported use of the app.

Results: The survey response rate was 37% (n=70). Of these, 79% (n=55) had the intervention app on their phone. The majority of parents 76% (n= 42) recalled reading any of the messages. Self-reported reading of weekly messages decreased over time with 57% (n= 24) reporting reading message 1 and just 21% (n=9) reporting reading message 11, with the average reading rate for any message being 41%. Only 33% of parents (n= 14) reporting clicking through to further links for additional information. Parents reported they felt it was appropriate to receive lunchbox information via the existing app (80%, n= 40/50), found the information easy to use 88% (n=36/41) and 76% (n=31/41) found the information helpful. Parents found the frequency and timing of the messages acceptable (100% n= 41/41).

Conclusion: Delivery of a lunchbox intervention using a series of weekly push notifications via an existing childcare communication app appeared to be highly acceptable to parents, however reasons behind less than expected parent viewing of weekly messages requires further investigation.



Psychological mechanisms underlying the relationship between commercial physical activity app use and physical activity engagement: A cross-sectional study

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#### Pre-recorded Presentation

Purpose: Previous studies have indicated a relationship between the use of commercial physical activity apps (e.g., Fitbit, Strava) and physical activity engagement. Use of social components of such apps, in particular app-specific communities (connecting with other app users) and existing social media platforms (e.g., Facebook) have the potential to enhance physical activity. This study aimed to explore the psychological mechanisms underlying the relationship between the use of commercial physical activity apps (and their social components) and physical activity engagement.

Method: An online cross-sectional survey assessed physical activity, engagement with commercial physical activity apps (and their associated social components), and psychological constructs (social support, self-efficacy, motivation, trait competitiveness, trait social comparison). The SPSS macro PROCESS was used to conduct mediation (Model 4) and moderation (Model 1) analyses. Alpha was set at 0.05.

Results: Participants were 1206 adults aged 18-83 years (Mage =  $34.0 \pm 13.5$  years, 88.5% female). App use was positively associated with physical activity engagement (p < .001, d = 0.40). The relationship between app use and physical activity was fully mediated by social support (b = 8.7, CI 3.3, 14.7), self-efficacy (b = 21.7, CI 14.2, 30.7), intrinsic motivation (b = 9.4, CI 1.4, 17.5) and identified regulation (b = 34.8, 2, CI 24.7, 48.5). Trait competitiveness (b = 25.3, p < .05) but not trait social comparison (b = 15.6, p = .372) moderated the relationship between app use and physical activity. In addition, the relationships between features of app-specific communities (providing/ receiving encouragement) and existing social media platforms (sharing posts, providing/ receiving encouragement and engagement in comparisons) influenced physical activity via social support, self-efficacy, and identified regulation.

Conclusions: The relationship between the use of commercial physical activity apps (and their social components) and physical activity is underpinned by social support, self-efficacy and motivation (intrinsic and identified). This highlights that commercial physical activity apps may be fundamental in promoting physical activity, given their capacity to influence psychological constructs associated with physical activity. Future research should further explore the use of commercial physical activity apps and their associated social components to increase physical activity engagement.



## A novel approach for promoting healthy eating on a budget among socioeconomically-disadvantaged people with type 2 diabetes

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#### **Pre-recorded Presentation**

Purpose: Programs to support self-management of diabetes (DSM) have been shown to improve diabetes outcomes and decrease the risk of its related complications. However, of those who are socioeconomically disadvantaged, many are unable to attend and engage with these programs due to barriers such as poor access, time limitations, lack of health knowledge and competing obligations. Increased accessibility and affordability of the Internet and mobile phones offer potential to provide more accessible, easily-distributable, ongoing low-cost DSM support programs for disadvantaged people with Type 2 Diabetes (T2D). This study aims to test the appeal and feasibility and explore the potential effectiveness of a 12-week, evidence-based, web- and mobile phone-delivered healthy eating behaviour change program to enable disadvantaged people with T2D to strengthen important skills necessary to eat in a healthy manner on a budget.

Methods: A multiple methods (quantitative-qualitative) pre-post-test design pilot study is underway. Sixty lowincome people with T2D aged 18-75 years were recruited. Participants completed baseline assessments on basic demographic and clinical data, dietary intake, dietary self-efficacy and barriers to healthy eating. Participants were provided with log-in access to a website, which includes six progressive skill-based modules presenting healthy eating planning; smart food shopping; time-saving meal strategies; cooking; modifying recipes; and a final reinforcement of the earlier modules' learnings. Over the three-month intervention, participants received three text messages weekly to encourage review of selected goals and continue to engage with different components of the website and eat healthy foods. At the end of the intervention, program appeal and effects will be evaluated via the same surveys, with additional questions asking about their experience with and perceptions of the program, and feasibility assessed using website log-in data and the number of participants recruited and retained.

Results: The EatSmart website has been developed, and the first four modules have been viewed by 46 participants as of mid-February 2020

Conclusions: Results from this study will provide new insights on how disadvantaged populations with T2D may benefit from digitally-delivered behaviour change programs.



# Perceptions and priorities of stakeholders towards a digital platform supporting health behaviour change in cardiovascular disease

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#### Pre-recorded Presentation

Purpose: Evidence suggests that digital health interventions are effective self-management solutions for addressing health behaviour change (BC) in cardiovascular disease (CVD) prevention, such as increased physical activity (PA). However, a proliferation of disparate digital health interventions are currently available to people living with CVD. We propose an innovative digital health platform structure, offering a variety of existing, evidence-based interventions to users based on their individual needs and preferences. This may be a more sustainable approach to health BC for those who are self-managing a complex long-term condition. This paper aims to better understand the perceptions of key stakeholders towards the proposed platform and identify the development considerations they may prioritise based on their experiences of CVD management.

Methods: A qualitative research design and triangulation of data collection methods were used to generate data. Data collection included focus group discussions, semi-structured interviews and guided conversations. Participants were people with a diagnosis of CVD (n=16) and relevant healthcare professionals (n=7). A thematic analysis was conducted to explore patterns and themes within the various participant contributions.

Results: Findings indicate that the proposed platform would be a beneficial solution for certain groups whose health BC is not currently supported by discrete solutions. Both participant groups perceive the digital health platform as more trustworthy than accessing multiple interventions through unsupported digital repositories. Healthcare professionals agree that they would endorse an evidence-based platform which had been rigorously developed and evaluated. CVD participants would prioritise a decision support tool to guide them through the platform, as they perceive an unstructured approach as overly complex. Both participant groups perceive selective data sharing to be a useful method for gaining support with health BC goals from certain self-selected individuals (e.g. spouse).

Conclusions: Improving health behaviour is a complex and life-long endeavour in CVD self-management. These findings suggest that an innovative digital health platform would offer a flexible and comprehensive solution for health BC to a wider and more diverse population. This paper makes a significant contribution to the rationale for developing an innovative digital health platform.



# What's for dinner? The healthiness of food outlets associated with the emerging trend of online food delivery services

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#### Pre-recorded Presentation

Purpose: Young people in Australia are spending \$AUD100/week eating at restaurants or ordering takeaway foods. Restaurant and take away food consumption have been associated with significant increases in daily energy, sugar, saturated fat and sodium intakes, which are leading risk factors for chronic diseases. The aim of this study was to evaluate food outlets on a popular online food delivery service to assess the healthiness of the ten most popular food outlets in each suburb as well as overall delivery costs.

Methods: Geographical areas of Sydney, Australia were selected using 2016 NSW Census data. We identified Local Government Areas (LGAs) with above-average populations (>30%) of young people aged between 15-34-years, as young people are the primary users of online food delivery services. Uber Eats was selected as it the most popular online food delivery service in Australia. In February 2020, all suburbs in the included LGAs were searched on the Uber Eats Website. The delivery time was set for 6.00PM-6.30PM for consistency. Data on the top 10 food outlets were extracted, including the food outlet name, category, and classified by type and healthiness score using The Food Environment Score (FES) (scores range from -10, unhealthiest outlets to 10, healthiest outlets). Data were analysed using descriptive statistics.

Results: Data from 2318 food outlets providing food service delivery to 233 suburbs were extracted. Most food outlets were unhealthy (average FES -6.9; SD 4.4) and most were franchise takeaway stores (42.9%, 995/2138) and local independent takeaway stores (31.8%, 738/2138). McDonald's® was the most popular food outlet in 79.8% (186/233) of suburbs. Healthier food outlets (salad/sushi bars and sandwich shops) accounted for only 5.3% (122/2318) of food outlets. The average delivery cost per order was \$AUD5.65 (range \$0-7.99).

Conclusions: The most popular food outlets on Uber Eats are unhealthy. Further research is needed to understand how online food delivery services change the geographical reach and accessibility of unhealthy food outlets, explore relationships across different socioeconomic areas and evaluate nutritional quality and costs of recommended menu items.



## Playing a nutritionally focussed educational game: can it improve children's nutrition knowledge?

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#### Pre-recorded Presentation

Purpose: Poor eating behaviours are common among Australians and are often established in childhood and have a high change of persisting throughout adolescence and into adulthood. Nutrition knowledge interventions have been found to be effective in changing eating behaviour.Primary school children are a popular population for early nutrition education. The use of computer games for the intent of nutrition education has previously been successful in changing health-related behaviours and teaching nutrition. The current study investigates the development and effects of a tablet-based educational game for improvement of nutrition knowledge.

Methods: 'VitaVillage' is a farming-style game, where the user converts a virtual village to a health-promoting village by completing quests posed by villagers in need of healthy foods and advice. The user needs to grow the foods on their farm by correctly answering questions about healthy foods and their nutritional value. Year 5/6 primary school students were recruited into either a control group (mean age: 10.9, SD 0.8, 53.2% female), or an intervention group (mean age: 10.9, SD 0.7, 51.5% female). Both groups completed a nutrition knowledge survey at baseline (T0), and one week later (T1). The control group received no nutrition education, while the intervention group played the VitaVillage game twice for 20 minutes each time.

Results: Results indicated there was a significant increase in total nutrition knowledge scores compared to the control group ( $\Delta$ M2.3, p<0.05, Cohen's d=0.35). On a likeability survey after the study, children reported that they liked the game overall, with mean score of 77 (SD 24.6), on a scale of 0-100. The comments made by the children were overall very positive and will assist in the ongoing development of VitaVillage.

Conclusion: The ability of VitaVillage's efficacy to increase children's nutrition knowledge is promising and the children enjoyed playing the game. Further development and a larger school based randomised controlled including a study arm with traditional nutrition education and measures of dietary intake and longer game exposure is needed to assess efficacy and for consideration of implementation into primary schools in the future.



## Differences in physical activity during walking and playing Pokémon Go

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Pre-recorded Presentation

Purpose: Exergames such as Pokémon Go may increase physical activity, however it is unknown how Pokémon Go impacts the volume and behavioral pattern of physical activity compared to a traditional continuous walking bout.

Methods: During spring of 2019, twenty Pokémon Go players participated in a randomized cross-over experimental study that used objective measurement tools (pedometer, accelerometer, heart rate monitor and GPS watch) and direct observation to compare a variety of physical activity-related variables (steps, intensity, heart rate, distance travelled, number of stops) during a 30-minute walk when playing Pokémon Go and not playing Pokémon Go. Participants followed the same ( $\sim$ 1.77 km) walking path, which incorporated all eight of the possible Pokéstops (with one being passed twice) as well as two of the three Pokégyms on campus on separate days. Results: Two distinct playing styles of Pokémon Go were identified: an intermittent style of play with periodic stopping, and a continuous style of play. Total steps, MVPA percentage, and distance travelled was significantly greater for continuous Pokémon Go participants and traditional walk conditions (p<0.05), compared to intermittent Pokémon Go participants, while number of stop breaks, percentage of time in sedentary activity, and percentage of time in light activity was significantly higher for intermittent Pokémon Go participants compared to continuous Pokémon Go participants and traditions (p<0.05). Differences in physical activity variables between traditional walking and Pokémon Go appear to be driven by the 60% of Pokémon Go players that used the intermittent style of play, which was characterized by frequent stops.

Conclusion: The continuous Pokémon Go style of play was most similar to a traditional bout of walking. However, overall, when compared to traditional walking, Pokémon Go resulted in lower volume, intensity and less continuous bouts of physical activity. Regardless of playing style, Pokémon Go elicited a substantial number of steps and significant time in MVPA, thus supporting that playing this game may be an effective strategy towards meeting physical activity recommendations, especially if it could encourage couch-bound videogame players to venture outside and walk around to play the game.


# Time-varying associations between ecological momentary assessment-reported sedentary behaviors, objectively-measured sedentary time, and affective responses among adolescents

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#### Pre-recorded Presentation

Purpose: Evidence of acute sedentary behavior (SB)-affective state associations among youth is inconsistent; this may be attributed to a limited operationalization of self-reported SB, the lack of objective measurement of sedentary time, and the failure to account for dynamic time-varying associations. This study investigated the within-day, time-varying associations between ecological momentary assessment (EMA)-reported screen-based SB and non-screen-based SB, accelerometer-measured sedentary time, and subsequent affective states.

Methods: Participants (N=15, mean age=13.1[1.0] years, 66.7% female, 40.0% Hispanic, 66.7% healthy weight) reported screen-based and non-screen based SBs "in the past 30 minutes" and their positive and negative affect "right now" via EMA up to 7 times/day for 7-14 days. EMA prompts occurred randomly within pre-selected 2-hour time windows between 7am and 8pm. Participants simultaneously wore ActivPAL thigh-mounted accelerometers and sedentary time (minutes) in the 30 minutes prior to each EMA prompt was calculated. Separate time-varying effect models (varying slopes across the day) assessed how EMA-reported screen-based SB, EMA-reported non-screen-based SB, and accelerometer-measured sedentary time in the past 30 minutes each related to current EMA-reported positive and negative affect.

Results: Participants completed N=633 EMA surveys (255 [40.3%] reports of screen-based SB, 109 [17.2%] reports of non-screen-based SB, and 269 [42.5%] no SB reported). EMA-reported screen-based SB was positively related to positive affect from approximately 7am-9am (ßrange 0.34 to 0.89) and from 3pm-6pm (ßrange 0.28 to 0.37); and was positively related to negative affect from approximately 7am-9am (ßrange 0.23 to 0.49). Non-screen-based SBs were inversely related to positive affect from about 7am-8am (ßrange -0.63 to -0.43) and after 2pm (ßrange -0.49 to -0.27), while they were inversely related to negative affect from about 7am-8am (ßrange -0.63 to -0.43) and after 2pm (ßrange -0.14). Accelerometer-measured sedentary time was unrelated to positive affect across the day but was positively related to negative affect from approximately 6pm-8pm (ßrange 0.01 to 0.02).

Conclusions: The strength of acute associations between SB and affective states differs across the day and by operationalization of SB (screen-based vs. non-screen based vs. accelerometer-measured sedentary time); highlighting the methodological importance of taking more nuanced approaches to operationalizing time and SB in within-day studies of SB and affective states.



# Sit less, get active! Delivery and evaluation of physical activity promotion via MOOCs

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Pre-recorded Presentation

Purpose: Physical activity (PA) interventions are often limited in engagement strategies (e.g., social competition and collaboration, and effective feedback loops) that may be essential for successful behavioural change. These strategies are core elements of massive open online courses (MOOC) that are free and with unlimited participation. However, there have been few attempts to use MOOCs for the purpose of promoting health behaviours of learners. The aim of this study was to evaluate the effect of PA promotion delivered via a MOOC on concern about current levels of PA, readiness, importance and confidence to change learners' PA behaviour.

Methods: The Sit less, get active MOOC consists of three weeks of core PA-related learning material, followed by weekly PA promotional messages and monthly PA promotional videos for six months. Learners who volunteered for the evaluation component completed PA-and health-related surveys: before the course started, upon the completion of the core course, and after 6 months during the time-period October 2016 and March 2018. The effect of the 3-week course on learners' concern about their current levels of PA, and their readiness, importance and confidence to change PA behaviour was explored using repeated measures ANCOVA adjusted for age, sex, and time from baseline to completing the follow up questionnaire.

Results/findings: 530 learners (mean age±SD of 48±14 years, 78% women, 89% with college/university degree) had complete data on variables of interest at baseline and 3-week follow up. After completing the course the learners expressed less concern about their PA levels, and reported being more confident in success to increase their PA and to incorporate extra PA throughout the daily routine. They were also more likely to report doing enough PA to stay healthy and that they intend to do 30 minutes or more of moderate PA at least 5 times per week (p<0.001 for all).

Conclusions: The results indicate that PA promotion delivered via a MOOC improved confidence and readiness of learners to increase their PA level. MOOCs could help scale up PA promotion strategies; and could aid delivery and evaluation of PA promotion among health professionals, patients, work force, and general public.



# Development and validation of behavioral and psychosocial text messages for the promotion of self-care in patients with type 2 diabetes mellitus

<u>Ms. Ana Carolina Hovadick</u><sup>1</sup>, Miss Jéssica Santos<sup>1</sup>, Dr. Ilka Reis<sup>1</sup>, Dr. Adriana Pagano<sup>1</sup>, Dr. Heloísa Torres<sup>1</sup> <sup>1</sup>Federal University of Minas Gerais (UFMG), Belo Horizonte, Brazil

#### **Pre-recorded Presentation**

Purpose: For the first time in the literature we develop and validate behavioral and psychosocial text messages to be used in educational interventions to promote self-care in Brazilian patients with type 2 diabetes mellitus (T2DM).

Methods: The messages were developed based on the scientific literature, as well as on the guidelines of the Brazilian Diabetes Society and the Food Guide for the Brazilian Population. In addition, 35 patients with T2DM from a public health center in Brazil were consulted through discussion groups about their main barriers in managing T2DM. This consultation was approved by the Research Ethics Committee of the Federal University of Minas Gerais (UFMG-Brazil). In the validation process the Delphi technique was adopted. Six diabetes experts from differing areas in Health Sciences (nursing, nutrition, pharmacy, psychology, and odontology) and one linguist were selected to evaluate the messages that were developed. All experts had master's and/or doctorate degree and had been involved in a research project about T2DM in the last 5 years. The evaluation criteria used to classify the messages were relevance, intelligibility, and readability. Experts rated each message with grades assigned from 1 to 3 in an online questionnaire. A comment field was also available. The validation process took place in two rounds until the messages exceeded the minimum Content Validity Index (CVI) recommended by the literature.

Results: Based on the behavioral and psychosocial aspects of T2DM, the themes chosen for the developed messages were medication use, eating habits, physical activity, emotions, and perceived support (friends, family, and medical staff). 34 messages were developed of which 33 were validated. At the end of the second round, consensus was achieved on 91%.

Conclusions: 33 messages were validated and considered relevant, intelligible, and readable for patients with T2DM. Based on this, the authors recommend their use in educational interventions since these are reliable messages with high potential to promote self-care.



# Users' perception of a smartphone app to promote physical activity through active transportation: a qualitative study within the Smart City Active Mobile Phone Intervention (SCAMPI)

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### <u>Poster</u>

Purpose: Globally, physical inactivity is identified as one of the highest risk factors for morbidity and mortality. Promotion of active transportation (AT) is a viable option for many to increase their daily physical activity (PA). The development of mHealth interventions broadens the opportunity to reach larger populations in order to promote AT. The Smart City Active Mobile Phone Intervention (SCAMPI) study is a randomized controlled trial evaluating the use of a smartphone application (app) promoting AT to increase participants' PA. This qualitative study examines the acceptance and usability of the SCAMPI app from a participant perspective.

Methods: Seventeen participants (13 women; age range 25-61 years), living in the county of Stockholm, who had completed the 3-month intervention (behavior change program delivered through an app) in the SCAMPI randomized controlled trial during 2018 agreed to participate in a semi-structured telephone-based interview. These 17 participants were representative of the whole intervention group (n=127) considering baseline characteristics such as age, sex and area of residence. The interviews were audio recorded, transcribed verbatim and analyzed with an inductive qualitative content analysis.

Results: The analysis resulted in two themes. The first theme "The main motivators: monitoring and messages" highlighted that monitoring AT and being able to set up weekly goals in the app were perceived as the main motivators to use more AT. The second theme "Acceptable although refinement is appropriate" showed that the app was accepted and encouraged many participants to use more AT. Nevertheless, there were functions in the app that needed to be modified. For instance, although the automatized tracking of travel behavior was appreciated, it was reported to be time consuming and unreliable at times.

Conclusions: This study contributes with novel knowledge about healthy adults' experiences of using an app for promoting AT. The results show that the app was well-accepted and that self- monitoring and goal-setting were the main motivators to use more AT. The automatized tracking of AT was appreciated; however, it was also reported to be energy- and time consuming when it failed to work. Thus, this feature should be improved in future research.



# SnackAR - An educational game app integrating nutrition and mathematics

<u>Dr. Tamara Bucher</u><sup>1</sup>, Ms. Berit Follong<sup>1</sup>, Ms. Pauline Verhoeven<sup>1</sup>, Mr. Mitchell Burley<sup>1</sup>, Dr. Elena Prieto-Rodriguez<sup>1</sup>, Dr. Andrew Miller<sup>1</sup>, Prof. Clare Collins<sup>1</sup>, Dr. Shamus Smith<sup>1</sup> <sup>1</sup>The University of Newcastle, Callaghan, Australia

#### <u>Poster</u>

Purpose: Poor eating patterns and larger portion sizes contributing to increased energy intake and excessive weight gain. Children and adults have difficulties in estimating food volumes and portion sizes and understanding food labels and kilojoule content. These tasks require basic mathematical skills. At the same time, worldwide interest and achievement in mathematics has declined in school-age children. This is partly due to the perceived misalignment with the school curriculum. Technology, gamification and real-life contexts can help make volume-learning fun and schools play a key role in promoting healthy lifestyles and healthy eating for children. This study aimed to develop and pilot-test a technology to embed aspects of the 'Health and Physical Education' syllabus within Mathematics to enhance learning experiences.

Methods: Our interdisciplinary team of Computer Scientists, Nutrition and Mathematics Education experts used codesign principles to develop an evidence-based tool to integrate mathematics and nutrition education. Primary school teacher surveys (N=101) and testing and interviews with children (N=14, age M=9.3, SD=0.8 years) and their parents (N=13 parents) informed the design of an augmented reality-based game application for food portion size and volume and unit learning that is aligned with the Australian curriculum was informed by

Results: Teachers expressed positive beliefs and interest in using digital games for teaching volume and capacity measurement. About 33% already used digital games, with 55% not currently using, but wanting to use them. SnackAR is an app, which displays a variety of virtual foods, and teaches children to estimate food portions using several different unit types, e.g. weight in grams, volume in millilitres, volume in cm3 and energy in kilojoules. The preliminary testing of the app indicates that 13 out of 14 children liked the application. Overall, the children perceived the estimations as challenging and further technological improvements relating to provision of feedback could be helpful.

Conclusions: Stakeholders reported that integration of a digital game to integrate nutrition and mathematics teaching is acceptable. However, usability and effectiveness of the prototype technology need to be tested in a randomised controlled trial to assess potential value of integration of the tool into the primary school curriculum.



# Acute Effect of Virtual Reality Exercise on Heartrate and Mood among College Students with Anxiety Symptomology: A Pilot Study

Dr. Jung Eun (June) Lee<sup>1</sup>, Dr. Charles Fountaine<sup>1</sup>, Dr. Zan Gao<sup>2</sup>

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<u>Poster</u>

Purpose: Depression and anxiety rate in college students are on the rise, and exercise has been shown to alleviate these symptoms. Virtual reality-based exercise has been an innovative means to motivate individuals to adhere to exercise. This study examined the acute effect of immersive virtual reality (VR) exercise bike on physiological and psychological outcomes in college students with depressive and anxiety symptoms.

Methods: Total of 20 participants (Mage= 20.45, SD=0.76 ;11 females; MBMI=23.33, SD=2.86) participated in the study in 2018. Penn State Worry Questionnaire (PSWQ) and Center for Epidemiologic Studies Depression (CES-D) were used to screen students with either symptomology of depression or anxiety. Participants participated in two 20-minute exercise sessions, each on a separate day: 1) VR bike exercise, and 2) traditional ergometer exercise. Brunel Mood Scale was used for mood assessment immediately before and after both sessions, and heart rate was assessed every 4 minutes during each session.

Results: Average score for PSWQ and CES-D was 52.06 and 16.65, respectively. Repeated two-way (Time and Condition) ANOVA indicated that there was a significant interaction effect on vigor (F (1,19) = 8.79, p < 0.01). Additionally, there were significant Time effect on depression (F (1,19) = 5.81, p < 0.05), tension (F (1,19) = 6.55, p < 0.05), and vigor (F (1,19) = 15.71, p = 0.01). Marginal significance of Time effect on Confusion (F (1,19) = 4.39, p = 0.05) was also shown. Paired t-test indicated that no significant difference on average heartrate between the two conditions.

Conclusions: College students who have moderate-to-high worry can benefit from 20 minutes of bike exercise. Although physiological responses may be comparable between the two exercise modes, VR bike exercise can be more effective in enhancing the positive mood compared to traditional bike exercise.





# Implementation and scalability (SIG)



# Implementing changes to the built environment to increase children's physical activity

<u>Dr. Jasper Schipperijn</u><sup>1</sup>, Dr. Henriette Andersen<sup>1</sup>, Miss Tanja Schmidt<sup>1</sup>, Dr. Charlotte Pawlowski<sup>1</sup> <sup>1</sup>Univeristy of Southern Denmark, Odense, Denmark

Symposium Recording

Purpose: Changing the built environment is one way to promote physical activity among children. However, creating and implementing effective environmental changes is challenging and requires involvement of many different actors. Also evaluating the effect of environmental changes is challenging and e.g. involves using a mixed methods approach using the RE-AIM framework (Glasgow et al 2019). We will present lessons learnt from three projects, 'When Cities Move Children', the 'Activating Schoolyards Study' and the 'Move the Neighbourhood study'.

Methods: When Cities Move Children was a natural experiment with a repeat-cross-sectional graded exposure design, The Activating Schoolyards Study and the Move the Neighbourhood study were quasi-experimental mixed methods studies with a pre-post design. Participants wore an accelerometer (ActiGraph GT3X) and a GPS (Qstarz BT-Q1000XT) for seven days to determine the changes in physical activity levels. Participant observation and goalong group interviews were conducted to be able to understand what influenced. Interviews with children, teachers and designers were used to assess adoption, implementation and maintenance.

Results: In When Cities Move Children and the Activating Schoolyards Study participants increased time spent being physically active in the built environments that had been changed. However, there were significant differences by school, gender, type of facility and the overall activity level of the students. In the Move the Neighbourhood study, children spent 15 minutes more in the space post-intervention. However, the space was used fewer days and by fewer children, being less physically active after the intervention. The qualitative findings revealed larger effects at schools where the students experienced their wishes for renewal had been carried out. Our evaluation highlighted challenges associated with how the children were involved, and that a lack of maintenance after the intervention ended impacted activity levels and use.

Conclusions: The results from these three studies show that changing that built environment can lead to device measured changes in children's physical activity behavior. However, there are large local and individual variations, and much of these differences could be explained by differences in implementation during the design and construction phase of the projects.



Embedding process, implementation and research-community partnership evaluation into the design of a 1088perationa controlled trial 1088perationaliz public transport for physical activity gain: A real-world perspective from the trips4health study

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Symposium Recording

**Purpose:** To describe 'how to' embed process, implementation and partnership evaluation into a real-world randomised controlled trial (RCT) incentivising public transport to increase physical activity (PA). Intervention participants receive public transport credit for achieving weekly travel targets, and weekly text messages over four months. This trial was developed in partnership with a public transport provider, local government and state government.

**Methods:** Evaluation was guided by three frameworks. Process evaluation elements included feedback from pilot study participants assessing participation experiences; individual interviews with partner organisation staff before, during and after trial implementation; and individual interviews with intervention group participants post-trial. Implementation evaluation elements included assessment of fidelity, dose and reach; development of a logic model; and consideration of significant weather events and policy, administrative or service-related changes to assess context. A partnerships analysis tool enabled reflection and strengthening of new and existing partnerships.

**Results:** Pilot study feedback (process evaluation) resulted in clarification of instructions for technology-based study measures, refinement of travel behaviour measures, and clearer guidance on study time commitments. Feedback from interviews with partner organisation staff resulted in refinements to data capture and exchange systems, and identification of contextual factors of potential. Since commencement (September 2019), implementation evaluation shows that of 179 people who read online study information, 99 were ineligible, and of the 80 who were eligible, 65 have consented and 24 of these have been randomised into the study. The number of partnerships (partnership evaluation) increased from four to 11 between 2018 and 2019.

**Conclusions:** Unlike traditional RCTs, this study is being conducted in a real-world setting through a researchcommunity partnership. Many potential issues associated with moving an intervention from the research setting to the real-world setting have been negotiated throughout the study design and development process. Factors identified as important in implementation science frameworks, such as leadership motivation and engagement, communication, engaging intervention staff, reflecting and evaluating, and empirical evidence, were critical for successful rollout. Embedded implementation, process and partnership evaluation measures have already been useful for refining and strengthening the study design, participant experience, partnerships and potential for scalability



# The "how to" of implementation: Use of the PRACTIS guide to support the statewide implementation of INFANT across Victoria, Australia

**Dr. Penelope Love<sup>1,2</sup>**, Dr. Rachel Laws<sup>1,2</sup>, Dr. Harriet Koorts<sup>1</sup>, Associate Professor Kylie Hesketh<sup>1,2</sup>, Prof. Karen Campbell<sup>1,2</sup> <sup>1</sup>Deakin University, Institute for Physical Activity and Nutrition (IPAN), Geelong, Australia, <sup>2</sup>Early Prevention of Obesity in Childhood Centre for Research Excellence (EPOCH-CRE), VIC, Australia

### Symposium Recording

**Purpose:** Obesity prevention in early life is critical, however few effective interventions have been scaled up and integrated into routine service delivery to achieve population level impact. The **in**fant **f**eeding, **a**ctive play and **n**utrition (INFANT) initiative is a previously trialled efficacious healthy lifestyle program delivered via first time parent groups in the first 12 months of the infants' life utilising a universally delivered maternal and child health service. From 2020, INFANT will be available to all (n=76) local governments across Victoria, Australia. This paper reports on key lessons learnt regarding implementation establishment for the delivery of INFANT 'at scale' within real-world settings.

### Methods:

This is a 5-year implementation research project involving 10 practice and policy partners ensuring reach to vulnerable communities across Victoria, Australia. Implementation establishment is described using the PRACTIS guide (Koorts et al 2018). Implementation evaluation uses a mixed methods approach using the RE-AIM framework (Glasgow et al 2019).

### **Results:**

PRACTIS guide steps were iterative in nature, with characterisation of the implementation setting and stakeholder engagement occurring concurrently. Evidence from INFANT efficacy trials and 'small scale' implementation studies expedited the describing of features and processes of adoption and implementation. The establishment of an implementation advisory group and the use of a co-design approach has been essential to refine implementation strategies. Baseline organisational readiness (RR 53.2%) showed high levels of motivation, commitment and efficacy for implementation. Levels of change capacity however were low with concerns about adequate funding and staffing to enable and sustain INFANT implementation. These and other contextual barriers and enablers explored over the duration of the research project will inform adoption and implementation to maximise opportunities for integration into existing delivery systems.

### **Conclusions:**

The PRACTIS guide was a useful tool to plan and operationalise the adoption and implementation of INFANT within a 'real world' context. Engaging practice and policy partners early in these processes has enabled early identification of important barriers and co-design of appropriate solutions, strengthening implementation and scale-up efforts



# Three-year sustainability of a teacher-led program targeting pre-adolescent girls' motor competence

**Dr. Natalie Lander<sup>1</sup>**, Prof. Jo Salmon<sup>1</sup>, Prof. Phil Morgan<sup>2</sup>, Ms. Naomi Symington<sup>1</sup>, Dr. Lisa Barnett<sup>1</sup> <sup>1</sup>Deakin University, Melbourne, Australia, <sup>2</sup>Newcastle University, Newcastle, Australia

**Pre-recording Presentation** 

Purpose: Motor competence (MC) is important to public health outcomes such as physical activity, fitness and weight status. Yet MC levels are low and are particularly low in girls. Although numerous studies address the effectiveness of MC interventions, less research addresses the implementation and sustainability of the interventions. This study aimed to investigate the extent to which teachers continued implementing an efficacious teacher-led program, which significantly improved MC in girls (12 years), three years post-intervention.

Methods: Teachers' ongoing implementation and perceptions of program sustainability were examined utilising the UK Medical Research Council (MRC)'s framework, in three specific domains: i)Implementation (post-evaluation) ii) Mechanism of (sustained) change, and; iii) Context (i.e., barriers and facilitators). All teachers who participated in the original trial (n=18) completed questionnaires followed by focus group discussions (FGs). Descriptive statistics analysed questionnaires. FGs were audio recorded, transcribed verbatim, and analysed in NVivo 11 using a framework approach.

Results: All teachers had continued to implement the program, or elements thereof, three years post-intervention. The structure of the intervention, in particular the alignment to the school, subject and unit configuration, emerged as the most influential factor in regard to ongoing implementation. In regard to mechanism of change, improvement, in regard to both teacher practice and student performance, emerged as a driver of change. The adaptations made to the program post evaluation significantly expanded the reach and appeared highly influential to program sustainability. The demand or need for the intervention appeared as the most predominant facilitator.

Conclusion: Engagement with the end-user (i.e., teacher), to identity individual need and contextual differences in the early stages of intervention development is integral not only to intervention effectiveness in the short term, but also to program sustainability. Framed by implementation science, these findings provide valuable understanding around the translation of research into practice, and useful information in regard to program sustainability and potential scalability.



# Time-efficient physical activity intervention for older adolescents: Preliminary findings from the Burn 2 Learn cluster randomized controlled trial

**Prof. David R Lubans<sup>1</sup>**, Dr. Jordan J Smith<sup>1</sup>, Prof. Philip J Morgan<sup>1</sup>, Dr. Narelle Eather<sup>1</sup>, Mr. Angus A Leahy<sup>1</sup>, Prof. Ronald C Plotnikoff<sup>1</sup>, Prof. Chris Lonsdale<sup>2</sup>, Prof. Michael Nilsson<sup>3</sup>, Dr. Michael Noetel<sup>2, 4</sup>, Miss Sarah G Kennedy<sup>1</sup>, Mr. Tatsuya T Shigeta<sup>5, 6</sup>, Dr. Sarah R Valkenborghs<sup>1</sup>, Dr. Myrto F Mavilidi, Ms. Sarah A Costigan<sup>1, 7</sup>, Prof. Charles H Hillman<sup>5, 6</sup>

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Pre-recorded Presentation

Purpose: Time-efficient interventions are needed for older adolescents ( $\geq 16$  years) in secondary schools where there is a heavy focus on academic performance and physical activity (i.e., physical education and school sport) is not mandatory. The aim of our study was to evaluate the impact of a school-based intervention designed to improve older adolescents' cardiorespiratory fitness by integrating vigorous intensity activity breaks into curriculum time.

Methods: The Burn 2 Learn (B2L) intervention was evaluated using a cluster randomized controlled trial with adolescents (N=670) from 20 secondary schools in New South Wales, Australia. We utilized a range of implementation strategies to support teachers to facilitate at least two high intensity interval training (HIIT) breaks/week during lessons: (i) training (professional development), (ii) resource provision (activity cards, heart rate monitors, bespoke smartphone/tablet application) and (iii) on-going support (observations, monitoring, feedback). The innovative HIIT sessions involved a combination of aerobic and muscle-strengthening exercises, designed to be fun and engaging as well as vigorous in nature. Teachers and students in the control group continued with their usual practice. Outcomes were assessed at baseline and 6-months. The primary outcome was cardiorespiratory fitness (multi-stage fitness test). Secondary outcomes were muscular fitness (push-up and standing long jump tests), body composition (body mass index), and mental health (questionnaires) assessed at baseline and 6-months. Data were analyzed using linear mixed models, accounting for clustering of effects at the class level. A detailed process evaluation was also conducted.

Results: Significant group-by-time effects were found for the primary outcome cardiorespiratory fitness (4.0 laps [95% CI, 1.7 to 6.4], p = 0.001) and for upper body muscular endurance (1.2 repetitions [95% CI, 0.3 to 2.2], p = 0.008]. Effects for lower body muscular power, body composition, and mental health outcomes were not statistically significant.

Conclusions: Implementing high intensity breaks during curricular time improved older adolescents' cardiorespiratory and muscular endurance, but not their mental health. Our findings highlight the health benefits of re-allocating curriculum time to physical activity during the final years of secondary school. Trial registration: ACTRN12618000293268



# How effective are physical activity interventions when they are scaled-up: A systematic review

<u>Ms Cassandra Lane<sup>1,2,3,4</sup></u>, Dr. Sam McCrabb<sup>1,3</sup>, Associate Professor Luke Wolfenden<sup>1,2,3,4</sup>, Dr. Nicole Nathan<sup>1,2,3,4</sup>, Professor Patti-jean Naylor<sup>5</sup>, Ms. Melanie Lum<sup>1,2,3,4</sup>, Ms. Judith Byaruhanga<sup>1,2,3,4</sup>, Dr. Rachel Sutherland<sup>1,2,3,4</sup>

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### Pre-recorded Presentation

Purpose: Researchers have found numerous interventions effective in increasing physical activity levels, yet little is known about their broader dissemination. This 'scale-up' of effective physical activity interventions is increasingly recognized as imperative for population wide health improvements and reduced burden of disease. The purpose of this study was to systematically review physical activity interventions scaled-up in community settings by exploring adaptations made as part of the scale-up process and any impact scale-up may have had on effect size.

Methods: We performed a search of six electronic databases, reference lists of reviews, and contacted experts within the field. An intervention was considered 'scaled-up' if it had been delivered to a greater number of participants than a preceding randomised control trial ('pre-scale') in which a significant intervention effect ( $p \le 0.05$ ) was found for any measure of physical activity. Two authors independently screened studies, extracted data and assessed risk of bias using the Cochrane risk-of-bias tool. Adaptations made to scale interventions were categorised using the Adaptome model and differences in effect size from pre-scale to scaled-up trials were quantified ([effect size reported in the scaled-up trial/effect size reported in the pre-scale trial]×100).

Results: Eleven studies were identified as eligible for inclusion. Of these, three targeted solely physical activity and the remaining eight studies focused broadly on obesity prevention or healthy lifestyles. A variety of adaptations were made for scale-up, with the mode of delivery being the most common adaptation (e.g., qualified facilitator vs member of the research team). Seven studies included a measure of physical activity common to the pre-scale trial that enabled calculation of an effect size difference. Majority of scaled-up studies retained a proportion of the pre-scale trial effect size (16-71%), one study experienced a scale-up penalty (<0%), and three studies showed improvements (>100%).

Conclusion: Adaptations may impact the effectiveness of interventions delivered at scale. Interventions adapted specifically for scale-up retained at least half the intervention effect. This review provides valuable insight for researchers and public health practitioners interested in the design and scale-up of physical activity interventions, and contributes to the growing evidence-base for delivering health promotion interventions at-scale.



# Optimising a school-based physical activity intervention for scale up

Ms. Cassandra Lane<sup>1,2,3,4</sup>, Dr. Nicole Nathan<sup>1,2,3,4</sup>, Dr. Rachel Sutherland<sup>1,2,3,4</sup>, Prof. Adrian Bauman<sup>5,6</sup>, Associate Professor Luke Wolfenden<sup>1,2,3,4</sup>

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#### **Pre-recorded Presentation**

PURPOSE: School physical activity policies have been mandated by many jurisdictions internationally however implementation of such policies is poor. Without population wide implementation, the potential benefits of school policies will not be realised. The aim of this paper is to describe how an intervention that increased schools' compliance with a mandatory physical activity policy was taken from efficacy to scale-up.

METHODS: Optimisation is an emerging field within implementation science involving an iterative, data-driven process to improve the impact of an intervention. The optimisation process involved a series of randomised controlled trials (RCT), undertaken between 2016-2018, with the aim of developing the most effective and scalable implementation strategy, that could be delivered by a service delivery organisation. Intervention effectiveness was measured via schools compliance with the mandatory policy and children's physical activity levels measured via accelerometer.

RESULTS: Following extensive formative research which included i) literature reviews; ii) interviews with teachers and iii) observations of teachers' delivery of physical activity the identified barriers/ facilitators to policy implementation were mapped to the Behaviour Change Wheel (BCW) and the Theoretical Domains Framework (TDF). Potential behaviour change techniques and implementation strategies were then identified and presented to an advisory group to assess against the APEASE criteria. Implementation strategies included; executive support, training in-school champions, provision of tools and resources, implementation prompts, reminders and feedback. The findings from each RCT as well as the methods used to modify the implementation strategies of each subsequent trial in terms of behaviour change technique, dose or modality will be presented.

CONCLUSIONS: This is the first study to optimise an implementation intervention to increase schools' compliance with a mandatory physical activity policy. Given the dearth of research, the findings will be important in informing future implementation efforts in this setting. Furthermore, the methodology used may inform the design of other health promotion programs in schools or other settings more broadly.



# A scalable school-based intervention to improve children's cardiorespiratory fitness: The internet-based Professional Learning to help teachers promote Activity in Youth (iPLAY) cluster randomised controlled trial

**Prof. Chris Lonsdale<sup>1</sup>**, Dr. Taren Sanders<sup>1</sup>, Dr. Michael Noetel<sup>1</sup>, Prof. Philip Parker<sup>1</sup>, Ms. Jane Lee<sup>1</sup>, Mr. Devan Antczak<sup>1</sup>, Dr. Diego Vasconcellos<sup>1</sup>, Prof. David Lubans<sup>2</sup>

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#### **Pre-recorded Presentation**

Purpose:Children's health is at risk because of declines in cardiorespiratory fitness. Meta-analyses of efficacy studies show that school-based physical activity interventions can improve children's cardiorespiratory fitness. These interventions, however, are rarely disseminated at scale, meaning they typically have little public health impact. iPLAY is a primary school intervention designed to build schools' capacity to promote physical activity without relying on external providers delivering programs to students. To enhance scalability and sustainability, iPLAY is delivered to teachers via an online learning platform, with mentoring support from experienced physical education teachers. Our aim was to determine whether iPLAY, when deployed across a large number of schools, could improve children's cardiorespiratory fitness.

Method: We did a cluster randomized controlled trial (RCT) with allocation at the school level (1:1 allocation). We completed assessments at baseline, post-intervention (12 months after baseline), and maintenance (24 months after baseline). The primary outcome was students' cardiorespiratory fitness, as measured by a 20m shuttle run test. We tested for between-arm differences in changes in student outcomes using linear mixed models.

Results: We recruited 132 primary schools in New South Wales, Australia. We assigned a representative sample of 22 schools to the cluster RCT. The remaining 110 schools entered an implementation study in which teachers received iPLAY but students did not complete primary outcome assessments. In the 22 schools involved in the cluster RCT, we recruited 1,217 students from Grades 3 and 4 who completed baseline assessments of their cardiorespiratory fitness. At 12-months (post-intervention), there was a significant between-arm difference in students' change in fitness favoring the iPLAY intervention condition (1.0 laps [95%CI=0.1,2.0]). Preliminary analysis of 24-month outcome data (maintenance) from 16 of the 22 cluster RCT schools showed this benefit continued to increase after the intervention ended (1.8 laps [95%CI=0.5, 3.2]).

Conclusion: iPLAY is a scalable model to deliver a school-based physical activity intervention that improves children's cardiorespiratory fitness. iPLAY may also build capacity in schools such that benefits are sustained or continue to grow after the intervention ends. Trial registration: ACTRN126160007314



# High-intensity activity breaks on adolescents' on-task behaviour and subjective vitality

**Dr. Myrto Mavilidi<sup>1</sup>**, Mr. Connor Mason<sup>1</sup>, Mr. Angus Leahy<sup>1</sup>, Miss Sarah Kennedy<sup>1</sup>, Dr. Narelle Eather<sup>1</sup>, Prof. Charles H. Hillman<sup>2</sup>, Prof. Philip J. Morgan<sup>1</sup>, Prof. Chris Lonsdale<sup>3</sup>, Mr. Levi Wade<sup>1</sup>, Dr. Nicholas Riley<sup>1</sup>, Miss Christina Heemkerk<sup>4</sup>, Prof. David R. Lubans<sup>1</sup>

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#### Pre-recorded Presentation

#### Purpose:

Physical activity levels drop dramatically during adolescence and less than 10% of older adolescents are sufficiently active. Considering that previous school-based physical activity interventions targeting adolescents have been largely ineffective, we need to explore novel intervention strategies to provide older adolescents with a dose of health-enhancing physical activity. The purpose of this study was to evaluate the impact of the "Burn 2 Learn" (B2L) intervention program that involved high intensity activity breaks on older adolescents' on-task behaviour and subjective vitality.

### Methods:

This was a sub-study of the Burn 2 Learn (B2L) cluster randomised controlled trial, which included two cohorts. Participants for this sub-study (N = 221) were from 10 secondary schools (23 classes) in NSW (cohort 2). Teachers allocated to the B2L intervention group were provided with training, resources and support to implement 2-3 high intensity activity breaks per week for the study period. The control condition followed their normal curriculum. Ontask behaviour was assessed at baseline and post-test, using a momentary time sampling procedure and expressed as a percentage of lesson time. Students were observed on a rotational basis in 15 sec intervals for 30 min in the allotted curricular time. At post-test, subjective vitality was assessed at the start and end of the lesson using a validated questionnaire. Linear mixed models were used to assess the impact of the intervention.

#### Results:

Linear mixed models revealed significant group-by-time effects for on-task behaviour in the B2L group [adjusted mean difference = 18.9% (95% CI, 3.2 to 34.6), p = .020, d = 0.4]. Also, significant group-by-time effects on subjective vitality favouring the B2L group were observed [adjusted mean difference = 0.71 (95% CI, 0.28 to 1.14), p = .003, d = .02].

### Conclusions:

The B2L intervention was successful in improving senior school students' on-task behaviour and their subjective vitality. These findings highlight the potential academic benefits of re-allocating curriculum time to physical activity during the senior school years.

Australian and New Zealand Clinical Trials Registry (ACTRN12617000544370)



# Linking implementation barriers to strategies to support prescription of E=M by clinicians

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### Pre-recorded Presentation

Purpose: Several barriers hinder clinicians to prescribe exercise to their patients, such as lack of time, knowledge or support. As a result, 'exercise is medicine' (E=M) is not systematically implemented in general routine hospital care. Therefore, the aim of this study was to link evidence-based implementation strategies to barriers identified by clinicians in order to develop an implementation blueprint for E=M prescription.

Methods: Guided by the systematic Implementation Mapping protocol (Fernandez et al. 2019), we applied the five steps using strong stakeholders participation to match implementation strategies to barriers identified during interviews with clinicians working at two university hospitals in the Netherlands. We used available theory and evidence-informed strategies from the Taxonomy of Behaviour Change Methods from Kok et al. (2016) and the Effective Practice and Organisation of Care taxonomy from Powell et al. (2015). For each barrier we defined what needed to be changed (e.g. knowledge, beliefs, structures, policy agendas). Next, we identified strategies on how to change these barriers, such as training for clinicians, insight into possible exercise options within the area, and role models for clinicians. Next, we matched the implementation strategies to the practical activities and developed a blueprint for implementation as well as an evaluation plan.

Results: The blueprint for implementation of the E=M consists of bundled implementation strategies to support clinicians, department managers and stakeholders in the broader context through the adoption, co-creation, implementation and sustainability stages. Each stage is supported by implementation tools, practical applications and materials bundled in an implementation blueprint allowing tailoring to the specific clinical context.

Conclusions: Operationalization of strategies into activities, tools, practical applications and materials led to the development of an implementation blueprint tailored to the specific clinical context. The implementation blueprint will be used to support implementation of E=M during a pilot study in four departments of university hospitals in the Netherlands (departments of Rehabilitation and Orthopaedics of UMC Groningen, and Rehabilitation and Oncology of Amsterdam UMC).



# Evaluation of the FAMILY HEALTHY LIVING PROGRAM Pilot (FHLP): exploring implementation from the family and program delivery level

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### Pre-recorded Presentation

Purpose: To evaluate the implementation of a free, evidence-based, childhood healthy weights program designed in British Columbia for children (8-12 years old) with a BMI ≥85th percentile and their families. The 10-week program, based on the multi-process action control theory, consisted of 90-minute weekly group sessions, weekly e-sessions, plus four community-based activities. Topics included healthy eating, physical activity, physical and food literacy, sleep, screen-time, positive mental health and behavior change techniques. Eleven programs ran in seven BC communities (September 2018 - March 2019).

Methods: A mixed-methods concurrent triangulation design assessed implementation at both family and program levels. Family measures were reach, adherence, satisfaction (acceptability), facilitators and barriers. Program delivery measures were adoption, fidelity, compatibility, context, feasibility, acceptability and facilitators and barriers. Qualitative data was collected through parent and Program Facilitator interviews and quantitative data through parent and Program Facilitator surveys, attendance tracking forms and e-session analytics. Interviews were recorded, transcribed using Transcriptive software and categories identified using NVIVO. Quantitative descriptives were generated using SPSS.

Results: 132 families were eligible (n=211 enquiries), and 79 families (88 children) registered (42%). 55 families (63 children) started the program and 80% completed. Of those, 82.5% of families attended 70% of sessions. 26% of families accessed 30%+ of core e-session content. Average contact time was 17.7 hours (range 12.78-25.02 hours). Family participation facilitators were: free of cost, location, sibling inclusion, and complimentary recreation passes. Participation barriers were: other commitments, illness, transportation and scheduling. Program acceptability/satisfaction across parents and children was high, with satisfaction ratings over 4/5 for all measures. Seven of the nine (78%) communities originally identified as pilot sites implemented the program. Fidelity was 73.5% across program components (range 42-95%). At the delivery-level, implementation facilitators were high compatibility, context (support from recreation center, having qualified staff), and resources (room availability, manual, equipment and grant funding). Barriers to implementation were recruitment, small group size, attendance, and limited time to deliver material. Interviews showed Program Facilitator acceptability/satisfaction acceptabi

Conclusions: The FHLP was acceptable and feasible for both families and program delivery partners, but recruitment, attendance, and on-line engagement were challenges.



