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A Field Experiment in Schools in Five European Countries

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The effect of smileys as motivational incentives on children's fruit and vegetable choice, consumption and waste: A field experiment in schools in five European countries

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ABSTRACT

To assess whether smiley stamps work as a motivational incentive to promote fruit and vegetable eating among children, we conducted a field experiment in ten primary schools in five European countries using one control and one treatment school per country. The six-week experiment was split into three two-week phases before, during and after the smiley was implemented. During the smiley phase, the children received a smiley stamp for choosing a portion of fruits or vegetables. We find an increase attributed to the smiley stamp on children's fruit and vegetable choice and consumption, but also waste. Comparing the effects across countries, we observe significant variations in the smiley effect. This study thus demonstrates, in general, that a low-cost, easy-to-implement incentive such as a smiley stamp has the potential to motivate school children to increase their fruit and vegetable consumption; the study simultaneously underscores the high relevance of context for the effects of incentives.

1. Introduction

The obesity pandemic illustrates that many consumers have unhealthy relationships to food (Bublitz et al., 2013). Fruit and vegetable (FV) consumption – one of the main drivers for reducing obesity (OECD, 2014; WHO, 2014) – is consistently reported at low levels (Evans et al., 2012; Kovacs et al., 2014). For example, in most American, Australian and European studies, children aged 2 to 11 ate on average two to three servings per day instead of the recommended five (Evans et al., 2012). In fact, in one European study, only 8.8% of the children sampled met the five-a-day target (Kovacs et al., 2014). The present research thus seeks to promote FV choice and consumption utilizing a positive incentive, i.e., a motivational incentive in the form of a smiley stamp, in field studies across five European countries.

Children are an ideal target group for such behavioral change for two reasons: first, their habits are not yet solidly entrenched and thus are more easily amended (Klein-Hessling et al., 2005); and second, behavior learned in childhood is likely to transfer into adulthood

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(Lobstein et al., 2004; Lowe et al., 2004). Research has also shown that preventive actions in early life have a better chance of being successful and effective (Procter, 2007). Nevertheless, much of the responsibility for children's food choices falls to the social agents in their sociocultural environment (Roedder John, 1999), with parents and older siblings being the key food-socialization agents when the children are very young (Moore et al., 2017), and caretakers and teachers taking over when the children enter preschool or school (Reisch et al., 2011). All these social agents serve as role models for children to observe and imitate, although it is in the school setting particularly that children learn essential skills for their lives as consumers (Caruana and Vassallo, 2003).

Against the current backdrop of high obesity levels, school authorities are increasingly striving to promote healthier diets among their students (Reisch et al., 2011; Lyson, 2016). Hence, in many European countries, authorities have implemented school-based childhood obesity-prevention programs and/or expert-approved dietary guidelines on a considerable scale (e.g., the school lunch guidelines in Sweden and Hungary) (Capacci et al., 2012). Nevertheless, improved access to healthy food does not seem to be sufficient to increase FV consumption. Rather, children's eating behavior is strongly linked to their food preferences (Gibson et al., 1998; Weible et al., 2013), with cross-country research identifying vegetables as among the least liked foods (Perez-Rodrigo and Aranceta, 2001; Skinner et al., 2002).

Not surprisingly, having children try disliked and/or unknown foods is not sufficient to increase consumption: familiarity also plays an essential role (Cooke and Wardle, 2005). In fact, both research and dietary practice confirm that habits can eventually be formed through repeated exposure (Becker and Murphy, 1988), making it a promising way to boost children's consumption of FVs (Lowe et al., 2004). Because successfully increasing familiarity involves motivation, fun and reinforcement, simply telling children that FVs are healthy and tasty is insufficient to make them try them (Bandura, 1977). One way to encourage children to get familiar with foods is to use nudges and incentives. Nudges aim to steer consumers towards a desired behavior without taking away the liberty to behave in another way; in school canteens nudges are often used by changing the choice architecture (plate size, priming, framing; see also Sunstein, 2014). Incentives encompass an explicit form of reward or punishment and can be material or immaterial or promote compliance with social norms. Incentives involving compliance with social norms may be in the form of priming ("eat what your superhero would eat"; Wansink et al., 2012; Zeinstra et al., 2017) or competition (the class with the highest FV consumption receives a prize; Belot et al., 2016). Material incentives are given in the form of redeemable tokens that are worth a certain amount of money (Loewenstein et al., 2016; Ferreira et al., 2019), in non-monetary form such as photos, stickers and toys (Emerson et al., 2017; Reimann and Lane, 2017; Toossi, 2017; Thapa and Lyford, 2018), as equipment (Raju et al., 2010) or in the form of lottery prizes (Just and Price, 2013; Ferreira et al., 2019). Yet, despite some success stories (e.g., Thapa and Lyford, 2018), a wide body of investigation into such incentives shows the short-run potentials of nudges and incentives (see, e.g., Gneezy et al., 2011; Gordon et al., 2018; Madden et al., 2018), while long-term and spill-over effects as well as transferability into other contexts remain unclear. What investigations in this field do show is that several factors influence an incentive's effect, including setting, type of food, type of incentive (monetary vs. non-monetary, tangible vs. non-tangible, social) and initial preference for the food.