# Partner supported dissemination and adoption of Transform Us! In the first 12months

<u>Mr. Samuel Cassar<sup>1</sup></u>, Prof. Jo Salmon<sup>1</sup>, Prof. Anna Timperio<sup>1</sup>, Dr. Harriet Koorts<sup>1</sup> <sup>1</sup>Deakin University, Geelong, Australia

Symposium Recording

Purpose: Exploring the adoption of interventions is critical to better understanding the scale up process needed for population-wide impact. Uptake of school-based programs is a slow and challenging process, with intervention characteristics and 1098egitimizing1098l culture particularly important. It is suggested interventions supported by educational stakeholders play is important in 1098egitimizing programs and supporting adoption. In partnership with 16 organisations, Transform-Us! Is being disseminated to all Victorian primary schools (n=1,794) as a 'real-world' program embedded into education practice and policy. We investigated the experiences and learnings of partner organisations disseminating the program to their educational networks in the first 12 months.

Methods: Partner consultation has been ongoing since 2017 with 16 organisations ranging from government departments (n=4), professional societies (n=3), educational bodies (n=3), advocacy organisations (n=2), community organisations (n=2), sporting clubs (n=1), and charities (n=1). Semi-structured interviews were performed with representatives of each partner following 12 months of dissemination. Interviews were audio-recorded, transcribed and coded anonymously. Thematic analysis was performed independently by two researchers. Descriptive statistics of adopting schools stem from an online survey school leaders and teachers completed at registration. School level characteristics were compared between adopting and non-adopting schools using the MySchools database.

Results: Partners reported multiple dissemination channels to increase adoption (web links, email listserves, newsletters, professional networks, conferences, and workshops). Partners outlined several local, regional and state organisations to partner with and provided comment on the preferred content and timing of dissemination activities for their networks. Suggestions relating to content, timing and channels resulted in a detailed dissemination plan. Dissemination activities resulted in 191 schools (Government 78.1%, Catholic 19.5%, Independent 2.4%) and 293 individual teachers adopting Transform-Us! In the first 12 months from inner regional (15.9%), major cities (73.2%), outer regional (8.5%), and remote areas (2.4%) of Victoria.

Conclusion: Experiences of targeted dissemination activities of key partner organisations to scale the Transform-Us! Program provides valuable information regarding the challenges and successes of embedding research within government and school systems for preventative programs.



# HOPP – the Health Oriented Pedagogical Project

<u>Prof. PM Fredriksen<sup>1</sup></u>, Dr. M Strand<sup>1</sup>, Dr. M Fredriksen<sup>1</sup>, Dr. OP Hjelle<sup>1</sup>, Dr. A Mamen<sup>1</sup> <sup>1</sup>Kristiania University College, Oslo, Norway

#### Symposium Recording

Purpose: Worldwide lifestyle-related diseases are increasing. A pedagogical system combining physical activity with learning has shown promising results. Studies show that active learning may contribute to reduction in risk factors for cardiometabolic diseases and improve academic performance. Other studies fail to show similar results, as small sample sizes and short study periods implies uncertainty regarding the effect. Horten municipality in Norway took initiative to implement active learning in all elementary schools as a part of a long term health promotion campaign for children to prevent future lifestyle related diseases.

Methods: HOPP, with seven intervention and two control schools (n=2300), aims to increase physical activity through active learning pedagogy during a school day by 45 minutes. Uniquely, teachers are trained to implement the program by the municipality. Annual measurements of anthropometrics, risk factors, physical activity, aerobic capacity, physical fitness, blood values, QoL, diet habits, executive function and academic performance are collected between 2015-2021.

Preliminary results: In HOPP's fifth year, no longitudinal effect has been analysed. Several papers on baseline data and one-year effect have been published. No one-year effect was found. Reference values for serum lipids, hand-grip strength and anthropometrics were established, in addition to factors affecting running performance. Waist-to-height ratio (WHtR) was found to predict fitness in children, however, no clustering of cardiometabolic risk factors in 6-12 year old children was shown, although 14% were overweight. A weight increase in Norwegian children has subsided, however, WHtR and waist circumference have increased compared to a decade ago, indicating more abdominal adiposity. Physical activity level is well above 60 minutes of MVPA a day. However, a tendency of diminishing activity with age is evident, with a 4-minute decline per year. QoL in Norwegian children is high, and increasing with age, however, parents by proxy score their children lower overall, and decreasing with age.

Conclusion: Data from HOPP has given important knowledge of a wide range of children's physical and mental health. There is yet a large proportion yet to be explored from a database now spanning across five years.



# Implementation and scaling of SWITCH (School Wellness Integration Targeting Child Health): Insights from a 10 year journey from efficacy to dissemination

<u>Dr. G J Welk<sup>1</sup></u>, Dr. G M McLoughlin<sup>1</sup>, Dr. L Lanningham-Foster<sup>1</sup>, Dr. S Vazou<sup>1</sup>, Dr. P Dixon<sup>1</sup>, Dr. D A Gentile<sup>1</sup>, Dr. J A Lee<sup>2</sup>, Dr. S Chen<sup>3</sup>, Dr. R R Rosenkranz<sup>4</sup>, Dr. D A Dzewaltowski<sup>5</sup>

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### Symposium Recording

Purpose: Schools provide an ideal setting for promoting healthy lifestyles in youth, but it has proven difficult to widely disseminate evidence-based programs in a cost-effective way. Through a USDA-funded project called SWITCH, we adapted and utilized an established implementation framework to help schools develop strategies to plan, implement, and operate school wellness programming on their own. We studied various facets of the implementation process over time to identify factors that facilitated or inhibited school wellness programming, and will share how these steps enhanced the planned dissemination.

Methods: The SWITCH implementation framework was based on an established training and implementation model, but adaptations and refinement were needed prior to broad dissemination efforts with the project. Effective dissemination also necessitated the development of a robust web-based platform to provide a structure for school-wellness programming efforts. Over the course of three years, we conducted several planned implementation studies to test and refine various aspects of the implementation framework and the integrated web-based platform.

Results: The sequential evaluation steps helped to refine the implementation process over time. An early evaluation documented the utility of the web-based self-monitoring system for promoting behavior change. A subsequent cluster randomized trial compared two distinct implementation strategies to clarify the best options for broader dissemination. Finally, a detailed process evaluation and mixed method approach provided insights about the capacity-building process and the challenges and barriers faced by schools in creating system changes. Schools have been able to plan and carry out programming on their own, but results have documented the importance of building capacity and the value of supplemental support provided by county extension coordinators that can work locally with schools.

Conclusions: The incremental adaptations informed by our ongoing analyses have helped to refine the SWITCH process and have facilitated the planned transition to sustained delivery through the 4H Youth Development arm of the state-wide Cooperative Extension system. We have gradually enrolled larger samples of schools over time (expanding from 6 to 60+) while laying the foundation for planned multi-state expansion through other state extension networks.



# SuperShelf: Can food pantries adopt a more nutrition-focused and client-centered approach?

<u>Other Nora Gordon<sup>1</sup></u>, <u>Dr. Rebekah Pratt<sup>1</sup></u>, Other Cynthia Davey<sup>1</sup>, Dr. Julian Wolfson<sup>1</sup>, Dr. Hikaru Peterson<sup>1</sup>, Other Christina Bliss Barsness<sup>1</sup>, Dr. Caitlin Caspi<sup>1</sup>

<sup>1</sup>University of Minnesota, Minneapolis, United States

#### Pre-recorded Presentation

Purpose: SuperShelf transforms food pantries, creating welcoming environments for communities to access healthy, appealing foods. Using a 6-step process, SuperShelf goes beyond typical behavioral economics-based interventions and supports both nutrition and client-centered practices by considering how food-insecure individuals may make choices in food pantry settings. SuperShelf methods aim to make the healthy choice the easy choice, while respecting individual preferences, cultural appropriate options, and creating a dignified experience. This presentation will focus on the feasibility for pantries to implement practices that are both nutritionally focused and client-centered, as measured by an environmental implementation tool.

Methods: The SuperShelf evaluation is an NIH-funded study conducted in two waves. Pantries (n=16) are randomized into "transformation" or "delayed-transformation" groups and evaluated over one year. Implementation is measured by a pre/post tool (total score range 0-100), comprised of four subscores that measure practices encouraging healthy choices while respecting individual preferences: stocking standards (29 points), healthy food prominence/appeal 21 points), unhealthy food placement/competition (22 points), and aesthetics/use of space (28 points). We measured all 16 food pantries with the implementation tool pre/post and calculated changes in total scores and subscores.

Results: Among wave 1 pantries (n=8), transformation site implementation scores increased 32.1 points on average, while delayed-transformation site decreased 1.2 points on average. All four subscores also increased among transformation sites and delayed-transformation sites did not change. For example, the healthy food prominence subscore increased an average of 6.5 points and the unhealthy food placement subscore increased an average of 6.6 points, while the delayed-transformation site subscores decreased less than 1 point each. Results from all 16 pantries will be presented.

Conclusion: Score changes in the transformation groups indicate adoption of the SuperShelf model. Although interventions in food pantry settings are challenging, implementation of an intensive model such as SuperShelf is possible and shows promise for improving health equity and the client experience among food insecure populations. Additional evidence evaluating implementation and the factors that translate to a more client-centered food pantry are forthcoming.



# Exploring experiences of accessing nutritious foods and perceived program outcomes among low-income adults participating in the British Columbia Farmers' Market Nutrition Coupon Program

<u>Ms. Stéphanie Caron-Roy<sup>1</sup></u>, Ms. Sayeeda Amber Sayed<sup>1</sup>, Dr. Katrina Milaney<sup>1</sup>, Dr. Bonnie Lashewicz<sup>1</sup>, Ms. Sharlette Dunn<sup>1</sup>, Ms. Heather O'Hara<sup>2</sup>, Mr. Peter LeBlanc<sup>2</sup>, Dr. Bonnie Fournier<sup>3</sup>, Dr. Kim D. Raine<sup>4</sup>, Dr. Charlene Elliott<sup>1</sup>, Dr. Rachel J. L. Prowse<sup>4</sup>, Dr. Dana Lee Olstad<sup>1</sup>

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### Pre-recorded Presentation

Purpose: Low-income households often lack funds to purchase sufficient nutritious foods, which are necessary for health and wellbeing. The British Columbia Farmers' Market Nutrition Coupon Program (FMNCP) provides low-income households with coupons valued at \$21/week to purchase healthy foods in local farmers' markets for 16 weeks during the summer. The purpose of this study was to describe participants' experiences and perspectives of accessing nutritious foods, and facilitators and barriers to participating in the program; and to explore perceived program outcomes. This study is the first of its kind in Canada and fills gaps in the literature for longitudinal qualitative studies examining participants' experiences of FMNCPs.

Methods: Qualitative description was used to investigate participants' experiences and perspectives of the FMNCP. We interviewed 28 adults from low-income households from three communities in BC who were enrolled in the program. Semi-structured interviews were conducted at two time points by two researchers; during the program, and 4 to 7 weeks after the program ended. Data generation and analysis was guided by Freedman et al.'s theoretical framework for nutritious food access in farmers' markets. Two researchers jointly developed a coding scheme and coded the data using directed content analysis. Themes were developed by coding within and between time points.

Results: Five main themes emerged from the analysis: 1) Coupon Program execution and delivery; 2) Availability of nutritious foods in farmers' market; 3) Nutritional and social outcomes; 4) Enhanced nutritional knowledge 5) Suggestions for program improvement. All participants acknowledged that the program improved access to nutritious foods. Shopping at farmers' markets increased accessibility to fresh produce, provided opportunities for education, and increased social interactions. Barriers such as transportation, limited variety in rural areas, as well as stigmatizing experiences were identified. Participants suggested extending the duration of the program, and allow for more types of foods to be purchased with the coupons.

Conclusion: Participants viewed the program as an opportunity to access fresh and local foods, and identified several positive outcomes from the program. The results elucidate information required to scale-up similar programs to other provinces in Canada, and other parts of the world.



# Evaluation of School Wellness Integration Targeting Child Health (SWITCH®) Program Dissemination and Implementation through a Mixed Methods Approach

**Dr. Gabriella Mcloughlin<sup>1</sup>**, Ms. Priscila Candal<sup>1</sup>, Associate Professor Spyridoula Vazou<sup>1</sup>, Dr. Joey Lee<sup>2</sup>, Prof. Richard Rosenkranz<sup>3</sup>, Prof. David Dzewaltowski<sup>4</sup>, Associate Professor Lorraine Lanningham-Foster<sup>1</sup>, Prof. Douglas Gentile<sup>1</sup>, Prof. Philip Dixon<sup>1</sup>, Associate Professor Senlin Chen<sup>5</sup>, Prof. Gregory Welk<sup>1</sup>

<sup>1</sup>Iowa State University, Ames, United States, <sup>2</sup>University of Colorado Colorado Springs, Colorado Springs, United States, <sup>3</sup>Kansas State University, Manhattan, United States, <sup>4</sup>University of Nebraska Medical Center, Omaha, United States, <sup>5</sup>Louisiana State University, Baton Rouge, United States

### Pre-recorded Presentation

Purpose: Factors within and outside the school environment can affect the degree to which wellness programs are implemented. The Cooperative Extension system in the U.S. provides a way to disseminate evidence-based programs within and across states, but little is known about its impact on school programming. The study addresses this gap by evaluating the influence of Extension on school wellness programming guided by the SWITCH (School Wellness Integration Targeting Child Health) process.

Methods: The study adopts a mixed-methods approach, informed by the Consolidated Framework for Implementation Research (CFIR), to study the facilitators and barriers of school wellness programming. Following the SWITCH capacity-building framework, elementary school (N= 30) wellness teams (SWT) were provided with training, resources, and a web-based platform designed to enhance health behavior change for obesity prevention in youth. The 2019 iteration of SWITCH intentionally promoted support from state Extension staff during implementation, but the SWTs had autonomy over how programming was implemented. Data on school programming efforts were collected from SWTs through 3 standardized surveys (pre-mid-post) and a post-implementation interview. Indicators of school wellness capacity and school wellness environment were assessed using the validated School Wellness Environment Profile (SWEP) and changes (pre-post) analyzed using 2-Way (Time\*Extension Support) ANOVA models. Interview data were analyzed using a constant comparison approach, followed by deductive analysis grounded in CFIR concepts, with particular emphasis on the outer setting, inner setting, and process domains.

Results: Quantitative data revealed no significant main or interaction effects for Extension support. Significant main effects of time (p=0.02) for school wellness environment were observed, but not for capacity (p=0.29). Qualitative data demonstrated that factors within the outer setting (e.g., engaging Extension and community partners) facilitated programming. Inner setting factors (high/low support from administration and school staff) significantly affected implementation. Process construct themes (SWT planning, communication, and engaging students) were found to have a positive influence on implementation.

Conclusions: Results highlight the facilitators and barriers of school wellness programming and the supportive influence from Extension and community partners. The mixed-methods framework identified other factors in inner setting and process domains that also explain variability in outcomes of school wellness programming.



# Unpack the Salt: Interim assessment of the Victorian Salt Reduction Partnership's media activities

<u>Ms. Emalie Rosewarne</u><sup>1</sup>, Ms. Kathy Trieu<sup>1</sup>, Ms. Clare Farrand<sup>1</sup>, Ms. Chelsea Davidson<sup>2</sup>, Ms. Elizabeth Joldeski<sup>2</sup>, Ms. Natasha Darrigan<sup>2</sup>, Ms. Sian Armstrong<sup>2</sup>, Ms. Jane Potter<sup>3</sup>, Ms. Jenny Reimers<sup>3</sup>, Prof. Jacqui Webster<sup>1</sup>

<sup>1</sup>The George Institute for Global Health, Sydney, Australia, <sup>2</sup>Heart Foundation, Melbourne, Australia, <sup>3</sup>Victorian Health Promotion Foundation, Melbourne, Australia

#### Pre-recorded Presentation

Purpose: Australians are consuming almost double the recommended maximum salt intake. The Victorian Salt Reduction Partnership was established to coordinate efforts to reduce salt intake in the state of Victoria. As part of an intervention strategy, media and advocacy strategies were used to raise public awareness and stimulate industry and government action on salt reduction. This included periodically scheduled media releases of product category reports, which highlight the salt content of different processed foods within a category. This study aimed to perform an interim assessment of outcomes and identify if there are characteristics of the media strategy that led to better uptake and engagement.

Methods: Descriptive quantitative analysis of indicators of media coverage (media items, cumulative audience reach, advertising space rate) and food industry engagement (number of food manufacturers engaged, number and type of follow up actions) were performed for six product category reports (bread, cooking sauces, ready meals, dips and crackers, processed meats, Asian-style sauces). A qualitative analysis of the content and framing of the media release statements, which accompanied the product category reports, was also conducted in NVivo.

Results: A total of 759 media items (print and online news, radio and TV) were generated. On average, the cumulative audience reach was over 5.6 million Australians, and this ranged from less than one million to more than seven million. Approximately one-quarter of food manufacturers contacted were directly engaged by the VSRP, with between one and three manufacturers being engaged per report. The qualitative analysis of the media releases identified three main themes: general salt information (e.g. current salt intake, salt intake and health outcomes), outcomes of the product category report (e.g. range in salt levels, contribution to maximum daily salt intake) and calls to action (e.g. industry to reformulate, government to set salt targets). Differences in the themes and framing of product category reports were identified.

Conclusions: The media can be used as a tool to reach consumers with salt reduction messages and to engage food manufacturers in discussions about salt reduction. Further research is needed to determine what characteristics increase the effectiveness of media advocacy for nutrition interventions.



# Innovative recruitment pathways to the ComeBACK trial: discussion of a variety of low cost recruitment strategies.

<u>Ms. Siobhan Wong<sup>1</sup></u>, Dr. Leanne Hassett<sup>1, 2</sup>, Ms. Sandra O'Rourke<sup>1</sup>, Ms. Catherine Kirkham<sup>1</sup>, Ms. Betty Ramsay<sup>1</sup>, Ms. Claire Morris<sup>3</sup>, Ms. Annie Lewis<sup>4</sup>, Dr. Maayken van de Berg<sup>3</sup>, Associate Professor Anne Tiedemann<sup>1</sup>, Prof. Cathie Sherrington<sup>1</sup> <sup>1</sup>Institute for Musculoskeletal Health, Sydney, Australia, <sup>2</sup>Discipline of Physiotherapy, Faculty of Health Sciences, The University of Sydney, Sydney, Australia, <sup>3</sup>Dept of Rehabilitation, Aged and Extended Care, Flinders University, Adelaide, Australia, <sup>4</sup>Eastern Health, Melbourne, Australia

### Pre-recorded Presentation

Purpose: Participant recruitment to community-based physical activity trials can be challenging. We are trialling different methods to recruit participants to the ComeBACK trial, a 3-arm pragmatic randomised controlled trial investigating the effectiveness of behavioural interventions on physical activity for adults with self-reported walking difficulty.

Methods: Recruitment to the ComeBACK trial is occurring using varied strategies

i) From the end of episode of care at an acute or rehabilitation hospital in New South Wales (NSW), South Australia (SA) and Victoria (VIC). Research staff facilitate screening at sites in VIC and SA.

ii) In each of these states and Queensland recruitment also occurs from the general community using advertisements in social media and through consumer organisations. Patients recruited via this method are directed to a website where they are screened using the eligibility criteria. Research staff then contact the person to assess their interest and confirm their eligibility.

The costs associated with each of these recruitment methods is being collected.

Results/findings: Since the commencement of recruitment in February 2019, 520 people have been screened, 118 participants have been recruited and 113 randomised. 76% of participants recruited are female with an average age of 69 years.

In the first 5 months of recruitment, 1 person (3%) was recruited from the community and 29 (97%) from health services. Social media advertising via Facebook commenced in more recent months in metro regions of Melbourne, Sydney and Adelaide (per advertisement: average cost \$235.00; average length 6 nights; average reach 15,172) and via a NSW government digital newsletter targeting older people. In the last 5 months 83 participants have been recruited, 59 (71%) from the community via advertisement and 24 (29%) from health services.

Conclusions: Several recruitment strategies have been successfully used in the ComeBACK trial. The use of advertising in both social media and with consumer organisations has yielded an increase in recruitment rates compared with recruitment from health services with or without the addition of research staff. Barriers to recruitment of participants directly from health services warrants further exploration to determine the suitability of this type of intervention within the Australian healthcare system.



# Second-level Active School Flag: end of the first year

**Dr Kwok Ng<sup>1, 2</sup>**, Ms. Fiona McHale<sup>1</sup>, Ms. Joanna Clifford<sup>1</sup>, Dr. Sarah Taylor<sup>3</sup>, Prof. Donal O'Shea<sup>4</sup>, **Professor Catherine Woods<sup>1</sup>** <sup>1</sup>Physical Activity for Health, Health Research Institute, Department of Physical Education and Sport Sciences, University of Limerick, Limerick, Ireland, <sup>2</sup>School of Educational Sciences and Psychology, University of Eastern Finland, Joensuu, Finland, <sup>3</sup>School of sport and Exercise Sciences, Liverpool John Moores University, Liverpool, United Kingdom, <sup>4</sup>University College Dublin, Dublin, Ireland

### Pre-recorded Presentation

### Purpose:

Whole-school physical activity programmes is recognised as part of Ireland's National Physical Activity Plan. Attempts to transfer the successful primary Active School Flag programme to second-level schools (SLASF) have led to the need for conducting a feasibly trial before a definitive randomised control trial. The SLASF is a theory driven two-year and two-tiered (Year 1 – certificate, Year 2 – flag) intervention using co-design between students, policy and researchers. The purpose of this study is to report the limited efficacy during the first year of the programme.

### Methods:

In the first year, three feasibility and process evaluation case-study schools (mixed, all-girls and mixed lower socioeconomic status) were recruited. Multiple methods throughout the school year included monthly observations, full school needs assessment questionnaires, stakeholder interviews and a subsample completed an outcomes survey and physical health measures including accelerometers at baseline (T0) and the end of year 1 (T1). Matched, by school type, control schools (without SLASF) were recruited to provide limited efficacy data on the SLASF outcomes survey and were analysed through t-tests between conditions and reported through Cohen's d.

### Results:

The response rate in the outcomes survey dropped by 86% (n=299) and 74% (n=216) between T0 and T1 in intervention and control schools respectively. Accelerometer data dropped by 79% (T0; n=163, T1; n=128), and physical health measures dropped by 89% (T0; n=206, T1; n=184) between the two time points from the intervention schools. Control schools were involved with these measures. At baseline, screening of physical activity levels and screen time did not differ among females, between the intervention and the control schools. However, females in intervention schools had lower levels of physical activity self-efficacy (p=.001, d=0.33), and higher student autonomy (p<.001, d=0.35), whereas for males there were higher levels of peer support (p=.04, d=0.32) than control schools.

### Conclusions:

The SLASF is a complex behaviour intervention. More effort on student engagement and staff involvement is needed to increase adherence of the intervention across the two-year two-tier intervention. Subtle statistical differences in T0 outcome data between the conditions must be taken into consideration when analysing the limited efficacy data from the feasibility study.



# What support was actually implemented and did schools uptake it? Fidelity and reach of an implementation support intervention – the scale up of the Physical Activity 4 Everyone (PA4E1) secondary school physical activity program

<u>Mr. Matthew Mclaughlin<sup>1,2,3,4</sup></u>, Mr. Tom McKenzie<sup>1,2,3,4</sup>, Dr. Rachel Sutherland<sup>1,2,3,4</sup>, Dr. Elizabeth Campbell<sup>1,2,3,4</sup>, Associate Professor Luke Wolfenden<sup>1,2,3,4</sup>, Prof. John Wiggers<sup>1,2,3,4</sup>

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### Pre-recorded Presentation

Purpose: Schools were randomly allocated to a control arm (n=25) or the Physical Activity 4 Everyone (PA4E1) program group (n=24). Program schools received implementation support incorporating seven overarching strategies to implement seven physical activity practices over 24 months. We address the fidelity and reach of, and modifications to, the implementation support strategies, as these domains are rarely well described. Firstly, to understand if the implementation support was delivered as intended, we specify what components of support were actually delivered to schools (fidelity). Secondly, to explore what support may have been useful or relevant to schools, we specify what support schools actually up-took (reach). Finally, we specify modifications to the implementation support provided.

Methods: We coded the seven implementation support strategies of PA4E1 into 23 sub-strategies and devised both fidelity and reach assessment criteria. Data were obtained from project administrative data; surveys with teachers leading the program and Head Teachers of Physical Education; and from a fidelity monitoring log completed monthly by the research team. Descriptive statistics summarise the dose of the implementation support intervention (fidelity and reach), allowing equal weight to sub-strategies (n=23) within each strategy (n=7). Modifications were recorded via consensus at monthly research team meetings according to the FRAME framework.

Results/findings: At 12 months, fidelity across all schools (n=24) was high, 95.6% (SD 6.4; range 86.1-100%). The reach score was 81.5% (SD 7.5; range 69.0 -91.7%), indicating that schools up-took the majority of sub-strategies. Sub-strategies with the lowest reach were: providing feedback reports to school principals (6/24 schools); the school committees responsible for PA4E1, as schools did not form committees, include an executive member or meet termly (10-15/24 schools); in 12 of 24 schools, less than 70% of PE teachers completed online training. Fidelity and reach at 24 months will be reported also. Modifications across the 24 months were mainly to content and context, and both planned and unplanned. Consensus indicated the impact of modifications was minimal, and none were to core program elements.

Conclusions: The majority of the support provided to schools was implemented as intended, at least over 12 months, and schools up-took the majority of what was offered.



# Active Recreation in Children and Adolescents: A Systems Dynamic Approach to Modelling Physical Activity Promotion

Mr. Samuel Cassar<sup>1</sup>, Dr. Harriet Koorts<sup>1</sup>, Dr. Chris Swain<sup>1</sup>, Prof. Paul Salmon<sup>2</sup>, Mr. David Strickland<sup>3</sup>, <u>Prof. Jo Salmon<sup>1</sup></u> <sup>1</sup>Deakin University, Burwood, Australia, <sup>2</sup>University of the Sunshine Coast, Sunshine Coast, Australia, <sup>3</sup>Sport and Recreation Victoria, Melbourne, Australia

### Pre-recorded Presentation

Purpose: Physical activity promotion is embedded within complex systems and active recreation represents an opportunity to improve children's physical activity participation. However, as the factors that influence active recreation are complex, new methodological approaches are required. This study developed an active recreation static systems model by mapping key stakeholders, correlates, and intervention evidence for promoting child and youth active recreation in Victoria, Australia.

Methods: Seven databases were searched for reviews of correlates and interventions of child active recreation, published between January 2013 and July 2018. These were mapped and causal loop diagrams generated. An actor map of stakeholders included six levels of influence: 1) international; 2) government; 3) regulatory and peak bodies, advocacy groups, and industry associations; 3) local government, education, and sport; 4) social environment; 5) individual; and 6) built environment. Stakeholders were invited to face-to-face interviews to provide input to expand and refine the maps and causal loop diagrams.

Results: Three maps and two causal loop diagrams for children and adolescent's active recreation were developed including relevant actors, correlates, and interventions. Literature searches uncovered correlates at the local (n=9), social (n=28), individual (n=35), and built environment (n=21) level. There were 49 variables at the local (n=9), social (n=13), individual (n=19), and built environment (n=8) targeted in interventions. The actor map identified 125 specific actors in relation to active recreation in Victoria. This included: international (n=10), government (n=19), regulatory body and advocacy group (n=44), local (n=16), social (n=20), individual (n=3), and built environment (n=13) levels of influence. Twenty-three individuals participated from 16 stakeholder organisations ranging from public, private, and not-for-profit groups, government, regulatory or advocacy, education, sport, social, and built environment organisations. Only a small number of stakeholders identified active recreation as their core business. Feedback indicated the positive potential for systems modelling approaches as a policy, appraisal, advocacy, and decision-making tool.

Conclusions: By identifying priorities and action areas likely to have system-level impacts, systems modelling approaches represent a vital step in moving beyond cause-effect models of physical activity promotion and could help identify leverage points to effectively promote active recreation in children and youth.



# Examining culture, context and systems in the development and implementation of the Stand Up for Health programme

Dr. Divya Sivaramakrishnan<sup>1</sup>, <u>Ms. Jillian Manner<sup>1</sup></u>, Prof. Ruth Jepson<sup>1</sup>, Dr. Graham Baker<sup>1</sup>, Mr. Richard Parker<sup>1</sup>, Mr. Andrew Stoddart<sup>1</sup>, Mr. Scott Lloyd<sup>2</sup>

<sup>1</sup>University of Edinburgh, Edinburgh, United Kingdom, <sup>2</sup>Public Health South Tees, Edinburgh, United Kingdom

**Pre-recorded Presentation** 

**Purpose:** Contact centres have been described as "constrained" work environments with rigid organisational and environmental structures, where staff members may experience limited autonomy over their working practices. Organisational pressures to maintain high levels of productivity and meet targets often work against investment into health and physical activity programmes within some contact centres. To maximise effectiveness and sustainability, it is essential that to consider these cultural, contextual and system factors while developing health promoting interventions for this sector. Stand Up for Health (SUH) is a workplace intervention developed to target sedentary behaviour in contact centres. In this symposium, we will examine the development and implementation of the SUH intervention, and the significance of culture, context and systems in this process.

### Methods:

Development: The 6SQuID model was used to develop the intervention. This included working closely with a pilot contact centre to understand the problem as well as identify cultural and organisational factors to be considered during intervention development, identifying modifiable factors and developing a theory of change. Implementation: A feasibility study is underway to test the acceptability and feasibility of implementing the Stand Up for Health intervention in contact centres. Eleven contact centres have been enrolled in the study. The centres are diverse with respect to culture (private and public ownership), contexts (size of centre, geographical locations), and systems (shift patterns, layout).

**Results:** The SUH intervention has been developed with due consideration given to complex, interacting elements within a contact centre. Over the course of development and delivery, a number of programme components have been identified that have enabled effective implementation and sustainability of the intervention: (i) Coproduction (ii) Fidelity to theories of change rather than activities that catalyse change (iii) Ownership (iv) Importance of organisational change (v) Communication.

**Conclusion:** The SUH programme highlights the importance of cultural, contextual and systemic factors for successful implementation and sustainability of interventions. It is a seminal case study illustrating the consideration of these factors in the development of any health promoting interventions for the workplace.





# Early Care and Education (SIG)



# PLEY-School: Evaluation of an early-elementary school-based outdoor loose parts intervention for its impact on the health of children

<u>Ms. Nila Joshi<sup>1,2</sup></u>, Ms. Jane Cawley<sup>1,2</sup>, Dr. Barbara Ann Hamilton-Hinch<sup>1,2</sup>, Dr. Sara Kirk<sup>1,2</sup>, Dr. Angie Kolen<sup>3</sup>, Dr. Patrick Maher<sup>4</sup>, Dr. Jessie-Lee McIsaac<sup>2,5</sup>, Dr. Daniel Rainham<sup>1,2</sup>, Dr. Laurene Rehman<sup>1,2</sup>, Dr. Rebecca Spencer<sup>1,2</sup>, Dr. Daniel Stevens<sup>1,2</sup>, Dr. Son Truong<sup>1,2</sup>, Dr. Joan Turner<sup>2,5</sup>, Ms. Crystal Watson<sup>1,2</sup>, Ms. Jillian Griffin<sup>6</sup>, Dr. Michelle Stone<sup>1,2</sup>

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Symposium Recording

#### Introduction:

Unstructured, active outdoor play is fundamental to children's physical, cognitive, and social-emotional development. The Physical Literacy in the Early Years (PLEY) project explored how unstructured outdoor play with loose parts in Nova Scotia (NS) childcare settings improved children's physical literacy: the motivation, confidence, competence, knowledge and understanding to be active for life. Loose parts are materials that can be manipulated and combined in various ways (e.g. wooden planks, buckets, tubes), and provide children with more affordances in how they play outdoors. These materials encourage collaboration, problem solving, creative thinking, and sensory awareness. They also help refine motor skill development and encourage risk taking, which helps children develop physical literacy.

#### Purpose:

To date, there is limited evidence exploring the value of outdoor loose parts play in Canadian school environments. Most evidence comes from the United Kingdom and Australia, however none of these school-based loose parts initiatives have done a rigorous, mixed-methods evaluation of the benefits of outdoor loose parts play to children's physical literacy and cognitive development. PLEY School, an upcoming school-based outdoor loose parts play project, will scale up and extend the outdoor loose parts intervention into the early elementary school environment (grades pre-primary to one) and evaluate its impact on children's physical and cognitive health.

#### Methods:

Children's physical literacy and cognitive development will be evaluated, comparing measures at the beginning and end of the school year, and to control schools. Children will be engaged in documenting their loose parts play through go-along interviews and photo-elicitation. Educators and parents will be engaged in dialogue to explore their experiences supporting outdoor play and associated benefits and challenges.

### Anticipated Results:

Preliminary findings from the PLEY project demonstrate that outdoor loose parts play provides physical, cognitive, social, and emotional health benefits for NS preschool-aged children. Similar findings are expected for PLEY School.

Conclusion:





The early years are the most advantageous time for establishing habits that maintain health across the lifespan. This work will be a critical step toward ensuring schools across NS provide an environment where children's health and development are optimized.



# The relationship between outdoor nature play and New Zealand children's physical, social and academic performance

Dr. Charlotte Jelleyman<sup>1</sup>, Ms. Luisa Schreiber<sup>1</sup>, Associate Professor Scott Duncan<sup>1</sup>

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Symposium Recording

### Introduction

The benefits of outdoor, risky play are holistic, numerous, and extend beyond health. We are conducting a programme of work, in collaboration with the Department of Conservation (DoC) and their children's programme, Toyota Kiwi Guardians (TKG), to understand characteristics of individuals most likely to spend time in nature, what the barriers are and what benefits may be associated with doing so.

### Methods

A survey of caregivers whose children had engaged in nature play was conducted. Questions included demographics, motivators and barriers to getting to TKG sites across New Zealand. We are also planning a cross-sectional pilot study that will assess the relationship between primary school children's exposure to nature and wellbeing, physical literacy, psycho-social development, behaviour and academic performance. Chi-squared tests and regression analyses will be used to draw associations between participation in TKG, exposure to nature and the outcomes of interest.

### Results

Preliminary results reveal that families earning more than the median national income, with easy access to outdoor activity sites, were most likely to take part in TKG. Having a positive experience with TKG encouraged families to visit other non-TKG sites such as national parks and beaches. Results from the cross-sectional study will be analysed by March 2020.

### Conclusion

TKG provides a fun and motivating opportunity for families to spend time together in nature. However, there are barriers to engaging, particularly for those from more deprived areas. We will provide preliminary evidence from New Zealand to demonstrate whether children benefit from spending time in nature. Ways to encourage teachers and parents in engaging more with outdoor education and natural spaces will be identified. Further research should implement interventions so that the causal effects of outdoor, risky play can be empirically demonstrated.



# Feasibility of video assessment to measure motor competency in school children

### Prof. Nick Draper

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#### Pre-recorded Presentation

Purpose: Children with higher levels of motor competence appear to maintain higher levels of physical activity across their lifespan. An increasing attrition rate in youth sports and a shift towards unstructured play and recreation means shifting towards a more inclusive way to measure movement beyond sport skills alone. A valid and reliable assessment tool called the Dragon Challenge (DC) is a circuit of fundamental movement skills created to measure both product and process-oriented aspects of motor competency. Although the DC takes 1.5 to 3 min per individual assessment, the purpose of this study was to determine the feasibility of it to be conducted using video recordings in the physical education setting where too few staff are able to execute live scoring (at least 3 are required).

Methods: Thirty-six video recordings of children performing the DC, 14 girls (Mean  $\pm$ SD age = 10.6  $\pm$ 0.84 years) and 22 boys (Mean  $\pm$ SD age = 11.55  $\pm$ 0.8 years), were taken during an otherwise standard DC assessment session. Video recordings were taken using two cameras placed diagonally across the test court. The DC was delivered and assessed in accordance with the DC manual and testing overseen by a gold standard assessor. After live scoring, each participant was also scored by three assessors using the video recordings.

Results: Intra-rater reliability between live and video-recorded assessment scores was excellent (ICC = 0.923; 95%, [CI] 0.850 - 0.961) with no significant differences. The results of a Bland-Altman plot indicated good levels of agreement.

Conclusions: The use of video recording to assess DC performance appears to provide a valid, reliable and time-saving alternative to live assessment and reduces the number of assessors required. Perhaps video recording DC could present a viable assessment tool which provides results that are more indicative of general motor competence for children engaging in all types of physical activities.



# Comparing the effectiveness of the Healthy Start-Départ Santé online training intervention to the in-person training on childcare educators' healthy eating and physical activity practices, and knowledge of fundamental movement skills

### Prof. Stephanie Ward<sup>1</sup>, Prof. Mathieu Bélanger<sup>2</sup>

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#### Pre-recorded Presentation

Purpose: Educators working in early childcare centres (ECCs) are important role models to promote healthy eating (HE) and physical activity (PA) in young children. In-person training interventions with educators have shown positive impacts on children's dietary intake and physical activity. However, the sustainability these interventions is limited by financial and human resource constraints. An online training intervention may be a more cost-effective, sustainable and effective way to reach educators, while also improving their practices. This study aimed to compare the effectiveness of an online version of the Healthy Start-Départ Santé (HSDS) intervention to the traditional inperson intervention and to usual practice on ECC educators' HE and PA practices and knowledge of fundamental movement skills (FMS).

Methods: Seventy-eight ECCs were randomly chosen across the provinces of New Brunswick and Saskatchewan, Canada and were allocated to either the online training, the in-person training or the usual practice group. Educators in each group completed the Nutrition and Physical Activity a self-administered questionnaire before and ten months after the intervention. The questionnaire included questions regarding educators' HE and PA practices in the ECC, as well as their knowledge of children's FMS. Group differences were assessed with mixed-effect models.

Results: Two hundred and four educators completed the pre and post questionnaire. Educators in the online training group reported a greater improvement in the score for HE practices then the change observed among educators in the in-person training and usual practice groups (2.4 vs. vs. 0.6 vs. 1.1, p=0.03). Educators in the online training group reported a greater improvement in the score for PA practices than the change observed among educators in the in-person training group (1.3 vs. 0.1, p=0.03). The rate of improvement in FMS knowledge did not differ across all three groups (p=0.9).

Conclusions: The HSDS online training is a cost-effective method of enhancing educators' knowledge of HE and PA practices in ECCs. Its ability to reach a greater number of educators makes the HSDS online training a promising method to create healthier environments in ECCs.


## Optimising nutrition education for primary school children: an evaluation of components of two existing Dutch programs

Ms. Angeliek Verdonschot, Prof. Emely De Vet, Dr. Tamara Bucher, Prof. Clare Collins, Dr. Annemien Haveman-Nies <sup>1</sup>Wageningen University & Research, Wageningen, Netherlands

Pre-recorded Presentation

Background: A healthy diet is important for children's growth and development. Children need encouragement and support to adopt healthy eating behaviours. Dutch nutrition education programs such as EU-Schoolfruit (EUS) and Taste Lessons (TL) contribute to this by providing children with fruit, vegetables (FV) (EUS) and nutrition education (TL). However, little is known about which components are most effective.

Aim: To examine effective components of existing Dutch nutrition education programs for primary school children (n=1436, n=38 schools) aged 8-12 years.

Hypothesis: It is hypothesized that nutrition education programs are more effective as more components are added.

Measures: Child nutrition knowledge, food literacy and FV intakes are measured by a 30-minute questionnaire for the children.

Design: A quasi-experimental study with three arms: (1) schools that implement EUS, (2) schools that implement EUS + TL and (3) schools that implement no nutrition education. Outcomes are being assessed pre-intervention (baseline), immediately following the intervention (post-intervention), and 6 months post-intervention.

Analysis: Descriptive analysis using the statistical program R. First, the two intervention groups and the control group are being compared on their socio-demographic characteristics using one-way ANOVA. Subsequently, multilevel regression analysis will be conducted to evaluate the effect of EU-Schoolfruit and Taste Lessons on nutrition knowledge, food literacy and fruit and vegetable intake, including three levels: (1) pupil, (2) class and (3) school. Simple linear regression will be used, and potential confounders and effect modifiers will be identified. Effect sizes will be expressed as Cohen's d.

Results: Preliminary results from T0 and T1 indicated a significant increase in nutrition knowledge only for children in schools that participated in both programs (EUS and TL), compared to the control group (p<0.01), but no significant increase in FV intake (fruits p=0.19 and vegetables p=0.20). The change in food literacy scores did not significantly differ between the three groups (p=0.99). Full results of the three measurements (T0, T1 and T2) will be presented.

Conclusion: The two existing nutrition education programs (EUS and TL) have some impact on children's nutrition knowledge and FV intake, but specific effects of individual components needs to be evaluated in the future.



## Similarity of Nutrition and Physical Activity Health Behavior and Effects of Role Modeling Between Childcare and Home Environments in Low-Income Children

Ms. Nina Nandi<sup>1</sup>, Ms. Aileen Rivell<sup>1</sup>, <u>Dr. Julie Gazmararian<sup>2</sup></u>, J Gore<sup>1</sup> <sup>1</sup>Emory University, Atlanta, United States, <sup>2</sup>Rollins School of Public Health, Atlanta, United States of America

Pre-recorded Presentation

Purpose: There is a growing prevalence of childhood obesity, especially within low-income populations. Children under age 5 spend a significant amount of time in early care education centers (ECEs), presenting an opportunity to impact their nutrition and physical activity (PA) behaviors. Aims of this study were to: understand the similarity of child health behaviors between ECE and home environments; and investigate the importance of teacher and guardian role modeling in ECE and home environments on impacting child health behaviors.

Methods: Surveys were conducted at 32 ECEs participating in the HealthMPowers program. Teachers and guardians reported their health behaviors and child's behaviors at ECE and at home, respectively. Measures were based on benchmarks created from federal health guidelines and included frequency of fruit and vegetable consumption and PA. Data was collected at baseline and post intervention. Analysis was done on both baseline data and changes from baseline to post intervention. Similarity of child behavior between environments was assessed by kappa agreement statistics. Spearman correlation analyses were conducted to understand the associations of adult and child health behaviors.

Results/Findings: Analysis indicates agreement between childcare and home environments of 5-10% for frequency of daily fruit and vegetable consumption, and 20% for PA behavior. Spearman correlation analysis indicates that there is a positive association between guardian and child health behaviors at baseline and for changes in behavior, with correlation in behavior ranging from 0.49-0.70. (p



Strategies to improve the implementation of healthy eating, physical activity and obesity prevention policies, practices or programmes within childcare services

### Ms. Courtney Barnes<sup>1,2,3,4</sup>, Prof. Luke Wolfenden<sup>1,2,3,4</sup>

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### Pre-recorded Presentation

Background: Although best practice recommendations exist to guide childcare service implementation of healthy eating and physical activity policies and practices, research indicates that implementation is poor. Due to the increasing amount of implementation research being conducted in the childcare setting, an update of this 2016 review was required to reflect the current state of the evidence.

Aim: The primary aim of the review was to examine the effectiveness of strategies aimed at improving the implementation of policies, practices or programmes by childcare services that promote child healthy eating and physical activity. Secondary aims were to examine the effect of implementation strategies on cost or cost-effectiveness, adverse effects on childcare service staff, and child diet, physical activity or weight status.

Methods: A search of electronic databases and a hand search of international implementation journals and trial registries was conducted in February 2019. Authors independently screened abstracts for eligibility, extracted trial data and assessed risk of bias. Studies with a parallel control group that compared any strategy to improve the implementation of a healthy eating, physical activity or obesity prevention policy, practice or programme by childcare services to no intervention, 'usual' practice or an alternative strategy were included.

Results: In addition to the 10 trials included in the 2016 review, a further 11 trials were identified as eligible. Collectively, the 21 trials sought to improve the implementation of policies and practices targeting healthy eating (six trials), physical activity (three trials) or both healthy eating and physical activity (12 trials). A range of implementation strategies were tested in the 21 trials. Nine studies using score-based measures of implementation were included in pooled analysis, indicating a significant improvement in implementation outcomes (SMD 0.49; 95%CI 0.19-0.79; I2 = 54%; p



## Association of tummy time with infant health outcomes. A systematic review

<u>Ms. Lyndel Hewitt</u>, Ms. Erin Kerr, Dr. Rebecca Stanley, Prof. Tony Okely <sup>1</sup>The University of Wollongong, Wollongong, Australia

#### Pre-recorded Presentation

Background: The World Health Organization (WHO) recommend tummy time for infants due to the benefits of improved motor development and reduced likelihood of plagiocephaly. Due to the poor uptake of these recommendations, a comprehensive analysis regarding additional benefits and/or the association of tummy time with other health outcomes is required. Further understanding the effects of tummy time on infant health and development may assist to improve compliance with the WHO tummy time recommendations of 30-minutes per day.

Objective: To review existing evidence regarding the association of tummy time with a broad and specific range of infant health outcomes.

Methods: Electronic databases were searched between June 2018 and April 2019. Peer-reviewed, English language articles were included if they investigated a population of healthy infants (birth to 12 months), used an observational or experimental study design containing an objective or subjective measure of tummy time which examined the association with a health outcome (adiposity, motor development, psychosocial health, cognitive development, fitness, cardiometabolic health or risks/harms). Two reviewers independently extracted data and assessed their quality.

Results: Sixteen articles representing 4237 participants from 8 countries were included. Tummy time was positively associated with gross motor and total development, reduction in BMI-z, prevention of brachycephaly and the ability to move while prone, supine, crawling and rolling. An indeterminate association was found for social and cognitive domains, plagiocephaly, walking, standing and sitting. No association was found for fine motor development and communication. Most studies were observational in design and lack the robustness of a randomized controlled trial. High selection and performance bias were also present. This review also highlighted that further work is required regarding the objective measurement of tummy time rather than relying on parent-proxy questionnaires.

Conclusions: These findings guide the prioritization of interventions aimed to assist infants meet the global and national physical activity guidelines. Results from this review can be used to educate parents, educators and clinicians about the additional benefits of tummy time.



## The relationship between educators' and children's physical activity and sedentary behaviour in early childhood education and care

Dr. Karen Tonge<sup>1</sup>, <u>Dr. Rachel Jones<sup>1</sup></u>, Prof. Anthony Okely<sup>1</sup> <sup>1</sup>University of Wollongong, Wollongong, Australia

#### Pre-recorded Presentation

Purpose: The early childhood education and care (ECEC) environment has a significant role to play in the promotion of physical activity and reduction of sedentary behaviour in young children. Educators' physical activity and sedentary behaviours maybe an important social factor influencing children's physical activity and sedentary behaviour, however limited evidence exists on this relationship. The primary aim was to examine the relationships between educators' physical activity and sedentary behaviours and children's physical activity and sedentary behaviour within ECEC settings.

Methods: A cross sectional study, involving 11 ECEC centres from NSW, Australia. Data for each centre were collected over five consecutive days. Objectively measured physical activity and sedentary behaviour were collected from children using Actigraph accelerometers. Data were analysed using STATA 13c. Linear regression was used to examine relationships between children and educators, adjusted for centre clustering.

Results: Data were collected from 110 educators and 490 children. A significant association was reported between educators' sedentary behaviour and children's sedentary behaviour (p=0.047). Educators spent 61% of their work day in sedentary behaviour sedentary behaviour and 4% in moderate- to vigorous-intensity physical activity. Children spent 48% of their day in sedentary behaviour and 16% in moderate- to vigorous-intensity physical activity.

Conclusions: The relationship between educators' physical activity and children's physical activity has received limited attention in previous studies. Furthermore, no studies have investigated the relationship between educators' sedentary behaviour and children's sedentary behaviour. The positive relationship identified between educators' sedentary behaviours and children's sedentary behaviour in this study highlights a novel area to target in future interventions. Improving physical activity and sedentary behaviours of educators will likely improve children physical activity levels and reduce time spent being sedentary and thus health and wellbeing outcomes.



## Validity and Reliability of the Movement Environment Rating Scale (MOVERS)

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### **Pre-recorded Presentation**

Purpose: Quality of early childhood education and care (ECEC) is important for children's outcomes. To date, quality has largely been measured in the cognitive and socio-emotional domains of child development. The Movement Environment Rating Scale (MOVERS) was recently developed to assess quality in the physical domain. The aim of this study was to determine validity and reliability of MOVERS.

Methods: Data were collected from 13 ECEC setting. Quality was assessed in the 3-5-year-old room using MOVERS, the Sustained Shared Thinking and Emotional Well-being (SSTEW) scale and the Environment Policy Assessment and Observation (EPAO). Children's gross motor skills were assessed using the Test of Gross Motor Development 2nd edition (TGMD-2). Children's fine motor skills were assessed using the Ages & Stages Questionnaire 3rd edition (ASQ-3). MOVERS test-retest reliability was calculated using ICCs, percentage agreement and weighted Kappa. Internal consistency was examined using Cronbach's alpha. To examine concurrent validity between MOVERS, SSTEW and EPAO, correlation coefficients were calculated. Multi-level regression analyses were conducted to examine the criterion validity related to child outcomes associations (TGMD-2, ASQ-3) with MOVERS.

Results: Test-retest reliability revealed excellent reliability of MOVERS (ICC=0.959; p<0.0001; Weighted Kappa 0.904; p<0.0001; percentage agreement: 69% - 100%). Cronbach's alpha analyses indicated excellent internal consistency of the scale (a=0.90 first observations, a=0.89 second observations). There were a large number of statistically significant correlations between the MOVERS and the SSTEW (Spearman's rho 0.57 – 0.87, p < 0.05). Generalized linear mixed models showed a strong relationship between Item 4 of MOVERS (Body movement to support fine motor skills) and ASQ-3. However, the relationship between Item 3 (Gross motor skills) of the MOVERS and TGMD-2 was not statistically significant.

Conclusion: This is the first study to report on the validity and reliability of the MOVERS scale. Despite the small sample size, the results revealed excellent test-retest reliability and excellent internal consistency of the MOVERS scale. Finding relevant tests to evaluate concurrent validity of the MOVERS was challenging due to MOVERS innovative focus on assessing both structural and process quality rather than just process quality.



## Longitudinal associations of sedentary time and physical activity duration and patterns with cognitive development in early childhood

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### Pre-Recorded Presentation

Purpose: The first five years of life are characterized by significant brain development that is critical for cognitive development. Sedentary behaviour and physical activity are important considerations for optimal cognitive development. Few studies have examined whether patterns of these behaviours (i.e., sedentary and physical activity bouts, and sedentary breaks) change across early childhood and none have examined whether these are longitudinally associated with cognitive outcomes. The current study examined: 1) changes in total duration and patterns of sedentary time and physical activity across three time-points, and 2) longitudinal associations of sedentary time and physical activity durations and patterns with cognitive development.

Methods: This longitudinal study included 100 participants aged 2-5 years from Edmonton, Canada, at baseline (2015-16). Participants wore ActiGraph accelerometers at baseline and 6- and 12-month follow-ups. Sedentary time, light- (LPA), and moderate-to-vigorous-intensity physical activity (MVPA) duration and patterns (time spent in a range of bouts [1-3 to  $\geq$ 10 min] and sedentary breaks) were calculated. Participants also completed response inhibition (Fish-Shark Go/No-Go), working memory (Nebraska Barnyard) and global cognitive ability (Woodcock-Johnson III) measures at 2 or 3 time-points. Multilevel growth modelling was used to examine sedentary and physical activity changes and their longitudinal associations with cognitive outcomes.

Results: Sedentary time decreased ( $\beta$  [95% CI]=-9.24 [-15.76, -2.72]; intercept=75.72 min), whereas MVPA duration increased (5.65 [1.89, 9.41]; 362.14) with age. There was also a significant decrease in time spent in  $\geq$ 10-min sedentary bouts (-9.76 [-13.56, -5.96]; 71.56) and significant increases in sedentary breaks (13.41 [7.18, 19.63]; 251.34), and time spent in 1-3-min (2.56 [0.96, 4.15]; 16.82) and 3-5-min (0.86 [0.33, 1.38]; 3.57) MVPA bouts. There was minimal evidence of longitudinal associations with cognitive outcomes.

Conclusions: The observed changes in sedentary time and MVPA are promising for child health. Nevertheless, these were unrelated to cognitive outcomes. Future studies with larger sample sizes should investigate whether specific types of activities are associated with cognitive development over time and establish whether or not these can be changed through interventions.



## A Novel Obesity Prevention Intervention Improves Diet Quality and Sedentary Behavior of 2-5 Year Old Children Cared for in Family Childcare Homes: Results from the Healthy Start/Comienzos Sanos Trial

**Dr. Kim Gans<sup>1, 2</sup>**, Dr. Alison Tovar<sup>3</sup>, Dr. Noereem Mena<sup>3</sup>, Mr. Augustine Kang<sup>2</sup>, Dr. Kristen Cooksey-Stowers<sup>1</sup>, Ms. Laura Dionne<sup>2</sup>, Ms. Jennifer Mello<sup>2</sup>, Ms. Qianxia Jiang<sup>1</sup>, Dr. Tayla Ash<sup>2</sup>, Dr. Patricia Risica<sup>2</sup> <sup>1</sup>University of Connecticut, Storrs, United States, <sup>2</sup>Brown University, Providence, United States, <sup>3</sup>University of Rhode Island, Kingston, United States

### Pre-recorded Presentation

Purpose: Family childcare homes (FCCHs) are the second-most utilized non-relative childcare in the United States and may be more obesogenic than childcare centers. Yet, little research has been done in this setting.

Methods: Healthy Start/Comienzos Sanos is a cluster-randomized trial to help family childcare providers (FCCPs) change FCCH environments and improve the diet and physical activity (PA) of children aged 2-5 years in their care. FCCPs completed two surveys and underwent two days of FCCH observation/measurement at baseline and 8 months. The intervention arm received a novel obesity prevention intervention and the control arm a literacy intervention. Child dietary intake was collected using the Dietary Observation in Child Care. Diet quality was calculated using the Healthy Eating Index-2015 (HEI) total and 13 component scores per child (n=366). Child's PA was measured using hip-worn triaxial accelerometers. Children's height and weight were measured to calculate BMI. HEI scores, PA and BMI were averaged by FCCH and ANOVA models examined change in from baseline to follow-up by experimental condition.

Results: 119 FCCP enrolled (100% female, 72% Hispanic, 16% Black, mean age 48.4 years, 11% no high school education) with 87 completing 8 month follow-up. Baseline: Children's HEI scores averaged 61.87 (SD 10.4) (80=healthful diet). Most of children's time in FCCH was spent sedentary ( $61.5\%\pm11.0\%$ ), with only 9.9% $\pm4.7\%$  in moderate-to-vigorous PA (MVPA); 33% of children were overweight/obese.; Pre-Post Change: Children in the intervention group FCCH had greater changes than control group in total HEI scores (+3.82 vs. -3.34, p = 0.0004), and total vegetable (+0.49 vs. -0.37, p =0.03); added sugar (+0.97 vs. +0.01, p = 0.03) and refined grain (+1.26 vs. -0.17, p = 0.06) HEI component scores. Furthermore, intervention children decreased percent sedentary time (-1.67% vs. +3.60%, p = 0.042) and increased percent time in MVPA (+1.46% vs. -0.40%, p < 0.08) more than control group children. As expected, there were no between treatment differences in BMI Z-score or BMI-percentile.

Conclusions: The Healthy Start intervention improved the dietary quality and decreased the sedentary time of 2-5 year old children cared for in FCCHs, which has important implications for professional development and policy.



## Menu planning practices in early childhood education and care – practices associated with menu compliance with sector dietary guidelines

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### Pre-recorded Presentation

Background: Despite recommendations, early childhood education and care (ECEC) services do not plan menus in accordance with sector dietary guidelines. An understanding of current practices undertaken in ECEC by service cooks to plan a menu, and whether these practices impact on guideline implementation, is needed to inform the development of future interventions to improve guideline implementation. This study aimed to examine the following among ECEC services: i) menu planning practices; ii) prevalence of menu compliance with sector dietary guidelines; and iii) menu planning practices associated with higher menu compliance with sector dietary guidelines.

Methods: A cross sectional study was undertaken with long day care services within Hunter New England region of NSW Australia. Cooks within participating services completed a pen and paper survey assessing a range of menu planning practices (e.g. frequency of menu review, time allocated to plan a menu). Service's two-week menus were assessed for their compliance with sector dietary guidelines, based on the number of servings of core food groups and discretionary foods provided per child, per day. Simple and multiple variable poisson regression models were used to determine associations between menu planning practices and "higher" compliance with dietary guidelines.

Results: Cooks from 72 services completed the survey, and 69 provided a copy of their menu for review. Results indicated that the service cook was fully responsible for planning the menu in 43% of services. Service menus were compliant with an average of 0.68 food groups, out of a possible 6. In the multiple poisson regression models, a shorter menu cycle length (p<0.05) and the receipt of training opportunities to support menu planning (p<0.01) were significantly associated with higher menu compliance.

Conclusions: Menu compliance with sector dietary guidelines was low among participating services. This study resulted in novel findings not previously reported, namely that services with a shorter menu cycle, and those who have received training opportunities to support planning a menu, are significantly more likely to have higher menu compliance. The implementation of such practices may assist in the planning of menus that are more compliant with dietary guidelines to improve child nutrition in this setting.



## "I was crouching but now I am flying": Impact evaluation of improving the quality of physical education delivery in New Zealand

Mr. Neil Snowling<sup>1</sup>, Ms. Sally Boyd<sup>4</sup>, Ms. Sandy Robbins<sup>4</sup>, Dr. Justin Richards<sup>1,2,3</sup>

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#### Pre-recorded Presentation

### Purpose

The global decline in the quality of physical education (PE) has prompted multiple actions to improve student experiences. As the primary delivery agents of PE, school teachers are a key target audience for intervention. The deterioration in PE delivery prompted Sport NZ to develop Play.Sport in 2016, which is a 4-year community-based initiative that provides hands-on practical support and training for teachers, schools, and community organisations to improve the quality of physical activity, play and sport experiences for young people. Our aim was to understand the impact of Play.Sport on teacher confidence and practice in delivering PE and how this affected the subsequent experience and participation of their students.

### Methods

A mixed-methods evaluation was completed through a total of 45 primary/intermediate schools in two regions of New Zealand between 2016-2019. We assessed change in teacher confidence and practice using a pre-post survey of 197 teachers and subsequent face-to-face interviews of 32 teachers. We assessed changes in student experiences and participation using a pre-post survey of 3185 students and subsequent focus groups with 38 students.

### Results

Teacher confidence to deliver all components of the PE curriculum improved significantly from 45% to 57%. Similarly, their confidence to effectively deliver at least one component of the curriculum significantly improved from 70% to 82%. Over 85% of teachers reported changes in how they delivered PE as a result of the initiative. This finding was substantiated by qualitative findings that highlighted the importance of the support provided by Play.Sport to develop new practice. Student data indicated significant improvement in PE classes as learning environments for: skill development (62% to 70%); working together (77% to 82%); leadership (60% to 67%); decision making (45% to 58%); community engagement (60% to 67%). The student qualitative results also indicated changes in participation across all strands of the PE curriculum.

#### Conclusions

We found that the Play.Sport initiative improved teacher confidence and practice, which subsequently positively influenced student experience and participation across the PE curriculum. Ongoing evaluation of Play.Sport will elucidate whether this translates into sustained physical activity behaviour change outside of the school setting over the longer term.



## Environmental Influences on Children's Physical Activity and Sedentary Behaviour in Early Childhood Education and Care

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#### Pre-recorded Presentation

Purpose: Physical activity is integral to children's health and wellbeing. Many children attend Early Childhood Education and Care (ECEC), and these environments afford the contexts to support children to be physically active, however, children are not meeting the recommended guidelines for PA while in ECEC. Children's physical activity and sedentary behaviour in ECEC settings is influenced by a number of factors. The purpose of this study was to examine three less-studied environmental factors on children's physical activity and sedentary behaviour in ECEC–routine, size of the outdoor environment and time spent in the outdoor environment.

Method: A cross-sectional study (n=490, aged 2-5y, 11 ECECs) was completed. ECEC routine, size of the outdoor environment and time spent in the outdoor environment were calculated for each centre. Children's physical activity and sedentary behaviour was measured using accelerometers. A multivariate linear regression analysis examined associations of the attributes of ECEC centres (routine, time outdoors, and size of outdoor environment) with the outcome variables, adjusting for the effects of centre clustering and gender.

Results: Children in centres that offered free routines spent significantly less time in sedentary behaviour (SB) (28.27mins/hr vs 33.15mins/hr; p=0.001) and more time in total physical activity (TPA) (7.99mins/hr vs 6.57mins/hr; p=0.008) and moderate- to vigorous- activity (MVPA) (9.49mins/hr vs 7.31 mins/hr; p=0.008) than centres with structured routines. Children in centres with an outdoor environment greater than 400m2 spent significantly less time in sedentary behaviour (28.94 min/hr vs 32.42 mins/hr; p=0.012). Although not significant, children in centres that offered >4h outdoor time spent less time in SB (29.12mins/hr vs 32.65mins/hr) and more time in TPA (16.79mins/hr vs 14.39mins/hr) than those that offered less outdoor time.

Conclusion: Modifiable practices such as offering a free routine, increasing the time spent in outdoor environments and managing the available space effectively could potentially offer an easy and sustainable way for ECEC to promote physical activity and reduce sedentary behaviour.



## Standardising food provision measurement, exchanging discretionary foods with vegetables and regulation: How do they work together in ECEC services?

Ms. Ros Sambell<sup>1, 2</sup>, Dr. Ruth Wallace<sup>1,2</sup>, Dr. Leesa Costello<sup>1,2</sup>, Dr. Johnny Lo<sup>1</sup>, Prof. Amanda Devine<sup>1,2</sup> <sup>1</sup>Edith Cowan University, Perth, Australia, <sup>2</sup>National Nutrition Network - Early Childhood Education and Care (NNN-ECEC), Perth, Australia

### Symposium Recording

Purpose: This presentation highlights the poor state of vegetable provision in Early Childhood Education and Care services (ECEC) at a time when obesity prevention is a public health priority. Young children are an important group as they present a unique early intervention opportunity to embed healthy eating language and practice. Around 1.3 million children access ECEC, with one in four (n=325,000) children likely to have health consequences from increased weight. Standardising measurement of food provision will provide accurate surveillance of the sector. Including strategies that recognise barriers for vegetable intake compliance and displacing discretionary foods with vegetables will likely increase vegetable provision thus intake.

Methods: In Western Australia 30 randomly chosen Long Daycare (LDC) had ingredients weighed, for morning tea (MT), lunch (L) and afternoon tea (AT), over two days. Data were analysed using R (version 3.4.2). A one-sample t-test compared the LDC mean servings of core food groups for a reference child (2.5-year-old male), against 50% of Australian-Dietary-Guidelines (ADG). Costing of ingredients (Foodworks 8.0.3) determined costing distribution. Logistic regression assessed if provision compliance was associated with food cost. Discretionary food serve calculation was based on ADG serve recommendations.

Results: 10% of services complied with all five food group recommendations, 40% of services were compliant for vegetable provision. Vegetables most commonly offered were; other (33.6%), red/orange (24.5%), potatoes (18%), other starchy (12.2%), legumes (9.3%) and green leafy vegetables (2%). A significant difference in vegetable provision based on expenditure between those spending <\$1.50 compared to those spending >\$2.50 per child/day; increased budget increased vegetable provision. >90% of LDC over provided sodium 766±492 mg/d, saturated fat 9.9±7.9 g/day and discretionary foods 1.0±0.9 serves/day by [median±interquartile range],all p<0.001.

Conclusion: Under provision of vegetables has significant impact on health outcomes for children. Standard food provision assessment methods would allow surveillance of vegetable provision in LDC nationally and against current guidelines, inform regulatory bodies to mandate for guidelines supporting adequate vegetable provision and strategies for implementation.



## Discrepancy between reported and observed role modelling by educators in the early childhood education and care setting

<u>Dr. Rebecca Byrne<sup>1, 2</sup></u>, Dr. Kim Baxter<sup>1</sup>, Dr. Elizabeth Martin<sup>1</sup>, Prof. Sue Irvine<sup>1</sup>, Dr. Helen Vidgen<sup>1</sup>, Dr. Danielle Gallegos<sup>1</sup>, Professor Stewart Trost<sup>1</sup>

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#### Symposium Recording

Purpose: Role modelling by educators in the Early Childhood Education and Care setting is a promising strategy to promote healthy eating amongst young children (Ward et al 2015). The aim of this analysis was to investigate the prevalence of educator role modelling including modelling of vegetable intake.

Methods: Participants were staff at long day care centres (n=10) across Brisbane and the Sunshine Coast in Australia, participating in a pilot trial of professional development for educators regarding responsive feeding practices. Self-reported feeding practices and demographic data were collected via online survey using the Childcare Food & Activity Practices Questionnaire (Gubbels et al 2015). Direct observation of feeding practices and food provision were collected using the 'Environment and Policy Assessment and Observation' tool (Ward et al 2008).

Results: Self-report data were available for 88 educators (96% female). Mean duration working in ECEC was 13 years (SD=9.4). Median factor score for role modelling was 5.0 (IQR=4.3-5.0), on a possible scale of 1-5. A total of 118 meals were observed across all centres. Nine centres provided food for the children. Of these, one had a kitchen onsite, while the remainder used a catering company. All centres shared a policy which stated 'model healthy eating habits when sharing meals with children'. The proportion of mealtimes at which practices were observed were [median (IQR)]: Educator sat with children, 75% (70.2-83.7); enthusiastic role modelling, 22% (0-33.3); ate the same food, 20% (5.8-33.3). In two centres, no educators were observed eating the same food as children at any meal. Of the 26 occasions in which an educator was observed to eat the same food, 14 of these were consuming a vegetable.

Conclusion: Despite policy support, opportunities for modelling, and high levels of educator self-report, prevalence of observed modelling was low. These findings will be discussed, prompting #ISBNPA2020 delegates to consider organisational barriers to modelling, such as shift rosters and food service, accuracy of measurement of practices, and potential to facilitate role-modelling by analysing economic costs and benefits of meal provision by centres to educators.



## Quantity and variety of fruit and vegetables served in New Zealand childcare centres: An analysis of menus, celebrations and nutrition policies

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#### Symposium Recording

Purpose: The proportion of New Zealand children meeting the vegetable intake guideline has declined over the past decade. Early childhood education (ECE) centres can assist to improve exposure, taste preference and liking for vegetables in children. This study aimed to assess the presence and variety of fruit and vegetables on ECE menus, at celebrations, and in policies.

Methods: All licensed ECE services in three regions of New Zealand were invited to participate in a 65-item online survey in May 2014. Policies were analysed using the Wellness Child Care Assessment Tool (WellCCAT-NZ). Menus were evaluated for adherence to 50% recommended fruit and vegetable (F+V) quantity (10+ serves/week) and variety (5+ different serves/week) using Ministry of Health guidelines for 2-4 year olds. Chi-square tests for differences in proportions and ANOVA for differences in means between categorical groups were conducted (p<0.05).

Results: 257 services participated (including 91 private, 81 community centres), providing 82 policies and 57 menus. 82.4% of private centres and 55.6% of community centres served food daily to children. All but one centre served adequate F+V quantity across the week. Only five menus (8.8%) contained the same or a greater number of vegetables compared to fruit. 82.4% contained adequate F+V variety: 37.8% of private centres compared to 94.7% of community centres. Centres with written nutrition policies and a cook with nutrition training were more likely to meet F+V variety criteria. 40% of centres usually served F+V at celebrations. Mean scores on the WellCCAT (max=100) were 27.7 and 26.1 for comprehensiveness of policy in private and community centres, respectively, and 10.7 and 13.8 for strength of policy wording.

Conclusions: Vegetables did not appear in sufficient quantity on ECE menus to enable children to improve their intake, liking or food preferences. The variety of F+V served in privately-run ECE centres was particularly concerning. Centres should consider adding specific policies regarding vegetables to ensure quantity and variety at lunch and snacks, and serve vegetables alongside other foods at celebrations.



## Barriers faced by childcare educators in influencing feeding practices of young children

### Dr. Penelope Love<sup>1,2,3</sup>, Ms. Melissa Walsh<sup>3</sup>, Prof. Karen Campbell<sup>1,2,3</sup>

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#### Pre-recorded Presentation

#### Purpose:

Childhood is a critical time for growth and development, with eating habits and food preferences influenced by their environments. Two-thirds of Australian children (1-4 years) attend childcare with long day care (LDC) used most frequently and for the longest period. Child food intakes in LDC have been shown to be inconsistent with dietary recommendations and increased exposure to childcare associated with adiposity. LDC is therefore an important environment for public health intervention to prevent childhood obesity.

### Methods:

A cross sectional qualitative study of newly graduating childcare educators across two campuses in Geelong and Melbourne, Victoria. Online surveys collected demographic data. Focus group discussions used photo elicitation to explore participant knowledge, attitudes and practices of the Childcare Food & Activity Practices Questionnaire (Gubbels et al 2015).

### Results:

Respecting child choice was considered important with pre-served versus self-served meals debated as preferred methods to facilitate self-regulation. Participants felt their role was to monitor types and amounts of foods offered, with children determining how much to consume. Self-regulation was challenged by childcare food monitoring procedures. Picky eating and emotional behaviours elicited personal beliefs and practices of coercion and pressure to eat. Role modelling was understood as important however often restricted by childcare policy. Participants described a gap between learnt knowledge and observed practice.

### Conclusions:

Childcare educators agree they are influential in the health of children. Knowledge learnt appears to be shifting towards healthy feeding practices, however application is often challenged by childcare policy and procdure. Australian childcare is a regulated industry, therefore existing policy and procedures could be strengthened to support healthy feeding practices of young children.



## Development of an app-based assessment tool for childcare physical activity environments and practices

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<sup>1</sup>Coburg University of Applied Sciences and Arts, Coburg, Germany

Poster

### Purpose

Childcare centers are settings with a huge impact on children's health and health behavior and should therefore be encouraged to implement policies and practices to promote physical activity. The project "QueB 2 – developing quality with and through physical activity" aims at exploring how stakeholders can be involved to identify childcare centers with need for action. For this purpose, an app-based quick assessment tool is developed.

### Methods

First, stakeholders working with childcare centers (consultants and supervisors) were identified and invited to take part in group discussions about the following questions: Which role does physical activity play in your daily work? Which issues concerning physical activity arise in the childcare centers you work with? How can you identify childcare centers' need for action concerning physical activity? What support do you need for that? Second, a first draft of a quick assessment checklist building on scientific evidence and existing frameworks was

created and sent to stakeholders for feedback. In the third step, the quick assessment tool is developed as a web app and tested by stakeholders.

### Results

Physical activity plays only a small role in the work of childcare consultants and supervisors. However, they consider it an important issue for childcare centers and see the added value of an app-based assessment tool giving it a stronger weighting. The tool should be simple and suitable for use in counseling to give a first impulse to childcare centers with small expenditure and without consequences. The assessment should be combined with information material and an invitation to activities like workshops or trainings for childcare center staff.

### Conclusions

Stakeholders can be involved to sensitize childcare centers to the issue of physical activity environments and practices with the help of an app-based quick assessment tool.



## CUPS pilot study: Evaluation of an integrated nutrition and mathematics curriculum with primary school teachers and children

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#### <u>Poster</u>

Purpose: Schools provide an ideal environment to implement nutrition education as many children can be reached frequently and for extensive amounts of time. However, research indicates that teachers find it challenging to implement nutrition lessons due to crowded curricula and limited time available. A cross-curricular approach integrating nutrition with core academic subjects could potentially address this challenge. Therefore, the study aimed to evaluate a teaching unit that integrated nutrition within mathematics and explore teacher and student perspectives.

Methods: Four primary schools participated in the CUPS randomised controlled trial (n=72 students in Year 3/4). Students in the intervention condition (n=46) received 6 x 40 min lessons on food groups, portion size, volume and capacity. Lessons included experiential learning with mathematics cubes and food models, conducted over four weeks. The control condition continued their usual lessons on volume and capacity. Semi-structured interviews (teachers, n=3) and focus groups (students, n=15) were held immediately post-intervention. Qualitative data was analysed using a thematic approach.

Results: Preliminary results from both interviews and focus groups found the responses could be divided into content and practical themes. These themes included several subthemes related to food models, mathematics cubes, mathematics, nutrition, time and integration. Most students indicated they liked the lessons, food models and cubes. Findings from the teacher interviews aligned with results from the student focus groups. Teachers reported most students were engaged and became more aware of healthy eating and serve sizes. Although they enjoyed teaching the lessons, teachers suggested integration of volume and capacity could be further improved in order to address the time barrier for teaching nutrition.

Conclusion: CUPS uses an innovative concept to teach primary school children about healthy foods and portion size estimation while simultaneously learning about the NSW k-6 Mathematics curricular standards. Although teachers and students perceived the program as fun and interesting, lesson plans could be refined to enhance integration of curriculum content, with complementary resources expanded.



## Associations between gross motor skills and executive functions in preschoolers

<u>Dr. Sanne Veldman<sup>1</sup></u>, Dr. Megan Hammersley<sup>2</sup>, Dr. Rachel Jones<sup>2</sup>, Dr. Rebecca Stanley<sup>2</sup>, Dr. Steven Howard<sup>2</sup>, Prof. Anthony Okely<sup>2</sup>

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<u>Poster</u>

Purpose: This study aims to examine the associations between components of gross motor skills (locomotor skills, object control skills, balance) and executive functions (working memory, inhibition, shifting) and self-regulation in Australian preschoolers. As executive functions are foundational for academic achievement, promoting their development is important. This study addresses the limitations of previous research and is the first to also examine sex differences.

Methods: This study used the baseline data collected for Jump Start; a two-arm, parallel group, 18-month randomized controlled trial aimed at increasing physical activity in preschoolers while attending Early Childhood Education and Care Services (ECEC). Gross motor skills were assessed using the Test of Gross Motor Development-2 and the balance subtest of the Get Skilled Get Active. Executive functions were assessed using the Early Years Toolbox. Self-regulation was assessed using the Head, Toes, Knees, Shoulders assessment. Associations were examined using linear regression models accounting for clustering of ECEC services and adjusted for sex and age.

Results: A total of 566 preschoolers across 43 ECEC services were included (mean age = 3.2±0.4 years, 51% girls). The gross motor quotient, locomotor subtest and object control subtest were all significantly associated with visual-spatial working memory and inhibition. Balance was also associated with inhibition. The gross motor quotient and balance were associated with shifting. The locomotor subtest was associated with self-regulation. Sex differences were observed in associations with object control skills and balance. Girls demonstrated an association between balance and visual-spatial working memory and shifting, whereas boys demonstrated an association between object control skills and visual-spatial working memory.

Conclusions: Gross motor skills and executive functions are related in this sample of young Australian preschoolers. Results reinforce the need for early commencement of gross motor skill promotion and attention for sex differences as this might be important for cognitive development throughout life.



## Physical activity and associated health and development in children aged 0-5 years: A systematic review

<u>Dr. Sanne Veldman<sup>1</sup></u>, Dr. Teatske Altenburg<sup>1</sup>, Prof. Mai Chin A Paw<sup>1</sup> <sup>1</sup>Amsterdam UMC, location VUmc, Amsterdam, Netherlands

Poster

Purpose: The aim of this systematic review is to critically review the evidence on the prospective relationship between physical activity and health and development in children aged 0 to 5 years. Over recent years, there has been increasing interest in early childhood. As such, and in combination with contradicting conclusions in previous reviews, the evidence on the effects of physical activity on health and development in early childhood has been reexamined.

Methods: Three electronic databases were searched (PUBMED, SportDiscus, PsychINFO) for observational longitudinal studies and (randomized) controlled trials. All forms of physical activity in healthy children (mean age <5 years) were included as long as the amount was specified by quantity. Outcome measures included body composition, cognitive development, motor development, psychosocial health, cardiovascular health, bone and skeletal health and risks/harm. Data on study methodology, participants, exposure, outcomes and results were extracted. Methodological quality was assessed using a modified version of the 'Quality Assessment Tool for Quantitative Studies'.

Results: Thirty-nine articles were included in this review. Outcome measures were body composition (n=14), motor development (n=11), cognitive development (n=10), cardio-vascular health (n=7), social-emotional development (n=2) and bone health (n=2). Ten studies had high methodological quality. There was moderate evidence for an association between physical activity and motor development, cognitive development and cardiovascular health. There was insufficient evidence for an association between physical activity and between physical activity and body composition, social-emotional development and bone health.

Conclusions: The current scientific evidence on the effects of physical activity on health and development in young children is insufficient. Based on consistent findings from studies with weak-to-high methodological quality, there is moderate evidence for an association between physical activity and motor development, cognitive development and cardiovascular health in children aged 0 to 5 years. More high-quality studies need to be conducted in order to determine dose-response relationships between physical activity and health and development in early childhood. Special attention should be given to toddlers (ages 1-3 years) as least studies were available in this age group.



## Accelerometer-based physical activity, perceived, and actual fundamental movement skill proficiency in Hong Kong preschool-aged children

Miss Qing He, Prof. Amy Ha

<sup>1</sup>The Chinese University of Hong Kong, Hong Kong, China

Poster

Purpose: This study aims to investigate the relationship among the actual fundamental movement skills (FMS) proficiency, perceived FMS and physical activity (PA) among Hong Kong preschoolers, and further to determine if actual and perceived FMS are associated with children's PA and their genders.

Methods: A hundred and forty-eight preschool-aged children (43% girls; mean age =  $4.52 \pm 0.67$  years) from five Hong Kong preschools/childcare centres were invited to complete the designated assessments. Actual FMS was rated using the Test of Gross Motor Development–2, whilst perceived FMS competency was assessed via the Pictorial Scale for Perceived Movement Skill Competence. Moderate- to vigorous-intensity PA (MVPA) was measured through accelerometers (Actigraph GT3X+) over five days. Mixed linear regression models were performed to assess associations among perceived FMS, actual FMS, and MVPA. Subsequently, mixed model regression analyses were performed to investigate the effects of actual FMS on MVPA levels by sex. All models adjusted for sex and age.

Results: Only 12.8% preschoolers met the WHO recommended 180-minute of PA per day (including 60-minute of MVPA daily). Boys were more active than girls for total PA and MVPA (p < 0.01 for both). Compared to boys, girls had poorer actual object control skills. Perceived motor skill competence was null associated with actual FMS (p = 0.068) and MVPA (p = 0.742) after adjustment for age and sex. Girls' actual FMS were positively correlated with MVPA (B = 1.459, p = 0.004). Neither locomotor skills (p = 0.910) nor object control skills (p = 0.307) of boys were associated with MVPA.

Conclusions: Compared with perceived FMS, actual FMS are valuable to drive PA involvement in the early years. Only girls' actual FMS were associated with their time spent in MVPA. Future studies are warranted to elucidate the underlining causal link of FMS on PA in early childhood that could inform the design of future evidence-based, sex-tailored interventions for preschool-aged children.





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## Fathers' food parenting: A scoping review

Professor Kirsten Davison<sup>1</sup>, Dr. Jess Haines<sup>2</sup>, Ms. Evelin Garcia<sup>1</sup>, Ms. Sabrina Douglas<sup>2</sup>, Dr. Brent McBride<sup>3</sup>

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### Symposium Recording

Objective: Food parenting, or strategies that parents use to shape children's dietary behaviors, is a robust area of inquiry with over 500 published studies to date. The majority of this research, however, has focused on mothers. Given the diversity of family structures today, and increases in the time fathers engage in caregiving, fathers' food parenting and its impact on children warrants attention. This study presents results from a scoping review of research on fathers' food parenting, summarizes knowledge gaps and recommends future directions.

Methods: Consistent with scoping review guidelines, we searched multiple databases (PubMed, PSYCHINFO, CINAHL, EDSCO) using a standard search string. Eligible studies (a) were peer-reviewed and published in English, (b) measured food parenting practices, and (c) reported results for fathers separate from mothers. Clinical studies and those focused on the pre-weaning period (0-6 mons) or adult children (>18 years) were excluded.

Results: Sixty six eligible studies were identified. The majority of studies (N=46, 70%) were published in 2011 or later. More than half of studies (N=41) were conducted in the United States, followed by 11 studies in Europe. Twenty one studies were published in Appetite compared with 2 studies in IJBNPA. While all studies included data on fathers, only 27% focused on fathers. Studies included a range of ages of the referent child and the racial/ethnic make-up of participants was varied. Fathers self-reported their food parenting practices in most studies (74%) compared with maternal report (9%), child report (5%) or behavioral observation (6%). The vast majority of studies were cross sectional (N=62, 94%), utilized quantitative methods (81%) and included residential fathers (65%); 14% included non-residential fathers and 21% did not report fathers' residential status.

Conclusion: Strengths of the literature include a reliance on father self-report of food parenting practices (versus proxy reporters) and the varied age range of children and racial/ethnic groups considered. The relative lack of longitudinal studies that explicitly focus on fathers and include non-residential and/or social fathers are gaps in the literature to address in future research.



## Dads' food parenting practices – Is it really that different than mothers?

<u>Dr. Louise C. Masse<sup>1</sup></u>, Ms. Olivia De-Jongh Gonzalez<sup>1</sup>, Dr. Claire N. Tugault-Lafleur<sup>1</sup>, Dr. Teresia M. O'Connor<sup>2</sup> <sup>1</sup>University of British Columbia, Vancouver, Canada, <sup>2</sup>Baylor College of Medicine, Houston, United States

#### Symposium Recording

Food parenting practices are an important determinant of childhood obesity, but published research exploring the influence of parenting practices on children's eating behaviours has mainly focused on the parenting practices of mothers. Little is known about whether mothers and fathers use similar food parenting practices to encourage their children in adopting healthy eating practices. This study examined invariances in psychometric properties of food parenting practices by parent's gender and whether Canadian mothers and fathers use different food parenting practices.

Methods. Parents of 5-12 year children (n=799) were recruited by a Canadian marketing research company to complete the food parenting practice item banks (86 items) measuring 11 constructs. A quota sampling approach was used to ensure adequate representation by gender of parents and to match the income and ethnicity distribution of the Canadian population (50% mothers, 51% white/Caucasian, 22% reporting an annual household income < \$50,000 CAD). Measurement invariance was first established using Item Response Modeling Differential Item Functioning analyses to ensure the 11 constructs can be validly compared between mothers and fathers. Differences in scores were then assessed using Student's T tests (for normally distributed variables) and Mann Whitney U tests for non-normally distributed variables. Multivariable regression analyses were then conducted to examine differences in food parenting practices after adjusting for children's age, sex, parental ethnicity, education attainment, and household income.

Results. The psychometric properties of the food parenting practices constructs were found to be invariant by parents' gender. After adjusting for covariates, parents' gender was associated with directive control practices. Mothers reported using less directive control compared to fathers (standardized  $\beta$ =-0.14 from covariate adjusted models, p=0.001). None of the other food parenting practices examined (involvement, scaffolding healthy eating, restriction for weight, nondirective support, healthy opportunities, rules and limits, routines, redirection, healthy environment and permissive) differed by parents' gender.

Conclusion. Canadian mothers and fathers have generally similar food parenting practices, but mothers exert less directive control compared to fathers. Since controlling parenting practices have been associated with poor self-regulatory skills in children, intervention messages need to particularly reach fathers.



## What children bring to the table: The association of temperament and child fussy eating with maternal and paternal mealtime structure

Dr. Elena Jansen<sup>1, 2</sup>, Ms. Bonnie-Ria Searle<sup>3</sup>, Dr. Holly Harris<sup>4</sup>, Prof. Karen Thorpe<sup>3</sup>

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#### Symposium Recording

Purpose: Parents of children with difficult temperaments may need to implement a variety of behavioural management strategies, particularly during mealtimes. Fussy eating is a nuanced, mealtime-specific behavioural outcome associated with difficult temperament but has been rarely examined with respect to a positive, structured mealtime environment. The aim of the study was first, to examine associations between child temperament and mothers' and fathers' structure-related food parenting practices and, second, to explore whether these associations were mediated by child fussy eating.

Methods: Cohabiting mother-father pairs (N=205) of children aged between 2- to 5-years residing in a socioeconomically disadvantaged Australian city completed self-reported, validated measures of child temperament, food fussiness and structure-related food parenting practices (structured meal timing, structured meal setting and family meal setting). Key variables were compared across parent gender before associations were examined. All models were tested separately for mothers and fathers and where appropriate adjusted for covariates.

Results: Fathers perceived their child as having a more difficult temperament (P=0.016) and reported using lower levels of structured meal timing (P=0.003) than mothers. Structured meal timing was not significantly associated with food fussiness for either mother or father reports and therefore was not examined further. Child temperament was associated with maternal and paternal structure-related food parenting practices, such that more difficult temperament was associated with less mealtime structure. Food fussiness fully mediated the relationship between mothers' reports of child temperament and family meal setting. Father's reports of child temperament was only associated with structured meal setting and family meal setting through the effect of child fussy eating.

Conclusions: For both, mothers and fathers, perceptions of child food fussiness may explain why parents use less structure at mealtimes with more difficult children. This suggests that, when designing interventions to manage child fussy eating both mothers and fathers would benefit from similar approaches. Promoting mealtime structure to facilitate parents' appropriate responses to food refusal or difficult behaviour at mealtimes is indicated.



## Sleep resilience moderates the association between smartphone ownership and summer weight gain among school age youth.

<u>Dr. Bridget Armstrong</u><sup>1</sup>, Dr. Michael Beets<sup>1</sup>, Dr. Keith Brazendale<sup>2</sup>, Dr. Gabrielle Turner-McGrievy<sup>1</sup>, Dr. Russell Pate<sup>1</sup>, Dr. Alberto Maydeu-Olivares<sup>1</sup>, Dr. Brian Saelens<sup>3,4</sup>, Dr. Shawn Youngstedt<sup>5</sup>, Dr. Glenn Weaver<sup>1</sup>

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### Pre-recorded Presentation

Purpose: An increasing number of elementary age youth own smartphones. Cross-sectional studies have linked smartphone use with childhood obesity, but longitudinal evidence is lacking. Smartphones may be particularly detrimental for children with low sleep resilience (i.e. the ability to re-establish typical sleep following a night of atypical sleep). Given that children are at risk for accelerated weight gain over the summer, the current study examined if smartphone ownership was associated with summer weight gain in children. This association was hypothesized to be stronger among children with low sleep resilience.

Methods: Timeseries data from Fitbits (Charge-2) were collected on 6,642 days from 196 children (median 22 days/child) as part of a larger school-based study. The sample was 53% female, 5-10yrs old with a mean zBMI of 0.75 (SD = 1.2). Dynamic Structural Equation Modeling (DSEM) was used to estimate sleep resilience from Fitbit data, defined as previous night sleep regressed on current night sleep (i.e., autoregression). Parents reported smartphone ownership and zBMI was measured in spring and fall of 2018. Linear regression was used to test sleep resilience as a moderator of smartphone ownership and zBMI change.

Results: 29% of children owned a smartphone. Sleep resilience was unrelated to zBMI change or smartphone ownership. Children who owned a smartphone had greater increases in zBMI over the summer ( $\beta$  = 0.22, 95%CI 0.05 to 0.38). Sleep resilience moderated ( $\beta$  = -2.10, 95%CI -4.14 to -0.06) such that smartphone ownership was associated with zBMI increases among children with low sleep resilience. Smartphone ownership was not associated with zBMI change for children with higher than average sleep resilience.

Conclusions: Owning a smartphone is a risk for accelerated summer weight gain in the context of average or low sleep resilience. Future longitudinal research should explore potential mechanisms and confounders of this association (i.e. if smartphone ownership engenders or exacerbates existing sleep dysregulation perhaps through blue light exposure). Alternatively, high sleep-resilience may indicate environmental context which supports sleep consistency, such as household rules or routines which may protect against negative health sequelae associated with children's smartphone usage.



## The impact of summer break on children's obesogenic behaviors: Preliminary outcomes from a natural experiment.

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Pre-recorded Presentation

Purpose: Changes in obesogenic behaviors (physical activity, sedentary time, screen-time, diet, sleep) during summer break (SB) may explain accelerated summer weight gain. This preliminary study examined changes in obesogenic behaviors of children attending year-round and traditional schools during SB.

Methods: Primary school children (48.7% male, 57.4% African American) attending one year-round (n=73) or two traditional schools (n=117) participated in this study. Fitbits (sleep, activity, sedentary) and daily diaries (screen time, diet) measured obesogenic behaviors over five measurement waves during school (spring 2018, fall 2018, spring 2019) and SB (2018 & 2019). SB was 11 weeks in traditional schools and 5 weeks in year-round schools. Multilevel regressions with schedule (yearround vs. traditional), time (SB weekdays vs. school days), and schedule-x-time as independent variables and engagement in obesogenic behaviors as the dependent variable estimated changes in obesogenic behaviors during SB.

Results: Children provided a mean 67.3 and 44.9 days of Fitbit and 13.7 and 12.9 daily diaries during school and SB, respectively. During SB moderate-to-vigorous physical activity (MVPA) increased for traditional children (5.3min, 95CI: 1.9, 8.7) but decreased for year-round children (-5.9min, 95CI: -10.8, -1.0). Sedentary time increased for traditional (36.1min, 95CI: 28.9, 43.3) and year-round (72.9min, 95CI: 62.6, 83.3) children. Screen time increased for traditional (49.3min, 95CI: 41.1, 57.5) and year-round (54.0min, 95CI: 43.1, 64.9) children. The number of unhealthy foods/beverages consumed increased for traditional children (0.3, 95CI: 0.2, 0.5) while healthy foods/beverages consumed decreased for year-round children (-0.2, 95CI: -0.3, -0.1). Sleep midpoint shifted later for traditional (88.5min, 95CI: 83.9, 93.1) and year-round children (113.9min, 95CI: 107.4, 120.5). Year-round children experienced more unfavorable changes in sedentary (+30.3min, 95CI: 18.6, 42.1), MVPA (-9.3min, 95CI: -14.2, -4.4), sleep midpoint (25.3, 95CI: 17.3, 33.3) and healthy food (-0.2, 95CI: -0.3, -0.1) consumed during SB compared to traditional children.

Conclusions: During SB children experienced unfavorable changes in some obesogenic behaviors with the magnitude of change differing by SB length. Understanding obesogenic behavior changes during SB is essential to interventions targeting accelerated summer weight gain.



## Relationships between 24-hour movement behaviours and mental health in English primary school children

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Pre-recorded Presentation

### Purpose:

Twenty-four hour movement behaviours represented by sleep, sedentary behaviour (SB), light physical activity (LPA), and moderate-to-vigorous physical activity (MVPA) may influence child mental health, which is underresearched relative to indicators of physical health. The study aims were (1) to examine the relationships between 24-hour movement behaviours and indicators of mental health in English primary school children, and (2) to investigate the predicted differences in mental health outcomes when time was reallocated between the movement behaviours.

### Methods:

Wrist-mounted accelerometers were worn continuously for 7-days by 132 children (66 boys) aged 9-10 years. Following processing, estimates of time spent sleeping, and in SB, LPA, and MVPA were calculated. Questionnaires were used to assess social and emotional wellbeing (SEW), prosocial behaviour (PSB), depression symptoms (DEP), and self-esteem (SE). To account for the mutually exclusive and co-linear nature of the movement behaviours compositional data analysis was used to express the movement behaviours in relative terms as isometric log-ratio coordinates. For aim 1, regression models adjusted for sex, age, parental education level, and BMI examined the influence of each movement behaviour on the outcomes, relative to the other behaviours. For aim 2 differences in mental health outcomes between the baseline composition and new compositions when 15 minutes was added to each movement behaviour in turn was calculated.

### Results:

Movement behaviours did not significantly predict SEW, DEP, and SE. PSB was significantly predicted by sleep ( $\beta$ = 3.26 (1.36), p=.018) and SB ( $\beta$ =-3.05 (1.12), p=0.007). The greatest predicted changes in mental health outcomes were observed when MVPA increased by 15-minutes with a proportional 15-minute decrease in the remaining behaviours. Specifically, there were favourable predicted changes in SEW (-0.25), DEP (-0.68), and SE (+0.51). Moreover, adding 15-minutes to SB reflected a predicted 0.12 decrease in PSB, while allocating this time to sleep resulted in a 0.12 predicted increase.

### Conclusions:

The relationships between 24-hour movement behaviours and mental health of the children in this study were equivocal. The exception was prosocial behaviour which was significantly related to sleep and SB. Time reallocations suggested that increasing MVPA may have a favourable influence on some mental health outcomes.



## Big Snack: Using wearable cameras to explore children's daily snacking behaviours

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Pre-recorded Presentation

#### Purpose

Snacking is a major contributor to children's daily energy intake. However, research on snacking patterns is mostly limited to self-report and has offered little information on the social context of snacking. Recently, 168 children aged 11-13 in the Wellington region recorded their world for four days, using wearable cameras that automatically took pictures every 7s and GPS devices, providing 1.3M images linked to 2.9M GPS points. Using this data, we aimed to assess the frequency, nature and social context of children's snacking patterns.

#### Methods

Two days' of image data (Thursday and Saturday) were analysed for snacking episodes and their context (e.g setting, source and screen use). Snacking was defined as any individual food item or meal consumed in between the three main meals. Data were entered in Excel and foods categorised as core or non-core, according to a nutrient profiling model. Data were analysed to determine differences in snacking patterns by setting, ethnicity, gender and deprivation.

#### Results/ findings

Children consumed more than twice as many non-core snack foods as core snack foods. Confectionary, cookies/cakes and sugary drinks and juices were the most commonly consumed non-core snacks. Fresh fruit was the most commonly consumed core snack. School cafeterias and convenience stores near schools were a significant source of non-core snack foods and drinks. Snacking was commonly associated with screen time.

#### Conclusions

This study provides objective evidence on children's snacking patterns and social context in children's everyday lives. The extent of non-core snacks sourced from school cafeterias and convenience stores near schools is concerning, raising support for healthy school food programmes and broader interventions targeting the obesogenic environment in which children live. Given the attenuated obesity epidemic, it is paramount that healthy snack options are made available to children.



## Latent transition analysis of physical activity and sedentary behaviour from adolescence to young adulthood

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Pre-recorded Presentation

Purpose:

The transition out of secondary school is a time of significant change, associated with declines in physical activity. However, it is possible that not all adolescents experience detrimental changes in activity-related behaviour when they leave school. This study identified activity-related behaviour typologies and explored subsequent changes in typology membership during the transition out of secondary school.

### Methods:

Year 11 students were recruited via schools and social media and completed annual follow-ups over two years (n=852 completed baseline (BL) and the two-year follow-up (FL); 75% female, mean age= 16.9±0.4 years). All measures were self-reported. Latent class analysis identified typologies of activity-related behaviours (active travel, leisure-time walking, moderate and vigorous physical activity, TV viewing, video gaming and computer use for leisure) at BL and FU, and transition analysis explored change in typology membership over time. Typology transitions were compared by gender, body mass index (BMI), post-school pathways.

### Results:

At BL and FU, three descriptively similar typologies were identified and labelled: 1) Sedentary gamers (BL: 18%; FU: 15%: characterised by high levels of sedentary behaviours, particularly video gaming); 2) Inactives (BL: 47%; FU: 47%: low physical activities and average levels of sedentary behaviours compared to the other typologies); and 3) Actives (BL: 35%; FU: 38%: high physical activities and low sedentary behaviours). Most participants remained in the same typology across both time points (84%), 10% transitioned to a typology with a more health-enhancing profile and 7% transitioned to a typology with a more detrimental behavioural profile. Although BMI increased among the whole sample between BL and FU, this did not differ by typology transition. Transitions between typologies from BL to FU did not differ by gender or post-school pathways.

#### Conclusions:

Few adolescents moved towards more health-enhancing or detrimental profiles of activity-related behaviours as they transitioned out of secondary school, with no difference by gender, BMI or post-school pathways. The high proportion of 'inactives' and stability over the transition suggests that interventions are required to improve activity-related behaviour typologies before adolescents leave school.



## Media Use and Metabolic Syndrome and its Components in European Children and Adolescents-Results from the I.Family Study

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### Pre-recorded Presentation

Purpose: To evaluate the relationship between media use and metabolic syndrome (MetS) and its components: waist circumference, blood pressure, dyslipidemia and homeostasis model assessment of insulin resistance (HOMA-IR) in children and adolescents and whether there is an interrelation between sedentary behaviour (SB), moderate to vigorous physical activity (MVPA) and media use.

Methods: 7263 children (2-16 years old) from 8 European countries of the I.Family study were included in the crosssectional analysis. Self-reported media use (hours/day) included TV, computer, game console and internet use. Children were categorized as having MetS and high level of its components when the latter exceeded the 90th percentile, based on reference curves. Using logistic regression models we examined the association between media use and MetS, adjusting for various covariates, including dietary behaviours and puberty status. In a subsample including accelerometer data (3640 children), SB, MVPA and media use were considered to check for interrelation in the association with MetS and its components. Based on WHO guidelines we examined whether meeting screen time recommendations ( $\leq$ 1h/day for children 2-5 years and  $\leq$ 2h/day for children  $\geq$ 5 years old) was associated with MetS.

Results: Children used media for 2.3 hours/day on average (SD=1.4). Only 49% of children met the guidelines for media use. There was a significant association of media use with high waist circumference (OR=1.16, 95%CI=1.09-1.23), dyslipidaemia (OR=1.06, 95%CI=1.008-1.13) and MetS (OR=1.22, 95%CI=1.07-1.40). The association remained after examining for interrelation between SB, MVPA and media use. Positive association was seen between media use and blood pressure (1.05, 95%CI=0.93-1.19) and HOMA-IR (OR=1.14, 95%CI=0.95-1.37). Children who met the media use guidelines, had lower odds for any of the metabolic outcomes, but significant only for having high waist circumference (0.75, 95%CI=0.67-0.84) and dyslipidaemia (OR=0.86, 95%=0.77-0.96), independently of covariates.





Conclusions: Media use was associated with metabolic syndrome, waist circumference and dyslipidaemia. Our novel approach suggests that this association is independent of dietary habits and physical activity patterns. However, meeting the media use guidelines seemed to have a protective role on the risk for MetS and its components. Longitudinal associations between media use and MetS will be investigated.



## The moderation effect of physical activity on the association between sitting time and cardiometabolic health markers

**Dr. Ana Maria Contardo Ayala<sup>1</sup>**, Prof. Anna Timperio<sup>1</sup>, Dr. Lauren Arundell<sup>1</sup>, Prof. Jo Salmon<sup>1</sup> <sup>1</sup>Deakin University, Institute for Physical Activity and Nutrition (IPAN), School of Exercise and Nutrition Sciences, Geelong, Australia

### Pre-recorded Presentation

Purpose: There is limited evidence of the association between device-measured sitting time and health markers and how physical activity impacts this relationship among children. The aim of this cross-sectional study was to examine whether device-measured light-intensity physical activity (LIPA) and moderate-to-vigorous physical activity (MVPA) moderate the associations between sitting time and cardiometabolic health markers: waist circumference z-score (zWC), body mass index z-score (zBMI), blood pressure (BP), high-density lipoprotein (HDL), low-density lipoprotein (LDL), cholesterol, triglycerides, glucose, insulin, vitamin D and C-reactive protein (CRP) among children.

Methods: This study included data from 114 children (mean age 8.2±0.5), collected in 2010 in Melbourne, Australia. ActiGraph GT3X accelerometers were used to determine time spent in LIPA, low-LIPA and high-LIPA (i.e. split at mid-LIPA cutpoint), and MVPA. Average time spent sitting was obtained from activPAL inclinometers. Anthropometric measures and resting BP were assessed by trained staff using standard protocols. Fasting-blood samples were obtained at a commercial pathology laboratory using standard protocols.

Interactions between sitting and LIPA, low-LIPA, high-LIPA, and MVPA on the health markers were examined using linear regression, adjusting for age and sex, and moderation by LIPA, low-LIPA, high-LIPA and MVPA was examined by adding interaction terms. Significant interaction effects were probed by comparing associations at the mean and at one standard deviation below and above the mean.

Results: There was a positive association between sitting time and glucose (p=0.015) that remained significant after adjusting for specific physical activity variables. A significant negative association was found between sitting time and vitamin D, however, this was non-significant after adjusting for physical activity variables. No moderation effects were found for any of the physical activity variables in the relationship between sitting time and cardiometabolic health markers.

Conclusions: The association between sitting time and glucose appeared to be independent of time spent in physical activity, which is consistent with research amongst adults. However, other cardiometabolic health markers were not independently related to children's sitting. Experimental evidence and more sophisticated analyses (e.g. compositional) are needed to further explore the moderation effects of the different physical activity intensities and relationships between sitting time and cardiometabolic health markers.