This study thus investigates the efficacy of a simple, non-monetary, motivational incentive – a smiley stamp – in promoting FV consumption among primary school children. The children received this incentive each time they chose an appropriate portion of FVs. The size of a portion was predefined as 80 g (WHO, 2006), which was communicated visually to the children a priori. In addition to incentivizing FV consumption, receiving a smiley provided feedback about the size of a portion.

The contribution of the study is threefold. First, in contrast to most existing studies, we use a motivational incentive to promote healthy eating behavior. The potential advantage of such an incentive is that it is less controlled and more autonomous than material incentives and carries features of both nudges and incentives, including its rewarding function as well as the ability to serve as a feedback mechanism. While money or toy incentives are attributed to the category of external regulation, motivational incentives belong to the category of introjected regulation, meaning that the incentive appeals to the inner person – for example, an incentive in the form of praise. From a Self-Determination Theory (SDT) perspective, autonomy or choice is a fundamental human psychological need, with the opposite being control. The benefit of less control and more autonomy is a stronger level of internalization, which again leads to stronger commitment and a more sustainable adherence to the desired behavior (Moller et al.,2006). Hence, if this immaterial type of incentive is effective, SDT suggests that it has a greater potential to establish a maintained behavior change in the long run.

Second, to the authors' best knowledge, this field experiment, conducted in school canteens in five European countries (Sweden, Estonia, Germany, Hungary and Poland), is the first cross-country investigation into the use of incentives to promote healthy food choices among children. Hence, even though cross-country research has clearly shown that children generally dislike vegetables (Perez-Rodrigo and Aranceta, 2001; Skinner et al., 2002), the present study is the first to provide evidence on whether incentives can be useful in amending these preferences and if they are transferable across contexts.

Last, whereas a wealth of research demonstrates that competitions and prizes have an effect on children's food choices, a smiley would be even easier for schools to implement and far less costly, which is a further advantage of the research design. That is, not only does the intervention meet school authorities' primary requirement that it be effective, cheap and easy to implement (Raju et al., 2010), it is also easily combinable with other educational and/or prevention activities.

2. Background on incentives

2.1. Children's food choices in cafeteria settings

Spurred by the public interest in creating healthier food environments at school, there is now a vast literature on children's food choice, incentives and health nudges in cafeteria settings. A clear focus is on increasing children's consumption of FVs as a generally agreed-upon strategy to improve the healthiness of diets. The health benefits of FVs are undisputed: they are high in water content and have a high nutrient-to-calorie ratio (Darmon et al., 2005). Nutritional scientists associate one additional serving of FV consumed per day with a 5% reduced risk of mortality (Wang et al., 2014). Studies investigating changing children's diets in general and increasing FV consumption in particular cover a broad age range from preschool to secondary schools. Most of the empirical studies are conducted in the US where the obesity problem has been severe for many decades. Recent reviews of the evidence (e.g., Gordon et al., 2018; Madden et al., 2018) provide a good overview of economic and behavioral-economic approaches to increasing FV consumption in schools. Overall, system-1 type (fast and intuitive thinking) school cafeteria interventions are more common than system-2 type (slow and cognitively demanding) interventions, and the latter are also less effective (Gordon et al., 2018). Simple but effective interventions include the right timing (i.e., giving kids enough time to eat and scheduling lunch after recess), increasing the variety of vegetables offered and serving sliced fruits instead of whole ones. Moreover, improving the taste of FVs as well as short-run incentivizing (e.g., by low-cost game-based incentive programs) seem to gradually increase FV intake (Madden et al., 2018).