## The school policy, social and physical environment and change in physical activity of adolescents

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### Pre-recorded Presentation

Purpose: We examined the association between the school policy, social and physical environment and change in adolescent physical activity (PA) and explored how sex and socioeconomic status modified potential associations.

Methods: Data from the GoActive study were used for these analyses. Participants were adolescents (n=1765, mean age±SD 13.2±0.4y) from the East of England, UK. Change in longitudinal accelerometer assessed moderate-tovigorous physical activity (MVPA) was the outcome. School policy, social and physical environment features (n=267) were exposures. The least absolute shrinkage and selection operator variable selection method (LASSO) was used to determine exposures most relevant to the outcome. Exposures selected by the LASSO were added to a multiple linear regression model with estimates of change in min/day of MVPA per 1-unit change in each exposure reported. Post-hoc analyses, exploring associations between change in variables selected by the LASSO and change in MVPA, were undertaken to further explain findings. Results: No school policy or physical environment features were selected by the LASSO as predictors of change in MVPA. The LASSO selected two school social environment variables (participants asking a friend to do physical activity; friend asking a participant to do physical activity) as potential predictors of change in MVPA but no significant associations were found in subsequent linear regression models for all participants. In the post-hoc analyses, for every unit increase in change in participants asking a friend to do PA and change in a friend asking participants to do PA, an increase in MVPA of ( $\beta$  (95%CI)) 2.78 (1.55, 4.02) and 1.80 (0.48, 3.11) min/day was predicted respectively.

Conclusions: The school social environment appears an important influence on physical activity during adolescence. Further exploration of how friendships during adolescence may be leveraged to support effective PA promotion in schools is warranted.



## Experimental evidence of within-day compensation following imposed or restricted physical activity

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#### Pre-recorded Presentation

Purpose: There has been ongoing debate about whether physical activity compensation occurs. However, few experimental studies have examined the activitystat hypothesis in children. This study investigated whether short-term compensatory responses were observed following imposed or restricted physical activity at school.

Methods: The Reactivity to Activity (REACT) Study was a cross-over randomised controlled experiment that involved three one day experimental conditions: (a) additional light-intensity physical activity (LPA; standing condition); (b) additional moderate- to vigorous-intensity physical activity (MVPA; sports condition); and (c) restricted LPA and MVPA (indoor play condition). In total, 368 children (47.3% boys) in Years 4-6 (age 8-12 years) from 7 primary schools participated. Children wore a hip-mounted ActiGraph accelerometer for 5 days (Monday-Friday) during a 'usual' week and during each 'experimental' week. Total counts for the experimental condition period, for the after-school period and overall on the experimental day, and overall on the following day were extracted from baseline and each experimental week. Paired t-tests examined differences between baseline and experimental time periods. Where differences were observed, differences in the composition of eight energy expenditure bands were examined using a paired Hotelling test for multivariate data using R (v3.5.1).

Results: Total counts decreased by 21.2% and 20.9% during the indoor play experimental condition and whole experimental day, respectively, compared to a usual day. For the sports class condition, total counts increased by 42.8% and 38% during the condition period and whole day, respectively, compared to a usual day. In the afterschool period, a 9.6% decrease in counts was observed following the sports condition. In this period, children reduced their energy expenditure in the highest bands, which equated to MVPA, by 31.7%. Energy expenditure in the lowest bands, which equated to sedentary time and LPA, increased by 35.4%. On the following day, no detectable differences in counts compared to the matched usual day were observed for any condition.

Conclusions: These findings provide some support for a within-day compensation of physical activity following increased MVPA, but not for the other conditions. There was no evidence of between-day compensation, possibly due to the structure of the school day and surrounding environment.



# Reallocating sedentary time with total physical activity and physical activity accumulated in bouts: Associations with children's cardiometabolic biomarkers using isotemporal substitution

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### Pre-recorded Presentation

Purpose: There is emerging evidence that the way in which total physical activity is accumulated may be important for health. However, little is known about whether replacing sedentary time with time in physical activity bouts of varying intensities is beneficial for the cardiometabolic health of children with healthy weight or overweight. This study investigated the theoretical effects of reallocating a specific amount of sedentary time with an equal amount of time in total physical activity and physical activity bouts of varying intensities on children's cardiometabolic risk biomarkers and examined whether this varies by weight status.

Methods: Children aged 8-9 years (n=599) from 20 primary schools in Melbourne, Australia, participated in the Transform-Us! study (2010). Children were included if they had complete accelerometer and blood biomarker data (high-density lipoprotein cholesterol [HDL-C]; low-density lipoprotein cholesterol [LDL-C]; triglycerides [TG]; homeostatic model assessment of insulin resistance [HOMA-IR]). Isotemporal substitution models assessed the theoretical impact of replacing 10 minutes of sedentary time with 10 minutes of physical activity or physical activity in bouts of varying intensities on cardiometabolic health risk factors. Analyses were conducted for the whole sample and stratified by weight status.

Results: Overall, 169 children (age 8.7 [0.4] years; 55.6% girls; 66% healthy weight) were included in the analyses. Replacing sedentary time with 10 minutes of vigorous-intensity physical activity (VPA), regardless of manner of accumulation, was associated with lower TG levels in the whole sample (0.96; 95% CI: 0.93, 1.00). Replacing sedentary time with VPA accumulated in bouts was associated with better HDL-C (1.04; 95% CI: 1.00-1.09) and TG (0.95; 95% CI: 0.91-1.00), and worse HOMA-IR (1.17; 95% CI: 1.05-1.29) in in children with a healthy weight only.

Conclusion: Replacing sedentary time with MPA and VPA, regardless of accumulation pattern, may have some benefits on cardiometabolic health. This was mostly observed among children with healthy weight; few associations were observed for children with overweight/obesity. No associations were found for replacing sedentary time with LPA. The findings suggest interventions should focus on replacing sedentary time with higher intensity activities to benefit children's cardiometabolic health.



## Understanding feeding goals and values during the first 1000 days of life among Hispanic women

**Dr. Erin Hennesy<sup>1</sup>**, Ms. Angelica Valderrama<sup>1</sup>, Ms. Noereem Mena<sup>2</sup>, Associate Professor Alison Tovar<sup>2</sup> <sup>1</sup>Friedman School of Nutrition Science and Policy, Tufts University, Boston, United States, <sup>2</sup>Department of Nutrition and Food Sciences, University of Rhode Island, Rhode Island, United States

### Pre-recorded Presentation

Purpose: Parental feeding styles and practices are driven by parental goals and values; yet, little research has focused on these antecedents. The goal of this study is to understand, the global- and feeding-specific goals and values of women during the first 1000 days of life, and how feeding goals and values evolve over time, and in response to contextual factors.

Methods: A purposive sample of Hispanic mothers were recruited from community programs (home visitation, WIC) via direct contact, word of mouth, etc. We attempted to recruit mothers who were pregnant (3<sup>rd</sup> trimester) or had children ages (months) 0-6, 6-12, 12-18 and 18-24. Semi-structure interviews with n=36 mothers were conducted by two research assistants, predominantly in Spanish, and audio recording transcribed. An inductive and deductive coding was completed. Transcripts were reviewed and initial themes identified based on a priori topics and themes that emerged integrated. Mothers completed a brief survey to asses their beliefs toward specific feeding practices.

Results: Mothers were on average 29 years old. Overall, mothers across all stages identified having a happy, healthy child, devoid of illness as one of their primary goals. Other global goals and values included being a good mother, being educated, and sharing traditions and culture. Feeding-specific goals and values did not initially emerge when asked about their primary goals and values for their child, but upon probing mothers did share these. Similarities across stages included not wanting a "picky eater" and having a healthy eater, specifically "a child that likes vegetables". Differences across stages included a focus on the ability to breastfeed or provide enough milk for infants (pregnant mothers) vs. limiting exposure to unhealthy foods (mothers with older infants).

Conclusions: Parents primary goals and values are not directly tied to feeding. When asked specifically about feeding, there were some clear goals, particularly around not wanting a picky eater. Better understanding of these parental goals and values and how they are similar and different across key development milestones can potentially help inform effective interventions to support parents and reduce disparities in obesity.


# Maternal food waste concern is linked to child feeding practices

Prof. Carol Byrd-Bredbenner<sup>1</sup>, Other K Eck<sup>1</sup>, Other J Martin-Biggers<sup>1</sup>

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Pre-recorded Presentation

Purpose: Increased environmental awareness has led to growing concerns about food waste in the home. Research suggests that concerns about waste influence the size of portions parents serve their children; however, links between food waste concern and other food related parenting practices are understudied.

Methods: Mothers of preschool children (mean age  $32.25\pm5.80$  years) completed an online survey and were divided into 3 groups using a 2-item, 5-point scale: low food waste concern (score<2.5; n=125), moderate food waste concern (score>2.5 to -3.5; n=286) and high food waste concern (score>3.5; n=137). ANCOVA, with Hager's 2-item Food Insecurity screener score as a covariate, and Tukey post hoc procedures were used to examine significant (P<0.01) links between food waste concerns and maternal feeding practices.

Results: Mothers who were the most concerned about food waste were significantly more likely to pressure children to eat, restrict children's food intake, use food and non-food rewards, overtly control when children ate, and control children's unsupervised access to both healthy and unhealthy foods than mothers with moderate and low food waste concern. Similarly, moderate concern mothers were significantly more likely to restrict children's food intake, use both food and non-food rewards for healthy eating, and control when children ate. Mothers in the lowest concern group had significantly higher BMIs than mothers in the other groups. Child BMI did not differ significantly by mother's food waste concerns.

Conclusion: These findings suggest that mothers with high food waste concern are more likely to utilize child-feeding practices that do not align with current best practice guidelines (i.e., pressuring children to eat, restricting child intake, using food and non-food rewards, and covertly controlling child intake). Future studies aiming to improve child-feeding practices may benefit by teaching mothers strategies for minimizing food waste that are in line with recommendations for child feeding.



# Associations between feeding practices and child diet quality, and the potential influence of child eating behaviours on these associations

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Pre-recorded Presentation

Purpose: Parents' feeding practices influence children's food intake. Little is known about how children's eating behaviours (fussiness, enjoyment of food, food responsiveness, satiety responsiveness) influence these associations or feeding practices. This study examines associations between feeding practices and pre-school children's diet quality and whether children's eating behaviours influence these relationships. Furthermore, this study examines the associations between feeding behaviours.

Methods: In 2018, 1400 Australian mothers of children aged 2-5 years completed an online survey including validated measures of feeding practices (n=9), child eating behaviours (n=4) and diet quality. Fourteen items were summed as a measure of diet quality; higher scores indicate better quality. Linear regression assessed associations between feeding practices and diet quality, including interactions between feeding practices and child eating behaviours.

Results: The feeding practices positively associated with diet quality were; structured meal timing, monitoring, covert restriction, modelling healthy eating and structured meal setting (coefficients: 0.64 to 2.68). The feeding practices negatively associated with diet quality were; overt restriction, persuasive feeding, reward for eating and reward for behaviour (coefficients: -0.91 to -1.84). Child eating behaviours were associated with feeding practices. Child eating behaviours moderated associations between three feeding practices and diet quality. The findings suggest that enjoyment of food and fussiness moderated the association between structured meal setting and child diet quality. The models also suggest that enjoyment of food and food responsiveness moderated the associations between monitoring and child diet quality. Lastly, satiety responsiveness moderated the associations between modelling and child diet quality.

Conclusions: Some associations between feeding practices and child diet quality appear to be moderated by children's eating behaviours and child eating behaviours influence most feeding practices. Additionally, child eating behaviours were associated with feeding practices. Therefore, nutrition promotion programs may need to be tailored for parents with different feeding practices and children with differing eating behaviours.



# Feasibility of implementing an adapted version of the 'Healthy Dads Healthy Kids' program for Hispanic families

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#### Pre-recorded Presentation

Background: Healthy Dads Healthy Kids (HDHK) was the first obesity prevention intervention for fathers and had positive outcomes in Australia. The aim was to assess the feasibility of implementing a culturally adapted version of HDHK to Hispanic families in southwestern US.

Methods: A randomized waitlist controlled trial with a process evaluation was conducted to assess the feasibility of implementing the program and study. Fathers, their partner (mother) and 1-3 children were enrolled. A priori feasibility criteria were: a) Recruit 40 Hispanic fathers and their families in  $\leq 4$  m (months); b) Retain 80% of participants for pre- and post-assessments (4 m later); c) Maintain  $\geq$ 70% attendance to program sessions; d) obtain 80% 'excellent'-'good' satisfaction from participants who attended the program; and e) collect anthropometric and behavioral data on  $\geq$ 75% of participants at baseline and follow up.

Results: In <4 months we recruited and screened in-person 42 Hispanic families, and enrolled 36 families who qualified. 64% of fathers had not completed high school, 83% spoke only Spanish at home, and 89% were born outside of the US. Baseline data were collected on 36 fathers, 64 children and 35 mothers, with complete data on 86% (5 families were missing some accelerometer data). 19 families were randomized to the intervention and 17 to the control group. Attendance to the 10 week intervention was 56% for the whole intervention group, and 72% for those that started the program and did not drop out (N=14). 100% of fathers and mothers rated HDHK excellent or good (excellent by 92% of fathers). Almost all the fathers (mean score of 4.6, SD 0.6) and mothers (4.78, SD 0.5) stated they would recommend the program to their friends (strongly agree [5] – strongly disagree [1]). 27 (75%) participated in some aspect of the post-assessment, with 26 (72.2%) having most data collected.

Conclusion: The culturally adapted HDHK reached a high-risk, low-income sample of Hispanic families. The study met some, but not all feasibility criteria. With adjustment to recruitment and retention the program should be evaluated in an efficacy trial



# Implementing and evaluating an intervention for fathers and their children: The Belgian Run Daddy Run intervention and its effects on fathers' and children's (co)-physical activity and -screen time

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#### Pre-recorded Presentation

Objective: Targeting fathers in lifestyle interventions is a novel approach to improve health behaviours in children, thereby preventing childhood obesity. The Run Daddy Run (RDR) intervention was therefore developed and implemented, targeting Belgian fathers and their primary school-aged children to improve their lifestyle behaviours (i.e. (co-)physical activity (PA) and screen time behaviour) and other health-related outcomes. The aim of the present study is to describe the development and implementation of the RDR intervention, and to investigate its effects on fathers' and children's (co)-PA and screen time behaviours.

Methods: A total of ±100 fathers/primary school-aged child (6-8 years) dyads residing in Flanders (Belgium) were randomly assigned to either the control group (n=50) or the RDR intervention group (n=50). The intervention consisted of 6 two-weekly (inter)active sessions for fathers and their children. The sessions included an informative component and an active component, and were guided by two trained facilitators. Furthermore, fathers and children of the intervention group had access to an online (personal) profile on which they could log PA goals and activities, access tips /ideas for physical activities and exercises. Before and after the intervention, fathers completed an online questionnaire questioning their (co-)PA, (co-)screen time, weight status and other health-related outcomes. Objective measures of PA were obtained from fathers and children using wrist-worn accelerometers (Axivity AX3). Longitudinal analyses were conducted to measure the effects of the intervention.

Results: Currently, no results are available yet as the intervention will take place between February and May 2020. The first results will be available by the end of May. We expect that in the intervention group there will be a larger increase from baseline to follow-up in (co-)PA and a larger decrease in (co-)screen time, compared to the control group.

Conclusions: The findings of this study will allow us to determine whether the RDR intervention is able to improve health behaviours in fathers and children (i.e. (co)-PA and -screen time), which might have important implications for future research and health policy.



# Findings from healthy summer learners: A pilot quasi-randomized control trial to stop the summer slide in academics and health

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#### Pre-Recorded Presentation

Purpose: Weight gain and academic loss during summer are concerns for low-income U.S. children. This may be explained by limited access to health and academic summer programming. This study examined the impact of health and academic focused summer programming on children's health behaviors, BMI z-scores, and reading proficiency.

Methods: Healthy Summer Learners (HSL) a 6-week summer program operated from 8:00am-3:30pm in two lowincome elementary schools. HSL provided reading instruction, physical activity, nutrition education, and breakfast, lunch, and a snack. The schools also operated a 6-week summer program exclusively focused on academics that provided breakfast and lunch. Participants (N=193, 6-9 years) attended HSL (n=60), academic-only (n=67) or no program (control, n=66). Height and weight and reading percentile on a standardized national test were collected before and following summer. Fitbit Charge 2© measured participants' physical activity and sleep while parents reported their child's diet and screen time twice weekly throughout summer. Daily logs tracked attendance for HSL and academic-only programs; parents of control children reported summer program attendance via daily diaries. Multilevel linear regression estimated differences in behaviors on program days and changes in reading percentiles and BMI z-score over the summer.

Results: On days children attended a summer program, children engaged in statistically significantly(p<0.05) more MVPA, less sedentary, and less screen time, while going to bed and waking earlier than control children. Intent-to-treat analysis showed no statistically significant group-by-time differences in BMI z-score or reading percentiles. As treated analysis (accounting for HSL and academics-only children who never attended and control children attending structured summer programming) showed children who attended a program during the summer gained - 0.08 (95CI=-0.15, -0.02) less BMI z-score than those not attending a program, but no difference in reading percentile changes.

Conclusions: Attending structured programing, regardless of program focus, can impact children's health behaviors and zBMI during the summer. Strategies to increase attendance at these programs are needed if they are to impact all children.



# The moderating role of parental characteristics in the association between child television viewing and measured childhood obesity: a cross-sectional study

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#### Pre-recorded Presentation

Purpose: The association between sedentary behaviour and obesity in childhood is complex and may be moderated by parental characteristics. This study investigates the association between sedentary behaviour and obesity in a pooled sample of New Zealand children and whether parental characteristics moderate any associations.

Methods: Cross-sectional child and adult data from the New Zealand Health Survey were pooled for the years 2013/14–2016/17 (n=9,022 children aged 2-14 and adults aged 15-70). Each adult survey participant was recorded as being the parent of the participating child. Sedentary behaviour for children was estimated using parental self-reported television (TV) time. Parents were asked for the average time the participating child spent watching TV each weekday and weekend. Childhood body mass index (BMI) and obesity was defined using measured height (cm) and weight (kg) and the International Obesity Task Force (IOTF) cut-off values. Parental participant characteristics, including ethnicity and education-level, were also collected as part of the survey. Effect modification was assessed by stratifying binary logistic regression analyses by parent education (low, moderate, high) and ethnicity (Asian, European/other, Māori, Pacific). Data are shown as Adjusted Odds Ratio (AOR) (95% Confidence Intervals (CI)).

Results: Watching  $\geq 2$  hours TV on average per day in the past week, relative to <2 hours TV viewing, was associated with a higher risk of childhood obesity (AOR=1.26 [1.06, 1.51]). Stratification showed that the association between  $\geq 2$  hours TV and obesity was most pronounced for parents of low education (AOR=1.36 [1.01, 1.85]) and high education (AOR=1.50 [1.03, 2.20]), and European/other parent ethnicity (AOR=1.85 [1.36, 2.52]).

Conclusion: Higher levels of sedentary behaviour in childhood was associated with higher risk of obesity. However, we found some support for a moderating role of parent education and ethnicity. This suggests a more complex relationship exists between child sedentary behaviour and obesity than is sometimes suggested.



"Not only adults can make good decisions, we as children can do that as well": Evaluating the youth-led participatory action research 'Kids in Action' targeting physical activity and dietary behavior

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Pre-recorded Presentation

Purpose: Most actions targeting children's health behaviors have limited involvement of children in the development, potentially explaining the disappointing effectiveness. In the 3-year 'Kids in Action' study, 9-12-year old children from a low socioeconomic neighborhood were involved as co-researchers in the development, implementation and evaluation of actions targeting healthy physical activity and dietary behaviors. We will present the process and effect evaluation of 'Kids in Action'.

Methods: Children from four intervention and four controls schools participated in the study. We used the RE-AIM framework to assess reach, effectiveness, adoption, implementation and maintenance, including assessments of children's empowerment, collaboration between researchers and stakeholders, and satisfaction with the actions. Data collection took place in eight focus groups with children (N=40) and eight interviews with community partners (N=11). Content analysis was used where transcripts were analyzed using evaluation and provisional coding. Dietary behavior, sports participation, self-rated health, moderate-to-vigorous physical activity, sedentary time and neuromotor fitness were assessed at baseline, one and two year follow-up using self-report (N=556), accelerometers (N=408) and fitness tests (N=485). Linear mixed model analyses were performed, adjusting for relevant confounders.

Results: Both children and community partners perceived an improvement in several skills in children who participated in Kids in Action, such as confidence, critical awareness, leadership and collaboration, leading to increased feelings of empowerment. Children felt involved in decision making and enjoyed being part of the development of actions. Children and community partners became more aware of health behavior. Effects on dietary behavior, physical activity, sedentary behavior and fitness, will also be presented. Community stakeholders were eager to continue child participation and focus on health behavior. For successfully conducting YPAR, a strong relationship between researchers, children, and community partners who value child participation is key. Involving more children, parents and school staff in co-creating actions may lead to even more support for the co-created actions and wider empowerment.

Conclusions: Actively taking part in Kids in Action improved children's empowerment, child participation and awareness of health behavior in the community. YPAR has the potential to improve children's health behaviors, however, many resources are required to reach effects on a large scale.



# Does Home-to-School distance matter? Parental perceptions of walking and cycling to high school in Dunedin, New Zealand

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#### Pre-recorded Presentation

Purpose: Parental perceptions of different modes of transport correlate with adolescents' mode choice for school trips. Whether parental attitudes towards active transport to school differ by mode and/or home-to-school distance is unknown. We compared parental perceptions of walking versus cycling to school in adolescents in Dunedin city, New Zealand and examined whether mode-specific motivations and barriers differ by home-to-school distance.

Methods: Parents (n=341; age: 47.5±5.2 years; 77.1% females) completed a survey about their adolescent's (age: 13-18 years; 48.1% boys) transport to school habits and their own perceptions of walking/cycling to school. Participants were categorised into three groups according to home-to-school distance (calculated using Geographic Information Systems analysis): 'walkable' ( $\leq$ 2.25 km), 'cyclable' ( $\geq$ 2.25 and  $\leq$ 4.0 km) and 'beyond cyclable' ( $\geq$ 4.0 km) distances.

Results: Common modes of transport to school differed significantly across the 'walkable'/'cyclable'/'beyond cyclable' categories: car passenger: 25.7%/40.5%/60.6%; public/school bus: 5.5%/15.4%/28.4%; walking: 66.2%/28.2%/1.2%; cycling: 0.0%/7.7%/0.5% (all p<.001). Irrespective of the home-to-school distance, most parents regarded both walking and cycling to work and school as important. As home-to-school distance increased, parents more frequently reported active transport-related barriers and increased convenience of driving and trip-chaining. Compared to walking, parents perceived cycling to school to be less important (walking/cycling: 87.5%/62.5%), with less social support from parents (46.2%/17.1%), peers (20.6%/4.8%) and school (24.5%/12.4%) and more personal barriers (lack of adolescents' interest: 51.5%/68.1%), environmental barriers (lack of footpaths/cycle paths: 35.0%/73.5%) and more safety concerns (35.0%/64.6%; all p<.001). As home-to-school distance increased, parents perceived less social support for walking to school whereas personal, environmental and safety-related barriers increased. Although less consistent, similar findings were observed for cycling to school. Parental perceptions of their adolescents' cycle skills did not differ across the three distance categories. Overall, 68.2% of parents expected to participate in walking/cycling to school decision-making for their adolescent.

Conclusions: Parents favoured walking compared to cycling to school. With increasing home-to-school distance, parental attitudes towards both walking and cycling were changing with less social support and more personal, environmental and safety-related barriers among those living further away. Future interventions should be mode-specific, take into account distance to school and focus on reducing parental concerns.



# Fun and meaningful movement: A survey on sports and exercise in individuals with autism spectrum disorder

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#### Pre-recorded Presentation

Purpose: Individuals with autism spectrum disorder (ASD) often experience motor difficulties and limited physical activity (PA). Nearly 80% of autistic people are estimated to also have developmental coordination disorder (DCD). This study explores three novel research questions in a New Zealand context: (1) What are the perceptions, preferences, and barriers of PA, and fitness goals of autistic individuals?; (2) What are their PA programme preferences?; and (3) What are potential impacts of DCD on their PA?

Methods: In this cross-sectional study, two versions of an anonymous survey were given to autistic adults (hereafter 'individuals'), and to parents, caregivers, and service providers of someone with ASD (hereafter 'parents'). Parents answered questions in relation to their child and also completed the Developmental Coordination Disorder Questionnaire (DCDQ), a screening tool for DCD in children aged 5-15 years. Preliminary descriptive results are reported.

Findings: Individuals. Thus far, 53 individuals (mean age  $33.9 \pm 12.7$ ; 68% female) have completed surveys. Overall, 81% believe PA will make them feel good, 100% believe PA is good for them, and 87% want to improve their physical functioning. However, just 11% engage in moderate to vigorous PA, and 29% in light PA, at least 5 times weekly; 70% want to exercise more. Several barriers were identified: poor weather, tiredness, boredom, and ASD-related challenges. Nearly 60% prefer doing a PA programme alone. Home and recreational centres are tied (~38% each) as preferred locations; swimming, running/walking, dancing, and biking are preferred activities.

Parents. Thus far, 150 participants (mean age 44.6 ± 9.9; 97% female) have completed surveys. Results are similar to individuals' results, with 77% believing PA is beneficial and 65% wanting to improve physical functioning. Of 71 participants with eligible DCDQs (within age range), 68 scored in the "suspect DCD" range.

Conclusions: Results provide important insights into PA perceptions, barriers, and preferences of autistic people in New Zealand, and will be used to develop and evaluate a PA programme for this population. Interestingly, DCDQ results suggest that 96% of autistic children show indications of DCD; future research into ASD+DCD co-occurrence is warranted.



# The association between sociodemographic variables, body composition and intake of healthy and unhealthy foods in 5–9 year old South African children

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#### Pre-recorded Presentation

Purpose: Poor dietary habits in children are associated with an increased risk for adult obesity. The purpose of this study was to assess the association between sociodemographic variables, body composition and intake from healthy and unhealthy food groups among young children in the North West Province, South Africa.

Methods: In this cross-sectional study 1065 children aged 5-9 years were selected from eight schools, stratified according to sex, race and socio-economic status. Frequency of intake from healthy (meats, milk, fruit, vegetables) and unhealthy food groups (fast food, cold sugar sweetened beverages (SSB), hot sweetened beverages, salty snacks, sweets/candy, cookies) was assessed. Height, weight and socio-demographic information were collected and body mass index (BMI) z-scores were calculated based on the WHO reference. Physical fitness was assessed using a pacer test to determine number of 20m laps successfully completed. Principal components analysis was applied to identify food group patterns. Associations between these food pattern scores, sociodemographic variables and BMI z-scores were assessed using multivariable regression analysis.

Results: Most of the children had normal weight, while more children were overweight/obese (19.4%) than underweight (3.8%). The median frequency of intake from healthy food groups was 3-4 days/week, for unhealthy food groups it was 1-2 days/week, except for SSBs (5-6 days/week), while staple foods were eaten daily. Three food group patterns were identified, namely 'Animal source protein foods-SSBs', 'Fast food-Snacks' and 'Fruit-Vegetables'. Positive associations between household income and 'Animal source protein foods-SSBs', as well as 'Fruit-Vegetables' patterns were found, while household income was negatively associated with scores on the 'Fast food-Snacks' pattern. Household income and child age were positively associated with BMI z-score, whereas physical fitness and 'Fruit-Vegetables' pattern score were negatively associated with BMI z-score.

Conclusions: Low household income limits access to more expensive foods, such as meats, dairy products, fruit and vegetables, rich in nutrients for child development, but not to cheaper snacks and fast foods. Physical activity and fitness among young school-age children contribute to lower BMI z-scores.



# Validity of self-reported intakes of school meals by older children using meal photography

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#### Pre-recorded Presentation

Purpose: Understanding the relative accuracy of dietary instruments to assess what children eat at school is critical to evaluate the impact of school-based nutrition programs. We examined the validity of a self-reported, web-based, time-use diary that records dietary intakes of children from a local primary school in Singapore.

Methods: Children were trained to record their food intake and daily activities on a web-based, time-use diary daily for four days. Pictorial images on the web-based diary were provided for selection of food items and portion sizes that best corresponded to what they consumed. Their school recess meal (includes school-bought foods and/or foods brought from home) was observed using the digital photography method for two of the four days to validate the accuracy of their self-reported records.

Results: Of 36 children (11 year old; 47% males), five children did not report their school recess meals on the webbased diary and were excluded from subsequent analysis. Based on the photographed food images (n=66 food items), 65% of food items were reported in the diaries, of which 23% were inaccurately reported (e.g. incorrect cooking method, type of juice). The remaining one-third (35%) of food items photographed were omitted from the self-report and were typically ingredients of a composite dish, such as 'Meat and Fish' and 'Vegetables and Mushroom' food items. From diary records (n=59 food items), around one in four food items reported (27%) were not captured in the photographed food images, and were mostly single items such as bread with spreads, snacks, and drinks. Portion sizes of 50% of food items were accurately reported in the diaries. Composite foods from the 'Noodles, pasta and potatoes' and 'Rice and porridge' category tended to be overestimated, while beverage portions were mostly well-estimated.

Conclusion: This study suggests that 11-year-old children could report 65% of food items consumed and correctly report portion sizes for 50% of food items through the web-based diary. This is comparable to other web-based questionnaires administered to children of similar age, where reporting accuracy ranged from 43% to 81.4%. The present web-based diary is thus a promising tool for assessing dietary intake among children of this age.



# Patterns of food parenting practices regarding junk food and sugary drinks among parent-child dyads

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#### Pre-recorded Presentation

Purpose: Food parenting practices affect children's dietary intake and are often used in combination, although they generally are studied independently. Hence, the purpose of this study was to determine patterns of food parenting practices regarding junk food and sugary drinks (JS) and explore their associations with demographic characteristics and dietary intake in parents and their children (12-17 years). Unique aspects of this study include the use of a person-centered analytic approach and data from a large sample of children and parents that purposely included fathers.

Methods: Dyadic survey data from Family, Life, Activity, Sun, Health and Eating, a cross-sectional, Internet-based study conducted in 2014, were analyzed using latent class analysis to identify patterns of parent- and child-reported JS parenting practices (n=6). Model covariates included parent and child sex, body mass index, intake of sugar from sugar-sweetened beverages (SSB), and beliefs about whether it is okay for a parent to make rules about a child's behavior like JS intake (JS legitimacy of parental authority [LPA]).

Results: Based on 1,657 parent-child dyads, five latent classes were identified – Complete Influencers (28%), Indifferent Influencers (21%), Negative Influencers (20%), Minimal Influencers (18%), and Disagreeing Influencers (13%). Compared to older child dyads, younger child dyads had 77% and 65% lower odds of belonging to Indifferent and Minimal Influencers versus Complete Influencers. Odds of belonging to Negative Influencers were 3% higher for every teaspoon increase in parent intake of sugar from SSB while odds for Minimal Influencers were 8% lower for every teaspoon increase in child intake of sugar from SSB versus Complete Influencers. Dyads with low compared to high parental and child agreement with JS LPA had between 2 and 27 times the odds of belonging to one of the other classes versus Complete Influencers.

Conclusions: This study's findings indicate that distinct patterns of JS parenting practices exist and are associated with dyadic demographic characteristics, dietary intake, and JS LPA. Because parents are not all the same in their use of and the number of parenting practices used to influence their child's dietary intake, a more personalized approach may be needed when designing family-based nutrition interventions.



# Parental influences on physical activity and screen time among preschool children from rural Brazil

<u>Miss Widjane Gonçalves<sup>1, 2</sup></u>, Dr. Rebecca Byrne<sup>1</sup>, Prof. Pedro Lira<sup>2</sup>, Dr. Marcelo Viana<sup>2</sup>, Prof. Stewart G. Trost<sup>1</sup> <sup>1</sup>Centre for Children's Health Research, Institute of Health and Biomedical Innovation, School of Exercise and Nutrition Sciences, Queensland University of Technology, Brisbane, Australia, <sup>2</sup>Federal University of Pernambuco, Recife, Brazil

#### Pre-recorded Presentation

Purpose: Childhood obesity is a global problem, with children from low-middle income (LMIC) countries being disproportionately affected. Understanding how parents influence children's obesity-related behaviours would inform interventions to promote healthy lifestyle behaviours and prevent obesity. However, to date, no study has investigated the relationships between parenting practices and young children's physical activity (PA) and screen time (ST) in families residing in rural Brazil. Therefore, the aim of this study was to examine the relationships between supportive and controlling parenting practices and movement behaviours in preschool-aged children residing in rural Brazil.

Methods: Parent-child dyads from rural Caruaru, Brazil (n=78) completed a validated interviewer-administered survey measuring sociodemographic data, parenting practices and children's movement behaviours, including PA and ST. Child PA and sedentary time were also objectively measured using an ActiGraph GT3X+ accelerometer. Spearman correlations were used to assess the relationships between parenting practices and children's PA and ST.

Results: 53% of the children were male, with a mean age of  $4.6\pm0.8$ , and 41% were mixed-race.Parents completing the interview were mostly female (92%), and employed full-time (54%).Rules around active play indoors (rho = -0.31 to -0.35), the use of PA to reward/control child behaviour (rho = 0.27 to 0.48), limiting or monitoring screen time (rho = 0.22 to 0.29), and limiting outdoor play due to weather (rho = -0.23 to -0.36) were controlling parenting practices significantly associated with PA (p<.05). Verbal encouragement for PA (rho = 0.27 to 0.33) and perceived importance and value of PA (rho = 0.34 to 0.35) emerged as significant supportive parenting practices associated with PA (p<.05). Greater exposure to TV (rho = 0.40), limiting or monitoring screen time (rho = -0.56), and explicit modelling and enjoyment of screen time (rho = 0.49) were significant correlates of child ST (p<.05).

Conclusions: Supportive and controlling parenting practices shown to be salient in high-income countries emerged as significant correlates of children's PA and ST behaviours in rural Brazilian families. The findings identify potential targets for family-based interventions to prevent childhood obesity and warrant further investigation in larger, more representative samples of rural Brazilian families.



# Psychometric properties of an instrument designed to measure parenting practices and children's obesity-related behaviours from Brazil

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#### Pre-recorded Presentation

Purpose: Childhood obesity has increased remarkably in low-middle income (LMIC) countries; however, validated measures of obesity-related behaviours and parenting practices are lacking. The current study evaluated the psychometric properties of an instrument designed to measure parenting practices and children's physical activity (PA), screen time (ST), and sleep (SL) adapted to Brazilian families.

Methods: Phase 1 involved translation of the instruments to Portuguese. The selected instruments included, the PA parenting practices questionnaire – PAPP (Vaughn, 2013), the bedtime routine questionnaire – BRQ (Henderson, 2010), the outdoor playtime recall (Burdette, 2004), and screen time and sleep items from the InFANT Study (Hesketh, 2013). Phase 2 involved cognitive interviews with 24 parents from urban and rural Caruaru, Brazil addressing the format, content and clarity of the items. Seventy-eight parent-child dyads then completed the adapted instrument as an interviewer-administered survey twice within 7 days. Child PA, sedentary time and SL were concurrently assessed using an ActiGraph GT3X+. Internal consistency and test-retest reliability was assessed using Cronbach's alpha and Intraclass Correlation Coefficients (ICC). Concurrent validity was evaluated by calculating Spearman correlations between parent reported outcomes and objectively measured behaviours.

Results: Cronbach alphas for the PAPP and BRQ scales were acceptable, and ranged from 0.66 - 0.88. The scales "limiting outdoor play due to weather" ( $\alpha$  = 0.39) and "maladaptive activities on sleep" ( $\alpha$  = 0.16) were excluded due to low internal consistency. Test-retest reliability of the parenting practices were acceptable, and ranged from ICC = 0.82 - 0.99. Parent reported PA was positively correlated with objectively measured LMVPA (r=0.43, p < .05) and MVPA (r=0.39, p < .05). Parent reported SED time was positively correlated with objectively measured SED (r = 0.26, p < .05), and inversely correlated with LMVPA (r = -0.35, p < .05) and MVPA (r = -0.29, p < .05). Parent reported SL duration was positively correlated with objectively measured SL on weekdays (r = 0.29, p < .05), but not weekends.

Conclusions: Previously published instruments to measure children's obesity-related behaviours and parenting practices, translated and adapted for use in Brazilian families, exhibited acceptable evidence of validity, internal consistency and test-retest reliability.



# Gender, parenting practices and adolescent dietary behaviours

Ms. Alysha L Deslippe<sup>1,2</sup>, Dr. Mariana Brussoni<sup>1,2</sup>, Dr. Teresia M O'Connor<sup>3</sup>, Dr. Louise C Masse<sup>1,2</sup>

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Pre-recorded Presentation

#### Purpose:

Structured, autonomy supportive and controlling parenting practices have been associated with adolescent's dietary behaviours. To date, little work has considered the interplay between parents' and adolescents' gender on dietary behaviours and parenting practices. Therefore, this study examined whether the associations between parenting practices and adolescents' dietary behaviours are similar by adolescents' gender and examined whether gender of parent moderated these relationships.

#### Methods:

This study conducted a secondary analysis of the Family Life Activity Health Sun and Eating (FLASHE) data. FLASHE recruited a nationally representative sample of US parents and adolescents to complete surveys about their health behaviours and environment. A total of 1633 adolescents (12-17 years; 50% girls) and 1619 (74% mothers) parents were analyzed. Linear regressions were used to assess the relationship between parenting practices and adolescents' dietary behaviours (fruit and vegetable (F&V) or sugar-sweetened beverage (SSB) consumption). All models controlled for known confounders and were run independently for boys and girls. Parent gender was explored as a moderator in each sample of adolescents.

#### Results:

Parenting practices seem to have a greater association with boys' dietary behaviours compared to girls. Boys consumption of F&V was found to have a significant positive association with use of structured (b=.24) and autonomy supportive (b=.20) parenting practices. Use of controlling parenting practices had a significant negative association with boys F&V consumption (b=-.12), but positive association with SSBs (b=.11). Girls F&V consumption only had a positive association with structured practices (b=.27). Parent gender did not moderate these associations.

#### Conclusions:

The relationship between parenting practices and adolescents' dietary behaviours differed by boys and girls. Controlling and autonomy supportive parenting practices was not implicated in girls but were in boys. These findings raise the possibility that gender may be an important factor in the associations between parenting practices and adolescent dietary behaviours. Further work exploring whether parents use different parenting practices based on gender of their child or whether boys and girls differ in the ways they respond to specific parenting practices is needed.



# Gender plays a role in the deterioration of dietary behaviours as youth transition to secondary school

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Pre-recorded Presentation

#### Purpose:

Diet is a well-established risk factor for childhood obesity. During the transition to secondary school, dietary behaviours deteriorate with boys engaging more frequently in unhealthy dietary behaviours compared to girls. To date, limited literature has considered the factors that may be affecting this observed shift in boys' and girls' dietary behaviours at this age. The aim of this qualitative study was to explore how individual and environment factors (including household, social, and school factors) relate to the changes in boys' and girls' dietary behaviours as they transition into secondary school.

#### Methods:

Twenty-eight semi-structured interviews were conducted with a diverse sample of families from Surrey, BC, Canada. Interviews were conducted separately for one parent and child (11-13 years) from each family with interviewers probing for changes in youth's environments that may be related to dietary behaviours. Codes were triangulated using three trained researchers. Thematic analysis was used to explore differences between boys and girls.

#### Results:

The analysis suggests boys' and girls' exposure to parenting practices and expectations surrounding food consumption within the familial environment differed. Specifically, boys' food consumption remained influenced by parental control whereas girls began to experience greater autonomy in food decisions including being more involved in food preparation. Boys further express pressure to consume larger quantities of food to increase body size whereas girls did not. Differences in the social environment also emerged; girls viewed fast food consumption as a key aspect of friendship, suggesting peer influence over this dietary behaviour, whereas boys consumed such foods based on hunger or convenience. Within the school environment, boys and girls experienced greater freedom during their school lunch hour but report using this time differently (boys-satiety or sports vs. girls-socialization).

#### **Conclusions:**

Boys and girls report differences in how parental, social and school environments influence their dietary behaviours as they transition to secondary school. Taking a gendered lens may help ensure that dietary interventions appeal to both boys and girls at this age. Addressing the retention of health promoting dietary behaviours can help protect against the development of childhood overweight and obesity.



# Recipes as a "sticky hook" to engage parents in family meals promotion

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#### Pre-recorded Presentation

Purpose: Nutrition in early childhood is suboptimal internationally, contributing to high rates of overweight and obesity. Family meals are linked to improved child diet and health outcomes, making them a potentially valuable setting for nutrition promotion, but little is known about ways to engage parents on this topic ("sticky hooks"). The aim of this study is to assess parent interest in different types of family meals information, and whether this differs by education level.

Methods: An online survey of Australian parents with children aged 6 months to 6 years was conducted in 2014 (T1), with follow up in 2016 (T2). At T1 parents were asked to rate their interest in various types of information to support family meals (17 options), and how they would prefer to receive information about family meals (15 options). At T2 parents were asked what types of recipe resources they would use (6 items). Parents also reported their education level. Differences by education level (dichotomised to tertiary vs non-tertiary) were tested using Pearson's Chi-Square test.

Results: Participants (n = 890 at T1, n = 387 at T2), mostly mothers (97%), reported high interest in recipes. Most indicated they were "very interested" in: healthy recipes (58%), easy recipes (57%), recipes to prepare with children (59%) and recipes the whole family will enjoy (60%), with no differences by education level. Recipes were more highly rated than other information such as benefits of family meals or ideas about planning or sourcing food. In regard to the method of receiving family meal promotion material, electronically on mobile or computer was rated highest (83% and 88% interested respectively), followed by newsletters (76-79%) and Apps (63%). Overall participants were just as interested in recipes or electronic cookbooks published by a university or health service as by well-known cooks, though those of lower education were less likely to be interested in evidence-based information from health professionals, researchers, or universities.

Conclusions: Knowing that recipes provided in various electronic formats are of interest to parents (a "sticky hook"), this could inform innovative approaches to engaging parents with interventions promoting healthy family mealtimes.



# Adolescents' perspectives on factors that negatively influence sleep behaviour in 10-14 year olds in Amsterdam: a participatory study

<u>Miss Helga Emke<sup>1, 2</sup></u>, Dr. Coosje Dijkstra<sup>2</sup>, Prof. Stef Kremers<sup>3</sup>, Prof. Mai Chin A Paw<sup>1</sup>, Dr. Teatske Altenburg<sup>1</sup> <sup>1</sup>Department of Public and Occupational Health, Amsterdam Public Health Research Institute, Amsterdam UMC, Vrije Universiteit Amsterdam, Amsterdam, Netherlands, <sup>2</sup>Department of Health Sciences, Faculty of Science, Vrije Universiteit Amsterdam, Amsterdam, Netherlands, <sup>3</sup>Department of Health Promotion, NUTRIM School of Nutrition and Translational Research in Metabolism, Maastricht University Medical Centre, Maastricht, Netherlands

#### Pre-recorded Presentation

Purpose During the transition from primary to secondary school adolescents' sleep disturbances and insufficient sleep duration increases. However, the factors underlying this are largely unknown. Therefore, we conducted a participatory needs assessment to identify 1) adolescent-perceived factors that negatively influence sleep, and 2) adolescent-perceived changes in these factors after the transition from primary to secondary school.

Methods During one school year weekly participatory meetings were held with one group of 10-12-year-olds and one group of 12-14-year-olds (n=5-8 per group) facilitated by an academic researcher. During these meetings adolescents actively participated as co-researchers in exploring factors influencing their sleep behaviour and that of their peers (e.g. using interviews, questionnaires, focus groups with peers). Of all identified factors, adolescent-co-researchers selected the most important factors that may negatively influence sleep, and subsequently indicated potential causal pathways.

Results As most important factor influencing sleep, adolescents mentioned social media: the accompanying notifications (e.g. messages from apps or friends on a mobile device) make them curious and anxious to miss out on something and keep them awake. Being energized by this, some adolescents subsequently game at night. Second, adolescents mentioned that a lack of sleep rules from their parents results in later bedtimes and an increased use of social media or gaming at night. Third, adolescents indicated that when experiencing stress at night - for example due to academic pressure - they lie awake more and have more nightmares. Additionally, environmental factors such as lights and ambient noise, and making homework or being physically activity close to bedtime were mentioned. Last, adolescents mentioned that they like to stay awake at night because it is fun; they consume candy and energy drinks to accomplish this. After the transition from primary to secondary school adolescents perceived less sleep rules from their parents, resulting in later bedtimes and an increased use of social media at night.

Conclusions This participatory study identified factors negatively influencing sleep from the perspective of adolescents themselves. This knowledge may be helpful for the development of effective interventions targeting healthy sleep behaviour for this age group.



# Are maternal feeding practices associated with toddlers' food neophobia?

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Pre-recorded Presentation

Purpose: Toddlerhood is a crucial period for developing eating habits. Evidence about the association between maternal feeding practices and children's food neophobia is lacking. This study was conducted to explore the relationship between maternal feeding practices and toddlers' food neophobia among a sample in Ireland.

Methods: This was a follow up to the DIT-Coombe Hospital cohort study in Ireland. Mothers in the original cohort were contacted by telephone call. Postal questionnaires were distributed to those who agreed to participate in the current follow up. Multivariate logistic regression analyses were performed to determine the association between maternal feeding practices and toddlers' food neophobia.

Results: There were 205 participants included in the study of which 98 (47.8%) toddlers had high degree of food neophobia (score>12). Children's food neophobia was positively associated with maternal practices of coaxing the children to eat at refusal (OR=2.279, 95% CI:1.048-4.955), maternal unpleasant feelings at mealtime (e.g. stressful or hectic for themselves, or tearful for children) (OR ranged between 1.618 and 1.952), and mothers' own degree of food neophobia (OR=1.036, 95% CI: 1.001-1.072). Mothers who were not anxious when confronted with food refusal of the child, was a protective factor for child's food neophobia (OR=0.251, 95% CI: 0.114-0.556).

Conclusions: The determinants of high level of child's food neophobia revealed in this study suggests that responsive feeding for the toddlers; and mothers remaining calm and patient with the child at mealtime be recommended.



# From "Stop running" to "Let's go play": Impact of a brief staff training intervention on children's physical activity during an after school program

**Dr. Emily Mailey<sup>1</sup>**, Ms. Jerica Garcia<sup>1</sup>, Dr. Richard Rosenkranz<sup>1</sup> <sup>1</sup>Kansas State University, Manhattan, United States

#### Pre-recorded Presentation

Purpose: After school programs are a promising setting to promote children's physical activity (PA). However, program staff may lack the motivation or capacity to structure the environment or implement evidence-based strategies to promote PA. The purpose of this study was to evaluate the impact of a brief staff training based on contemporary theoretical approaches on PA among children attending an after school program.

Methods: Two Boys and Girls Club (BGC) after school sites participated in this quasi-experimental study. Four days of data were collected from each site in February 2019 (baseline) and May 2019 (follow-up). Data collection included accelerometer-measured PA of participating children (n=27 per site) and direct observation of BGC staff behaviors (frequency of PA encouragement and discouragement). Following baseline data collection, BGC staff at site 1 attended a 30-minute training, which incorporated principles from the Theory of Expanded, Extended, and Enhanced Opportunities (TEO) and the Supportive, Active, Autonomous, Fair, Enjoyable (SAAFE) framework. Staff identified strategies to allocate more time to PA and free play and facilitate a variety of games to promote PA among all children. Site 2 served as a comparison group. Changes in sedentary time, light activity, and moderate-to-vigorous physical activity (MVPA) were compared between sites using independent samples t-tests (alpha = 0.05). Children with at least two days with >30 minutes of wear time at both time points were included in a complete case analysis.

Results: Significant differences between sites were observed for all variables. Relative to the comparison group, children at the intervention site decreased sedentary time by 14.4 min/day (p=.04, 95%CI=1.3-27.7 min/day), and increased light activity and MVPA by 8.8 (p=.007, 95%CI=2.7-14.7 min/day) and 6.8 minutes (p=.002, 95%CI=2.9-10.7 min/day), respectively. The ratio of staff encouragement to discouragement improved from 40% to 94% at site 1, compared to 51% and 59% at site 2.

Conclusions: The application of TEO and SAAFE principles with leaders of an after school program shows promise for increasing children's PA in this setting. Future studies should examine the effectiveness of these approaches across a wider range of after school programs and explore sustainable strategies for conducting staff training.



# Translation of two healthy eating and active living support programs for parents of 2-6 year old children: preliminary results of a parallel partially randomised preference trial (the 'Time for Healthy Habits' trial).

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Pre-recorded Presentation

#### Purpose

Parents are key decision makers and role models in establishing and maintaining healthy behaviours in preschoolaged children. Interventions involving parents have been shown to be more effective than those that do not. However, there are barriers to group participation, which telephone-based and online programs have the potential to overcome. Efficacy trials have previously been conducted on two such interventions - Healthy Habits (telephonebased) and Time2bHealthy (online) with promising results. Further research is now required to determine their effectiveness and cost-effectiveness in a real-world context.

#### Methods

Time for Healthy Habits is a three-arm partially randomised preference trial to evaluate the effectiveness of two theory-based healthy eating and active living programs for parents of 2- to 6-year-old children (Healthy Habits Plus (telephone) and Time2bHealthy (online)), compared to a comparison group (written materials). It is planned to recruit 636 participants primarily from five Local Health Districts in New South Wales, Australia. The partially randomised preference design initially allows for participants to decide to be randomised or select their preferred intervention, a design recommended to test effectiveness in a real-world setting. Interventions provide practical information on healthy eating, physical activity, sedentary behaviour and sleep over 12 weeks. Outcomes are assessed post-intervention and at 6-month follow-up. Participants also complete a process evaluation questionnaire post-intervention. Outcomes include fruit and vegetable intake (primary outcome), discretionary food intake, weight status, physical activity, sedentary behaviour, and sleep habits.

#### **Results/Findings**

Of the 218 participants who had a strong preference for study group, 61% chose the online intervention, 29% chose written materials and 10% chose the telephone intervention. A limited number of participants have completed the interventions at the time of submitting this abstract. Post-intervention outcome and process results for participants who have completed the intervention will be presented at the ISBNPA meeting.

#### Conclusions





To our knowledge, this is the first translational research trial evaluating the effectiveness of a healthy eating and active living intervention in the 2- to 6-year age group. Results will build the evidence base regarding the translation of effective childhood obesity prevention interventions and inform the implementation and delivery of publicly funded childhood obesity prevention programs.



# Relationship between physical activity behaviour and motor skills among preschool children in Malaysia: Preliminary results from SUNRISE study Malaysia

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Pre-recorded Presentation

Purpose: This study aimed to determine the prevalence of children aged four years who meet the WHO's 2019 guidelines on physical activity (PA). The guidelines states that children aged 3-4 years old should participate in at least 180-minutes of PA a day including 60-minutes of moderate-to-vigorous intensity PA (MVPA). A secondary aim for this study is to explore the relationship between meeting the PA guidelines and motor skills among these children.

Methods: This is a cross-sectional study. Preschool children aged four years were recruited from urban and rural localities in three states in central region of Peninsular Malaysia, namely Kuala Lumpur, Selangor and Negeri Sembilan. PA was measured using Actigraph GT3X+ accelerometers. The accelerometer was worn on the waist for five days, from Monday to Friday. Children with at least one 24-hour day of data were included in the analysis. Gross and fine motor skills were measured using the Ages and Stages Questionnaire Third Edition (ASQ-3) for age 48 months.

Results: A total of 82 children completed the study protocol. There was a good representation of boys (51.2%) and girls (48.9%), and from rural (47.6%) and urban (52.4%) areas. Accelerometer data showed that slightly more than half (57.3%, n=47) of the children participated in at least 180-minutes of PA a day. However, among them, only 30 (36.6%) also participated in at least 60-minutes of MVPA, thus meeting the WHO PA guidelines. Most children were developing on schedule without needing intervention or assessment, for gross motor skills (72.0%) and fine motor skills (69.5%). We found no significant association between sex and location with meeting PA guidelines. Further, there were also no significant association between meeting PA guidelines and gross and fine motor skills in this age group.

Conclusions: The findings showed that many preschool children in Malaysia have insufficient physical activity, particularly MVPA. Future research should focus on innovative ways to promote physical activity, especially energetic play among preschool children.



# OzHarvest's school-based FEAST (Food Education and Sustainability Training) program: A pilot study.

<u>Ms. Fay Karpouzis<sup>1, 2</sup></u>, Dr. Rebecca Lindberg<sup>1</sup>, Dr. Adam Walsh<sup>1</sup>, Associate Professor Smita Shah<sup>2</sup>, Ms. Amelia Berner<sup>3</sup>, Prof. Kylie Ball<sup>1</sup>

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Pre-recorded Presentation

#### Objective:

This pilot study investigated the feasibility of FEAST, a community-based school program involving students, teachers, and volunteers (caregivers/community). It aimed to promote healthy eating, teach cooking skills, and develop food waste awareness, amongst children.

#### Methods:

Children aged 10-12 years in Grades 5-6 from New South Wales (NSW) Australian primary-schools participated in the study. A pre-test/post-test design using mixed methods was used. FEAST is a curriculum-integrated program that provided training to teachers to deliver the program over 10-weeks. It was guided by social cognitive theory and used project-based approaches, which are student-centred and interactive involving theory and cooking activities. FEAST aligned with Australian Dietary Guidelines and has been recognized by the UN's Global Compact Network as a program capable of contributing to 7/17 SDGs. The primary outcomes were changes in self-reported fruit and vegetable (F&V) intakes (serves/day). Secondary outcomes included: (i) F&V variety, (ii) discretionary food intake, (iii) cooking skills, (iv) food waste perceptions and behaviours, (v) sustainability understanding and (vi) satisfaction with FEAST (by students and teachers).

#### Results:

Two schools involving six teachers, six classes, 158 students, and 14 volunteers participated in FEAST. Post-FEAST, 84% of students reported meeting recommended fruit intake (2 serves/day), which was a 6% increase from pre-FEAST data. Additionally, 26% of students reported consuming  $\geq$ 4 serves of vegetables/day, which represented a 7% increase. Teachers reported high satisfaction with FEAST, observing children eating more F&Vs and less discretionary foods at school. Cooking activities were the most valuable component, helping students better understand how to prepare nutritious foods, reduce food waste and eat sustainably.

#### **Conclusions:**

The implementation of FEAST across NSW provides an invaluable opportunity to gain scholarly and translational research outcomes. Combining nutrition with wider aspects of food and sustainability may create alternative avenues for promoting nutrition education messages to children.

Given the challenges of promoting healthy and sustainable eating practices, FEAST is well-positioned to play a key student-engagement role by supporting the health-promotion within schools initiative, government-supported public health initiatives, SDGs and the national agenda to reduce food waste.



# Development of FLASH, an automatic, objective assessment of children's screen use: Face verification and gaze tracking accuracy

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#### Pre-recorded Presentation

Purpose: Current measures of children's screen use limit the ability to accurately assess children's exposure to screen media for surveillance and research. Most studies rely on self- or parent-reports. Advances in image technology, such as facial verification and gaze tracking offer solutions to objectively measure children's screen use. We report two steps in the development of an objective screen use monitoring system: FLASH (Family Level Assessment of Screen use in the Home).

Methods: FLASH-TV uses machine learning algorithms to process videos based on convolutional neural networks (CNN) to 1) detect faces, 2) verify presence of target child's face, and 3) estimate time child's gaze is on screen. Here steps 2 and 3 are reported. A video dataset was collected from 12 families in an observational lab. The target child, parent, and sibling spent time watching and not watching a TV in different positions and lighting conditions. Trained staff coded video data for target child's presence and gaze on TV (10% double coded) to serve as gold standard. Videos from 10 families were available to assess face verification. Face verification was stratified by gaze/no-gaze and reported as accuracy (true positives) and false positive rate (FPR). In a separate protocol, 5 other parent-sibling triads took part in observational protocols on two visits to assess face verification across days. A CNN-based gaze detection algorithm was trained on 5 families and, to date, tested on 4 families' data.

Results: Kappa of staff double-coding gaze was 0.91 (SD 0.15). Face verification accuracy of target child was 94.7% (SD 4.8%) for gaze and 78.5% (SD 14.4%) for no gaze, with FPR of 1.96% and 15.3% respectively. Face verification accuracy for visit 1 was 96.6% and 96.4% for visit 2. FLASH gaze detection achieved accuracy of 84.0%.

Conclusions: Current face verification algorithms are robust during gaze. Face verification during no-gaze will not be necessary to calculate screen use estimates. Our short-term goal is to optimize FLASH gaze detection to accuracy of 95%. In parallel, we are developing FLASH-Mobile, which will be a background application on mobile devices.



# Effects of a curriculum-integrated dance programme on children's physical activity: A mixed methods study

<u>Miss Geeta Sharma<sup>1</sup></u>, Dr. Tom Stewart<sup>1</sup>, Dr. Scott Duncan<sup>1</sup> <sup>1</sup>AUT University, Auckland, New Zealand

Pre-recorded Presentation

Purpose: Curriculum-integrated dance programmes are an under-researched strategy to increase children's physical activity, particularly in the New Zealand (NZ) primary school context. The purpose of this study was to evaluate an integrated dance intervention on NZ schoolchildren's physical activity (PA), and to explore children's perceptions of dance as a form of learning and fitness.

Methods: A total of 134 schoolchildren aged 8 - 9 years were recruited from four primary schools in Auckland, NZ. Each school was randomly assigned to either the dance group (DG; n = 78) or the control group (CG; n = 56). The DG participated in a six-week, curriculum-integrated dance programme with their teacher during school time. In addition to focusing on curricular learning (such as science, mathematics, English, and Māori culture), the dance programme also embedded activities related to fitness and coordination. The intensity of PA varied according to the focus of each dance session. PA was measured at baseline and post-intervention using waist-mounted ActiGraph GT3X+ accelerometers for eight consecutive days.

DG participants also shared their perceptions of the dance programme through journal reflections and focus group interviews. Intervention effects on sedentary, light, moderate, and vigorous physical activity and daily step counts were examined using generalised linear models. Qualitative data from children's journal writing and focus group interviews were coded and thematically analysed.

Results: There were no significant effects of the dance programme on step counts or PA levels; however, DG children did perceive the dance programme to be a form of intense physical activity as themes pertaining to fitness, energy, movement, and exercise emerged. This overlapped with other themes related to cognition and curricular learning.

Conclusions: While the dance programme in this study did not influence daily physical activity, qualitative findings suggested that children felt energised and active after the dance sessions. This adds to the literature surrounding children's perceptions towards movement-based learning and embedding dance into primary school teaching.



# Effectiveness of a novel digital platform for the development of fundamental movement skills in 3- to 6-year-old children

#### Prof. Stewart Trost<sup>1</sup>, Dr. Denise Brookes<sup>1</sup>

<sup>1</sup>Queensland University of Technology, Brisbane, Australia

#### Pre-recorded Presentation

Purpose: Fundamental movement skills (FMS) are the foundational building blocks for lifetime participation in physical activity (PA). However, with less than half of Australian children proficient in FMS, there is a need for effective interventions to promote FMS. To date, programs to promote FMS development have been primarily delivered in child care and school-based settings. To our knowledge, no studies have evaluated the effectiveness of an interactive digital platform, designed to be co-used by the parent and child, to increase FMS proficiency in preschool-aged children. Therefore, the current study evaluated the effectiveness of a digital platform application known as Moovosity<sup>™</sup> to promote FMS in 3- to 6-year-old children.

Methods: A RCT was conducted involving 34 parent-child dyads randomly assigned to either the 8-week intervention (n=17) or wait-list control (n=17) condition. Participants completed assessments of FMS proficiency (TGMD-2), PA (Burdette Checklist), and parental support for PA (Trost et al. 2003) at baseline (prior to randomization) and 8-weeks follow-up. Participants randomized to the intervention were given access to freely use Moovosity<sup>™</sup> over a period of 8 weeks. Wait-listed controls were given free access to the app at the end of the 8-week intervention period. Group differences in post-test scores for object control, locomotor skills, parental support for PA, and child PA were evaluated for statistical significance using analysis of covariance (ANCOVA), adjusting for baseline values and child age.

Results: Children randomized to the intervention exhibited significantly higher post-test scores for object control [28.0 vs. 22.6; mean difference = 5.4, 95% CI = 1.4 - 9.4]. Intervention children exhibited higher locomotor standard scores than wait list controls [34.1 vs. 30.7]; however, the p-value for the difference [3.42 (95% CI = -7.2 - 0.34) was marginally significant (P=0.07). No significant differences were observed for child PA or parental support for PA.

Conclusions: An 8-week exposure to a digital platform to promote motor competence within a family environment was effective in improving FMS proficiency in preschool-aged children, in particular, object control skills. The results are encouraging and warrant further investigation in larger trials involving more families, objective measures of PA, and longer follow-up periods.



# A peer-led intervention targeting obesity-related behaviours and delivered to parents at community-based playgroups is both feasible and acceptable

<u>Ms. Andrea Fuller<sup>1,4,5</sup></u>, Dr. Rebecca Byrne<sup>1,4,5</sup>, Associate Professor Rebecca Golley<sup>2,4</sup>, Prof. Kylie Hesketh<sup>3,4</sup>, Prof. Stewart Trost<sup>1,4,5</sup>

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Pre-recorded Presentation

Purpose:

Use of autonomy promoting parenting practices in relation to eating, screen time, physical activity and sleep reduces obesity risk in young children. Obesity prevention interventions rarely focus on parenting across all four obesity-related behaviours. In addition, most are delivered by researchers or health professionals in a health service delivery setting. The aim of this pilot trial was to evaluate the feasibility and acceptability of a peer-led obesity-prevention intervention delivered to parents of young children attending community playgroups.

Methods:

Community playgroups were recruited through Playgroup Queensland, a not-for-profit organisation in Brisbane, Australia. A pilot clustered randomised controlled trial was conducted to evaluate the feasibility and acceptability of a peer-led intervention delivered over five sessions within a 10-week school term. The content and delivery mode of the intervention was informed by focus groups conducted with parents at playgroup. It was delivered by parent peer facilitators, who received training on facilitating group discussions using the "healthy conversations" concept. The conversation topics covered parenting challenges with respect to child eating, screen time, active play, and sleep. Feasibility and acceptability were evaluated via post-session surveys.

#### Results:

Thirty-three playgroups (220 parents) took part in the trial (intervention n=113; wait-list control n=107). Just over 74% of the parents receiving the intervention were satisfied or very satisfied with the group conversations, and 68% rated the overall program to be useful or very useful. All topics were rated positively, with the conversations about active play the most popular. Parents commented on how much they enjoyed talking about their parenting challenges and sharing information and ideas with other parents facing similar issues.

#### Conclusion:

A peer-led intervention targeting obesity-related behaviours in families attending community playgroups is feasible and acceptable. The peer-led "healthy conversations" delivery model, and the leveraging of existing social support networks were important and novel aspects of the intervention.



# Movement behaviours and physical, cognitive, and social-emotional development in preschool-aged children: Compositional substitution analyses

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Pre-recorded Presentation

#### Purpose

Movement behaviours (e.g., sleep, sedentary behaviour, and physical activity) in isolation have demonstrated benefits to preschool-aged children's development. However, little is known on the integrated nature of movement behaviours and their relationship to healthy development in this age range. Thus, the objective of this study was to examine the relationships between accelerometer-derived movement behaviours and indicators of physical, cognitive, and social-emotional development using compositional substitution analyses in a sample of preschool-aged children.

#### Methods

Children (n=95) were recruited from Edmonton, Canada. Movement behaviours were measured with ActiGraph wGT3X-BT accelerometers, worn 24 hours/day. Physical (i.e., BMI z-scores, percent of adult height, and motor skills), cognitive (i.e., working memory, response inhibition, and vocabulary), and social-emotional (i.e., sociability, externalizing, internalizing, prosocial behaviour, and cognitive, emotional, and behavioural self-regulation) development were measured. Objective height and weight were measured for BMI z-scores and percent of adult height, and the Test of Gross Motor Development-2 was used to assess motor skills. The Early Years Toolbox was used to assess all cognitive and social-emotional development indicators. Compositional substitution models were conducted in R for each development outcome.

#### Results

Children accumulated 11.1 hours of sleep, 6.1 hours of stationary time, 5.1 hours of light-intensity physical activity (LPA), and 1.8 hours of moderate- to vigorous-intensity physical activity (MVPA). Consistent favourable associations were found when adding MVPA while subtracting other movement behaviours for locomotor, object, and total motor skills; except one null association when removing stationary time for locomotor skills. The majority of associations for stationary time, LPA, and sleep were non-significant. However, some additional favourable associations were found when adding MVPA and subtracting other behaviours (i.e., sociability when subtracting stationary time and sleep; cognitive self-regulation when subtracting LPA), and when adding stationary time and subtracting other behaviours (i.e., vocabulary when subtracting sleep; BMI z-scores when subtracting MVPA).

#### Conclusions

When considering the composition of movement behaviours in this sample, the findings confirmed the importance of MVPA for motor skills. Favourable results were found for some other substitutions, but further research is needed in larger and more representative samples to confirm these findings.



# The use of wearable cameras in assessing children's dietary intake and exploring risk factors for childhood obesity in China

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#### Pre-recorded Presentation

Purpose: The use of lifelogging device in dietary assessments can reduce misreporting and underreporting of foods, which are common in previous studies using conventional method among adults. However, no similar study among children has been conducted. This is the first study in Chinese children that applied the wearable cameras in assisting dietary recall and exploring dietary risk factors for childhood obesity.

Method: Children (n=52) wore the wearable cameras (Narrative Clip 2) for seven consecutive days, during which they completed a 3-day 24-h dietary recall at home (DR). Then children modified their dietary recalls at school by reviewing the photos taken by the wearable camera, with the assistance of the investigator, and generated the camera-assisted 24-h dietary recalls (PDR). Children's satisfaction with the wearable camera was measured by a short questionnaire at the end of the study. Foods consumed, energy and nutrients intakes recorded by DR were compared against that from PDR. Binary logistic regressions were performed on the PDR data, to identify the dietary risk factors for childhood obesity.

Results: Compared with PDR, 8% (n=160) and 1% (n=11) of food items were underreported and misreported by dietary recalls without camera-assistance (DR), respectively. DR underestimated daily energy intake by  $149 \pm 182$  kcal/d (8%) in comparison to the PDR results. Foods consumed on the snacking occasions (40%) were more likely to be underreported than those consumed at main meals (P<0.001). Beverages (37%), fruits (30%), snacks and desserts (16%) were foods most likely to be inaccurately reported. Children were satisfied with the wearable cameras, with a median score of of 5.0 for most features. Children who were infrequent to dine with family members had higher risk of obesity (OR=14.59, 95% CI: 1.83, 116.22), after controlling for potential confounders.

Conclusions: Wearable cameras hold promise for improving accuracy of dietary intake assessment in children, providing rich objective information on dietary behaviours, and received high level of satisfaction and compliance of the users. Our results suggest that eating with others may be a protective factor for childhood obesity.



# Short-term efficacy of reducing screen media use on physical activity, sleep, and physiological stress in families with children aged 4-14: The SCREENS randomized controlled trial

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#### Pre-recorded Presentation

Purpose: During the recent decade presence of digital media, especially handheld devices, in everyday life, has been increasing. Survey data suggests that children and adults spend much of their leisure on screen media, including use of social media and video services. Despite much public debate on possible harmful effects of such behavioral shifts, evidence from rigorously conducted randomized controlled trials (RCTs) is lacking. The purpose of the SCREENS trial is to investigate the short-term efficacy of limiting leisure screen media use on objectively assessed physical activity, sleep duration and quality, and physiological stress in parents and their 4-14-year old children.

Methods: The SCREENS pilot was conducted during the fall of 2018 and spring of 2019. Based on experiences from the pilot, we developed a protocol for a parallel group RCT. The trial is being conducted from May 2019 to ultimo 2020 in 95 families with children 4-14 years recruited from a population-based survey. As part of the intervention family members must handover most portable devices for a 2-week time frame, in exchange for classic mobile phones (not smartphones). Also, entertainment-based screen media use during leisure must be limited to no more than three hours/week/person. At baseline and follow-up, 7-day 24-hour physical activity will be assessed using two triaxial accelerometers; one at the right hip and one the middle of the right thigh. Sleep duration will be assessed using a single channel EEG-based sleep monitor system. Also, to assess physiological stress (in adults), parameters of 24-hour heart rate variability, the cortisol awakening response and diurnal cortisol slope will be quantified using data sampled over three consecutive days. We will objectively monitor the families' screen media use via different software and hardware monitoring systems.

Discussion: Using a rigorous study design with state-of-the-art methodology to assess outcomes and intervention compliance, analyses of data from the SCREENS trial will help answer important causal questions of leisure screen media habits and its short-term influence on physical activity, sleep, and other health related outcomes among children and adults.



# Resiliency in the face of migration: How exercise protects against perceived discrimination and fosters well-being

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#### Pre-recorded Presentation

Purpose: Although the proportion of individuals with a migrant background is growing worldwide, migrants are still severely underrepresented in health research. Social Stress Theory (SST) proposes that migrants are at higher risk of being exposed to psychosocial stressors compared to non-migrants, resulting in decreased well-being. However, studies comparing well-being in migrants and non-migrants have shown both, lower well-being (supporting SST) and higher well-being in migrants (Healthy Migrant Effect). Research on individual factors or mechanisms that are associated with well-being in migrant populations is dearly needed. We address this research gap by examining the role of physical exercise for well-being in migrants. We hypothesize that physical exercise buffers the negative effects of experienced stress on well-being and that the more vulnerable migrant populations benefit more from this stress-buffering effect.

Methods: Data from N = 18,714 adolescents from the CILS4EU study, a multinational, longitudinal panel that oversamples migrants, were analyzed with regression analyses to test the moderating effect of migration background on the relation between exercise and experienced stress (perceived discrimination) and well-being (life satisfaction). Results/findings: In line with our hypothesis, migrants reported more discrimination and exercised less often than non-migrants. At the same time, migrants showed higher well-being. The regression analysis shows that discrimination was negatively ( $\beta$  = -.24, p < .001) and physical exercise positively associated with well-being ( $\beta$  = .12, p < .001). The interaction between discrimination and exercise was significant, such that exercise buffers the adverse effect of discrimination on well-being ( $\beta$  = .03, p < .05). Further, the positive effect of exercise on life satisfaction was stronger in migrants compared to non-migrants ( $\beta$  = .02, p < .05).

Conclusions: Well-being is not only a key determinant of integration but also of general health. Despite lower levels of exercise, migrants benefitted more from exercise for well-being compared to non-migrants. Because health behavior change interventions targeting the general population may not reach migrants, innovative, culturally sensitive interventions could lead to improved health behavior in migrants and, ultimately, resilience in the face of adversity and higher well-being.



# Effects of exergaming on preschool children's physical activity, sedentary behavior, and cognition: A cross-over study

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Pre-recorded Presentation

Purpose: Early childhood physical activity (PA) interventions may help promote preschoolers' healthy lifestyle habits and optimal development. However, effects of innovative exergaming interventions on preschool children's PA and cognition remain largely unanswered. In response, this study was designed to examine the effectiveness of a home-based exergaming program on preschool children's PA, sedentary behavior, and cognition in a randomized cross-over trial.

Method: A total of thirty-two preschool children (16 boys; 59.4% Asian; Mage = 4.72, SD = ± .73) were recruited from the Twin Cities, MN in the U.S. During baseline testing, preschoolers' percentages of time in light PA, moderate-tovigorous PA (MVPA), sedentary behavior, and cognition were assessed via ActiGraph accelerometers and Dimensional Change Card Sort Test. Children were then randomly assigned to 1) an intervention condition: engaging in home-based LeapTV exergaming at least 30 minutes/session 5 times/week for the first 12 weeks and then resumed their regular PA patterns without exergaming during the second 12 weeks; or 2) a delayed-intervention control condition: maintaining their regular PA patterns for the first 12 weeks, and participated in the same dose of home-based exergaming during the second 12 weeks. Identical assessments were conducted at the 13th and 25th weeks.

Results: Data were analyzed with PROC Mixed in SAS. Results suggested significant interaction effects of treatment by period for percentage of time in MVPA, F(1,26) = 1.94, p = 0.049; and cognition, F(1,28) = 2.02, p = 0.04, favoring the exergaming intervention. In addition, there was a significant sequence effect for percentage of time in MVPA, F(1,26) = 5.08, p = 0.03. No other effects were identified. For example, there were no interaction effects of treatment by period for percentage of time in light PA, F(1,28) = 1.06, p = 0.44; and in sedentary, F(1,26) = 1.02, p = 0.48.

Conclusions: Home-based exergaming has the potential to positively impact cognitive functions and percentage of time in MVPA in preschoolers, although its significant effects on light PA and sedentary behavior were not evident in this study. Thus, the novel exergaming intervention program may be a good PA alternative for home-based interventions.



# Supporting migrant mothers with infant feeding and healthy growth: qualitative evaluation of the culturally adapted Healthy Beginnings program

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Pre-recorded Presentation

Background/Aims

Promoting healthy behaviours during infancy is critical for establishing healthy growth in early childhood and the early prevention of obesity. Healthy Beginnings is an established evidence-based program in Sydney, Australia, led by child health nurses to promote and support best-practice infant feeding, nutrition and physical activity. To reduce inequalities and extend reach to culturally and linguistically diverse families, a feasibility study was conducted to culturally adapt the Healthy Beginnings program for Arabic and Chinese communities. This study aimed to explore program successes, satisfaction and suggested improvements through interviews with staff and mothers involved in the adapted program.

#### Methods

The culturally adapted program was piloted with 94 Arabic- and 69 Chinese-speaking women from their third trimester until their baby was aged 6 months. Mothers were offered adapted and translated health promotion materials and text messages, and telephone support from bi-cultural nurses. At program completion, all implementation staff and mothers were invited to participate in a semi-structured interview to contribute to program evaluation. Interviews were audio-recorded with consent and transcriptions were analysed using descriptive thematic analysis.

#### Results

10 implementation staff, 22 Arabic-speaking mothers and 19 Chinese-speaking mothers participated in individual interviews. Analysis highlighted positive factors, particularly the key role of bi-cultural nurses in providing not only quality tailored infant feeding and care advice, but also culturally sensitive support for the mother's health and wellbeing. Suggested enhancements included greater availability of nurses to receive calls, options to connect mothers through groups or online forums, and strengthened community partnerships to support the cultural adaptation process and referrals.

#### Conclusions

The culturally adapted Healthy Beginnings program shows potential for continued delivery and scale-up. These qualitative findings provide opportunities to enhance the program adaptations to further the relevance among Chinese and Arabic migrant families. Learnings from this study offer insights for future cultural adaptations of maternal and child health promotion programs to reach culturally and linguistically diverse families and provide culturally appropriate support for healthy infant feeding and the early prevention of obesity.



# Photographs assist in identifying Socio-Ecological factors influencing dietary behaviors of families living in underserved communities

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#### Pre-recorded Presentation

Purpose: Although diet is an essential component of a healthy lifestyle, diet quality of US children is suboptimal. Disparities exist; children from low-income, minority families are at greatest risk. Because parents influence home food choices, we investigated parent perspectives of factors that influence dietary choices. Family-produced photographs added insight and context.

Methods: Using a convergent mixed methods design (surveys, interviews, photographs), a purposive sample of parents/caregivers of 8-13 year-olds living in underserved communities in a large US city were recruited (n=18). Surveys were completed online; descriptive statistics were calculated. Mobile phones were used to take photographs of factors that make it easy/hard to eat healthfully; photographs were discussed during the interview. Interviews were scripted, digitally recorded, and professionally transcribed. Two coders used hybrid thematic analysis to separately code transcripts. Coders met routinely to compare decisions and resolve differences. A codebook was maintained.

Results/Findings: All parents/caregivers were female and mostly 40-49 years old (61%), minority (56% Black/African-American, 44% Hispanic), and married/living with significant other (61%). Annual household income was \$21,000-\$44,000 (44%). Emerging interview findings reveal that mothers have a strong influence on the home food environment, although child and spouse preferences exert an effect. Opinions vary as to the influence of culture. Availability, cost, convenience, and time are cited as positive and negative influences. Mothers use a variety of strategies to help their families eat healthy foods: involving children in food shopping/preparation, buying food on sale, employing food substitutions, and making food-related activities fun. Technology is used to locate recipes, find substitutions, or view demonstrations. Cooking is seen as an important life-skill, and mothers express interest in attending a cooking class with their children, although opinions vary as who the class leader should be (e.g., chef, nutritionist, knowledgeable/experienced community member). Although mothers want to help their families consume a healthy diet, photographs, supported by interviews, reveal beliefs, practices, and misconceptions that may limit effectiveness.

Conclusions: Understanding family perspectives can provide insight into ways to enhance diet quality of children and families living in underserved communities.



# How can we use family meals from the past to understand family meals today?

<u>Ms. Georgia Middleton</u><sup>1</sup>, Dr. Karen Patterson<sup>1</sup>, Prof. Rebecca Golley<sup>1</sup>, Prof. John Coveney<sup>1</sup> <sup>1</sup>Flinders University, Adelaide, Australia

Poster

Purpose: What was the family meal like thirty years ago? What can the past tell us about the present and future? How can behavioural nutrition benefit from archival data? These are the questions we sought to answer by analysing thirty-year-old interview data on the family meal for the first time. The purpose of this research was to investigate the family meal, its involved processes and expectations thirty years ago, allowing us to further our understanding of experiences of the family meal over the last three decades.

Methods: In 1992-1994, qualitative interviews regarding family eating behaviours were carried out with parents across South Australia. For the present study, transcripts from this sample were selected via purposeful sampling, which continued until theoretical saturation was achieved. Drawing on the methodology of grounded theory, data were analysed through the cyclical process of initial coding, 1187ocused coding, memo writing and team meetings. This is the first time this data has been thoroughly analysed.

Findings: A total of 49 transcripts from 16 families were analysed. Analysis of the data shows that thirty years ago there were numerous considerations and processes involved in getting the family meal on the table. Parents spoke about needing to be flexible to achieve a family meal that fit their lifestyle, often requiring numerous strategies. Some parents upheld the traditions of their childhood, where others specifically changed their practices from those they remembered growing up. Some parents were adamant about sitting at the table and communicating, where others were more flexible in their renditions of the family meal, eating separate meals, at separate times, in separate places.

Conclusion: This data represents a time capsule of what the family meal was like thirty years ago. It is a baseline of data from which we can build, compare to the present and project into the future. It is a look into the past without relying on recollections and the memories of participants. With this information, we can gain a greater understanding of what was, which may help us with understanding what is, and what the future may hold for family meals.


## What can families gain from the family meal? A mixed-papers systematic review

<u>Ms. Georgia Middleton<sup>1</sup></u>, Prof. Rebecca Golley<sup>1</sup>, Dr. Karen Patterson<sup>1</sup>, Ms. Fairley LeMoal<sup>2</sup>, Prof. John Coveney<sup>1</sup> <sup>1</sup>Flinders University, Adelaide, Australia, <sup>2</sup>Institut Paul Bocuse, Ecully Cedex, France

Poster

Purpose: The family meal has been associated with health and wellbeing benefits for both adults and children. However, majority of the research is correlational, and thus unable to prove a causal relationship between family meals and positive outcomes. Our systematic review set out to determine the causal relationship between family meals and health and wellbeing and explore family members' perceptions of the family meal. This is the first systematic review to investigate the impact the family meal has on the health and wellbeing of children and parents, and which collates parent and child perspectives on the family meal.

Methods: A systematic search across five databases was employed and aimed to capture family meal intervention and qualitative studies published between 2008-2019. To be included, interventions had to have an active intervention and control group, target the family meal and measure family meal and health outcomes postintervention. Qualitative studies had to employ focus groups or interviews with parents or children, focussing on the family meal. Two reviewers were involved in screening of studies, appraising included articles and extracting data. Quantitative data was synthesised in narrative form, and qualitative data underwent meta-aggregation

Results: Thirty-two articles were deemed eligible for inclusion. Only one intervention included in this review exclusively targeted the family meal, the remaining studies included other target strategies as part of their intervention (e.g. physical activity, snacking, sleep routines). Only two of the eight interventions reported statistically significant differences between control and intervention groups for family meal frequency or quality. The qualitative studies identified multiple barriers to the family meal, including scheduling conflicts, exhaustion and lack of time, and reported family connection and communication as the main perceived benefits of the family meal

Conclusions: There is a gap between the benefits and barriers to the family meal identified through qualitative research, and current intervention strategies, with few interventions exclusively targeting the family meal. Interventions that are informed by qualitative literature and exclusively target the family meal are needed to further investigate the causal relationship between family meals and potential health and wellbeing outcomes for adults and children.



## Can a family-based intervention increase children's physical activity in Hong Kong? Preliminary results from a randomized controlled trial.

<u>Miss Ying Huang<sup>1</sup></u>, Prof. Amy Ha<sup>1</sup>, Dr. Johan Ng<sup>1</sup> <sup>1</sup>The Chinese University of Hong Kong, Hong Kong, China

Poster

Purpose: Physical activity levels between parents and children are positively associated. Parents therefore play a crucial role in shaping children's behavior, through appropriate support and modeling. To this end, a family-based intervention based on self-determination theory was designed to enhance the support parents provided to children, and to increase co-physical activity between the dyads. The effectiveness of the intervention was evaluated using a randomized controlled trial.

Methods: Children (N=158, 8-11 years, from seven Hong Kong primary schools) and their parents were randomly allocated to an experimental (n=81) or a wait-list control group. The intervention included ten sessions spread over approximately six months. Each session included a 30-minute workshop and a 60-minute period of activities tailored for parents and children to play together. Children's moderate-to-vigorous physical activity (MVPA) was measured using accelerometers (ActiGraph wGT3X-BT) for a five-day period at baseline and at end of intervention, respectively. Only valid cases, defined by a minimum wear time of three days with 8 hours, were included in the analyses. Multi-level analyses were conducted to examine the intervention effects on children's MVPA.

Results: A significant group by time interaction in favor of the experimental group was found for daily MVPA (B=8.82, 95% CI [2.38, 15.25], p =.007). The experimental group indicated a 7.29 minutes increase (p = .016) in MVPA from baseline (47.85 $\pm$ 1.90 minutes) to the end of the intervention (55.14 $\pm$ 2.60 minutes); no significant difference was found in the control group. At baseline, no differences were found between groups (p =.574). While at the end of the intervention, there was a difference between groups (p =.041).

Conclusion: Preliminary evidence suggested that the intervention was feasible and effective. The intervention provided knowledge, opportunities for parents and children on physical activity. Future studies should consider engaging more family members in interventions, and to incorporate more exercises suitable for wider age groups. Additionally, researchers could also examine if embedding family-based approaches in physical activity promotion could strengthen relationships among family members.



## Maternal stress, maternal feeding practices and child weight – preliminary data from the RESONANCE/NomNom cohort

<u>Dr. Elena Jansen<sup>1</sup></u>, Dr. Muriel Bruchhage<sup>2</sup>, Ms. Alexandra Volpe<sup>2</sup>, Mr. John Rogers<sup>2</sup>, Ms. Jennifer Beauchemin<sup>2</sup>, Dr. Viren D'Sa<sup>2</sup>, Prof. Sean Deoni<sup>2</sup>, Prof. Susan Carnell<sup>1</sup>

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#### Poster

Purpose: Multiple early risk factors for childhood obesity have been identified, including environmental influences like maternal stress and non-responsive feeding practices. Less is known about underlying biological mechanisms, for example, impacts on early development of neural appetite systems. To address this gap, the NIH-funded RESONANCE study, and its sub-study NomNom, are collecting longitudinal brain imaging data and biological specimens, in parallel with rich environmental and behavioral data relevant to obesity risk, beginning in infancy. We present preliminary associations between maternal stress, feeding practices and child weight which will form the basis for future investigation of neural mechanisms.

Methods: Mothers' Perceived Stress Scale (PSS) scores and Comprehensive Feeding Practices Questionnaire (CFPQ) scores, and child BMI z-scores (BMIz) based on measured weight and height, were available for 92 RESONANCE/NomNom mothers of children (62.0±24.0 months, 43.5% girls). Spearman correlations were examined. We additionally examined correlations between CFPQ scores and child BMIz stratified by low and high PSS scores (median split).

Results: Higher maternal stress was associated with higher restriction for health reasons (p=.032) and higher child BMIz (p=.006). Higher restriction for health reasons, and weight control, were both associated with higher child BMIz (p<.05). Higher encouragement of a balanced variety of foods, and monitoring, were associated with lower child BMIz (p<.05). Stratified analyses showed that while higher child BMIz was associated with greater restriction for weight control in both low and high stress groups (p<.005), the association with restriction for health reasons only emerged among the low stress group (p=.002 vs. p=.885).

Conclusions: Maternal perceived stress was correlated with feeding practices and child weight, with relationships between feeding practices and weight differing by stress level. Future analyses will consider the role of other household characteristics such as SES, as well as neural mechanisms. Since RESONANCE forms part of NIH's US-wide Environmental influences on Child Health Outcomes (ECHO) program, future analyses using large samples obtained from multiple cohorts will allow more complex longitudinal modelling of these relationships and their biological mechanisms.



## Which one is relatively important? Paternal or maternal supports for children and adolescents' physical activity

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#### Poster

Purpose: Social support from parents has a positive influence on promoting children's physical activity (PA). Since social supports were frequently examined with mixed parent gender in China, the specific associations between supports from either father or mother and PA were unclear. The objective of this study was to examine the associations between six kinds of social support from fathers/mothers (encouragement, observation, involvement, discussing benefits of PA, financial support and role model) and children and adolescents' moderate-to-vigorous physical activity (MVPA).

Methods: From September to October 2019, using a multi-stage stratified and random cluster sampling method, 1509 (age 8-18) students from 16 primary, middle and high school of two districts in Shanghai participated in this survey. MVPA and social supports were measured by self-reported questionnaires with good reliability and validity, and finally, 1307 (boys 50.5%, mean age 12.66  $\pm$  2.78) participants were included. Descriptive statistics and Chi-square were used to report the level of MVPA and differences between variables. Logistic regression was used to examine the association between paternal/maternal support and MVPA.

Results: 16.8% of children and adolescents engaged in MVPA at least 60 minutes per day with gender difference (boys vs. girls: 10.6% vs. 6.2%, p < 0.001). Compared to those who received low paternal support, boys (OR: 2.60-3.51, 95% CI: 1.75-5.25) and girls (OR: 1.84-2.81, 95% CI: 1.15-4.52) with high paternal support both exhibited a higher ratio of MVPA. As for maternal support, boys with high maternal support regardless of support type were more likely to reach MVPA (OR: 1.96-2.83, 95% CI: 1.28-4.18). Girls who received five kinds of high maternal support (except for discussing benefits of PA) had a higher likelihood for MVPA (OR: 1.79-2.73, 95% CI: 1.07-4.44).

Conclusions: The level of PA among children and adolescents was low, while boys were more physically active than girls. The findings from this study suggested that different kinds of social support from parents were important in facilitating children and adolescents' participation in MVPA, and possibly the "father-son" relationship was relatively the strongest.



# The effect of parental report and child perception of parental support on children's need satisfaction in physical activity and well-being

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**Poster** 

Purpose: Based on the tenets of self-determination theory, parents' psychological need support is an important predictor of children's physical activity behaviors. By contrast, parental behaviors perceived as controlling would have negative consequence on behavioral outcomes and may even diminish the well-being of youngsters. In this study, we examined the relation between parent- and children-rated parental support in terms of physical activity, and how these affected psychological need satisfaction and frustration in children.

Methods: Questionnaires were administered to 161 children-parent dyads (children mean age = 8.77±0.81 years, 94 male) who took part in a family-based physical activity promotion program. The administered questionnaires included scales measuring need support and psychological control (by parents and children), psychological need satisfaction and frustration, and quality of life (children only). Structural equation modeling was used to test a model based on self-determination theory.

Results: The results showed that children perceived parental support and parent-report support were positively correlated (r=.18, p=.04). Children perceived parental control and parent-report control (r=.32, p<.001) was also associated. Using structural equation modeling, we found support for a model linking need support and control, need satisfaction and frustration, and quality of life of children:  $\chi^2(7)=11.40$ , p=.12, CFI=0.969, RMSEA =0.062. Positive paths were found between parents- and children-reported need support ( $\beta$ =.206, p=.016) and control ( $\beta$ =.318, p<.001), respectively. Perceived need support was related to need satisfaction and well-being. Whereas perceived control predicted need frustration, which in turn affected children's well-being negatively.

Conclusions: Results indicated that parents' self-reported need support and control are perceived similarly by their children. These behaviors were also related to children's well-being indirectly via need satisfaction and frustration. Therefore, teaching parents to become supportive, and less controlling, may result in better physical activity behaviors and well-being in their children. Engaging and educating parents may hence be an effective means to promote physical activity in children.



## Links among breastfeeding history and subsequent weight-related behaviors of mother: Child dyads

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Poster

Purpose: Breastfeeding has beneficial effects on maternal and child health; however links between breastfeeding history and subsequent weight-related behaviors of mothers and their preschool-aged children are understudied. Thus, this study examined links among breastfeeding history and weight-related behaviors of mother: child dyads 2 to 5 years post breastfeeding.

Methods: Mothers (age=32.25±5.80SD years) of preschool children (age=3.47±1.09SD) completed an online survey assessing weight-related behaviors (dietary intake, child feeding strategies, sleep duration, eating behaviors, physical activity) of themselves and one of their randomly selected children aged 2-5 years. Mothers were divided into 2 groups based on breastfeeding history: 135 did not breastfeed and 415 had breastfed their child.

Results: T-tests revealed mothers who had breastfed had significantly (P<0.05) lower BMIs than never breastfeeders ( $27.23\pm7.53$ SD vs. 29.10 ±8.82SD). Sugar-sweetened beverage intake was significantly lower for mothers who had breastfed vs non-breastfeeders ( $0.83\pm0.86$ SD vs.  $1.08\pm0.94$ SD servings/week). Breastfed children consumed significantly less 100% juice than comparators ( $4.17\pm2.70$ SD vs. $5.31\pm2.53$ SD servings/week), although milk intake did not differ for mothers or children. Responses to 5-point Likert scales indicated mothers who had breastfed were significantly more likely to pressure children to eat healthy foods than other mothers ( $2.22\pm0.95$ SD and  $2.01\pm0.99$ SD); no other child feeding behavior (i.e., restriction, control of food choice and timing, rewarding healthy eating) differed. Mothers who had breastfed and their children had significantly longer sleep duration than counterparts (mothers= $7.30\pm1.88$ SD and  $6.84\pm1.71$ SD hours/night; children= $10.60\pm2.14$ SD and  $10.13\pm1.83$ SD hours/night, respectively). Mother and child eating behaviors (emotional eating, food neophobia), physical activity, and health status did not differ by breastfeeding history.

Conclusion: Breastfeeding history is associated with some, but not all, maternal and child weight-related behaviors 2-5 years post breastfeeding. Future studies should examine how length of breastfeeding affects mother: child dyad weight-related behaviors to identify temporal links and how they may support adherence to breastfeeding recommendations.



# Breakfast habits and dietary intakes of school-going children from 1 primary school by food groups and eating location in Singapore

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**Poster** 

#### Purpose:

Dietary habits are established in childhood and may have lifelong influences on health outcomes. We aim to examine the prevalence of breakfast skipping and key food groups consumed by children at home and out-of-home, including school and other locations.

### Methods:

Children aged 11-12 years were recruited from a primary school in Singapore and were asked to record their dietary intakes, eating location, and activities over a 4-day period using a self-administered time-use web-based diary. Breakfast skipping was defined as not eating (except water) between waking and the commencement of morning school classes at 0800 for weekdays and 1100 for weekends.

### Results

Among 114 children (55% males), the proportion who completed 4-day, 3-day and 1 to 2-day diaries were 61%, 9%, and 30% respectively. Nearly half of the children reported consuming breakfast on all days while 42% skipped breakfast on some days and 11% never ate breakfast. Based on intakes averaged over 1 to 4 days, about half of the children reported not consuming any fruits or vegetables per day. Even for children who reported consuming fruits and vegetables, the majority had less than 2 servings of fruits or 2 servings of vegetables per day. Fruits and vegetables were consumed by 40% and 70% of the children at home, respectively. A large proportion of the children reported not consuming any dairy products or wholegrains per day (72%, 65%). Most of those who consumed dairy products had less than 1 serving per day and mostly consumed at home. Three-quarter of the children reported consuming sugar-sweetened beverages (SSB) per day and consumed them at multiple locations. About one-third of SSB consumers had more than 1 serving per day.

### Conclusions:

Less than half of the children consume breakfast regularly and intakes of fruit, vegetables, dairy, and wholegrains were generally inadequate, while daily consumption of SSB was common. A large proportion of the healthier food groups was consumed at home. These highlight the need to further review the food environment of children to increase their uptake of healthier foods.





# Policies and environments (SIG)



# Developing healthy eating, sleeping and physical activity habits among 10-14 year olds in Amsterdam: Design of a systems evaluation framework

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Symposium Recording

#### Purpose:

Programmes addressing childhood obesity have long focused on targeting single determinants. Causes of childhood obesity are however diverse, complex and multiple.

Systems thinking embraces the complexity of problems such as overweight and obesity and aids in understanding how factors in the system are interrelated and affect each other so that these can be targeted and produce favourable changes in a system.

While there is a growing call for systems approaches in public health research, there is relatively little guidance on how to best develop and evaluate public health interventions in complex systems. This study therefore aimed to develop an evaluation framework using a complex systems approach.

### Methods:

The LIKE (Lifestyle Innovations based on youths' Knowledge and Experience) project was used as a case study. LIKE is part of the Amsterdam Healthy Weight Program and aims to create healthy habits amongst young adolescents in lower socio-economic and ethnically diverse neighbourhoods.

The evaluation framework served both as a tool for informing and supporting the development and implementation of the intervention programme and as way of generating generalizable knowledge on the impact of the programme so that it could be applied elsewhere.

### Results:

A developmental evaluation design was used at the start of the LIKE project as it is particularly well suited for programmes that target complex environments with high uncertainty. It assisted evaluators in developing an understanding of the system and in framing and adapting the intervention in real time as patterns of change emerged and as the intervention unfolded.

Besides supporting the intervention development, the evaluation framework also aimed to produce generalizable knowledge using a summative evaluation. Here the evaluation focuses on comparing pre-existing and follow-up systems and developing indicators on system level changes using the Intervention Level Framework.

### Conclusions:

An evaluation framework was developed for the LIKE project that was informed by key principles of developmental and summative evaluation using a complexity perspective. This evaluation design can inspire future public health programmes in developing and evaluating interventions in complex systems.



# Building a literature-based systems map of determinants of dietary intake in low-income groups as a basis for health equity policies

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#### Symposium Recording

Purpose:

Inequalities in obesity and related non-communicable diseases pertain in part to less healthy dietary intake in disadvantaged groups. Examining determinants of intake in low-income groups as a complex adaptive system – i.e. interconnected determinants exerting non-linear influence on outcomes - honours the complexity of the reality governing individuals' dietary choices, behaviours and intake, and could enhance assessment of policies. However, it is not clear if existing literature on relevant determinants can be synthesised, and understood, as a complex system.

This study aimed to use existing literature to map the complex system underlying dietary intake in low-income groups, in order to identify system structures and goals perpetuating poorer dietary outcomes.

### Methods:

A systematic umbrella review was conducted on literature examining determinants of dietary outcomes in lowincome children, adolescents and adults. Inclusion criteria:

- Low-income (or related construct) sample or analysis by income;
- (Non-)systematic, scoping, mapping reviews or meta-analysis of quantitative or qualitative, observational or intervention studies;
- Higher/upper-middle-income countries;
- Exposures: individual, sociocultural, physical, political determinants, effect modifiers;

The following outcomes were excluded: breastfeeding, alcohol and neophobia.

Data on determinants, associations and mechanisms were extracted and, using causal loop diagramming, embedded in a systems map of determinants underpinning dietary intake. The map was analysed in terms of system structure (e.g. subsystems) and goals (e.g. structure and feedback loops).

Results:

A systems map of hypothesised mechanisms underlying dietary intake in low-income groups was developed from 43 reviews and expert consensus. The system was interpreted as underpinned by cross-sectoral subsystems supporting goals around: commercial competitiveness, cost-efficient purchasing, use of food to indicate group membership and preference-based food selectivity. Goals may undermine opportunities for healthy intake; e.g., energy-dense food choices resulting from cost-efficiency and preferences determined by heightened exposure to energy-dense foods.

Conclusions:



Using an innovative but challenging systems approach, we developed a literature-based systems map which begins to articulate the systemic basis of dietary outcomes in low-income groups. Deeper understanding of identified system structures and goals will facilitate the development and assessment of effective and equitable policies. 77

# The DINAMICS project: Application of system dynamics models to understand the role of social norms in obesity prevalence

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Symposium Recording

Background Body weight perception is a product of interactions between an individual and their socio-cultural environment. We consider this a complex system inducing population-level obesity as an emergent property. The system consists of a micro-macro feedback loop between 1) social norms; 2) individuals' body weight perception; and 3) individual lifestyle and BMI. Lifestyle affects norms while also being affected by norms. Given this feedback loop, it remains unclear whether addressing lifestyle only via health awareness can decrease obesity prevalence; norms might be a counteracting driver. Still, norms have been neglected in epidemiological research as quantitative methods cannot consider micro-macro feedback loops. System dynamics modelling (SDM) can be a solution to understand and simulate a system's emergent behaviour.

Methods: We used an expert-informed causal loop diagram as a template for six SDMs. These correspond to six sociocultural groups (Dutch, Moroccan and South-Asian Surinamese men and women) from an Amsterdam-based cohort, which includes body weight (BMI) and weight perception measures. We validated the SDMs based on their performance on validation statements compared to random SDMs. We simulated the effect of three scenarios on population-level BMI: where individual lifestyle was driven 1) only by health awareness, 2) only by norms, 3) by their interaction (health awareness and norms).

Findings We operationalised norms in the SDMs based on population-level median BMI and data describing sociocultural ideal BMI. The SDMs outperformed random SDMs. They showed that median BMI drops 10.8% (2.78 BMI points) in scenario 1), 5.3% (1.36 points) in 2), and 7.4% (1.91 points) in 3). The male groups demonstrated a 2.06 times larger drop in scenario 1) than in 3) than their female counterparts (1.12 larger drop).

Interpretation Social Norms diminish the potential effect of health awareness on BMI. This was consistent in all groups but the effect was stronger in males than females. Our findings imply that, since norms affect the lifestyle (and ultimately BMI) of female groups to a lesser extent, there must be additional underlying drivers of obesity in women.



## The online food environment and its interaction with individual food purchases: The development of a conceptual model

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### Symposium Recording

Purpose: Traditionally, food environment exposures are expressed as the availability or accessibility of food outlets (e.g., fast-food restaurants) in people's living environment, the characteristics of these outlets (e.g., distance, opening-hours) and the products for sale at these outlets (e.g., nutritional value, shelf-space, price). The online environment, however, has changed the way food is now available and promoted, and how people interact with the food environment. The primary objective of this study is to present a conceptual framework, relevant for researchers and policymakers, which depicts key relationships between the online food environment and food purchases.

Methods: Based on the current literature, by means of a concept mapping exercise and expert consensus, a conceptual model is currently being developed.

Results: At this stage, the conceptual model provides conceptual insights into how food purchases are influenced by online food environments. To illustrate, the conceptual model depicts how individuals are exposed to food online (e.g., via apps, social media, websites, and email), the mechanisms via which the online environment shapes food purchasing decisions (intention) and directly and through interactions with the "brick-and-mortar" environment influences food purchases (adoption). In addition, the model incorporates potential mechanisms via which the online food environment may shape determinants of food choices (e.g., social norms, knowledge, values) and mechanisms shaping online food purchase behaviors (e.g., convenience, time-stress).

Conclusions: The proposed conceptual model will help advance research on possible multidimensional influences of online food environments on food purchases. Specifically, the model suggests multiple new lines of research that may identify new interventions and policies to improve population health. It is, however, vital that researchers, public health professionals and policy makers become aware of this online component of the food environment.



# Online food delivery service use and associated sociodemographic characteristics: A cross-sectional, multi-country analysis

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Symposium Recording

Purpose: Foods prepared away-from-home, in fast-food outlets and restaurants, are characteristically high in energy, fat and salt. Foods are often purchased in person, however, online food delivery services like Just Eat (Menulog) offer an alternative and could influence purchasing. It is not well known how much, or by whom, online food delivery services are used. We aimed to describe the prevalence of online food delivery service use, and correlated sociodemographic characteristics of users, across five countries.