In general, children react positively to different kinds of incentives and nudges. Even preschool children seem to respond to simple nudges such as plate design and choose more vegetables (but not fruit) in a field experiment when plates with FV pictures are present (Melnick and Li, 2018). A study that examined the use of stickers and toys to nudge FV selection and consumption among elementary school students in two Texan low-income schools also showed effectiveness, to a modest extent even in the post-intervention stage (Thapa and Lyford, 2018). A school experiment using raffles and small financial incentives for choosing fruit as snacks in Brazil (Ferreira et al., 2019) resulted in significant purchase increases but had no long-term effect. In a large field experiment with 18 elementary schools in the US (Ozturk et al., 2018), increasing salience and prominence of a healthy lunch entrée through visual and verbal tools in the school cafeterias increased choice of the healthy option by 10 to 20%. However, effects completely dissipated when the nudge was removed (ibid.). This can possibly be explained by the fact that "children are temporally myopic discounters of future events" (Madden et al., 2018, p. 112); hence, interventions designed to increase the immediate benefits for FV consumption – such as immediate small rewards in the form of stickers or smileys — might work well.

While the literature on the long-lastingness of nudge interventions is inconclusive, most of the work shows the short-run potential of nudges and incentives. Educational programs and healthy eating intervention programs in primary schools might be ideal accompanying long-term methods helping children adopt healthy eating patterns. This is particularly true if the program has a tested and effective design, if the content is systematically included in the usual curriculum (Jung et al., 2019) and when children are actively involved, for instance, by naming food products, taste-testing or in creating marketing materials (Mumby et al., 2018).

2.2. Incentives for healthier choices

Inspired and informed by studies such as the ones sketched above, the present study focuses specifically on motivational incentives. Incentives are given to induce a behavioral change in the short term (e.g., Skinner, 1953) and potentially to form habits in the long term (e.g., Becker and Murphy, 1988). Whereas the short-term effect is – as predicted by behavior-modification theories—an increased probability of the behavior on which it is contingent, an incentive may actually generate one of three possible outcomes (List and Samek, 2014): the incentive may initially modify behavior, which then bounces back to baseline after incentive removal (standard economic theory); the incentive effect may remain after the incentive is removed (habit-formation theory); or the observed behavior may fall below baseline after incentive removal because of a crowding-out of intrinsic motivation (self-determination theory; Deci et al., 1999).

Research on children and eating shows that incentives as reinforcement do not always produce the desired outcome. For example, whereas field studies support the positive effects of incentives on food acceptance (e.g., Lowe et al., 2004; Hendy et al., 2005), laboratory studies often show the liking for foods falling to below pre-intervention levels (e.g., Birch et al., 1982; Birch et al., 1984). These conflicting results have been explained in the literature in terms of three factors (Cooke et al., 2011):

1) The desired study outcome varies from motivational (e.g., liking vegetables) to actual behavior change (e.g., eating vegetables). In the first instance, the incentive effects are unclear (Birch et al., 1982; Birch et al., 1984; Mikula, 1989; Hendy, 2002), but in the second, they are generally successful (Stark et al., 1986; Baer et al., 1987; Hendy, 1999; Wardle et al., 2003; Hendy et al., 2005). Building on the existing literature, we target behavioral change.
2) The initial liking is a moderator between the incentive and the acceptance and level of consumption of a food (Cooke et al., 2011).Laboratory studies tend to use palatable foods that the children already like pre-experiment, whereas field studies often focus on the less liked and consumed vegetables, which increases the effect of the incentive (DeCosta et al., 2017).
3) Incentive effects depend on how the incentives are designed, the form they are given and on what happens after they are withdrawn (Gneezy et al., 2011). Incentives can be immaterial (e.g., positive feedback or praise) or material (e.g., monetary or other materialistic incentives or food incentives). Whereas food incentives generally work but may have unintended side effects such as an increased liking for an unhealthy dessert (Mikula, 1989; Hendy, 1999), immaterial incentives are less undermining (Henderlong and Lepper, 2002). Both social and immaterial nonfood incentives have positive and negative side effects (Birch et al., 1984; Stark et al., 1986; Baer et al., 1987; Hendy et al., 2005).

2.3. Incentives in the context of Self-Determination theory

Generally, incentives are forms of extrinsic motivation to change behavior. Extrinsic motivation enforces doing something because it is instrumental to some separable consequence. Extrinsic motives can be relatively controlled or relatively autonomous. Autonomy, equating to a more self-regulated form of behavior, exists when individuals perceive they have the freedom of choice to do things they consider interesting and/or personally important as well as consistent with their sense of self. With non-self-regulated behavior, on the other hand, the locus of control shifts and individuals feel external pressure to behave in a particular way (Moller et al., 2006). Hence, whether an incentive is successful depends on how much an individual enjoys the activity, values the incentive or cares about his/her image vis-à-vis the self or others (Benabou and Tirole, 2006).