Methods: We used cross-sectional, self-reported, online survey data (n=17,573) from Canada, Australia, the UK, USA and Mexico, collected in 2018 through the International Food Policy Study. We identified respondents who used an online food delivery service to order at least one meal prepared away-from-home in the past 7 days and calculated the number and proportion of meals ordered. We used adjusted logistic regression to investigate whether odds of online delivery service use varied according to sociodemographic characteristics.

Results: Overall, 2,580 (14.7%) respondents reported online food delivery service use. Prevalence of use was highest in Mexico (n=839 (25.8%)) and lowest in Canada (n=304 (8.8%)). In total, 5,526 meals; 11.1% of all meals purchased away-from-home.

Odds of online food delivery service use decreased as age increased (per year, OR: 0.47; 95% CI: 0.44, 0.50), and was associated with being male (vs female, OR: 1.50; 95% CI: 1.34, 1.67), from an ethnic minority (vs majority, OR: 1.66; 95% CI: 1.45, 1.89), more educated (highest vs lowest, OR: 1.56; 95% CI: 1.35, 1.79), and living with children aged under 18 (vs not, 2.45; 95% CI: 2.17, 2.77), but not body weight. Similar patterns were observed across countries.

Conclusions: Prevalence of online food delivery service use varied by country. Typically, younger, male, adults, those from an ethnic minority, with greater education, and living with children under 18 years had greater odds of use. Further work to understand why fast food is ordered online, how it could displace other order modes, nutritional quality of food available and overall impact on diet and health is required.



## Residential vs school neighborhoods: associations with physical activity among adolescents

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### Pre-recorded Presentation

Purpose: Adolescents have the potential to be active in multiple places across weekdays and weekends. However, most studies of the built environment and physical activity focus exclusively on residential neighborhoods. This study aims to examine cross-sectional associations of objective built environments around home and school with accelerometer-assessed moderate-to-vigorous physical activity (MVPA) across the week.

Methods: Data were collected from 417 adolescents (12-20 years) in Melbourne, Australia as part of the Neighborhood Activity in Youth study. MVPA outside school hours on weekdays and weekend were assessed by accelerometer. Built environment features around home and school (500m, 1km and 2km street network buffers), including recreation facilities, park count, park size, trails, and walkability and its components, were assessed using Geographic Information Systems. Sociodemographic information were self-reported by adolescents. Multilevel linear regression models were used to estimate associations.

Results: On weekdays, three features of the built environment (park count, park size and trails) around school (mostly within 500m-1km street network buffers) and one feature of the built environment (recreation facilities) within 2km from home were positively associated with MVPA. On weekend days, seven of eight of the selected built environment features (all except trails) around home across the three buffer sizes were positively associated with MVPA. Only park count within 500m from school was also positively associated with weekend MVPA.

Conclusion: Selected built environment features around home appear to be more important for weekend MVPA and features around school more important for weekday MVPA among adolescents. Understanding the contribution of built environment features around both home and school could serve as a basis for policy recommendations and public health interventions to be developed for each setting.



## Walkability and energy intake: Moderating effects of area-level socioeconomic status

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#### Pre-recorded Presentation

Purpose: While walkable neighbourhoods are beneficial for active living, some adverse associations between walkability and cardio-metabolic health indicators have been reported. Potential explanations include detrimental health impacts of other behaviours that may take place in walkable neighbourhoods, such as dietary behaviours. Since walkable neighbourhoods have more commercial destinations, residents of such neighbourhoods may have easy access to unhealthy food outlets. We examined the association of walkability with energy intake; and, potential moderating effects of area-level socioeconomic status (SES) on this association, given that accessibility of unhealthy food outlets have been found different by area-level SES.

Methods: We used the 2011–12 wave of the Australian Diabetes, Obesity and Lifestyle Study (AusDiab3) data from 2,354 participants (54% women, mean age = 63.0 years) who had not changed their residential locations since the 1999-2000 baseline survey. The outcome variable was daily energy intake (kJ/day) assessed using a food frequency questionnaire, and higher values reflected the consumption of energy-dense foods. A walkability index was calculated, using dwelling density, intersection density, and destination density, all within 1 km street-network buffer around participants' residence. Area-level SES was determined from Census data. Multilevel linear models estimated main and interaction effects.

Results: The average energy intake was 7087.8 kJ/day. After adjusting for potential confounders, walkability was not associated with energy intake (b= -81.8 kJ/day, p = 0.154). We found statistically significant interactions of walkability and area-level SES with energy intake (p = 0.003). Higher walkability was associated with lower energy intake in high SES areas (b= -276.4 kJ/day, p = 0.055), whereas higher walkability was associated with greater energy intake in low SES areas (b= 433.4 kJ/day, p = 0.018).

Conclusions: These findings suggest that dietary behaviours may also contribute partially to the relationship of walkability with cardio-metabolic health. However, the role of dietary behaviours may differ by area-level SES. The development of walkability-focused strategies to reduce the burden of cardio-metabolic diseases should take into account multiple health behaviours, which may differentially influence the disease risk.



# The trips4health study protocol: A single-blinded randomised controlled trial incentivising public transport use to increase physical activity

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### Pre-recorded Presentation

Purpose: Public transport users accumulate more physical activity (PA) than motor vehicle users, but evidence of effective, cost-effective and scalable strategies for increasing public transport-related PA is sparse. Further, incentive-based strategies show promise for increasing leisure-time PA, but no studies have examined impacts on other PA domains, such as transport PA. This paper describes the trips4health randomised controlled trial (RCT), which aims to determine effectiveness of an incentive-based strategy to increase public transport use on PA.

Methods: trips4health is a single-blinded RCT with a four-month intervention phase and six-month follow-up phase. Three hundred and fifty adults ( $\geq$  18 years) from southern Tasmania will be randomised to: an incentives-based intervention (bus trip credits for reaching bus trip targets, theoretically-driven weekly text messages to support greater bus use, written PA guidelines); or an active control (written PA guidelines). Incentives are allocated by the public transport provider. The primary outcome is change in mean accelerometer-measured daily step count at baseline, four- and ten-months. Secondary outcomes are changes in: measured and self-reported travel behaviours (e.g. public transport use), PA and sedentary behaviour; self-reported and measured health (blood pressure, waist circumference, height, weight); travel behaviour enablers/barriers; quality of life; and participant and provider transport-related costs. Linear mixed model regression will determine group differences. Extensive process, implementation and scalability evaluation is embedded throughout (e.g. participant surveys, intervention group interviews, public transport provider interviews, reach, fidelity).

Results: Since October 2019, 77 participants have provided been randomised. The intervention appears to be showing a high level of participant acceptability, with only one withdrawal to date (due to a non-trial-related injury). Data from process evaluation interviews with public transport provider staff (n=4) indicate high acceptability, with mutual benefits identified, workloads not significantly impacted and recognition of scalability potential.

Conclusions: trips4health will determine the effectiveness of an incentive-based strategy to increase PA by targeting public transport use. The findings from this novel partnership-based intervention will enable evidence-informed decisions about the worthiness of such strategies.



## Assessing the consumer nutrition environment for the implementation and adoption of recommended policy, system and environmental practices within food pantries in Illinois

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Pre-recorded Presentation

### PURPOSE

Within the United States, food pantries are one support service for food insecure individuals to obtain food at no cost. Many individuals experiencing food insecurity have compromised diet quality which can lead to poor health. There is support that the broader consumer nutrition environment (CNE) of the pantry can influence patrons' food selections and could play a role in addressing dietary quality. This research describes the implementation and adoption of recommended policy, system, and environmental (PSE) supports that influence the pantry CNE, specifically using a validated assessment tool, Nutrition Environment Food Pantry Assessment Tool (NEFPAT). While others have described adoption of specific recommendations qualitatively, this research quantitatively describes the implementation and adoption across multiple recommendations for a statewide network of pantries.

### METHODS

The study included a sample of pantries in Illinois that were interested in receiving programming support in FY2019. The repeated measures design included a baseline NEFPAT assessment, support to implement PSE interventions, and NEFPAT post-assessment. The NEFPAT measured the implementation of recommended practices, scored as one point for each practice (total = 47). Pantries self-selected into the intervention, consisting of technical assistance, where adopted recommended practices were logged into a database.

### RESULTS

61 pantries completed a baseline assessment, scores ranged from 9-40 (Mean 22.62). 233 recommended changes were adopted across 54% of pantries. The greatest frequency of adopted recommendations was at the supply-level or using promotion tactics. Policy adoption was most infrequent (n=16). 31 pantries completed a post-intervention assessment, scores ranged from 16-41 (Mean 28.45), for an average score improvement of 5.83.

### CONCLUSION

Overall, there was modest implementation of recommended practices within the CNE for study pantries. During the intervention, pantries were most likely to adopt supply-level and promotion practices in the CNE. The higher adoption of these practices may indicate they are more feasible for pantries to implement. As changes across PSE levels are important to improve the CNE, this information of pantry uptake will empower implementation support staff to understand which recommendations to first implement before engaging on more complex levels. More pantries adopting various PSE practices could greatly impact the diet quality of pantry clients.



## The impact of traditional school uniforms on primary school student's physical activity: outcomes of a pilot cluster randomized controlled trial

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Pre-recorded Presentation

### Purpose

Many countries in the world have mandatory school uniforms. An emerging barrier to student physical activity at school, particularly among girls are traditional uniforms that are impractical, i.e. dresses, skirts and black leather shoes. Modifying the school uniform to be more activity enabling may be a simple intervention to improve student's physical activity. The aim of this study was to assess the impact of a uniform intervention on students aged 8-10 years physical activity levels across the segmented school day.

### Methods

A cluster randomised controlled trial was undertaken in 21 primary schools in New South Wales, Australia with students in grade 2 and 3. School days were randomised to a one day activity friendly uniform intervention, whereby students wore their sports uniform one randomly selected day of the week that they would otherwise wear their traditional uniform. This was compared with up to three other days where traditional uniform was worn. Student physical activity was measured using wrist worn GT-3X accelerometers for 5 school days, Chandler cut points were applied. Repeated measures linear mixed models were used to analyse the data comparing measures of physical activity during segments of the school day (whole school day, combined breaks and classroom time). Physical activity was a combination of light, moderate and vigorous.

### Results

There were 1215 consenting students of which 475 had valid data. The preliminary findings of the study found that overall students participated in 3.95 [2.74-5.16] (p=<0.001) more minutes per day. When segmented for student sex, both boys and girls participated in significantly more physical activity on the day they wore their sports uniform 4.59min [2.85-6.32] (p=<0.001) and 3.35min [1.66-5.04] (p=<0.001) respectively, compared to the day they wore their traditional uniform.

### Conclusion

Given the many challenges faced when implementing at scale, school physical activity interventions this study suggests that a school uniform policy change may represent a simple means of improving student physical activity; one that does not require significant resource to build the capacity of schools and their staff to support implementation.



## Is urban growing of fruit and vegetables associated with better diet quality and what mediates this relationship?

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#### Pre-recorded Presentation

Objective: Urban agriculture (UA), the growing of fruits and vegetables in urban and peri-urban areas, has potential as a means of improving food security, public health and dietary quality on both a broad and personal scale. However, there is little research on the relationship between UA and diet, and potential mediating factors are also unclear. The purpose of this study was to assess if proximity to and engagement with UA is associated with healthy and sustainable dietary choices and what accounts for this relationship.

Methods: UK-based adults (N=583, 69% Female) completed measures of proximity to and engagement with UA, perceived access to fruits and vegetables, health and ethical food motivations, connection with nature, psychological distress and dietary quality in an online survey. Participants were recruited from UA-related groups and the general public. The study protocol and analysis plan were preregistered via Open Science Framework: https://osf.io/4zrhy/

Results: Proposed relationships were analysed using a structural equation model (CFI=.948, IFI=.949, NFI=.932, RMSEA=.070, SRMR=0.719). Greater proximity to and engagement with UA was associated with greater perceived access to fruits and vegetables (B=.017, SE=.004, p<.001), more health-related food choice motivations (B=.003, SE=.001, p<.001), more ethical-related food choice motivations (B=.008, SE=.001, p<.001), feeling more connected with nature (B=.009, SE=.001, p<.001) and, unexpectedly, with greater psychological distress (B=.032, SE=.014, p=.027). More health-related food choice motivations were, in turn, associated with better diet quality (B=2.541, SE=.515, p<.001), as was more ethical food choice motivations (B=.887, SE=.431, p=.039). The direct pathway between proximity to and engagement with UA and diet quality (i.e. not including the mediators) was not significant (p=.665).

Conclusions: Results indicate that proximity to and engagement with UA is associated with better dietary quality, and this was partly explained by healthier and ethical food choice motivations. Upscaling UA may have benefits for dietary quality via these factors, and more research is needed to test these causal relationships and to understand these complex interactions.



## Evaluating the impact of an active play policy on licensed childcare environments, policies and practices: a longitudinal analysis

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#### Pre-recorded Presentation

Purpose: Physical activity (PA) and physical literacy are critical to development in the early years and provide a foundation for PA over the life course. Childcare is a key setting to promote PA supportive policies, practices, and environments. In 2017, the British Columbia government enacted the Director of Licensing Standard of Practice – Active Play (AP standards). To support the AP standard, a capacity building intervention [Appetite to Play (ATP)] was also initiated. Surveys were conducted prior to and following policy enactment to determine the impact of the AP standard and capacity building intervention on childcare policies and practices.

Methods: Managers of licensed group childcare centers for children aged 3-5 years completed 2 waves of surveys (n=581 for Wave 1 and n=536 for Wave 2). The surveys asked about AP standard awareness, ATP training and policies and practices for fundamental movement skills (FMS), free play, active play, outdoor play, screen time, PA modelling, and sedentary behaviour. Chi square tests assessed change in the proportion of centers with policies in line with the AP standard. Multilevel logistic regression models in centers with matched data across waves will explore predictors of supportive policies, environments and practices.

Results: A significantly greater proportion of facilities reported supportive PA policies in Wave 2 compared to Wave 1 (p<.01). For example in Wave 1, 41% of managers reported a policy about daily outdoor play time and in Wave 2 it was reported by 79% of managers. Over half of wave 2 participants indicated that in the past year, they had changed their PA policies related to time spent outdoors and FMS development. In Wave 2, 22% of managers had participated in ATP training and participation was significantly associated with having a policy for amount of active play time (p=.03).

Conclusions: A greater proportion of childcare centers were implementing written active play policies following the enactment of the AP standard, and training was significantly associated with policy implementation. The analysis of the matched data set will provide further insight into the mediators and moderators of policy implementation and adherence.



# Assessing the Reach of Investments to Reduce Early Childhood Obesity in Los Angeles (LA) County, California

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#### Pre-recorded Presentation

Purpose: This study assesses the reach of a diverse set of investments that employed innovative strategies (nutrition education, media campaigns, financial incentives, changes to physical activity environments, policy changes) aimed at reducing early childhood obesity (RECO) in low-income communities in LA County. We assess reach in terms of communities served and networks created through executing the RECO work. We also explore facilitators and barriers to reach.

Methods: This study used several innovative methods. Geospatial analyses of reach were conducted using ArcGIS with location data collected via grantee reports and interviews, and census-tract-level data on community need characteristics from Public Health Foundation Enterprises, WIC administrative data, and the American Community Survey. Network analysis conducted using UCINET examined connections between RECO-funded organizations based on grantee-reported partnerships and geographic overlap, using location data. Inductive thematic qualitative analysis of data from grantee reports, focus groups with community members, and interviews with RECO grantees assessed facilitators and barriers to reaching populations targeted by RECO, using NVivo 11.

Results: Geospatial analyses revealed that RECO activities reached a majority of LA County; 59% of census tracts received RECO activities. Even higher percentages of high-need communities were reached (e.g., 75% of census tracts in which more than 20% of WIC-participating 2 to 5-year-olds were obese were reached). Network analysis revealed connections between grantees and indicated greater network density based on geographic overlap compared to grantee-reported connections (25% vs. 15%), suggesting there was greater potential for grantee collaboration (based on serving the same geographic areas) than was actually realized (based on grantee-reported partnerships). Qualitative findings highlighted that building relationships with community members, policy-makers, and other stakeholders was key to reaching targeted populations. Lack of awareness of RECO activities due to minimal outreach and marketing was a key barrier to reach.

Conclusions: RECO reached many high-need communities in LA County; relationship-building and partnerships were key facilitators to this reach. Many partnerships between RECO grantees were established, but realizing additional potential for collaboration among grantees serving the same geographic areas might have expanded the reach of RECO to even more communities in need of these nutrition and physical activity promotion services.



# The association between neighbourhood walkability and physical activity in 74,000 people across 17 countries: The PURE study

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Pre-recorded Presentation

### Purpose:

Research linking walkability with higher physical activity (PA) has been done in high-income countries with limited environmental and economic heterogeneity leaving it unclear if these findings apply to low- and middle-income countries. This investigation uses cross-sectional data from the Prospective Urban Rural Epidemiologic study to identify the association between walkability and physical activity (PA) in communities throughout the globe.

### Methods:

Community-dwelling people between 35 and 70 years were recruited from multiple city-sites in 17 low-, middleand high-income countries. Within each city, participants were recruited in geographical clusters with representation from rural and urban areas. The International Physical Activity Questionnaire (long-form) was used to quantify total, transportation and recreation PA. Walkability was assessed using the Neighborhood Environment Walkability Scale to generate eight domains and a total score. Due to zero-inflated and highly-skewed data distribution of the PA, we used a two-parts model to assess the association between walkability and PA (logistic regression to model the probability of engaging in PA and log-normal regression to model PA values greater than zero). Models were generated for each walkability domain (and total walkability) and each PA domain; adjusted for age, sex, education, disability, location, country income level and community-level socio-economic status. Significance was set at p<0.001 to account for multiple comparisons.

### Results:

Data were available for 73 528 participants (43% male,  $51.2 \pm 9.8$  years, 59% urban residents) from low- (9%), middle- (76%) and high-income (15%) countries. Total, transportation and recreation PA were greater at higher tertiles of total walkability. Greater access to amenities, safety from crime, land use mix, neighbourhood aesthetics and satisfaction, street connectivity, safety from traffic and total walkability, but not infrastructure for walking, were associated with greater total PA (p<0.001 for all). Transport PA was associated with all walkability domains except for safety from crime and traffic (p<0.0001 for all), while recreational PA was associated with all walkability domains except for safety from crime (p<0.001 for all).

#### Conclusions:

Higher neighbourhood walkability was associated with greater PA in a population from a diverse range of environments and socio-economic levels.



# Empowering children to influence changes in their school environment for learning, physical activity health and wellbeing

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#### Pre-recorded Presentation

Purpose: Outside of home, children spend most of their time in the school environment. Schools are important settings to promote physical activity and healthy eating. This project utilised a Citizen Science community-based participatory research (CBPR) approach to engage children from 2 intermediate schools about barriers and facilitators of the school environment impacting their learning, activity levels, health and wellbeing.

Methods: Utilising the "Our Voice" citizen science methodology to discover, discuss, advocate and change their school environments, 241 children (10-13 years old) were actively involved in four project phases: self-led school walks with a mobile app (Stanford Discovery Tool) to capture barriers to and facilitators of their school environment, action group discussions of the data collected, advocacy training, and presentations to stakeholders. Action group participants (group size=8-10 students; total N=115) reviewed their school data, prioritised issues and brainstormed potential solutions. A subsample of students (N=23) were invited to participate in the advocacy training and co-creation presentation to stakeholders. Both schools' advocacy groups presented videos of their findings. Qualitative thematic analysis was used for narrative data evaluation.

Results: In total, 1236 photos, 401 audios and 918 texts were taken. Barriers identified across both schools included lack of healthy food options, broken basketball hoops, low fencing around the court that didn't stop the balls, and not having shelter in the outdoor activity areas to allow activity when it rained. Providing healthy eating options, a playground, new basketball hoops, higher fencing and a shelter to allow outdoor play year-round were suggested solutions. Specialty classes, fields/courts, and sports days were perceived as facilitators. Subsequently, the principal of one of the schools invited the researchers to conduct a follow-up evaluation to track improvements in early 2020. School 2 has already initiated changes within their school environment.

Conclusions: Integrating citizen science with a CBPR approach empowered children to collect significant and meaningful information about their local school environments, prioritise their concerns, and present their data to school personnel. Engaging in conversations with the schools' principals and Board of Trustees generated practical solutions benefiting the school community. Findings were presented at various dissemination events.



## Health and nutrition knowledge: a qualitative study with US adolescents

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#### Pre-recorded Presentation

Background: Public health food guidance could help shape adolescent dietary behaviors. However, food and nutrition-related terms are likely inconsistently defined and understood among adolescents. Investigating these concepts among adolescents may elucidate how best to communicate them. Objective: Assess how adolescents define terms commonly used in the health and nutrition field.

Methods: This was a qualitative study conducted with 21 adolescents (12.05±1.32 years old, 57.1% male) from Houston, USA. Telephone interviews were conducted in a private office. Semi-structured questions and prompts were developed by the research team and content was informed by a literature review and the Dietary Guidelines for Americans. Script questions were pre-tested with five staff members from the research center and revisions were made as necessary. The script was divided into: demographics, terms, description of someone (un) healthy, and ratings. Interviews were digitally recorded and transcribed verbatim. Hybrid thematic analysis was used to code and analyze data by three independent trained qualitative researchers.

Findings: Adolescents defined "healthy" in terms of wellness-type behaviors related to diet, physical activity, and body weight. Adolescents' ratings of their personal health varied from "not healthy or unhealthy" to "healthy" just based on their diet and physical activity behaviors. Examples of healthy individuals were specific persons (e.g., parents) or someone engaged in a particular profession (e.g., athlete) or being active. Examples of unhealthy individuals included specific persons (e.g., siblings) or someone engaged in unhealthy lifestyle behaviors (e.g., unhealthy diet and physical activity). Most adolescents reported that healthy individuals should eat a healthy diet and be active. Few mentioned adequate sleep or weight status. Clear descriptions for healthy and unhealthy foods were provided, while energy-dense, nutrient-dense, and processed foods adolescents struggled to define. Fast-foods and junk-foods were identified with non-health benefits, except for being convenient and tasty. Natural and organic foods were used as interchangeable terms with health benefits.

Conclusion: Adolescents have a limited understanding of common health and nutrition-related terms. National dietary guidelines should use terms that are easily understood by adolescents. More comprehensive research is needed in this regard.



## The emergence and use of the term 'food literacy': A scoping review

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#### Pre-recorded Presentation

Purpose: The term 'food literacy' emerged to address the skills, behaviour and knowledge needed by individuals to navigate the complex food environment and meet day-to-day food needs. Despite extensive publications and use of the term in the past 20 years, little has been done to track the progression of the concept over time. Therefore, this study aimed to describe the change in the use and reach of the term 'food literacy' over time and analyse the context and outcomes of academic papers with respect to the year of publication.

Methods: A scoping review was conducted using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, across several databases (PubMed, ScienceDirect, Embase, Scopus, EBSCOhost, ProQuest, Google Scholar), using the term 'food literacy'. Papers were reviewed, and those which were i) not in English, ii) grey literature iii) did not mention the term 'food literacy' or iv) had no full-text available were removed. The year, country, context and outcomes of the publication were extracted and compared.

Results: 436 academic papers were extracted from the literature. The first journal article which included the term 'food literacy' appeared in 1998, with the literature steadily increasing over time, with 108 journal articles published in 2018. The term has been published in academic literature across 37 countries, with the highest number of publications in Australia (109), followed by Canada (89), United States (85), United Kingdom (31) and Italy (13). The context of publications on food literacy tend to take a health and environmental frame.

Conclusions: This review found that the concept of food literacy has transitioned from primarily future research recommendations to defining and conceptualising, measuring and more recently, investigating proposed relationships between food literacy and diet quality. Additionally, the relevance of the term indicates that harmonisation of measurement and cross-country comparison of food literacy may be possible, which could assist in improving health and nutrition by addressing food literacy in a multi-tiered approach, world-wide.



## Urban-regional patterns of food purchasing behaviour: A cross-sectional analysis of the 2015-16 Australian Household Expenditure Survey

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#### Pre-recorded Presentation

Purpose: In many high-income countries people living in regional areas have higher rates of chronic disease compared to people living in urban areas, with diet a known contributor to these inequities. Food purchasing provides a potential pathway linking residential location with dietary intake and health outcomes. Little is known about geographic differences in food purchasing behaviours. This study examined the relationship between geographic location and food expenditure on a range of foods. This is the first known Australian study to examine the relationship between geographic location and food expenditure.

Methods: Data from the 2015-16 Australian Household Expenditure Survey (n=9827) was used to examine weekly household food expenditure and proportion of total food expenditure on fourteen categories of food items. Foods were classified using the Australian Guide to Healthy Eating. Two-part models and zero-one inflated beta regression models were used to assess the association between geographic area and food expenditure.

Results: Average fruit expenditure was more for households located in major cities (\$13.35, 95% CI = 12.28;14.41) compared to households located in inner regional (\$11.81, 95% CI = 10.67;12.96) and outer regional areas (\$11.31, 95% CI = 10.13;12.48). Furthermore, compared with households located in major cities, households located in inner and outer regional areas spent less on fresh fruit, fish and meals out. Households located in outer regional areas spent less on all core foods except meat. Households located in inner regional areas spent more on sweet cakes, biscuits, puddings, desserts, chocolate and ice-cream compared to households located in major cities and outer regional areas.

Conclusions: The geographic patterns in food purchasing suggest those in regional areas may be at risk of diets less aligned with healthy guidelines. By examining food purchasing patterns across urban and regional areas, this study has enhanced understanding of potential factors contributing to health disparities for people living in regional areas. Given the known geographic differences in diet and health and findings of this study suggesting geographic differences in food purchasing, further research is warranted to determine the drivers of food purchasing behaviours in regional areas.



## Assessment of nutrition environments in the rural Lower Mississippi Delta region of the United States

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Pre-recorded Presentation

Purpose: To better understand the persistently low diet quality of pregnant women and their children who participated in a lifestyle intervention, the study participants' local food environments were measured. This is the first comprehensive assessment of food environments in the rural Lower Mississippi Delta Region of the United States.

Methods: Food environments of 5 towns in which participants resided were measured using the Nutrition Environment Measures Survey for grocery stores, convenience stores, full service restaurants, and fast food restaurants. General linear models were used to test for ratio score differences among food outlet classes and subclasses. Spatial analysis was used to explore geographic clusters of food outlets and to compute distances between study participants' residence and the closest food outlet by class.

Results: Of the 266 food outlets identified, 11 (4%), 86 (32%), 50 (19%), and 119 (45%) were classified as grocery stores, convenience stores, full service restaurants, and fast food restaurants, respectively. Nutrition Environment Measures Survey mean total ratio scores among the 4 classes of food outlets were significantly different from one another except for convenience stores and full service restaurants. On average, 54%, 21%, 16%, and 8% of maximum points possible was achieved by grocery stores, full service restaurants, convenience stores, and fast food restaurants, respectively. Seventy-five percent, 50%, and 54% of study participants lived in or adjacent to a convenience store cluster, full service restaurant cluster, and fast food cluster, respectively. On average, study participants lived closer to convenience stores and fast food restaurants (0.4 and 0.5 miles, respectively) than grocery stores and full service restaurants (1.6 and 1.1 miles, respectively).

Conclusions: Food outlets in the 5 Lower Mississippi Delta towns scored low on nutrition environment measures associated with healthful eating and characteristics of food deserts and food swamps were prevalent in the towns. Behavioral interventions designed to affect positive changes in dietary habits of rural residents are needed; however, prior assessment of nutrition environments is necessary to first ascertain if environmental supports that facilitate healthful eating are present.



# Stakeholder Input to Inform the Adaptation and Dissemination of Ghana's Physical Activity Guidelines

<u>**Dr. Laura Balis<sup>1</sup>**</u>, Mr. Kwame Adjei<sup>2</sup>, Mr. Solomon Nyame<sup>2</sup> <sup>1</sup>University of Arkansas, Little Rock, United States, <sup>2</sup>Ghana Health Service, Kintampo, Ghana

Pre-recorded Presentation

Purpose: Ghana is experiencing a shift in public health shift issues, including an increase in non-communicable diseases and a decrease in physical activity rates. The Ministry of Health (MOH) and Ghana Health Service (GHS) developed physical activity guidelines in 2009. However, a 2019 study found that Ghanaian older adults were not aware of the physical activity guidelines and the example activities (e.g., ballroom dancing) were not culturally appropriate. The purposes of this study were to investigate 1) dissemination of the physical activity guidelines through MOH/GHS and 2) culturally appropriate physical activities.

Methods: Through a concurrent mixed-methods design, data were collected in urban and rural regions of Ghana. Focus groups (N=2) were conducted with community stakeholders; the semi-structured guide included recommended types of physical activity. Surveys (N=12) and in-depth interviews (N=4) were conducted with purposively selected MOH/GHS employees, including research officers and non-tropical disease coordinators. Survey questions were based on the Diffusion of Innovations Theory; the semi-structured interview guide also included recommended types of physical activity. Quantitative results were analyzed through frequencies and proportions. Qualitative results were analyzed through inductive thematic coding of transcripts.

Results: Most survey respondents (72%) were not aware of the physical activity guidelines. Respondents indicated that the guidelines could be better disseminated through making regional and district directors aware of them (90%). Most common dissemination modes for new policies were internet (45%), publications (35%), and trainings (36%). Focus group and interview participants recommended physical activities including walking (N=20 meaning units), running (N=16), football (N=14), traditional games (N=14), and gardening (N=10).

Conclusions: A dissemination intervention including regional and district directors as a communication channel and packaging into user-friendly, accessible publications should be considered. Adapting the guidelines to replace unfamiliar activities with culturally appropriate activities (e.g., ampe, a traditional children's jumping game) could improve understanding uptake of guidelines. Disseminating culturally appropriate physical activity guidelines is a necessary step in translating research to practice to increase physical activity levels and prevent non-communicable diseases.



## Associations between light-intensity physical activity and obesity among children and adolescents

**Dr. Meijing An<sup>1</sup>**, Ms. Xinyue Cui<sup>2</sup>, Prof. Jun Ma<sup>1</sup>, Prof. Patrick Lau<sup>3</sup>, <u>Associate Professor Tianjiao Chen<sup>1</sup></u> <sup>1</sup>Institute of Child and Adolescent Health, School of Public Health, Peking University, Beijing, China, <sup>2</sup>Center for Medical Device Evaluation, CFDA, Beijing, China, <sup>3</sup>Department of Sport & Physical Education, Faculty of Social Sciences, Hong Kong Baptist University, Hong Kong, China

#### Pre-recorded Presentation

Purpose: Evidence to support the effectiveness of moderate-to-vigorous-intensity physical activity (MVPA) on weight management is well established in the literature. However, few studies have examined the relationship between light-intensity physical activity (LPA) and obesity. This study intends to examine the relationship between LPA and central and general obesity among children and adolescents.

Methods: In 2013, a cross-sectional study was conducted with 19,848 children and adolescents between the ages of 6 and 18 from seven provinces in China. Height, weight, and waist circumference were measured objectively. The time of LPA and MVPA over the preceding seven days were collected using the questionnaire modified according to short last 7-day self-administered International Physical Activity Questionnaire. The Chi-square test and logistic regression analysis were conducted.

Results: After controlling for covariates, children and adolescents who were active in LPA had a lower risk for central obesity (OR = 0.885, 95% CI: 0.797–0.982, P = 0.022) and a marginally lower risk for general obesity (OR = 0.924, 95% CI: 0.843–1.014, P = 0.095) compared with those who were inactive in LPA independent of MVPA. Children and adolescents with inactive MVPA showed a lower risk for central obesity or a marginally lower risk for general obesity if they were active in LPA compared with those who were inactive in either LPA or MVPA (OR = 0.843, 95% CI: 0.728–0.976, P=0.022, for central obesity; OR = 0.893, 95% CI: 0.784–1.107, P=0.087, for general obesity).

Conclusions: PA independent of MVPA is inversely associated with obesity among children and adolescents. Participating in active LPA may exert an important role in the prevention of adiposity, especially for those who are inactive in MVPA, which deserves further investigation and calls for formulating the recommendation time for LPA. Future longitudinal research that will focus on the effects of LPA on adiposity is required to verify this finding.



# Community-level impacts of nutrition and physical activity strategies to reduce early childhood obesity

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### Pre-recorded Presentation

Purpose: Obesity often begins early in life, with many children entering school already overweight or obese. Accordingly, a leading grant-maker funded multiple grants aimed at reducing early childhood obesity (RECO) in Los Angeles County, California. RECO adopted a wide variety of innovative strategies (nutrition education, media campaigns, financial incentives, changes to physical activity environments, policy changes), focusing on low-income communities. Over 1,000 activities took place in different communities and at different times over six years (2011-2017). This study capitalizes on variations in strategy, timing, and location of the RECO activities and has two goals 1) describe the RECO strategies used to target early child obesity in communities across Los Angeles County and 2) assess the community-level impact of these strategies, individually and combined.

Methods: The study team gathered data on RECO activities and their timing and location through review of documents and interviews with organizations implementing RECO activities. Activities were then categorized into four obesity reduction strategies based on those identified by the Centers for Disease Control and Prevention (CDC). Census-tract level child obesity data (n=1,223 census tracts) were aggregated from the Public Health Foundation Enterprises (PHFE) Women Infants and Children (WIC) administrative data. A Comparative Interrupted Time Series analysis approach was used, comparing trends in outcomes before and after a specific RECO activity was implemented within a community, as well as trends across other communities in Los Angeles County not affected by the activity.

Results: Descriptive analyses demonstrated that RECO activities adopted all four strategies; the strategy of supporting healthy food and beverages was used across the most census tracts. Impact analyses revealed that RECO as a whole significantly reduced early childhood obesity rates by .59 percentage points in communities where RECO activities occurred. RECO activities that encouraged breastfeeding and those that encouraged communities to organize for change significantly reduced early childhood obesity but impacts of the different strategies were not significantly different from each other. There were also greater impacts on reducing early childhood obesity in majority non-white communities.

Conclusions: The findings have implications for the community-level effectiveness of different strategies to address early childhood obesity.



## Effects of more prominent shelf placement of healthier food products on supermarket purchases: A co-designed pilot study

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#### Pre-recorded Presentation

#### Purpose

A retailer-academic collaboration aimed to co-design and pilot commercially sustainable strategies to increase sales of healthier foods relative to less healthy foods within a product category in a major supermarket chain.

#### Methods

Two co-design workshops were held, involving supermarket corporate strategy staff and public health nutrition academics, to identify potential interventions. These were mapped against choice architecture frameworks and retailer strategic priorities before one intervention, more prominent shelf placement of healthier products within one category (breakfast cereals), was selected for piloting. A 36-week pilot study (12-weeks each, baseline, intervention and follow-up) was undertaken in six supermarkets (three intervention and three control stores) in Auckland, New Zealand. Products were ranked by nutrient levels and nutrient profile, and healthier products were placed at eye level and less healthy products were placed on lower shelves. No changes were made in matched control stores. The primary outcome was change in sales of healthier products relative to total category sales. Secondary outcomes included nutrient profile of category sales, in-store promotions, customer perceptions, and retailer feedback.

#### Results

Overall, there was no difference in the sales of more prominently positioned products between intervention (56%) and control stores (56%) during the intervention. There were also no significant differences in sales across the study time periods nor the nutritional composition of product sales. Intervention stores were found to have a greater number of in-store displays compared to control stores (685 vs 583) with a higher proportion of less healthy less prominent products (57% vs 43%) displayed. A significant interaction was evident between in-store promotions and sales. Most customers (265, 88%) supported shelf placement as a strategy to improve purchases but noted that brand preferences and price could override product choice.

#### Conclusions

Shelf placement alone was not an effective strategy to increase purchases of healthier products. Other important influences within the retail environment, including space management logistics, in-store promotions, and habitual shopping habits in the breakfast cereal category, may have diluted the effect of the shelf placement intervention.



## Barriers and enablers to implementing healthy food and drink policies delivered at scale

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#### Pre-recorded Presentation

Purpose: Policies that support healthier food environments, including healthy retail food availability and promotion, are an important strategy for obesity prevention. The aim of this rapid review is to examine the evidence for barriers and enablers to successful implementation of healthy food and drink policies, delivered at scale. Implementing healthy food environment policies at scale is needed to achieve greater impact and this is the first review of both barriers and enablers to implementing such policies at scale.

Methods: MEDLINE, SCOPUS and INFORMIT were searched (1979-May 2019) for peer-reviewed studies. Google and Google Scholar were searched for grey literature. Studies of any design relating to a healthy retail food and drink policy delivered at scale ( $\geq$ 10 sites) in government and non-government based settings and that reported on implementation barriers and/or enablers were included. Studies in commercial retail environments were excluded. Studies were appraised for quality and key information was extracted and summarised. Barriers and enablers were grouped into overarching themes relating to perceptions of the policy itself, organisational and contextual factors influencing policy implementation, stakeholder responses to the implemented policy and perceived policy impacts.

Results: Of 19 studies, 16 related to policies implemented in schools, 2 in hospital/health facilities and 1 in a sport/recreation setting. The most commonly cited barriers across themes were: lack of stakeholder engagement/prioritisation (10 studies in schools, 1 in hospital/health facility); concern over profitability, revenue and/or commercial viability (6 studies in schools, 1 in hospital/health facility, 1 in sport/recreation setting); and resistance to change from stakeholders/customers (7 studies in schools, 1 in hospital/health facility). Enablers most commonly raised were: stakeholder engagement, whole school approach and/or prioritisation (9 studies in schools); information/guidance/training support from policy level or higher level support (5 studies in schools, 1 in hospital/health facility); and leadership, school/policy champion, management commitment and/or organisational capacity (4 studies in schools, 1 in sport/recreation setting).

Conclusions: Key considerations for policy implementation ranged from building stakeholder support, prioritising policy implementation within organisations to implementing strategies that address financial concerns and implementation barriers.



# Reducing early childhood obesity at the county-level: Impacts of efforts to improve nutrition and physical activity in Los Angeles (LA) County, California

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#### Pre-recorded Presentation

Purpose: Early childhood obesity is of great concern given its links to adverse health outcomes, social marginalization, and discrimination (Reilly & Kelly, 2010). Accordingly, there has been an increase in national and regional efforts to address early childhood obesity. In LA County, a leading public grant-making and child advocacy organization funded a diverse portfolio of investments to reduce early childhood obesity (RECO). RECO adopted a wide variety of strategies (education, media campaigns, financial incentives, changes to the built environment, policy changes) primarily targeting nutrition and physical activity as a means to reducing early childhood obesity. This study examines the county-level impacts of RECO on early childhood obesity and overweight in LA County.

Methods: Given the unique characteristics of LA County, particularly its size and diversity, it is difficult to identify appropriate comparison counties in order to estimate county-level impacts. To address this challenge, this study uses the innovative synthetic comparison group method (Abadie, 2010), which relies on a pool of "donor" counties in southern California and weights them to create a "synthetic" county that is similar to LA County prior to RECO. Our analysis then compares LA County and the synthetic county after RECO to test for a county-level impact. We use overweight (BMIs > 85th percentile) and obesity (BMIs > 95th percentile) data for children aged 2-5 from Southern California Kaiser Permanente.

Results: Examining early childhood overweight and obesity rates over time in LA County reveals that rates were lower after RECO compared to before. After accounting for what might have happened in the absence of RECO by introducing the synthetic comparison group, we find a significant county-level impact of RECO on early childhood overweight and obesity: full implementation of RECO across LA County would significantly reduce early childhood overweight by almost 5 percentage points (Impact Estimate = -4.88, p<.001) and obesity by 1.5 percentage points (Impact Estimate = -1.52, p<.05) in LA County compared to the synthetic comparison county.

Conclusions: These findings demonstrate the potential utility of a diverse set of nutrition and physical activity strategies to reduce early childhood obesity at the county-level.



## Engaging citizen scientists to build healthy park environments in Colombia

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#### Pre-recorded Presentation

Purpose: Promoting healthy behaviors requires focusing on priority communities. In Colombia, where women are less physically active than men, the Bogotá government offers free physical activity (PA) classes in public parks through the Recreovía program. Despite broad uptake, especially among women, there is notable variability in participation across Recreovía sites. We aimed to 1) evaluate built and social environmental factors associated with Recreovía local park environments; 2) identify perceptions that influence Recreovía engagement; and 3) facilitate an advocacy process among community members, policymakers and academic researchers to improve uptake of the program.

Methods: Using an explanatory sequential mixed methods design, we first collected contextual quantitative data using the System for Observing Play and Recreation in Communities and the Physical Activity Resource Assessment. We assessed participants' anthropometrics, sociodemographic characteristics, and PA levels (using accelerometers). The qualitative component involved the Our Voice citizen science model in which community members use a mobile application to identify park features that promote or hinder PA, then analyze and use data to advocate for changes to enhance PA. We selected two public parks, representing the lowest and highest 10% in Recreovía attendance. We used descriptive statistics to analyze park and users' characteristics. Qualitative data were thematically analyzed.

Results: Although both parks presented similar levels of moderate to vigorous PA (P=0.290), one had better quality than the other (P=0.009). Participants (n=48) were primarily women (65%) who were meeting PA recommendations (93%), and highly satisfied with Recreovía (97%). Factors influencing use of the program included perceptions that it enhanced social and individual well-being, improving the friendliness of the park environment, and fostering self-confidence, social capital, mental health and civic engagement. Reported barriers to usage were related to park cleanliness, and safety. Presentations to stakeholders sparked planning aimed at reducing these barriers.

Conclusions: This study provides an adaptable framework for using technology-driven participatory methods to evaluate park-based interventions and understand factors supporting community-based PA behaviors. The Our Voice process elicited community dialogue, empowerment, and advocacy, facilitating interaction among stakeholders to optimize the Recreovía program and facilitate active living.



# The effects of a supermarket-based intervention on the nutritional quality of private-label foods: A prospective study

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#### Pre-recorded Presentation

Purpose: Private-label products, products that are owned by supermarkets, continue to experience increased growth and popularity amongst consumers. The aim of this study was to assess the effect of a novel intervention that provided an Australian supermarket with nutritional benchmark data to guide the formulation of healthier foods and beverages for their private-label range.

Methods: Over nine-months (April 2015 to January 2016), the supermarket ('intervention supermarket') received 35 reports that ranked the nutritional quality of their products against competitors across 150 subcategories of foods and beverages. Changes in the nutrient content of private-label products from the intervention supermarket between 2015 and 2018 were compared to the changes of three comparators (private-label products from two other Australian supermarkets and all branded products combined). The primary outcomes were mean sodium (mg/100g), sugar (100g/g), saturated fat (g/100g), energy (kJ/100g) content and Health Star Rating (HSR) (stars).

Results: Between 2015 and 2018, the intervention supermarket reduced the mean sodium content of their products (-40mg/100g, 95% confidence interval [CI] -73 to -7; p=0.02) but there were no changes for other nutrients or HSR (all p>0.05). This reduction in sodium content was significantly greater than for all three comparators (all p<0.05). Conversely, compared to the intervention supermarket, the three comparators each achieved a greater relative reduction in the sugar content of their products between 2015 and 2018 by between -3.5 and -1.6g/100g (all p<0.05). One of the comparators also had a greater relative reduction in the saturated fat and energy content of its products compared to the intervention supermarket (both p<0.05). HSR were unchanged across the intervention supermarket and comparators (all p>0.05).

Conclusions: Providing comparative nutrition data to an Australian supermarket resulted in a favourable effect on the sodium content of their products but had no beneficial effect on other nutrients or HSR. The limited impact of this intervention raises questions about the value of voluntary initiatives and the potential need for mandated initiatives to improve the healthiness of the packaged food supply.



## Impact of a state-wide policy on New South Wales (NSW) hospital staff and visitors' food purchasing behaviours

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#### Pre-recorded Presentation

Purpose: To examine changes in NSW hospital staff and visitors' food purchasing behaviour following the introduction of an innovative state-wide policy, which aimed to increase the availability and promotion of healthy food for sale in NSW hospitals.

Methods: Two repeated cross-sectional surveys were conducted in 10 randomly selected NSW hospitals in March-May 2018 and again in April-June 2019, following the target date for initial implementation (1 January 2019). The time period represented the initial phase of an ongoing intervention. Interviewer-administered intercept surveys were conducted with hospital staff and visitors at hospital entrances and main cafés, including questions on awareness, support, and usual purchasing behaviour, and observations of foods purchased (café only). Food items were coded as 'Everyday' (healthy) or 'Occasional' (unhealthy). Mixed effects logistic regression analyses explored the difference in 'Everyday' food items purchased over the initial intervention period, controlling for sex, staff/visitor status, age group and education.

Results: Most staff (91.1%) and visitors (89.8%) supported the policy. There were significant increases over the study period in awareness of the policy, for both staff (29.3% vs 59.2%; p<0.0001) and visitors (15.8% vs 34.9%; p<0.0001), and for staff, noticing more healthy food items for sale (38.0% vs 57.5%; p=0.0007). Of 3,551 food purchases observed, the proportion of 'Everyday' items increased slightly in this period (56.3% vs 59.2%; p=0.3). 'Everyday' purchases increased slightly for snack items (36.0% vs 40.0%; p=0.5), hot meal items (55.9% vs 57.4%; p=0.4), and cold meal items (85.3% vs 91.6%; p=0.1). Visitors, younger adults (18-35 years), and non-tertiary educated participants were significantly less likely to purchase 'Everyday' food items than staff (OR 0.8 95%CI 0.7-0.9), older adults (aged 55+) (OR 0.7 95%CI 0.6-0.9), and tertiary educated participants (OR 0.7 95%CI 0.6-0.9), and tertiary educated

Conclusions: This study shows promising short-term impacts of a policy implemented at scale, with significantly increased staff and visitor awareness of more healthy food availability, and a slight increase in 'Everyday' food item purchases. Longer-term follow-up is recommended, with continued efforts targeting 'Everyday' healthy food availability and promotion.


### Association between the Nutri-Score front-of-pack nutrition label and mortality risk in the SUN cohort

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#### Pre-recorded Presentation

Purpose: Front-of-pack nutrition labelling is a key public health policy that can be implemented as part of a comprehensive set of measures to promote healthy diets. The Nutri-Score, a five-colour summary label based on a modified version of the British Food Standards Agency Nutrient Profiling System (FSAm-NPS), is being considered for implementation in several European countries including Spain. This study aimed to prospectively assess the association between the FSAm-NPS and all-cause and cause-specific mortality in the SUN ("Seguimiento Universidad de Navarra" – University of Navarra Follow-up) cohort.

Methods: Analyses included 20,503 participants from a Spanish cohort of university graduates (mean [SD] age: 38 [12] years). Dietary intake was assessed at baseline and after 10-years of follow-up with a validated semiquantitative food-frequency questionnaire. The FSAm-NPS was calculated for each food/beverage based on their amount of energy, saturated fat, sugar, sodium, fibre, protein, fruits, vegetables, legumes, nuts, rapeseed, walnut and olive oils per 100 grams of product. The FSAm-NPS Dietary Index (DI) was computed as an energy-weighted mean of the FSAm-NPS scores of all foods and beverages consumed by each participant. Multivariable-adjusted Cox proportional hazards models were used to estimate hazard ratios (HRs) and 95% confidence intervals (CIs) for allcause and cause-specific mortality according to baseline and updated FSAm-NPS DI scores.

Results: Over a median follow-up of 10.9 years, 407 participants died. A higher baseline FSAm-NPS DI score, reflecting a lower nutritional quality of the food consumed, was directly associated with all-cause mortality (HR Q4 versus Q1 = 1.82; 95% CI: 1.34 to 2.47; p-trend<0.001) and cancer mortality (HR: 2.44; 95% CI: 1.54 to 3.85; p-trend<0.001). No association was found for cardiovascular mortality.

Conclusions: The consumption of food products with a higher FSAm-NPS score (ie, lower nutritional quality) was associated with a higher risk of all-cause and cancer mortality in a cohort of Spanish, middle-aged university graduates. These findings further support the implementation of Nutri-Score in Spain.



#### Sugar-sweetened beverage tax pass-through rates: A systematic review

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Pre-recorded Presentation

#### Purpose

Numerous jurisdictions have implemented health-oriented taxes on the manufacturers of sugar-sweetened beverages (SSBs), with the expectation that these taxes will translate into increased prices for consumers. The higher the price, the more effective a tax policy will be at producing behaviour change and positively impacting population health. A number of studies report 'pass-through' rates. The current study's purpose was to conduct the first known systematic review of real-world SSB tax pass-through rates.

#### Methods

Following the PRIMSA checklist, the databases Scopus, PubMed, EconLit, and Google Scholar were systematically searched for articles published from January 2000-July 2019. Peer-reviewed English-language articles from any country were included if they reported the change in prices from real-world SSB excise tax interventions. Data was extracted and synthesized on tax policy, study design, methods, and pass-through rates (eg, by beverage type, brand, retailer type, package size). The articles were critically appraised for quality.

#### Results

The review included 14 studies with 15 study designs from seven jurisdictions: Mexico (n=3), Berkeley (n=3), Philadelphia (n=3), Chile (n=2), Barbados (n=1), France (n=1), and South Africa (n=1). The type of taxes varied and included volumetric, sugar-based, and ad valorem. There was evidence of undershifting (<100% pass-through) and overshifting (>100% pass-through), but the majority of SSB taxes were undershifted (median of 67% pass-through). Variations in the pass-through rates were found both within and across jurisdictions and by beverage type, brand, retailer type, and package size. The majority of study designs (93%) scored as high quality.

#### Conclusions

This systematic review found strong evidence that SSB prices increased following the enactment of SSB taxes, but the taxes were undershifted and did not result in a full tax price increase for consumers. If policymakers wish to maximise the health impact of SSB taxes they may need to consider higher taxes and supplementary interventions. Future research, forthcoming in early 2020, includes a novel meta-analysis of the pass-through rates included in this review.



### Exploring the Role of Socio-Cultural Influences in the Perceptions of Park Quality

#### Dr. Cristina Barroso, Dr. Eugene Fitzhugh

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Pre-recorded Presentation

#### Purpose

The co-existence of high levels of physical inactivity, obesity, and diabetes is often observed in ethnic/racial minority and/or low-income communities. These heath disparities may be related to the built environment. In particular, the quality of local neighborhood parks (features and amenities) may be related to visits by people for physical activity (PA). Furthermore, ethnic/racial minority and/or low-income individuals may perceive their local neighborhood parks to be lacking park features and amenities that are conducive to health-enhancing PA. The purpose of this qualitative study is to explore the socio-cultural influences in the perceptions of park quality among ethnic/racial and/or low-income individuals in a metropolitan area in Southeast United States.

#### Methods

We employed a cross-sectional study design and purposive sampling to recruit participants for five focus groups with ethnic/racial minority and/or low-income individuals from a city in the Southeast United States. A semistructured focus group guide was used to elicit participants' perceptions of local neighborhood parks, including barriers and facilitators to park use. Focus groups were audio-recorded and transcribed verbatim. Transcripts were analyzed using descriptive and interpretive coding to identify themes. Demographic information was also collected.

#### Results

Participants were primarily female (n=48, with nine male participants), Black (63%), and on average 50 years old. Participants perceived their local neighborhood parks to be in disrepair (e.g., broken playground equipment, damaged athletic courts), and lacking amenities (e.g., water fountains, restrooms, benches, and shaded areas). Although participants perceived poor park quality, participants also believed local neighborhood parks to be sources of community unity because parks were named for historical figures, cultural events held at parks, and the contributions of community groups. Nevertheless, Black participants believed they have been displaced from local neighborhood parks by emerging immigrant groups.

#### Conclusions

Our findings indicate that disparities in health-enhancing PA among racial/ethnic minority and/or low-income individuals from a city in Southeast United States may be related to perceived park quality. Strategies for increasing park use and PA among racial/ethnic minority and/or low-income individuals should address socio-cultural factors such as community pride, neighborhood input, and shared experiences to ignite park activation.



### Perceived importance of neighbourhood features for preschooler's active play, parent's active recreation, and parent-child coactivity.

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Pre-recorded Presentation

Purpose: Identify neighbourhood features parents perceived as being important for their child's active play, their own active recreation, and their coactivity (physical activity performed together).

Methods: A cross-sectional study design was used. During May to September 2019, a convenience sample of 145 parents (Mage = 36.21 years) with preschoolers (Mage = 3.90 years) living in Edmonton, Canada were recruited online, through existing lab databases, and in-person from various destinations throughout the city. To achieve a representation of Edmonton, at least 10 families were recruited from each of its 12 electoral wards. Participating parents completed a 20-minute survey (electronic or paper) where they rated the importance of several neighbourhood features (destinations, design, social, safety, aesthetics) for their child's active play,their own active recreation, and their coactivity via 6-item Likert scales (1 = not at all important, 2 = unimportant, 3 = neutral, 4 = important, 5 = most important, 6 = not applicable). Responses "important" and "most important" were collapsed into one group "important". Descriptive statistics were used to summarize categorical and continuous variables.

Results: Over 75% of parents perceived several neighbourhood features (17/32) as important for their child's active play, their own active recreation, and their coactivity. Of these, there were 2/9 destinations (parks, playgrounds), 3/6 design features (quiet streets, trails, sidewalks), 4/6 social features (friends/family, child's friends, knowing neighbours, trusting neighbours), 6/6 safety features (street lighting, crime, traffic, daylight, sidewalk maintenance, crosswalks), and 2/5 aesthetic features (cleanliness, natural features). Neighbourhood features considered important by over 90% of parents for their child's active play, their own active recreation, and coactivity were parks (97.9%, 97.9%, 97.2%), playgrounds (99.3%, 95.9%, 97.2%), sidewalks (90.9%, 97.9%, 90.3 %), low crime (92.3%, 93.1%, 92.4%), and cleanliness (98.6%, 99.3%, 95.9%).

Conclusion: Parents perceived several neighbourhood features as important for all three physical activity behaviours. These findings may be helpful in guiding future research examining neighbourhood correlates of physical activity among preschoolers and their parents. Further, neighbourhood planners may find this information useful for developing neighbourhoods conducive for active living in young families.



### Global Implementation of Obesity Prevention Policies: a Review of Progress, Politics, and the Path Forward

**Dr. Rodney Lyn<sup>1</sup>**, Ms. Erica Heath<sup>1</sup>, Ms. Janhavi Dubashi<sup>1</sup> <sup>1</sup>Georgia State University, Atlanta, United States

Pre-recorded Presentation

Purpose: To review global progress on adoption of obesity prevention policy across five areas: taxation, nutrition labeling, media/marketing, built environment, and school based initiatives.

Methods: A review of the literature yielded 173 peer-reviewed articles, which serve as the basis for reported findings.

Results/Findings: Globally, the adoption of obesity prevention policies has been slow and inconsistent. Efforts to shape the information environment and the political environment have been central in determining outcomes. Governments have lacked sufficient political will. The food industry has aggressively, and effectively, manipulated the information environment (through marketing and advertising, mass media, sowing doubt, bias in obesity science, promoting physical activity to minimize nutrition) and the political environment (through lobbying, cooptation, preemption) to support their commercial interests. Three approaches hold promise. First, there is a need to unsettle the power/influence of the food industry and other commercial interests, and to increase their accountability. The recent and growing work on countering the corporate and commercial determinants of health holds promise. Research in political science focused on advancing knowledge related to policy and issue regimes, which promote long-term stable power arrangements in a given policy system and facilitate resistance to fundamental change (e.g., food industry and politicians collaborate to maintain current food policies) should be explored, with a goal of restructuring/reducing the existing influence/control of commercial interests on food policy and obesity prevention. Second, despite calls for greater emphasis on advocacy and mobilization of civil society, implementation of these efforts remains inadequate. Increased use of available frameworks and guidance for producing increased engagement and stronger collective advocacy is needed. Third, prioritizing equity in the application of policy and regulatory approaches is vital. Sub-populations experiencing social disadvantage often have greater exposure to obesity-producing influences and the resulting higher prevalence. Failure to target vulnerable populations most affected by obesity will limit the effectiveness of the global campaign to mitigate it.

Conclusion: Global action on obesity prevention policy has been slow/inadequate. No country to-date has significantly improved its overall food environment or reversed its obesity epidemic. There is an urgent need to reshape the information and political environments to support healthy behaviors.



### Associations between light-intensity physical activity and obesity among children and adolescents

**Dr. Meijing An<sup>1</sup>**, Ms. Xinyue Cui<sup>2</sup>, Prof. Jun Ma<sup>1</sup>, Prof. Patrick Lau<sup>3</sup>, <u>Associate Professor Tianjiao Chen<sup>1</sup></u> <sup>1</sup>Institute of Child and Adolescent Health, School of Public Health, Peking University, Beijing, China, <sup>2</sup>Center for Medical Device Evaluation, CFDA, Beijing, China, <sup>3</sup>Department of Sport & Physical Education, Faculty of Social Sciences, Hong Kong Baptist University, Hong Kong, China

<u>Poster</u>

Purpose: Evidence to support the effectiveness of moderate-to-vigorous-intensity physical activity (MVPA) on weight management is well established in the literature. However, few studies have examined the relationship between light-intensity physical activity (LPA) and obesity. This study intends to examine the relationship between LPA and central and general obesity among children and adolescents.

Methods: In 2013, a cross-sectional study was conducted with 19,848 children and adolescents between the ages of 6 and 18 from seven provinces in China. Height, weight, and waist circumference were measured objectively. The time of LPA and MVPA over the preceding seven days were collected using the questionnaire modified according to short last 7-day self-administered International Physical Activity Questionnaire. The Chi-square test and logistic regression analysis were conducted.

Results: After controlling for covariates, children and adolescents who were active in LPA had a lower risk for central obesity (OR = 0.885, 95% CI: 0.797–0.982, P = 0.022) and a marginally lower risk for general obesity (OR = 0.924, 95% CI: 0.843–1.014, P = 0.095) compared with those who were inactive in LPA independent of MVPA. Children and adolescents with inactive MVPA showed a lower risk for central obesity or a marginally lower risk for general obesity if they were active in LPA compared with those who were inactive in either LPA or MVPA (OR = 0.843, 95% CI: 0.728–0.976, P=0.022, for central obesity; OR = 0.893, 95% CI: 0.784–1.107, P=0.087, for general obesity).

Conclusions: LPA independent of MVPA is inversely associated with obesity among children and adolescents. Participating in active LPA may exert an important role in the prevention of adiposity, especially for those who are inactive in MVPA, which deserves further investigation and calls for formulating the recommendation time for LPA. Future longitudinal research that will focus on the effects of LPA on adiposity is required to verify this finding.



### Eating away from home: An examination of eating outside the home among Americans

#### Dr. Stephanie Rogus

<sup>1</sup>New Mexico State University, Las Cruces, United States

Poster

Purpose: Changes in the food environment, such as increases in the number of quick-service, sit-down restaurants, and ready-to-eat foods, has led Americans to consume more food outside the home. Food eaten outside the home is of lower nutritional quality than food eaten at home. This research presents results on consumption of food outside the home among Americans by age, income, and race/ethnicity. This study used the 2015-2016 National Health and Nutrition Examination Survey (NHANES) to examine differences in food consumption outside the home that previous studies have not examined.

Methods: This research used the 2015-2016 NHANES to assess differences in food consumed outside the home by age, income, and race/ethnicity using t-tests. It also examined differences in the share of calories consumed outside the home by meal occasion.

Results/findings: Sixty six percent of the US population aged 2 years and over consumed any food outside the home on any given day. A larger share of older children (6-11 years; 78%) and lower share of older adults (60 years and older; 46%) consumed food outside the home compared to all other age groups. A higher percentage of non-Hispanic white (66%) and Hispanic (67%) individuals consumed food outside the home compared to non-Hispanic white (77%) and Hispanic (70%) children consumed food outside the home compared to black children (60%). A higher percentage of consumers above 131% of the poverty line (65%) consumed food outside the home compared to individuals below 131% of the poverty line (57%). Lunch and dinner were the eating occasions at which consumers ate the highest share of calories outside the home.

Conclusions: Food consumed outside the home varied by age, income, race/ethnicity and by meal occasion. As the share of food eaten outside the home continues to rise, it is important to examine differences in the demographic and socioeconomic make-up of Americans who eat outside the home frequently. This will help guide policy and public health nutrition intervention efforts.



#### Evaluation of public open spaces in Mexico City

<u>Dr. Catalina Medina</u><sup>1</sup>, Miss Maricruz Morales<sup>1</sup>, Miss Claudia Nieto<sup>1</sup>, Dr. Célida Gómez<sup>2</sup>, Dr. Simón Barquera<sup>1</sup> <sup>1</sup>National Institute of Public Health, Mexico City, Mexico, <sup>2</sup>Universidad Iberoamericana, Mexico City, Mexico

Poster

Urban parks are key settings in the community that can promote healthy lifestyles, however the lack and low maintenance of facilities could reduce participation. Objectives were to identify public open spaces (POS) into public databases, and to evaluate internal and external features of these spaces in Mexico City.

Methodology. POS were those green spaces, grey areas and natural environments, regardless of the size, with recreation purposes, accessible to the general public, mostly free of charge or with low cost (<5 USD). An exhaustive review of the national public geostatistical databases was carried out on the "Digital Map" platform. Previous searches were complemented by performing a visual review on the Roji Guide (a jumbo format that has 31 state plans plus Mexico City). Trained field workers visited and evaluated POS in Mexico City using the Mexican Parks Instrument. This instrument was divided into 5 different themes: geographic and weather characteristics (GWC), physical activity facilities (PAF), support facilities (SF), internal environment (IE), neighborhood surrounding (NS).

Results. A total of 944 POS were mapped and evaluated. The second largest municipality within the city holds only 0.3% of POS. GWC - there are no site maps in 96.5% of the POS. PAF - 85.7% of the parks had tracks within their facilities. SF - 43.1% of the POS are unattractive, public security police were identified in 16.5% POS, 9.5% of these spaces have bathrooms. IE - 98.9% of them do not have a medical service, only 4% of the POS have drinking fountains and 13.4% of the these have food sales inside. NS - 59% of these spaces have at least one nearby public transportation station, most POS are surrounded by residential units, advertising of food and beverages around were found in 3.6% of the POS.

Conclusion. In order to increase participation, local and federal government should identify some strategies to improve these spaces in Mexico City.



#### Built environment changes and active transport to school among adolescents: BEATS Natural Experiment

Associate Professor Sandra Mandic<sup>1,2</sup>, Associate Professor Debbie Hopkins<sup>3</sup>, Dr. Enrique García Bengoechea<sup>4</sup>, Associate Professor Antoni Moore<sup>5</sup>, Associate Professor Susan Sandretto<sup>6</sup>, Associate Professor Kirsten Coppell<sup>7</sup>, Dr. Christina Ergler<sup>8</sup>, Associate Professor Michael Keall<sup>9</sup>, Dr. Anna Rolleston<sup>10</sup>, Mr. Gavin Kidd<sup>11</sup>, Mr. Gordon Wilson<sup>11</sup>, Prof. John C. Spence<sup>12</sup> <sup>1</sup>Active Living Laboratory, School of Physical Education, Sport and Exercise Sciences, University of Otago, Dunedin, New Zealand, <sup>2</sup>Centre for Sustainability, University of Otago, Dunedin, New Zealand, <sup>3</sup>Transport Study Unit, School of Geography and the Environment, University of Oxford, Oxford, United Kingdom, <sup>4</sup>Department of Physical Education and Sport Sciences, Faculty of Education and Health Sciences, University of Otago, Dunedin, New Zealand, <sup>5</sup>School of Surveying, University of Otago, Dunedin, New Zealand, <sup>6</sup>College of Education, University of Otago, Dunedin, New Zealand, <sup>7</sup>Department of Medicine, University of Otago, Dunedin, New Zealand, <sup>8</sup>School of Geography, University of Otago, Dunedin, New Zealand, <sup>9</sup>Department of Public Health, University of Otago, Wellington, New Zealand, <sup>10</sup>Faculty of Health, Sport, Human Performance, University of Waikato, Hamilton, New Zealand, <sup>11</sup>Dunedin Secondary Schools' Partnership, Dunedin, New Zealand, <sup>12</sup>Faculty of Kinesiology, Sport, and Recreation, University of Alberta, Edmonton, Canada

#### Pre-recorded Presentation

Purpose: Natural experiments are considered a priority for examining causal associations between the built environment (BE) and physical activity (PA) because the 1232andomized controlled trial design is rarely feasible. Following the original 2014-2015 Built Environment and Active Transport to School (BEATS) Study conducted in Dunedin, New Zealand, cycling infrastructure construction has occurred in some neighbourhoods, including those of six secondary schools. Pedestrian-related infrastructure changes began in 2018. The BEATS Natural Experiment (BEATS-NE) will examine the effects of these recent cycling and pedestrian infrastructure changes on adolescents' active transport to school (ATS).

Methods: BEATS-NE is guided by ecological models for active transport that account for individual, social, environmental, and policy factors. Follow-up data for BEATS-NE will be collected in 2020-2021 and will include an online survey (1,600 adolescents), accelerometers (420 adolescents), school route mapping (750 adolescents), focus groups (10 sessions; 62 adolescents), Geographic Information Science analysis of the BE, environmental scans of school neighbourhoods (MAPS Global; 12 schools) and participatory mapping (200 adolescents).

Results: At baseline (2014/2015), only 17.9% of adolescents met minimal PA guidelines, 24.2% used ATS and the average distance to school was 6.2±7.4 km. Common ATS barriers included long distance, personal factors (e.g. sweating), lack of social support, convenience of being driven, the weather, BE factors, and traffic safety concerns. School neighbourhoods' intersection density, land use mix and walkability correlated with adolescents' perceptions of traffic volume, crossings, walking/cycling safety, and pedestrian/cycling infrastructure along the school route. Adolescents' perception of safety of walking to school was the strongest correlate of ATS. Compared to walking, cycling to school was less common, perceived as less safe, and received less social and infrastructure support. The six 'exposure' and six 'control' schools are similar with respect to the number of students enrolled ['exposure' vs. 'control' school: 658 (360-869) vs. 514 (388-872)], school-level baseline ATS rates [24% (10%-45%) vs. 21%(14%-31%)] and topography (3 schools on a hillside and 3 on the flat in each group).

Conclusions: Natural experiment design and comprehensive data collection will extend current knowledge to inform planning of future school-, neighbourhood- and city-wide BE changes to encourage ATS in adolescents.



### Te Ara Mua – Future Streets – Examining impacts of community-wide changes on mobility and physical activity

<u>Associate Professor Melody Smith<sup>1</sup></u>, Dr. Alexandra Macmillan<sup>2</sup>, Mr. Bert van der Werf<sup>1</sup>, Prof. Karen Witten<sup>3</sup>, Dr. Adrian Field<sup>4</sup>, Ms. Rebekah Thorne<sup>5</sup>, Dr. Jamie Hosking<sup>1</sup>, Prof. Alistair Woodward<sup>1</sup>, Dr. Hamish Mackie<sup>5</sup>

<sup>1</sup>University of Auckland, Auckland, New Zealand, <sup>2</sup>University of Otago, Dunedin, New Zealand, <sup>3</sup>Massey University, Auckland, New Zealand, <sup>4</sup>Dovetail, Auckland, New Zealand, <sup>5</sup>Mackie Research Ltd, Auckland, New Zealand

#### Pre-recorded Presentation

Purpose: Te Ara Mua – Future Streets is the first study of its kind – an area level 1233andomized, controlled before and after community intervention study with the goal of making streets safer and easier for people to travel around actively. Components of the intervention included traffic calming, widening footpaths, cycle lane installation, and cultural landscaping (see <u>www.futurestreets</u>.org.nz). This presentation will share the research methods used to evaluate intervention effectiveness and outline preliminary results with a focus on the pathway to increasing mobility and physical activity (PA).

Methods: The study was conducted in Māngere, Auckland, New Zealand, with baseline measures conducted in 2014, and early follow-up in 2016/17. Every household in the intervention and control area was enumerated to obtain a random sample of children/young people aged 7-13 years and those aged 14 years and older. Participants were revisited at follow-up and replenishment sampling was employed to replace participants who were no longer available to participate. The survey collected sociodemographic information, travel patterns, PA, neighbourhood perceptions, social wellbeing, road traffic injuries, and physical abilities. Video footage of road user characteristics and behaviours, and measures of traffic volume and speeds were also collected. In the intervention area only, qualitative interviews, go-along interviews, school focus groups, and participatory mapping were undertaken to understand neighbourhood use, accessibility, perceptions, and barriers for active travel (AT). Generalized linear mixed models are being used to analyse changes in outcomes, accounting for repeated measures and intra-cluster dependencies. Qualitative data have been analysed using thematic analysis.

Results: In total, 1243 adults and 658 children participated in thesurvey at baseline, and 1280 adults and 630 children participated at follow-up. Improved perceptions of walking and cycling and significant reductions in vehicle speeds and volumes have been found in the intervention area. Sociocultural norms, safety concerns and practical limitations were identified as barriers to AT. Changes in PA and AT are currently being examined.

Conclusions: Early findings from Te Ara Mua – Future Streets demonstrate the potential of community-wide infrastructural interventions to improve safety from traffic and improve resident perceptions for mobility and PA.



#### Does a park refurbishment promote active transport to the park?

Dr. Alison Carver<sup>1</sup>, Prof. Anna Timperio<sup>2</sup>, Prof. Billie Giles-Corti<sup>3</sup>, Dr. Jenny Veitch<sup>2</sup>

<sup>1</sup>Australian Catholic University, Melbourne, Australia, <sup>2</sup>Deakin University, Geelong, Australia, <sup>3</sup>RMIT University, Melbourne, Australia

#### Pre-recorded Presentation

Purpose: Evidence suggests that living in neighbourhoods that support active transport (AT) to local destinations such as shops, services, and parks is beneficial for residents' health. Improving park design/facilities has been shown to promote visitation rates and park-based physical activity, however it is unknown whether such interventions increase AT to parks. This study examined the impact of a playscape installation in a large metropolitan park in Melbourne, Australia, on AT to/from the park, compared with an unaltered control park.

Methods: Using a natural experiment design, intercept interviews were conducted to record adults' AT to the intervention and control parks pre- (T1, 2013) and post-intervention at 2 (T2, 2014) and 14 months (T3, 2015). Both parks were accessible via shared walking/cycling paths external to and within each park. At each time-point, participants also reported: purpose of visit, accompaniment by child(ren), and frequency of visits. To examine habitual AT, analyses focused on frequent visitors (>once/week).

Results: Total participant numbers (and response rates) were: T1, 794 (75%); T2, 1166 (81%); T3, 1042 (75%). Around one third visited at least once/week (T1, 36%; T2, 34%; T3, 32%). Among frequent visitors, AT rates were consistently higher to the intervention park (T1, 22%; T2, 19%; T3, 18%) compared with the control park (T1, 14%; T2, 18%; T3, 12%). Among AT users, their main reason for visiting was to walk (T1, 39%; T2, 53%, T3, 47%), walk a dog (T1, 17%; T2, 18%; T3, 18%), or cycle within the park (T1, 16%; T2, 18%; T3, 20%). AT among those accompanying a child to the intervention park were low and increased only slightly, post-intervention, then dropped to pre-intervention levels (T1, 11%; T2, 14%; T3, 11%), while these rates dipped at T2 at the control park (T1, 19%; T2, 12%; T3, 19%).

Conclusions: Rates of AT to parks were low, despite the presence of walking/cycling paths. The introduction of a playscape had little impact on AT. Future studies of varying park size/location should investigate which features/facilities would encourage visitors to travel there by AT.



### Understanding the lived food environment to generate urban policy recommendations: The Heart Healthy Hoods study in Madrid

#### Miss Julia Díez<sup>1</sup>, **Prof. Manuel Franco<sup>1,2</sup>**

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Pre-recorded Presentation

#### Purpose

1) Identify, using Photovoice, community perceptions of urban factors associated with dietary behaviors.

2) Generate community-driven policy recommendations to improve the food environment.

#### Methods

Madrid residents from two low-income neighborhoods engaged in collecting, analyzing, and disseminating their results in this Heart Healthy Hoods (HHH) Photovoice project. In a first phase, 24 residents engaged in a Photovoice project where they took photographs on their local food environment. These photographs served as prompts to elicit their health concerns and be-liefs regarding food environment determinants of dietary behaviors. In a second phase, residents translated their results into more concrete recommendations to improve their local food environment. Finally, we organized a nominal group session including participants, researchers, public health practitioners and local policymakers to discuss and prioritize the previouosly proposed policy recommendations.

#### Results

Participants took 163 photographsand selected 31 as the ones best reflecting their local food environment. They identified 30 categories, which emerged from

these photographs and their corresponding narratives. Out of these, they generated a set of 12 policy recommendations related to their food environment. Some related to the political (e.g., regulation of street vending) and the economic environment (e.g., the cost of gluten-free foods). Regarding the physical environment, they suggested increasing the availability of organic foods in the neighborhood while restricting the availability of unhealthy products within vending machines in their worksites. In relation to the sociocultural environment, participants discussed the social meaning of grocery shopping, stating the need to support local small retailers and public markets.

Madrid photovoice team also offered trainings and helped conducting lived food environment projects in Baltimore and Bilbao. Lived food environment research conducted in Madrid, also included qualitative approaches in combination with geospatial and mapping analyses.

#### Conclusions

Residents' direct experiences in combination with other stakeholders' views as researchers, public health professionals and local policymakers, contributed adapting nutrition related diseases prevention approaches to realworld local needs. Since nutrition related diseases as diabetes and obesity do affect disproportionally vulnerable populations, interventions that include community engagement and build local capacity are key to address urban health disparities.



### The social and physical environment as drivers of dietary behaviours in a low income urban setting: A participatory photovoice project in Nairobi City, Kenya

<u>Ms. Milka Wanjohi<sup>1</sup></u>, Dr. Rebecca Pradeilles<sup>2</sup>, Prof. Michelle Holdsworth<sup>3,4</sup>, Dr. Elizabeth Kimani-Murage<sup>1</sup>, Dr. Gershim Asiki<sup>1</sup>, Dr. Dickson Amugsi<sup>1</sup>, Dr. Marco Bohr<sup>5</sup>, Prof. Paula Griffiths<sup>2</sup>

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#### Pre-recorded Presentation

#### Purpose

Kenya is experiencing rapid urbanisation leading to changes in food environments, which are associated with changing diets and related non-communicable diseases (NCDs). The aim of our study was to identify which drivers in these social and physical food environments influence dietary behaviours among urban dwellers in Nairobi.

#### Methods

We used participatory photography (Photo voice), with men/women (n=48) aged  $\geq$ 13 years living in a low income neighbourhood in Nairobi. Participants took photographs representing: places where they eat; things that make eating healthy difficult/easy; and a person/things that influence what they eat. Participants told the 'stories' of their photographs during in-depth interviews. NVivo was used for thematic analysis drawing on principles of socio-ecological theory.

#### Results

The photographs and interviews with the participants revealed that poor hygiene, environmental sanitation, food contamination and adulteration were key concerns regarding foods sold in the neighbourhood. While quality and food preparation methods were major considerations in decisions on food purchase and consumption, money was a major barrier to accessing good quality healthy foods. In the home environment, urban farming supplemented household food needs. Within the social food environment, family and food vendors were key influencers of dietary behaviours. Preferences of children, spouses and parents were important drivers of food purchases/consumption. Food vendors' hospitality and services including credit, packaging and subsidized prices also influenced dietary behaviours.

#### Conclusions

The findings highlight the continuing challenges of poor food hygiene and food safety alongside unhealthy diets associated with NCDs in urban areas. Enforceable food safety legislation is essential in lowering this risk. Urban farming could be promoted to address financial barriers that influence access to healthy diets. Impact on policy/ actions

Our findings strengthened the evidence on urban farming as a source of affordable, healthier foods which has consequently been incorporated into the National Healthy Diets and Physical Activity Resource/Training Manual. The Nairobi County Government has committed to consider i) food hygiene and safety and ii) food vendors as a driver of dietary behaviours, in the ongoing development of the five year county nutrition action plan (CNAP).



### You can't find healthy food in the bush: Lived experience of poor accessibility, availability and adequacy of food in rural Australia

**Dr. Jillian Whelan<sup>1</sup>**, Prof. Colin Bell<sup>1</sup>, Prof. Steven Allender<sup>1</sup>, Dr. Lynne Millar<sup>2</sup>, Dr. Penelope Love<sup>3</sup>

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Pre-recorded Presentation

#### Purpose

Within Australia, major inequities exist between rural, regional and metropolitan areas including chronic disease risk profiles, access to healthcare and to a fresh, healthy, affordable food supply. We explored living in the food environment of a 7000 square kilometre municipality in rural Australia. Four elements were investigated: whole of community food supply audit; comparative pricing study; a multi-factor evaluation of health promoting food outlets; and an exploration of the impact of life in a largely unhealthy rural food environment.

#### Methods

Multiple validated methods were used to understand the food environment, and this lived experience. The Nutrition Environment Measurement (NEMS) tools for stores and restaurants were used to determine food availability. The Australian Standardised Affordability Pricing (ASAP) tool assessed food affordability and comparative pricing. Understanding local food environments utilised complexity and co-design principles informed by community-based systems dynamics. Community readiness to change interviews along with ethnographic research provided insight into the lived experience of local food environments and impacts on individuals and families.

#### Results

The availability of healthy food was very limited, and the quality of fresh food was highly variable. Healthier choices, such as wholegrain versus white bread, were usually more expensive. Cross-cutting themes from these multiple methods emerged: community members voiced a demand for healthier foods, suppliers voiced reluctance to supply healthier foods due to concern with falling profit margins and product waste. Separately rural businesses supported each other, for example a supermarket did not supply meat to ensure a viable local butcher. With support of key leaders and co-design principles, catering policies were introduced across local government, health services and agreements with local food retailers to trial healthier options and reduce portion sizes. The creation of a health promoting café inside the health service contributed to a 'therapeutic landscape' that showcased healthy environments. This research further highlighted rural policy inequities.

#### Conclusion

This lived experience of limited choice, higher prices, and poorer quality produce requires stronger policies to underpin change. The loyalty observed for locally owned food outlets provide great opportunities to secure healthier food supply to improve the health of rural communities.



#### Measuring the effects of walkable streets – Lessons from London and Auckland

#### Mr. George Weeks<sup>1</sup>

<sup>1</sup>Auckland council, Auckland, New Zealand

Symposium Recording

Purpose

As a mode of transport, walking suffers from ubiquity – its importance is hidden in plain sight. Recent research in New Zealand and the UK has attempted to quantify to the significance of walking and its relationship with street design to inform urban planning decisions.

Method

In New Zealand, Auckland Council's Business Case for Walking examined the economic value of foot travel in Auckland city centre. Here, on a typical weekday, 500,000 trips are made by foot. This study examined user benefits to determine the net present value (NPV) of delays to people using pedestrian crossings.

A second study in this programme examined the relationship between Auckland's effective job density (EJD), labour productivity and the effects of increasing job density via walkability.

In the UK, the London Borough of Waltham Forest's Mini-Holland Programme sought to increase cycling, walking and public transport use. Interventions included low-traffic neighbourhoods, new junction designs and protected space for cycling along main roads.

Results

The NPV of pedestrian crossing delays along Queen Street, the main street in central Auckland, totalled \$186m compared to a best-case scenario. This implies that pedestrian delay could be costed as a function of street design. Changes to the street environment to increase EJD by 1% in Auckland city centre would increase the value of the study area's economy by 0.53%. This demonstrates a statistically significant relationship between urban design and macroeconomics.

In Waltham Forest, residents of areas receiving Mini-Holland interventions were cycling an extra nine minutes per week and walking an extra 32 minutes per week. In addition to the health benefits of everyday physical activity, this also has had a positive impact on air quality and motor traffic reduction.

Conclusion

These examples are part of a wider discourse which show that the benefits of pedestrian-friendly urban design can be quantified and, in turn, used to inform policymaking and evaluation. The onus is on decision-making bodies to enshrine these types of findings as part of the process by which the built environment is designed, built and managed.





#### The role of inclusive access in walkability

#### Dr. Bridget Burdett<sup>1</sup>

<sup>1</sup>MRCagney, Auckland, New Zealand

#### Symposium Recording

Inclusive access - the ability of all people to participate- is central to walkable environments. However, there is a risk that without measurable indicators of inclusive access, it can get trumped by safety or amenity values. This presentation will present desktop and observational survey methods to compare inclusive access as a component of walkability at community and street levels. Inclusive access requires consideration of human variety, including physical and sensory characteristics and capabilities; fluctuating states and variation in wellness; and the impacts of income on people's access choices. Although humans are unique, there are visible proxies (such as gender, walking speed, and mobility aid use) that can be used to compare inclusiveness in different places. Community catchment analyses, using age, gender and ethnicity-specific rates of disability as well as income levels, can be used to identify the relative need for investment in accessible (walkable) environments.

Considering the impact of participation on wellbeing, the presentation will argue for "safety: access: amenity" as ordered, guiding principles for investment in more walkable places.



#### Urban liveability: A social determinants of health perspective on walkability

<u>Mr. Carl Higgs<sup>1</sup></u>, Dr. Hannah Badland<sup>1</sup>, Dr. Koen Simons<sup>2</sup>, Prof. Billie Giles-Corti<sup>1</sup> <sup>1</sup>*RMIT University, Melbourne, Australia,* <sup>2</sup>*University of Melbourne, Melbourne, Australia* 

Symposium Recording

#### Purpose

The concept of liveability is found in urban policy discourse globally. Liveable neighbourhoods are underpinned by walkable neighbourhoods and offer proximity to things needed for our daily living. However, levels of liveability and walkability are not equally distributed across a city. Across the past seven years, our liveability research programme has defined liveability through a social determinants of health lens; and have measured its sub-domains: food, transport, social infrastructure, employment, walkability, housing, green infrastructure and the ambient environment. Our definition is referenced in state policies in Australia, and our urban liveability spatial indicators are used by federal and local governments. This presentation will describe methods for calculating and communicating high resolution spatial measures of urban liveability, and its association with walking and cardiometabolic outcomes.

#### Methods

An urban liveability index (ULI) was developed as a composite measure of liveability for residential addresses in Melbourne, Australia. These were linked with VISTA travel survey (2012) participants for analysis against transport mode choice; and with some refinement, the Victorian Population Health Survey (VPHS, 2014) participants for analysis with physical activity and health outcomes.

#### Results

The ULI was positively associated with walking for transport (VPHS Adjusted odds ratio per interquartile range change in ULI: 1.63, 95% CI 1.48, 1.78) and negatively associated with body mass index (VPHS kg/m2 per IQR change in ULI: -0.35; 95% CI -0.55, -0.16). A pilot interactive map was developed for visualising the distribution of the ULI and its sub-domains.

#### Conclusions

The concept of liveability is an accessible means of communicating research on the social determinants of health to diverse audiences, and we identified spatial inequities in its delivery across Melbourne. Widespread availability of open data, powerful computing and open source software offers new opportunities for measuring neighbourhood attributes that promote active living in diverse cities. Liveability indicators are now being estimated for urban dwellings across Australia's 21 largest cities and other cities, globally. An urban observatory with interactive maps visualising the spatial distribution of the ULI and its domains will be launched in 2020.



# Translating research to practice: Implementation and scale-up of physical activity, sedentary, and behavioral nutrition interventions at worksites in Kansas

**Dr. Elizabeth Ablah<sup>1</sup>**, Ms. Allison Honn<sup>1</sup>, Mr. Mason Rohleder<sup>1</sup>, Ms. Melinda Kellogg<sup>1</sup>, Mr. Jeff Usher<sup>2</sup>, Ms. Virginia Barnes<sup>3</sup> <sup>1</sup>University of Kansas School of Medicine, Wichita, United States, <sup>2</sup>Kansas Health Foundation, Wichita, United States, <sup>3</sup>Blue Cross and Blue Shield of Kansas, Wichita, United States

Pre-recorded Presentation

#### Purpose

The objective of this session is to describe how research can be translated into practice by describing a process of implementation and scale-up of physical activity, sedentary, and behavioral nutrition interventions for hundreds of worksites across Kansas, a rural state in the United States.

#### Methods

WorkWell KS has a 10-year history of developing and implementing evidence-based participatory interventions, resulting in four iterations: Phases I through III and Pathways to a Healthy Kansas. For each iteration, we identified evidence from research regarding strategies that improve physical activity, sedentary, and behavioral nutrition in worksites. These intervention strategies were implemented, evaluated, and updated based on data about the interventions' reach, effectiveness, adoption, implementation, and maintenance (RE-AIM).

#### Results

A total of 816 worksites and 2,983 worksite contacts have completed at least one iteration of WorkWell KS. Implemented worksite changes impacted up to 211,865 employees and another 245,618 dependents. Effectiveness, adoption, and maintenance of the interventions were assessed through standardized employee-level assessments (at baseline and one-year follow-up), WorkWell KS assessments developed to measure evidence-based practices (at baseline and one-year follow-up), and participant feedback (at baseline, post-workshop, and one-year follow-up). As the same individual facilitated all WorkWell KS workshops and curricula, fidelity to the protocol was strong.

#### Conclusions

Worksite wellness research can be translated into practice by establishing and evaluating processes and systems using the RE-AIM framework, expanding worksites' capacity through participatory processes, and emphasizing organizational-level changes





### Socio-economic Inequalities (SIG)



#### Is food insecurity associated with food skills among grade five boys and girls?

**Dr. Rosanne Blanchet<sup>1</sup>**, Ms. Olivia K. Loewen<sup>1</sup>, Dr. Stephanie L. Godrich<sup>2</sup>, Dr. Noreen Willows<sup>1</sup>, Dr. Paul Veugelers<sup>1</sup> <sup>1</sup>University of Alberta, Edmonton, Canada, <sup>2</sup>Edith Cowan University, Bunbury, Australia

Symposium Recording

Purpose: To examine the associations between food insecurity and children's involvement in family meal choices and food preparation, used as indicators for children's food skills, among school-aged boys and girls.

Methods: Data from the Children's Lifestyle and School Performance Study (CLASS) were used for this study. CLASS was a population-based survey conducted in 2011 among children in grade five (10-11 years old) in Nova Scotia, Canada. A total of 5,244 children participated. Household food insecurity status was assessed using the 6-item Household Food Security Survey Module (food secure: score 0; food insecure: score 1-6). Children's involvement in family meal choices and food preparation were assessed by (i) asking children how often they helped make family meal choices; and (ii) how often they helped prepare or cook food at home. Mixed-effects multinomial logistic regression models were conducted using Stata/IC 14.

Results: One in four children (24%) lived in a food insecure household. Most children reported being involved in family meal choices (74%) or food preparation (68%) at least weekly, while one in ten (11%) children reported never doing either activity. Overall, boys were less likely to be involved in family meal choices and food preparation than girls. Girls from food insecure households were 33% less likely to help choose family meals once a week than girls from food secure households, although household food insecurity status was not associated with girls' involvement in food preparation. There were no differences in boys' involvement in family meal choices according to household food insecurity status; however, the likelihood of boys assisting with food preparation/cooking four times per week was 65% higher among boys from food insecure households compared with boys from food secure households.

Conclusions: These findings suggest that interventions aiming to address food insecurity by enhancing children's food skills are unlikely to be effective. Among adults in Canada, food preparation and cooking skills are not associated with food insecurity. Likewise, children in CLASS who lived in food insecure households had similar or better involvement in home food preparation than those living in food secure households.



### Associations between household food insecurity and barriers to vegetable utilization in low-income families

<u>Dr. Matthew J. Landry</u><sup>1</sup>, Dr. Fiona M. Asigbee<sup>1</sup>, Ms. Reem Ghaddar<sup>1</sup>, Mr. Matthew R. Jeans<sup>1</sup>, Dr. Jaimie N. Davis<sup>1</sup> <sup>1</sup>The University of Texas at Austin, Department of Nutritional Science, Austin, United States

Symposium Recording

Purpose: Assuming nutritious foods are available and accessible within a household, additional barriers linked with the transformation or utilization of food into meals including planning, management, selection of foods, preparation and cooking skills may impact dietary intake in food insecure (FI) households. This study examined the association between household food insecurity and barriers to vegetable utilization in low-income families.

Methods: This was a cross-sectional baseline study that analyzed self-reported data from the parents of children in TX Sprouts, a cluster-randomized school-based gardening, cooking, and nutrition intervention. Cooking attitudes and self-efficacy were self-reported by parents via validated questionnaires. Household food insecurity was assessed using the 18-item Household Food Security Survey Module. Binomial logistic regressions were used to investigate perceived barriers to the utilization of vegetables within the household.

Results: Data were available on 1891 parents and included the following demographics: 87% female, 63% Hispanic, and 27% reported household food insecurity. Not having time for preparation was associated with two-fold greater odds of having household food insecurity (p<0.001). Parents who reported the barriers of vegetables being hard to use before spoiling, not knowing simple, easy recipes, and not having assistance in cooking from other family members also had 1.6, 1.9 and 1.9 greater odds of food insecurity (p<0.001), respectively, compared to parents not reporting experiencing that barrier. The barriers of family members not liking vegetables and not knowing how to prepare vegetables were not associated with greater odds of being food insecure.

Conclusions: In addition to improvements in psychosocial behaviors, skill development as part of multi-context or multi-level public health interventions is needed to overcome barriers to utilization of foods to improve diet quality in food insecure households.



### Food Community: Assessing the potential of community and government initiatives to enhance food security

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#### Symposium Recording

Purpose: To understand how a novel Systemic Innovation Lab methodology can be used to assess initiatives' capacity to enhance community-level food security.

Methods: This pilot project took place in the South West region of Western Australia. The Systemic Innovation Lab methodology used included a six-stage process: Form, Explore, Map, Learn, Address and Share. A core team and reference group oversaw the project and a launch was held to engage government and community stakeholders (Form stage). Interviews with directors, volunteers, staff and business owners of 52 included initiatives (i.e. food literacy programs) enabled the team to determine possession of 36 desirable characteristics for enhancing complex issues like food security (Explore stage). These characteristics were outlined by the organisation Wicked Lab and reflected existing literature. Characteristics were embedded within nine Focus Areas, relating to supporting communities to move to a new way of working and supporting governments to explore and reuse community knowledge. The Map stage included uploading interview data into an online tool, to create a matrix of food security initiatives and the Focus Area characteristics they possessed. The online mapping tool was used to identify "windows of opportunity" across Focus Areas; initiatives could be supported to enhance their way of working. An action-planning workshop co-designed strategies to address windows of opportunity to facilitate initiative functioning.

Results: Many initiatives possessed qualities facilitating change towards more effective ways of working, such as through e-newsletters. Few initiatives possessed characteristics that supported a shared understanding of their common goal or used role models. Significant gaps existed in the connection between community and government, particularly in the utilisation of community knowledge.

Conclusions: Significant change is required to ensure greater collaboration between community and government food security initiatives. Governments should create the enabling conditions for community-based food security initiatives to thrive. Project participants were encouraged to utilise common language/branding and involve community and government in project governance to ensure the utilisation of community innovation and knowledge. Participants were referred to a free advocacy course and will be supported through a new "Food Community" website/app currently being developed.



### Day-to-day pattern of physical behaviours at work and leisure among adults with low socioeconomic status.

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#### Pre-recorded Presentation

#### Purpose

Most studies on day-to-day patterns of physical activities and sedentary behaviour are based on adult populations of high socioeconomic status (SES) without differentiating between work and leisure. Consequently, little is known about domain-specific day-to-day patterns of physical behaviours and potential correlates of such patterns among low SES adults. Thus, we aimed to characterize the day-to-day pattern among low SES adults and to investigate the influence of day of the week and its interaction with workday, work duration and work physical behaviours on day-to-day leisure physical behaviours.

#### Method

This study included 1012 adults from typical low SES occupations (e.g. manufacturing, cleaning and transportation). The participants wore accelerometers for 1-5 days to measure daily physical behaviours at work and leisure, expressed as 3-part time-use compositions consisting of time spent 1) sedentary, 2) standing or 3) active (i.e. walking, stairclimbing or running). Multilevel linear log-ratio models were used to regress leisure time-use composition on (1) type of day, i.e., work/non-work, (2) day-of-week, (3) work duration, and (4) work time-use composition. Models were adjusted for sex, age, BMI and smoking-status.

#### Results

During leisure, sedentary time increased during the week (300 min/day on Monday, 307 min/day on Friday), while active time decreased (42 min/day on Monday, 38 min/day on Friday). At work, sedentary time decreased during the week (176 min/day on Monday, 167 min/day on Friday), while active time increased (83 min/day on Monday, 90 min/day on Friday). Leisure physical behaviours were associated with type of day (p < 0.005, more sedentary on work days vs. non-work days) and day-of-week (p < 0.005, more sedentary on Friday). There were no associations with work duration or work time-use composition.

#### Conclusion

Our findings suggest that low SES adults' leisure time is more sedentary towards the end of the workweek, while their work time becomes more active. Leisure time was spent significantly more sedentary (and less active) on workdays compared to non-workdays, indicating that these workers might organize their day according to work obligations. Our findings highlight the need to differentiate between domain when investigating day-to-day physical behaviour patterns and its correlates among low SES adults.



### Mediating role of lifetime discrimination on associations between neighborhood social environment and TV viewing in Jackson heart study participants

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#### Pre-recorded Presentation

Purpose: We tested the hypothesis that lifetime discrimination mediates associations between perceived neighborhood social environment (PNSE) and TV viewing among African American (AA) adults. This study is innovative because it can shed new light on potential mechanisms linking neighborhood social environment to sedentary behavior.

Methods: Baseline data for 4,716 Jackson Heart Study (JHS) participants (mean age=55.1y), a large prospective cohort study of AAs in Jackson, Mississippi were used. One binary TV viewing outcome was created:  $\geq$ 4 hours/day. PNSE variables included neighborhood violence, problems (higher value=more violence/problems), and social cohesion (higher value=more cohesion). Lifetime discrimination was based on a validated instrument about unfair treatment (workplace), summed to create a mediator. Covariates included demographics, health-related factors, and population density. Multivariable linear regression with bootstrap-generated 95% bias-corrected confidence intervals (BC CIs) was used to test for significant indirect mediation effects (determined by 95%BC CIs [not including one] for logistic regression (odds ratios; OR) adjusting for covariates. Significance of unstandardized coefficients was determined by 95%CIs (not including zero).

Results: Participants (37%) reported TV viewing≥4 hours/day. Neighborhood violence, problems, and social cohesion were indirectly related to TV viewing via lifetime discrimination (OR=1.03, 95%BC CI=1.00, 1.07; OR=1.03, 95%BC CI=0.99, 1.06 [marginal], and OR=0.98, 95%BC CI=0.94, 0.99, respectively). That is, lower neighborhood violence and problems (B=-0.41, 95%CI=-0.64, -0.18 and B=-0.36, 95%CI=-0.53, -0.20, respectively) and higher social cohesion (B=0.11, 95%CI=0.08, 0.53) were associated with higher lifetime discrimination. In turn, lifetime discrimination was inversely associated with TV viewing. No direct associations were observed.

Conclusions: Each PNSE variable was indirectly associated with TV viewing via lifetime discrimination among JHS participants. Unexpected relationships between PNSE, lifetime discrimination, and TV viewing revealed when examining indirect associations warrant further investigation. Future research is needed to pinpoint effective community efforts to reduce discrimination and adverse neighborhood factors, and thereby decrease TV viewing and subsequent cardiovascular disease risk.



### Food security related to depression and anxiety predisposition and anemia among undergraduate Mexican students.

Dr. Cesar Octavio Ramos Garcia<sup>1</sup>, Dr. Karla Janette Nuno Anguiano<sup>1</sup>, Ms. Karen Esmeralda Sanchez Aguayo<sup>1</sup> <sup>1</sup>Health Sciences Division, University Centre of Tonala, University of Guadalajara, Guadalajara, Mexico

#### Pre-recorded Presentation

Several studies have described the impact that Food Insecurity (FIS) has on different factors at a physical, mental and social level, which is also observed in young adults and adolescents. The aim of the study was to describe the association of food insecurity in undergraduate Mexican students with the presence of anemia, and depression and anxiety predisposition.

An online survey was applied to 1329 young students. FIS was assessed by the Latin American and Caribbean Food Security Scale (ELCSA). To asses depression predisposition, the Patient Health Questionnaire (PHQ-9) was used. And for Anxiety the Generalized Anxiety Disorder Scale (GAD-7) was applied. In a subsample of 286 female students, hemoglobin (Hb) was measured by capillary blood with an HemoCue Hb201+.

A food insecurity (FIS) rate of 58.2% was observed, of which 29.4% was low, 19.9% moderate, and 8.9% severe FIS. The prevalence of low Hb was 14.3%. Regarding depression and anxiety predisposition, it was observed in 58.5% and 67.2% of the subjects respectively. 52.1% of the students presented simultaneously depression and anxiety predisposition. That variable was contrasted with FIS, obtaining an OR of 2.642 (95% CI, 2.110 - 3.306).

This study indicates that the predisposition of depression and anxiety among undergraduate Mexican students is highly related to living with food insecurity. It also indicates a relatively high prevalence of low hemoglobin values (anemia). Food insecurity is a matter of great concern for national and international health agencies since it not only has implications on nutritional, but also mental health.



### The longitudinal influence of neighbourhood disadvantage on cardiovascular disease in older adults and the mediating effects of physical activity

<u>Dr. Tayebeh Saghapour</u>, Prof. Billie Giles-Corti, Dr. Lucy Gunn, Prof. Gavin Turrell <sup>1</sup>*RMIT University, Melbourne, Australia* 

#### Pre-recorded Presentation

Introduction: Evidence from longitudinal studies on the influence of neighbourhood disadvantage on cardiovascular disease (CVD) is limited. We investigated the prospective association of neighbourhood-level deprivation with CVD in older adults and whether physical activity (PA) mediated this association.

Methods: Data comes from the HABITAT project, a multilevel longitudinal investigation of health and wellbeing in Brisbane. Data included 11,035 residents in 200 neighbourhoods in 2007, with follow-up data obtained in 2009, 2011, 2013 and 2016. Neighbourhood disadvantage was derived using a Census-based index and divided into quintiles. CVD was defined as reporting one or more medically diagnosed long-term conditions: coronary heart disease, high blood pressure/hypertension or any serious circulatory condition. PA was self-reported, and an overall measure of energy expenditure was derived by multiplying the time (minutes/week) spent in walking, moderate activity and vigorous activity by an intensity value, and summing the products. Hazard ratios were estimated using a multilevel mixed-effect parametric survival model, adjusting for age, sex, education, occupation, and household income. Those with pre-existing CVD at baseline were excluded from the analyses. The mediation effect of PA on CVD was examined using multilevel generalized structural equation modelling.

Results: There were a total of 20,018 observations at five-time points. Observations were clustered into three levels of year, individuals and HABITAT neighbourhoods. The risk of CVD was highest in the most disadvantaged neighbourhoods evidenced by higher hazard ratios (HR) (Q1: HR 1.56, 95% CI 1.24,1.90). HRs of CVD in Q1 were 1.22 (95% CI 1.01,1.47), 1.42 (95% CI 1.14,1.76), 1.38 (95% CI 1.11,1.72) after adjusting for education, occupation and household income, respectively. PA as a mediator had the strongest effect (both total and indirect p<0.001) on CVD among residents of the most disadvantaged neighbourhoods.

Conclusion: Neighbourhood disadvantage was associated with the incidence of CVD, and PA was a significant mediator of this relationship. Future research should investigate which neighbourhood-level features promote or inhibit PA in disadvantaged areas as the basis for policy initiatives to address inequities in CVD.



### The independent and combined effects of nudging and pricing on food purchasing behavior in a virtual supermarket setting

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#### Pre-recorded Presentation

Purpose: There is a need for evidence on what strategies - or combination of strategies - work best in increasing healthy food purchases and consumption, while not enhancing socio-economic inequalities in dietary intake. This study is the first to examine the efficacy of combined nudging and pricing strategies on increasing healthy food purchases and possible differences by socioeconomic position (SEP).

Methods: A randomized study design was used within a virtual supermarket (SN VirtuMart). Participants were exposed to five within-subject conditions (control, nudging, pricing, price salience and price salience with nudging) and randomized to one of three between-subject arms (25% price increase on unhealthy products, 25% price discount on healthy products, or 25% price increases and discounts). 455 participants of low and high SEP (using either education or income as proxy) conducted their weekly shopping in the supermarket for five consecutive weeks. Data were analyzed using linear mixed models.

Results: In total, 346 (76%) adults completed all five shops within the SN VirtuMart. Median age was 32.5, 49.2% had high education and 32.8% had high income. Nudging and pricing strategies alone did not significantly increase healthy food purchase (e.g., in the price increase and discount arm Bnudging = 1.8, 95%CI = -0.1; 3.7 and Bpricing= 0.7, 95%CI = -1.2; 2.6), whereas combined salient price increases with discounts led to an absolute increase in the percentage of healthy food purchases (Bprice salience = 4.5, 95%CI = 2.6; 6.4). Combining salient pricing and nudging strategies led to significant increases in the percentage of healthy products in all three pricing arms, with the largest effect found in the combined price increase and discount arm (Bprice salience and nudging = 4.0, 95%CI = 2.0; 6.0). These effects were not modified by SEP.

Conclusions: Combining price increases of unhealthy foods with price discounts on healthy foods and advertising these price changes (salience), and combining the salient price strategies with nudges increases healthy food purchases. These effects were similar across socioeconomic subgroups. Further research is needed to estimate the effect of combined nudging and salient pricing strategies in real world settings.



## Evaluating the Intersection of Race/Ethnicity & Socioeconomic Status: An Assessment of Food-Away-From-Home (FAFH) Purchasing among U.S. Households

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#### Pre-recorded Presentation

Purpose: Food-away-from-home (FAFH, a meal or food item prepared for consumption by a commercial or noncommercial institution) continues to make up a large proportion of the American diet. Over 50% of U.S. adults consume at least three FAFH meals per week. This statistic is concerning because FAFH meals are often higher in calories, saturated fat, sodium, and added sugars compared to home-prepared meals. Several studies have reported racial/ethnic and socioeconomic differences in FAFH purchasing, respectively. There is limited understanding of the how the intersection of these two factors influences FAFH purchasing. Thus, the objective of this research is to evaluate the intersection of race/ethnicity and socioeconomic status (SES) in regards to FAFH purchasing among U.S. households.

Methods: We obtained and analyzed cross-sectional data from the United States Department of Agriculture's (USDA) National Household Food Acquisition and Purchase Survey (FoodAPS). This program collected detailed information on food purchases over a 7-day period for 4,826 households between April 2012 and January 2013. The FAFH data contained information on 116,074 food and beverage items purchased by members of these households. We assessed the relationship between race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, and other) and SES (<100%, 100-185%, >185% of the federal poverty line) in regards to several FAFH measures including total money spent (\$), total pounds of food acquired, and sources of FAFH (i.e., grocery store, fast food, etc.).

Results: Preliminary analyses revealed racial/ethnic and SES differences in total money spent and total pounds of FAFH acquired over the 7-day period. Non-Hispanic black and Hispanic households spent less money on FAFH compared to non-Hispanic white households. On average, the amount of money spent on FAFH increased across levels of SES with >185% households spending the most on FAFH. We observed this trend among all households except non-Hispanic black households. Low-income non-Hispanic black households (i.e., <100%) spent more money on FAFH compared to low-income households of other races.

Conclusions: Regression models with interaction terms will assess the intersection of race/ethnicity and SES in regards to FAFH purchasing after adjusting for important covariates such as education level and geographic location.



#### Diet quality of Canadian preschool children: Associations with sociodemographic characteristics

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Pre-recorded Presentation

Background: Understanding socio-demographics disparities in diet quality can inform health policy and populationbased interventions aimed at reducing nutritional and health inequities. Socio-demographic differences in diet quality have been described in adults, school-aged children, and adolescents, but few studies have explored these associations in preschoolers. Objective: To describe the diet quality of Canadian preschool-aged children and explore its associations with socio-demographic characteristics.

Methods: Data from 100 children participating in the Guelph Family Healthy Study pilot, a family-based cohort-study, were used in this cross-sectional analysis. Children's dietary intake was measured with three-day food records and diet quality was determined using the Healthy Eating Index (HEI-2015). Linear regression analysis was used to explore associations between diet quality and socio-demographic characteristics.

Results: Children's mean± SD HEI-2015 score was  $68.9\pm9.31$  and 86% had HEI-2015 score in the "needs improvement" category (51-80 out of 100). Children's overall HEI-2015 score was inversely associated with children's age ( $\beta$ = -0.19, 95%CI -0.37, -0.02); specific components of HEI-2015 score that decreased with children's age included total fruit ( $\beta$ = -0.19, 95%CI -0.37, -0.02), whole fruit ( $\beta$ = -0.24, 95%CI -0.45, -0.03), refined grains ( $\beta$ = -0.57, 95%CI -0.93, -0.21), and sodium ( $\beta$ = -0.62, 95%CI -1.01, -0.24). Parental education was positively associated with children's overall HEI score ( $\beta$ = 9.58, 95%CI 3.81, 15.35) and with scores for total fruit ( $\beta$ = 1.00, 95%CI 0.39, 1.76), total vegetables ( $\beta$ = 1.11, 95%CI 0.03, 2.18), total protein foods ( $\beta$ = 1.06, 95%CI 0.28, 1.84), and seafood and plant protein ( $\beta$ = 1.67, 95%CI 0.43, 2.89). Children who identified as Caucasian ( $\beta$ = 4.29, 95%CI 2.46, 6.14), had Caucasian parent ( $\beta$ = 3.01, 95%CI 0.78, 5.25), or had parent born in Canada ( $\beta$ =2.32, 95%CI 0.53, 4.1) had higher scores for dairy component of HEI-2015.

Conclusion: These results suggest that diet quality of Canadian preschoolers needs improvement and that there are disparities in diet quality across certain sociodemographics.



### Mediators of socioeconomic inequalities in dietary behaviours among youth: A systematic review

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#### Pre-recorded Presentation

Purpose: Children and adolescents with a lower socioeconomic position (SEP) have poorer dietary behaviours compared to their counterparts with a higher SEP. A better understanding of the mechanisms behind such socioeconomic inequalities in dietary behaviours would provide useful information about modifiable factors to target in interventions that tackle the inequalities. Hence, this systematic review aimed to summarize existing evidence regarding the mediators of socioeconomic differences in dietary behaviours among youth.

#### Methods and results

A systematic literature search of MEDLINE, Embase, PsycINFO, and Web of Science databases yielded 20 eligible studies. The majority of the studies had a moderate methodological quality. The consistent mediators of the effects of socioeconomic position on dietary behaviours among youth were: self-efficacy, food preferences and knowledge at the intrapersonal level; and availability and accessibility of food items at home, food rules and parental modelling at the interpersonal level. No consistent mediators at the organizational, community and policy level were found.

#### Conclusions

Our review found several modifiable factors at the intrapersonal and interpersonal levels that could be targeted in interventions aimed at combating SEP inequalities in dietary behaviours. Rigorous studies exploring organizational, community and policy level mediators are warranted.



#### Fresh Pantry: A novel mobile food pantry program for low-resource households

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#### Pre-recorded Presentation

Purpose. Food pantries are distribution centers where low-resource households can receive food at no cost. Used by over 46 million Americans annually, food pantries are an important part of the United States food system. Low-resource adults who use food pantries are at higher risk for nutrition-related chronic diseases; therefore, novel food pantry distribution models that provide convenient access to fresh, healthier foods need to be evaluated.

Methods. Fresh Pantry is a partnership between a food pantry and a federally qualified healthcare center that provides medical services to low-resource individuals. Fresh Pantry uses a refrigerated truck to provide monthly mobile food pantry distributions of fresh, healthier food packages on-site at the healthcare center. Food distributions are coupled with nutrition education, taste tests, and health promotion activities. Fresh Pantry aims to determine the feasibility and acceptability of this novel food pantry model, and its impact on participants' food security status and food coping strategies. This abstract reports descriptive statistics on a baseline sample (n=100) of Fresh Pantry participants and process evaluation metrics of food distributions to date.

Results. The majority of the sample was white (52%) or African American (41%) and female (75%). 12% of the sample had high or marginal food security, 31% had low food security, and 57% had very low food security. 89% of the sample used governmental assistance programs, 67% used Supplemental Nutrition Assistance Program (SNAP) benefits, and 77% had visited other food pantries >2 times in the past year. 38% and 41% of participants reported "sometimes" or "often/always" making trade offs between paying for food and other basic needs like medical care or housing, respectively. Over the first six months of the program, Fresh Pantry served 206.3+53.9 (Mean+Standard Deviation) households per distribution, providing 49.3+12.5 pounds of food to each household at each distribution (approximately 16.5+3.3 meals per person).

Conclusions. Fresh Pantry provides healthier food packages to a large volume of households with high need for food assistance. Future analyses will determine the impact of Fresh Pantry on participants over time.



### Socioeconomic inequities in cancer morbidity and mortality are partially mediated by modifiable risk factors

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#### Pre-recorded Presentation

Background: Inequities in cancer morbidity and mortality have been well reported; however, the extent to which these inequities are mediated by modifiable risk factors is unclear. This study aimed to quantify the mediating effects of modifiable risk factors including smoking, excess alcohol consumption, low fruit and vegetable intake, physical inactivity and obesity in associations between socioeconomic position (SEP) and cancer morbidity and mortality.

Methods: We used eight cycles of the nationally representative cross-sectional Canadian Community Health Survey (2000-2011) to identify a cohort of adults ( $\geq$ 35 years) without cancer at the time of study administration (n = 400,250) and followed until March 31, 2012. SEP was measured by creating a latent variable consisting of self-reported education and household income. Self-reported modifiable risk factors including smoking, excess alcohol consumption, low fruit and vegetable intake, physical inactivity and obesity were considered as potential mediators. The outcome was cancer morbidity and mortality and for its ascertainment, the cohort was linked to administrative health data in the Discharge Abstract Database and the Canadian Mortality Database. We used generalized structural equation modeling to estimate mediating effects of modifiable risk factors in associations between low SEP and cancer morbidity and mortality in the total population and stratified by sex.

Results: There was a clear socioeconomic gradient in cancer morbidity and mortality. Modifiable risk factors mediated 45.6% of associations between low SEP and cancer morbidity and mortality. Smoking was the most important mediator in the total population and in males, which respectively explained 15.5% and 42.2% of associations between low SEP and cancer morbidity and mortality. For females, obesity was the most important mediator.

Conclusions: Modifiable risk factors are important mediators of inequities in cancer morbidity and mortality. Nevertheless, over half of these associations remained unexplained. While midstream interventions that target modifiable risk factors may help to alleviate inequities in cancer risk in the short-term, ultimately upstream interventions are needed to reduce and prevent inequities in cancer morbidity and mortality.





#### Food insecurity is linked to maternal weight-related cognitions

<u>Dr. Carol Byrd-Bredbenner<sup>1</sup></u>, Ms. Kaitlyn Eck<sup>1</sup>, Dr. Jennifer Martin-Biggers<sup>1</sup> <sup>1</sup>Rutgers University, New Brunswick, United States

<u>Poster</u>

Purpose: Food insecurity is negatively associated with diet quality and health; however, links between food insecurity and maternal weight-related cognitions are understudied. Thus, this study explored relationships between food insecurity level and maternal body dissatisfaction, perceptions of their children's BMI, and concerns about their children's future weight status.

Methods: Mothers of children aged 2-5 years (maternal age=32.25±5.80SD years) completing an online survey were divided into groups using responses to Hager's Food Insecurity screener (alpha=0.84): experiencing no (n=175), low (n=172), moderate (n=129), and high (n=74) food insecurity in the past 12 months.

Results: ANOVA and Tukey post hoc procedures revealed the no food insecurity group scored significantly (P<0.01) lower on the Eating Disorder Exam Questionnaire 4-point body dissatisfaction indicator item, indicating mothers experiencing no food insecurity were significantly more satisfied with their bodies than all other groups. A root cause of this dissatisfaction likely is linked to maternal BMI which also increased with food insecurity (high food insecurity mothers had significantly higher BMIs than other mothers; P=.01). Maternal selections of the silhouette representing their own children's body size from 7 sex-specific child silhouettes of increasing BMI revealed a significant (P=.04), positive Spearman rank order correlation with food insecurity level and scores on the 2-item, 5-point Likert Maternal Concern about Children's Future Weight Status scale (alpha=0.91) (higher scores indicate greater concern child will be overweight) were significantly (P=.03), positive.

#### Conclusions:

Findings support previously reported links between food insecurity and BMI and expands this to links between food insecurity and maternal weight-related cognitions of body dissatisfaction, maternal recognition of higher child BMIs, concern about their children's future weight status. Future research should examine the interrelationships among maternal BMI, body dissatisfaction, and food insecurity continuum along with the impact of the psychological burden of mothers' concern about their children's current and future weight status and strategies for ameliorating this burden.





# Disease prevention and management



### Links between anxiety and weight-related concerns, behaviors, disordered eating risk of young adults

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Pre-recorded Presentation

Purpose: Anxiety, characterized by excessive uncontrolled worry or concern, is associated with increased risk of disordered eating; however little is known about how anxiety is related to specific weight-related concerns (eating concern, shape concern, weight concern) and behaviors (restraint eating, inappropriate weight-management behaviors). Thus, this study examined links between anxiety, weight-related concerns and behaviors, and overall disordered eating risk.

Methods: Young adults (n=1792, 65% female, age=20.36±1.32SD years) completing an online survey comprised of all Eating Disorder Exam Questionnaire (EDE-Q) assessments (eating, shape, and weight concerns; restraint and binge eating; inappropriate weight-management behaviors) were divided into 3 groups based on Generalized Anxiety Disorder-7 (GAD-7, alpha=0.93) scale score (7-item, 4-point Likert; possible score 0-21): low (score <7; n=991), moderate (score  $\geq$ 7 to <14; n=625), or high (score  $\geq$ 14; n=286) anxiety.

Results: ANOVA with Tukey post hoc tests revealed the low anxiety group had significantly (p<0.01) less concerns about eating, shape, and weight and were less likely to engage in restraint eating, binge eating, or use inappropriate weight-management behaviors (i.e., vomiting, laxative use, excessive exercise) than both the moderate and high anxiety groups. Similarly, the moderate anxiety group had significantly less eating, shape, and weight concerns and restraint and binge eating behaviors than the high anxiety group. Use of inappropriate weight-management behaviors did not differ between moderate and high anxiety groups. Overall disordered eating risk scores increase with anxiety, with all groups differing significantly from each other.

Conclusion: Anxiety is associated with every concern and behavior assessed by the EDE-Q, as well as overall EDE-Q score. The prevalence of moderate to high anxiety in young adults (48% of this sample), the links elucidated between weight-related concerns and behaviors, and the risks these concerns and behaviors pose to immediate and long-term health all suggest that nutrition interventions targeting young adults should consider incorporating anxiety reduction tools and evaluating the potential for these accessory tools to improve overall health.



### The contribution of physical inactivity and socioeconomic factors to the rise of type 2 diabetes in Nepal: a structural equation modelling analysis

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Pre-recorded Presentation

#### Background

Type 2 diabetes mellitus (T2DM) is emerging as a major public health challenge in Nepal. Increasing physical inactivity, rising overweight and obesity levels, changing dietary patterns along with economic transition, industrialisation, rural-to-urban migration and urbanisation are creating environments conducive for developing T2DM. Understanding the pathways between physical activity and social position to T2DM is crucial for designing effective prevention programs.

#### Methods

This study analysed cross-sectional data from 1977 Nepalese adults aged 40-69 years from the 2013 WHO STEPwise approach to surveillance survey. Participants' fasting blood glucose level was used to ascertain their diabetes status. Structural equation modelling, with adjustment for the complex sampling design, was conducted to identify the regression pathways between physical activity, social position, anthropometric and metabolic variables and T2DM.

#### Results

The overall prevalence of T2DM was 7% with almost double the burden among urban residents (13%). The prevalence was greater among males (9.8%) compared to females (5.5%). After adjusting for the effects of age, sex and place of residence, standardised path coefficients indicated that social position (0.380), waist circumference (0.204), triglycerides (0.087) and hypertension (0.152) had a statisticallysignificant direct effect on T2DM. We also found a positive direct effect of social position on body mass index (0.638), waist circumference (0.134), triglycerides (0.208) and total cholesterol (0.189) and a negative effect on physical activity (-0.303). Physical activity had a negative direct effect on waist circumference (-0.068), total cholesterol (-0.070) and hypertension (-0.064) and an indirect effect on T2DM mediated by waist circumference (-0.014).

#### Conclusion

Among Nepalese adults, the higher social position has a significant direct effect on T2DM, while both physical activity and higher social position have significant indirect effects. In addition to having its own direct effect on T2DM, waist circumference was an important mediating variable of the indirect effects of social position and physical activity on T2DM. Policies and programs to address T2DM in Nepal should address the factors contributing to unhealthy weight status, particularly among those of higher social position.


# Impact of a gender-tailored, eHealth weight loss program for men with depression: The SHED-IT: Recharge randomised controlled trial

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Pre-recorded Presentation

Purpose: Obesity and depression are major, inter-related health concerns for men, yet most men with these conditions are reluctant to seek help. Gender-tailored lifestyle programs have shown potential to improve men's physical and mental health, but none have included specific mental health strategies or targeted men experiencing mental illness. This study investigated whether an eHealth weight loss program with integrated mental health support could improve the weight and mood of men with overweight/obesity and depression.

Methods: Overall, 125 men (mean weight=103.8 kg (SD 15.8), age=48.3 years (SD 11.7)) were recruited for a 6-month RCT. All men were overweight/obese (BMI >25kg/m2) and experiencing mild (55%) or moderate-to-severe (45%) depression according to the validated Patient Health Questionnaire (PHQ-9). Men were randomised into i) the SHED-IT: Recharge group (n=62), or ii) a wait-list control (n=63). The 3-month eHealth program was adapted from the evidence-based SHED-IT program, but the content was tailored for men with depression and supplemented with interactive online modules featuring cognitive behavioural techniques targeting mental health (e.g., cognitive reframing). The primary outcomes were weight and depressive symptoms (PHQ-9). Secondary outcomes including MVPA, sleep quality, and risky alcohol consumption were measured with validated scales. Men were assessed at baseline (September 2019) and 3 months (December 2019, primary endpoint), and will be followed up at 6 months (March 2020).

Results: Intention-to-treat linear mixed models identified medium-sized treatment effects at post-test for weight (adjusted mean difference -2.6 kg, 95%CI -4.3,-0.8, d=0.5) and depressive symptoms (adjusted mean difference -2.5 units, 95%CI -4.4,-0.7, d=0.5). Significant (p<0.05) intervention effects were also observed for MVPA (d=0.4), sleep quality (d=0.4), and risky alcohol consumption (d=0.5). On a scale of 1-Poor to 5-Excellent, the mean (SD) program rating was 4.4 (0.7).

Conclusions: Among men with depression, a gender-tailored, eHealth program that combined behavioural weight loss advice with specific mental health support generated significant, short-term improvements in weight loss and mood. These effects are particularly meaningful given men are traditionally hard to engage in weight loss and mental health research. The program was also completely self-directed, which greatly increases its potential for dissemination, particularly to men in regional and remote areas.



# Physical activity, sedentary behaviour, and barriers to exercise in people living with Dystonia

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#### Pre-recorded Presentation

Purpose: Dystonia is a neurological movement disorder that presents as sustained or intermittent involuntary muscle contractions causing abnormal postures and movements. Physical activity (PA) is an important aspect of neurological disease management, with wide-ranging benefits for overall health and quality of life. No studies have quantified PA and sedentary behaviour (SB), nor explored barriers to being physically active in people with dystonia.

Methods: Participants diagnosed with dystonia completed a mixed-methods anonymous online survey on activity behaviours. The International Physical Activity Questionnaire (IPAQ) and Adult Sedentary Behaviour Questionnaire (SBQ) assessed self-reported PA and SB. Barriers to exercise engagement were investigated according to the five-factor social-ecological framework and dystonia-specific questions regarding the impact of exercise on symptoms were included.

Results: Two-hundred and sixty-three participants consented to the study (mean (SD) age = 55 (13) yrs, 76% Female). A large proportion of respondents (40%) reported living with cervical dystonia. Overall, the median (IQR) time spent in walking, moderate, and vigorous activity was 60 (0-120), 120 (15-300) and 0 (0-13) mins/day respectively. SB time during weekdays was 285.0 (157.5-465.0) mins/day and 345.0 (195.0-502.5) mins/day on weekends. Fifty-five percent of participants were dissatisfied with their current level of PA and 75% reported dystonia had decreased their level of PA. Fifty-seven percent found their symptoms were worsened during exercise though the after-effects on symptoms varied. Fatigue, motor symptoms, pain, and poor balance were commonly cited limiting factors. Qualitative and quantitative data indicated difficulties with more vigorous intensity activity. The common barriers to engagement were personal and governmental factors, such as physical impairments, lack of funding and lack of trained exercise professionals.

Conclusions: While more than half of respondents indicated they were not satisfied with their current level of PA, and exercise primarily worsened their dystonia symptoms, most participants were meeting the minimum guidelines. Future studies should incorporate more robust methods of PA and SB measurement and explore the mechanisms underpinning exercise-induced aggravation of dystonic symptoms to enhance life participation of people living with dystonia.



# Maternal Health Behaviours and Child's Birth Weight: Findings from the Communication Healthy Beginnings Advice by Telephone (CHAT) Study in Australia.

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Pre-recorded Presentation

Purpose: Birth weight has been linked to infant morbidity and mortality, childhood development and health status in adulthood. Past studies indicate the link between pre-pregnancy body mass index (BMI) and infant birth weight. Maternal nutrition is also recognised as one of the key determinants of fetal growth. This study examined whether mother's weight status before pregnancy and their dietary habits during third trimester predict infant's birth weight.

Methods: This study used baseline data from a randomised controlled trial of Communicating Healthy Beginnings Advice by Telephone, conducted in four local health districts in New South Wales, Australia. Women in their third trimester of pregnancy were included. Telephone survey was used to collect baseline data such as the women's demographic background, pre-pregnancy BMI, dietary habits including fruits, vegetables, processed meat, chips, fast foods, soft drinks, and juice consumption, gestational diabetes and smoking status. Infant birth weight data were collected using a second telephone survey while the baby was 6 months of age. Multivariate regression modelling was used to determine the factors predicting low (<2,500g) and high ( $\geq$ 4,000g) birth weight.

Results/findings: Data were available for 1,154 participants. The majority of the infants (86%) were within normal birthweight, 4% were classified as low birth weight while 10% were classified as high birth weight. Findings indicate high consumption of soft drinks (ARR= 2.30, p<0.05), chips (ARR= 0.30 p<0.05), and fast food (ARR= 1.54, p<0.05) during pregnancy were associated with infant's low birth weight. Mothers who were obese before their pregnancy (pre-pregnancy BMI  $\geq$ 30) (ARR= 2.01, p<0.05) were associated with infant's high birth weight.

Conclusions: The study findings revealed that mother's weight status and certain dietary behaviours during pregnancy could play significant role in infant birth weight. These findings support the need of intervention to promote healthy weight status among women who plan for pregnancy as well as to promote less junk food consumption during pregnancy in order to reduce the risk of unhealthy infant birth weight.



# Health behavior correlates of intuitive eating in a community-based sample of men and women

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Poster

Purpose: Intuitive eating (i.e., eating according to internal hunger and satiety cues) is associated with better psychological well-being and lower body mass index, but relatively little is known about its behavioral correlates. The purpose of this study was to examine how intuitive eating is associated with health behaviors aligned with those Tribole & Resch suggest may cultivate attunement to internal cues (i.e., eating breakfast daily, yoga practice, and adequate sleep) and disrupt attunement to internal cues (i.e., self-weighing, dieting, and unhealthy weight control behaviors [UWCBs]).

Methods: Cross-sectional data from 765 men and 1,009 women (mean age = 31.1 years) who participated in Project EAT-IV (Eating and Activity in Teens and Young Adults) were used for the present study. Intuitive eating was assessed via seven items (e.g., "I trust my body to tell me when to stop eating") adapted from the Intuitive Eating Scale (IES) and IES-2, with responses recorded on a 4-point Likert-type agreement scale (McDonald's omega = .85 in both men and women). Responses were averaged, and participants who, on average, agreed with all seven items were classified as intuitive eaters. Logistic regression was used to generate sex-stratified, demographics-adjusted prevalence estimates of each health behavior.

Results: At EAT-IV, 41.5% of men and 43.2% of women were classified as intuitive eaters. Among men, intuitive eaters were less likely than non-intuitive eaters to report past-year dieting (29.7% vs. 57.5%, p < .001) and UWCBs (29.0% vs. 47.3%, p < .001). Among women, intuitive eaters were more likely than non-intuitive eaters to eat breakfast daily (46.4% vs. 36.0%, p = .003) and to get at least seven hours of sleep per night on average (90.6% vs. 85.3%, p = .03), and intuitive eaters were less likely than non-intuitive eaters to report past-year dieting (59.9% vs. 74.7%, p < .001) and UWCBs (51.9% vs. 62.2%, p = .004). No associations were observed for regular yoga practice or frequent self-weighing among either sex.

Conclusions: Results suggest a cluster of modifiable health behaviors that may influence attunement to internal cues, though longitudinal research is needed to elucidate temporality of these relationships.



# Relationships between physical activity, cardio-respiratory fitness, and prescribed medication for risk factors of non-communicable diseases in a low-resource community: B-Healthy study

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Pre-recorded Presentation

Purpose: The global economic burden of non-communicable diseases is significant and on the rise. Pharmacological intervention is often the choice of the initial intervention, although exercise is considered a cost-effective alternative. This study aimed to determine the relationship between physical activity, physical fitness, and medication prescribed for risk factors of NCDs in a low-resource community of Potchefstroom, South Africa.

Methods: Participants (n=200) were recruited from a convenience sample in a catchment area of two public healthcare clinics for this observational study. Prescribed medication was collected from clinic records. Objective physical activity data were collected over seven consecutive days by combined heart rate and accelerometry (ActiHeart®). Cardiorespiratory fitness was measured with a step test and risk factors for NCDs with measurements of blood pressure, body composition, and peripheral blood. Partial correlation coefficients were calculated, adjusted for age, to determine the strength of the association between prescribed medication for risk factors of NCDs and physical activity and cardiorespiratory fitness with an alpha level of  $p \le 05$ .

Results: Results from the 180 participants with an average age of 59,4 years, indicated that the women were classified on average as obese (BMI = 32,1 kg/m2). Hypertension was prevalent in 52% of the participants and Diabetes Mellitus type 2 in 15,6%. The partial correlation analyses found a significant inverse relationship between medicine usage and cardiorespiratory fitness (r = -0,23; p<0.001), physical activity as counts per minute (r = -0,18; p = 0,01) and moderate-to-vigorous physical activity (r = -0,15; p = 0,04).

Conclusion: Data from the present study suggests that prescribed medication use is inversely associated with high cardiorespiratory fitness and moderate to vigorous physical activity levels. Implementation of exercise interventions to increase physical activity levels could assist in lowering the cost of medication for non-communicable diseases in low-resourced communities



The association between fast-food outlet density and proximity and Body Mass Index within Dutch urban and rural areas: evidence from a population-based cohort study (N=147,027).

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#### Pre-recorded Presentation

Purpose: Fast-food outlet exposure may be associated with elevated Body Mass Index (BMI), which is a risk factor for various chronic diseases. Yet, evidence on this association is inconsistent due to a lack of accurate and comprehensive exposure measurement. We examined the association between residential fast-food outlet exposure, in terms of proximity and density, and BMI in the Dutch adult general population. Additionally, we investigated to what extent this association was modified by urbanisation level and mediated through daily caloric intake.

Methods: We linked residential addresses of baseline adult Lifelines cohort participants (N=147,027) to fast-food outlet locations using geo-coding. We computed residential fast-food outlet density within 500 metres(m), and 1, 3, and 5 kilometres(km), and proximity. Urbanisation level was defined as living in an urban ( $\geq$ 1,000 addresses/km2) or rural area (<1,000 addresses/km2). Daily caloric intake was measured using a Food Frequency Questionnaire and food composition database. We used stratified (urban versus rural areas) multilevel linear regression and mediation models, adjusting for age, sex, partner status, education, employment, neighbourhood deprivation, and address density.

Results: Participants had a mean BMI of 26.1(SD 4.3) kg/m2. In urban and rural areas, having five or more fast-food outlets within 1km was associated with a higher BMI (B=0.40, 95% confidence interval (CI): 0.12, 0.69; B=0.23, 95% CI: 0.10, 0.36, respectively). Furthermore, participants in urban and rural areas with a fast-food outlet within <250m had a higher BMI (B=0.30, 95% CI: 0.03, 0.57; B=0.20, 95% CI: 0.09, 0.31, respectively). In rural areas, participants also had a higher BMI when having at least three fast-food outlets within 500m (B=0.19, 95% CI: 0.09, 0.29). Associations were stronger in rural than urban areas for 500m density and were not explained by daily caloric intake.

Conclusions: The presence of fast-food outlets within 1 km is associated with BMI. Although we cannot rule out reverse causation, this study provides entry points for policymakers to create healthy living environments.



# How to measure the food environment in relation to Body Mass Index? A comparison of measures in 147,027 Lifelines participants.

<u>Mr. Carel-Peter van Erpecum<sup>1</sup></u>, Dr. Sander van Zon<sup>1</sup>, Prof. Ute Bültmann<sup>1</sup>, Associate Professor Nynke Smidt<sup>1</sup> <sup>1</sup>University Medical Center Groningen, Groningen, Netherlands

Pre-recorded Presentation

Purpose: Unhealthy food environments may contribute to an elevated Body Mass Index (BMI), a major disease risk factor. Yet, it is unclear which measure most accurately reflects the food environment. Moreover, potential mediating factors within the association between the food environment and BMI need further investigation. We compared associations between fast-food outlet exposure, healthy food outlet exposure, the ratio between fast-food and healthy food outlet exposure, and the percentage fast-food outlets out of total (fast-food, healthy, and neutral) food outlets with BMI. Furthermore, we examined to what extent these associations were mediated by diet quality.

Methods: We linked baseline adult data of the Lifelines cohort study (N=147,027) to retail outlet location data using geo-coding. We computed four exposure measures within 1-kilometre(km)-density around participants' residential address; number of (1) fast-food outlets, (2) healthy food outlets, (3) ratio between fast-food and healthy food outlets, and (4) percentage fast-food outlets out of total (fast-food, healthy, and neutral) food outlets. We measured diet quality by the Lifelines Diet Score. We used multilevel linear regression and mediation models adjusting for age, sex, partner status, education, employment, neighbourhood deprivation, urbanization, sport facility density, and adjusted exposure measures for one another.

Results: Participants had a mean BMI of 26.1 (SD 4.3) kg/m2. Participants living with five or more fast-food outlets had a higher BMI than participants with no fast-food outlet within 1 km (B=0.17,95% CI:0.06,0.28). Participants living with relatively many fast-food outlets (50-75% of total food outlets) had higher BMI than participants with relatively few fast-food outlets (<25% of total food outlets) within 1 km (B=0.13,95% CI:0.03,0.22). Healthy food outlet exposure and the ratio between fast-food and healthy food outlets were not associated with BMI. Diet quality did not explain any observed association.

Conclusions: Fast-food outlet exposure may be an important risk factor for an elevated BMI. Policy-makers should specifically target fast-food outlets, rather than healthy food outlets, to create healthier food environments.





# Other



# Is there sufficient evidence for sedentary (screen) time recommendations in youth?

#### Dr. Teatske Altenburg<sup>1</sup>

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Symposium Recording

Purpose: Due to the increased use of screens (smartphone, TV, computer), sedentary (screen) behaviour has become increasingly visible in the lives today's children and adolescents. The assumption that this has adverse health effects has led to screen time recommendations accompanying an explosion of preventive interventions targeting the reduction of screen and sedentary time. But, is there sufficient evidence justifying a quantitative recommendation for sedentary (screen) time in children and adolescents?

Methods: A scoping review was conducted in PubMed, summarizing studies on the association between sedentary behaviour and health indicators in children and adolescents (0-18 years). A broad search was conducted, including studies with various designs (cross-sectional, prospective, experimental) and with various physical and mental health outcomes. Findings are evaluated by critically considering the methodological quality of included studies.

Results: A number of methodological issues should be considered when examining the literature on potential adverse health effects of sedentary behaviour in children and adolescents. First, evidence is predominantly based on cross-sectional studies, that are obviously not able to distinguish cause and effect. Second, self- or proxy-reported TV viewing time is often used as an indicator of overall sedentary behaviour, while TV viewing is only one of the many sedentary behaviours that children and adolescents engage in. Third, mostly only total time spent in sedentary behaviour is considered – whether or not adjusting for physical activity, ignoring the pattern in which sedentary behaviour and physical activity are accumulated and alternated throughout the day and week. Prospective studies or studies using device-based sedentary behaviour report less consistent findings compared to cross-sectional studies and self- or proxy-reported sedentary behaviour.

Conclusions: The evidence regarding associations of childhood sedentary behaviour and health is inconsistent and varies across study design and type, measurement and analysis of sedentary behaviour. Future youth public health guidelines may need to address the accumulation and alternation of sedentary behaviour and physical activity throughout the day and week.



# Sedentary behavior in adults: Are we ready for more prescriptive recommendations?

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#### Symposium Recording

Purpose: While current sedentary behavior recommendations are typically stated in broad terms, the interplay of emerging evidence from observational and experimental studies may inform more sophisticated messaging, particularly with respect to chronic disease prevention and management. The purpose of this presentation will be to examine the collective evidence in adults, with a specific focus on population groups with heightened chronic disease risk.

Methods: The presentation will be informed by the evidence synthesis undertaken by the 2018 Physical Activity Guidelines Advisory Committee for the 2ndEdition of the Physical Activity Guidelines for Americans, along with recent reviews we have published that have emphasized the importance of integrating evidence from observational and experimental research to better inform public health strategies. An example of how this evidence triangulation has led to new specific recommendations in the context of type 2 diabetes (T2D) management will be provided.

Results: There is strong evidence that exposure to high volumes of sitting time can significantly increase risk for allcause and cardiovascular mortality, and incident CVD and T2D. The association between sedentary behavior and allcause mortality can vary by the amount of moderate-to-vigorous physical activity, being much more pronounced in those who are inactive (i.e., not meeting physical activity guidelines). Interactions of sedentary behavior with physical activity for other health outcomes are not well understood. The concept of 'breaks in sitting time', shown in the early observational studies to have beneficial associations with cardiometabolic risk biomarkers, has since been pursued in laboratory trials comparing prolonged sitting to 'sitting interruptions' involving brief periods of postural change and/or physical activity. Notably, this experimental evidence has identified cardiometabolic risk benefits to be amplified in those with/at risk of developing T2D. The American Diabetes Association now recommends that at least in adults with T2D, 'prolonged sitting should be interrupted with bouts of light activity every 30 minutes for blood glucose benefits.

Conclusion: Readiness for inclusion of more prescriptive ST recommendations is more advanced for clinical guidelines than for public health guidelines. Addressing the interplay between physical activity and sedentary behaviour will be key for future guideline development.



# Sedentary behaviour and healthy ageing: How much sitting is "too much" for older adults?

#### Dr. Jennifer Copeland

<sup>1</sup>University of Lethbridge, Lethbridge, Canada

Symposium Recording

Purpose: Older adults are the fastest growing segment of the population, are the least likely to achieve minimum recommendations for physical activity, and accumulate the most sedentary time of any other age group. The purpose of this presentation is to examine the relationship between sedentary time (ST) and health, with a focus on outcomes of particular relevance to an older adult population.

Methods: The primary source of data for this presentation is a critical inspection of the literature, including an update to a published review (BJSM, 2017). Cross-sectional, longitudinal observational, and intervention studies were compared to determine if there is consistent evidence of a dose of ST that is associated with significant and meaningful outcomes. In light of estimates that > 65% of older adults have at least two chronic conditions, the outcomes of focus during this presentation will be cognitive function and mobility, as these are highly relevant to longevity and quality of life, even among those with multi-morbidity. Associations with time spent in different sedentary behaviours and breaks in ST were examined and the presentation will consider whether guidelines should focus on specific behaviours, total ST, or patterns of ST.

Results: ST poses a unique problem for older adults by impacting mobility and cognitive function, thus increasing risk for disability in activities of daily living. There is evidence that suggests reducing ST by 1 hour/day could have clinically meaningful effects on health and mobility. Breaks in ST are positively associated with physical function among older adults, although the evidence is primarily cross-sectional. The type and context of ST may be important; some cognitively engaging sedentary behaviours appear to be associated with less risk of both physical and cognitive impairments compared to passive ST. The impact of ST is most significant among older adults with low physical activity.

Conclusion: Including ST in activity guidelines may be especially important for older adults given their relatively lower participation in physical activity. While guidelines for an optimal pattern of ST may be most appropriate based on the evidence, complicated public health messages have disadvantages that must be considered.



# Are all jobs equal? Work-related physical activity and psychological distress among women in different occupations.

Dr. Rhiannon White<sup>1</sup>, Dr. Jason Bennie<sup>2</sup>, Dr. Gavin Abbott<sup>3</sup>, Dr. Megan Teychenne<sup>3</sup>

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#### Pre-recorded Presentation

Purpose: Current physical activity guidelines encourage individuals to be active during any life domain. However, recent evidence shows that work-related physical activity does not have the same mental health benefits as leisure-time physical activity. This is particularly important given that many people participate in large amounts of work-related physical activity without engaging in any leisure-time physical activity. Work-related physical activity however is likely to include a variety of different behaviours for people with different occupations. As such, the purpose of this study was to determine if occupation type moderated the association between work-related physical activity and psychological distress.

Methods: A randomly selected sample of 1,080 women from Melbourne, Australia completed the International Physical Activity Questionnaire (IPAQ) and General Health Questionnaire (GHQ-30) and reported their current occupation.

Results: Linear regression analyses indicated that occupation significantly moderated the association between work-related walking and psychological distress (F [8, 55] = 2.26, p = .036). Given evidence of moderation, we fitted linear regression models to test the associations between work-related physical activity and psychological distress for three separate groups: professionals, sales and services workers, and tradespersons. Female tradespersons who engaged in a low (B = -3.81, p = .006) or high amount of work-related walking (B = -3.23, p = .029), had significantly lower psychological distress symptoms than those who engaged in no work-related walking. There were no significant associations between work-related physical activity of any intensity and psychological distress for professionals, or sales and service workers.

Conclusions: Physical activity at work is not consistently associated with psychological distress as the relationship varies between different occupations. As such, a number of mechanisms and potential moderators need to be investigated before we can truly understand how to best promote mental health through workplace physical activity. Nevertheless, walking at work for female tradespersons may reduce psychological distress, and therefore, work-related physical activity should not be completely discounted in terms of its potential for improving mental health.



# Health vs. lifestyle influencers: Examining authenticity and credibility

<u>Ms. Eva Jenkins<sup>1</sup></u>, Associate Professor Jasmina Ilicic<sup>2</sup>, Ms. Annika Molenaar<sup>1</sup>, Dr. Tracy A McCaffrey<sup>1</sup> <sup>1</sup>Department of Nutrition, Dietetics and Food, Monash University, Notting Hill, VIC, Australia, <sup>2</sup>Monash Business School, Monash University, Caulfield East, VIC, Australia

#### Pre-recorded Presentation

Purpose: The use of Social Media Influencers (SMIs) to promote products and brands is an increasingly popular form of marketing, especially targeting young adults. However, little is known about SMIs and whether they are perceived to be authentic and credible. The discipline of nutrition science is currently facing credibility issues in the eyes of the general public, particularly on social media. This study aimed to understand consumer perceptions of SMIs and Nutrition Professionals (NPs), in relation to their credibility and authenticity.

Methods: A cross-sectional questionnaire was developed and administered to 153 Undergraduate students in May 2019, with 149 providing complete responses. Participants viewed screenshots of real-life Instagram profiles and two posts from a NP (with tertiary qualifications in nutrition) and a SMI. Main outcomes were authenticity and credibility (i.e., expertise and trustworthiness) measured on 5-point Likert scales. Multiple regression analyses were used to assess credibility and authenticity of both SMI and NP. Covariates included participant gender, perceived attractiveness, familiarity, and likeability of the source (i.e., SMI and NP).

Results: Participants were young adults (median age [25th,75th percentile]: 20[19,21]), approximately half were female (54.0%). The SMI profile was significantly more attractive (p= 0.01) and familiar (p<0.001) compared to the NP. However, participants perceived no difference between the SMI's and NP's expertise (p=0.78), trustworthiness (p=0.11), or authenticity (p=0.51). Results indicated that attractiveness was the main predictor (p<0.001) of expertise, trustworthiness, and authenticity. Familiarity was a significant predictor of trustworthiness (p<0.001) of the profile but did not predict expertise or authenticity. The post content from the NP was perceived as more authentic and trustworthy than the SMI (p<0.001). Females were more likely to perceive a post as trustworthy and authentic than males (p<0.001).

Conclusions: Holding a formal nutrition qualification had no significant effect on perceived expertise, trustworthiness, or authenticity, indicating other factors, such as attractiveness, are more important in forming a judgment of a profile on social media. If appropriate, sharing personal experiences may increase the authenticity of social media content.



# Play to play, or play to eat? Exploring food rewards in youth sport

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Pre-recorded Presentation

Purpose: Children involved in organized sport report higher levels of physical activity (PA) than those who are not in sport. However, children who are meeting PA guidelines also have the unhealthiest diets. This may be due in part to the pervasive use of unhealthy "treats" as rewards within the culture of youth sport. Therefore, the purpose of this study was to explore the use of food as a reward related to youth sport participation.

Methods: A constructivist paradigm with a relativist ontology guided this project. An instrumental case study explored food as reward in youth soccer. Criterion-based sampling was used to recruit children aged 4-12 (N = 24), parents (N = 7), and coaches (N = 6) within Ontario, Canada. Data generation included surveys about sport participation, focus groups with parents and children, and one-on-one interviews with coaches. Transcribed audio recordings underwent thematic analysis.

Results: Key themes included: the use of food (treats) as a reward for effort, time constraints dictating food choice, friends as motivators, and the role of sponsorship in youth sport. Parents, coaches, and athletes indicated food, typically from a fast-food restaurant chain because of limited time, is given as a treat or reward for motivating and praising effort. Children consistently reported their friendships with teammates as a primary motivator for participating in sport; parents and coaches explained that snacks foster those friendships and promote comradery. Monetary support of sponsorship was seen as critical to the success of youth sport, regardless of the sponsor. Parents and coaches indicated fast-food sponsorship did not influence their choice of rewards for their child.

Conclusions: Although parents, coaches, and children agreed that participation and effort in soccer would continue without external motivators, food rewards are still offered to motivate and celebrate performance. Given the children claimed they are intrinsically motivated to play soccer, it begs the question of why treats are offered at all. Knowing that using food as a reward is not required to motivate children's participation suggests a need to educate parents on what truly motivates their child, and how to celebrate success and effort in a healthier way.



# Emergency nurses: A shift a day can impact work, rest and play

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**Pre-recorded Presentation** 

#### Purpose

Emergency nursing is a physically demanding occupation yet research suggests emergency nurses do not meet current physical activity guidelines. Interventions to increase nurses' physical activity have had limited effectiveness as they may unintentionally impact on the amount of physical activity nurses' accumulate in another domains (e.g., leisure, household). Currently, little is known about how physical activity during leisure time may affect work activity and vice versa. This study aimed to determine the associations between emergency nurses' activity levels at work and during their leisure time on work days.

#### Methods

Data from 49 emergency nurses (44 female, five male) participated in the Physical Activity in Emergency Departments (PACED) Study were analysed. Nurses wore an ActiGraph accelerometer and completed work and sleep diaries for up to four weeks. An activPAL inclinometer was simultaneously worn by 41 nurses. Time spent sedentary (SED), sitting, standing, stepping, and in light-, and moderate- to vigorous-intensity physical activity (MVPA) during work and leisure time (before and after a shift) were determined. Multi-level analyses examined associations between emergency nurses' activity levels and their work and their leisure time.

#### Results

On workdays' emergency nurses engaged in 39 minutes of MVPA. Increasing MVPA prior to a morning shift was associated with more SED time and less physical activity (light and MVPA) at work. Conversely, increased stepping time at work was associated with more sitting, standing and stepping time after each shift, but the opposite was observed for night shifts. Lastly, increases in sitting and standing time at work were associated with less sitting and stepping time after the shift, with less standing time observed specifically after a morning shift.

#### Conclusions

This is the first study to examine associations between emergency nurses' physical activity at work and their leisure time activity (and vice versa). The results demonstrate that increased physical activity before a morning shift may impact emergency nurses' occupational activity. These findings provide critical insights into how and when researchers should intervene if seeking to increase physical activity levels to facilitate adequate recovery for nurses' post-shift and balance competing demands on their leisure time.



# Summer body composition trajectories of young adolescent children

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#### Pre-recorded Presentation

Objectives: Accelerated gains in weight, particularly age and sex-specific body mass index (zBMI), during summer break from school are well established in elementary age children (6-11yrs.). It is unclear if young adolescents (12-14 yrs.) experience increases in zBMI or percentage body fat (%BF) during summer break. This study examined the summer trajectories of zBMI and %BF via bioelectrical impedance (BIA) in a sample of young adolescents.

Methods: Two middle schools in the southeastern United States participated in this observational study. Measures of height, weight, and %BF measured via the Tanita DC-430U (Tanita Corporation of American, Arlington Heights, IL) were conducted in the spring (T0), just before summer break from school, and again in the fall (T1), as students arrived for new school year approximately 12 weeks apart. All students who provided body composition measures were included in this analysis. Separate multilevel mixed effects linear regression with measures nested within participants estimated change in zBMI and %BF. Age, sex, and race/ethnicity were included in the models as covariates. A sex-by-time interaction was included to examine differences in zBMI and %BF change over summer by sex.

Results: A total of 73 adolescents (45% female, 52% non-white) were measured at both T0 and T1. At T0 (baseline). Unadjusted regression models showed zBMI and %BF increased over the summer by 0.09 (95%CI 0.02, 0.15) and 1.37% (95%CI, 0.69, 2.04), respectively. Adjusting for age, sex, and race/ethnicity, %BF increased over the summer by 2.13% (95%CI=0.28, 3.99), but zBMI showed no statistically significant increase (0.03, 95%CI=-0.16, 0.23). Sexby-time interactions indicated no statistically significant difference in %BF or zBMI change by sex.

Conclusions: Summer appears to be associated with increases %BF in young adolescents and possibly increases in zBMI. It is unclear if this represents an acceleration in %BF and zBMI gains when compared to the school year. To understand and compare summer vs. school body composition change, a third measurement is planned in the spring of 2020 following school.



# Development of the Irish Physical Activity Research Collaboration (I-PARC) and a practical standardised evaluation framework for monitoring physical activity interventions.

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Pre-recorded Presentation

Purpose: Despite multiple interventions for promoting physical activity (PA) being delivered across Ireland, the majority of the population fail to meet the recommended levels of PA. Ireland's national physical activity plan calls for collaboration between the relevant stakeholders to gain a better understanding into what interventions work, for whom, and in what context. The purpose of I-PARC is to bring together those stakeholders to find answers to these questions.

Methods: I-PARC uses a mixed methods approach to develop and transfer knowledge between researchers, policy makers and practitioners across three work packages (WPs). WP1 seeks to develop the collaboration, the project aims, objectives and methods of effective communication between the various stakeholders. A combination of surveys, workshops, interviews and iterative feedback from the I-PARC team has led to a practical standardised evaluation framework (SEF) for monitoring PA interventions (WP2). The same method is being used to develop good practice statements for successful evaluation (WP3)

Results: To date, I-PARC has brought together a research team (n=20), practitioner advisory group (n=25) and research advisory panel (n=6) involved with PA promotion. The collaboration has been enhanced through participation events (n=4), social media and an I-PARC website that has 1,725 views since March 2019. The SEF has been developed through observation of previous evaluation frameworks (n=12) and feedback from the collaboration (3 rounds). Using this feedback, the SEF has been revised through two versions, now asking questions to both the intervention coordinator (25 questions) and participants (8 questions). The SEF collects information around intervention reach, resources needed, cost and impact on PA levels.

Conclusion: I-PARC highlights the need for effective partnerships in order to promote PA. This collaboration has allowed stakeholders to begin communicating their needs and aligning their goals for the promotion of PA as a whole system. I-PARC has seen the creation of a SEF that is more usable in practice than previous approaches and provides key information to both those involved in practice and policy. Furthermore, gathering information from those involved in the delivery of PA interventions will provide valuable insight into the facilitators and barriers of implementation.



# Neighbourhood fast food exposure and fast food consumption: The mediating role of neighbourhood norms

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#### Pre-recorded Presentation

Purpose: The relationship between the fast food environment and diet has gained growing attention, but it remains poorly understood how the food environment relates to eating behaviours. There are initial indications that the physical food environment contributes to social consumption norms, yet, this has not been studied on the neighbourhood level. This study aimed to investigate residents' neighbourhood fast food consumption norms as a potential mediating pathway between residential fast food outlet exposure and consumption.

Methods: A cross-sectional study was conducted. A nationwide sample of 1038 respondents living across the Netherlands recruited through a panel bureau completed a survey. Respondents reported their fast food consumption (amount/week) as well as descriptive and injunctive norm perceptions regarding fast food consumption in their neighbourhood. The Locatus database provided addresses of all fast food outlets in the Netherlands. Fast food exposure was measured as the count of fast food outlets within a 400m street-network buffer around the respondents' zip-codes. Regression models were used to assess associations between fast food exposure, fast food consumption, and norm perceptions. A bootstrapping procedure was used to test indirect effects.

Results: There was no direct association between fast food exposure and fast food consumption (OR=1.02, p=.22). Residential exposure to fast food outlets was positively associated with descriptive norms (B=.05, p<.001), and injunctive norms (B=.03, p<.001), which in turn were associated with increased odds of consuming fast food (OR=1.16, p=.03, and OR=1.44, p<.001, respectively). There was evidence of indirect effects of fast food exposure on fast food consumption, via descriptive norms (B=.01, 95% CI =.0003 to .013) and injunctive norms (B=.01, 95% CI =.004 to .017).

Conclusions: Individuals who have a higher residential availability of fastfood outlets, perceive fast food consumption in the neighbourhood as more common and appropriate. Future research may explore how the changing food environment may shift consumption norms. Insights may support policymakers in urban planning to develop healthier neighbourhoods and ultimately stimulate healthier consumption