Largely, incentives are more closely related to controlling methods. According to Moller et al. (2006), external regulation is the most controlled method. Material incentives fall into that category by providing an unrelated reward for performing the desired behavior. Competitions also belong to the category of controlling methods, as they induce external (peer) pressures on an individual to perform a certain behavior. Because of the lack of autonomy, external regulations are not internalized and must, in theory, be in place indefinitely to maintain the behavior change. This might be cost- and labor-intensive and tends not to work, as incentives are often subject to a wear-out effect and become less enjoyable, exciting or interesting over the long run.

A more autonomous form of regulation is introjected regulation, as internal, self-esteem-based contingencies drive behavior. Introjects are within-person, but their operation is controlled (Moller et al., 2006). We argue that an incentive such as the smiley on a stampcard is more similar to a form of introjected regulation than external regulation, as it is more similar to a clap on the shoulder than to receiving a toy as reward. Such an incentive is still extrinsically induced and hence partially controlled, but it is more autonomous because the smiley on a stamp card helps children to make food choices for themselves in a context where relevant information is provided, i.e., the smiley carries information about the size of a portion of FVs (a feature of nudges). To convey this information, we use a positive primer in the form of a smiling face – a symbol that is usually associated with positive and joyful feelings. We further argue that the smiley on a stamp card has a value, but this value is small enough that not choosing a portion of FVs does not entail serious consequences – the worst-case scenario is no smiley for the day. Hence, children have a higher chance of following their own preferences, and because internalization and autonomous self-regulation are facilitated, long-term behavioral change is more likely.

2.4. Incentives across countries

Despite a lack of other published cross-country field experiments on motivational incentives to increase healthy food choices among children, we assume differences in the size of the incentive effect across countries, primarily attributable to such unobservables as taste preferences, prevailing food cultures or societal value systems (including the meaning of incentives).

Regarding societal value systems, Hofstede's (2001) masculinity versus femininity dimension is a deeply ingrained social value system whose importance for competitiveness, achievement, and the material rewards of success is already recognized by school children. Assuming that the number of smileys collected each week as an incentive for choosing FVs has a competitive angle, the degree of the society's masculinity dimension could influence the smiley's effect on the children's choices. We would therefore expect a country scoring higher in the masculinity dimension to be more competitive and therefore subject to a large incentive effect.

Another possible explanation for differences across countries could be varying initial levels of FV consumption. For example, if initial liking and consumption of a food is high, lower incentive effects are expected because of sufficient satiation (Georgescu-Roegen, 1954; Pascinetti, 1981). In the presence of such a saturation point, demand growth slows and finally ceases when the marginal utility of more food is zero or even negative (Moneta and Chai, 2014). Thus, when consumption is already saturated, the effect of an incentive is minimal to nonexistent. As consumption levels of FVs – with vegetables being one of the food categories least liked by children – rarely meet nutritional guidelines but vary largely across countries (Evans et al., 2012; Kovacs et al., 2014), we expect to find variations in the size of the incentive effect.

3. Method

3.1. Experimental design

The motivational incentive used to encourage the primary school children to choose more healthful side options was a smiley, which was stamped on a personalized lunch ID card whenever a child took a portion of at least 80 g of FVs (WHO, 2006). The field experiment was conducted between September and December 2014 at ten primary schools across five European countries (Estonia, Poland, Sweden, Germany and Hungary), with one treatment school and one control school in each country. Schools were recruited via our local survey centers, and each pair was located within one region that shared similar sociodemographic factors (see also Ahrens et al., 2017). Parental consent was obtained passively using a standard form.

To ensure cross-country comparability, field workers for the local survey centers were first trained in centralized training workshops and then sent into the field accompanied by local staff and equipped with a 30-minute step-by-step training video and a set of detailed written standard operating procedures (all available upon request). Before the experiment, a setting questionnaire was sent to the local survey centers to identify similarities across canteen settings in the different countries, which allowed the experiment to be planned and designed based on site feasibility in addition to theoretical and methodological paradigms. Details of the school settings and canteens were gathered through onsite visits.

We developed both a between-schools and within-subject experimental design. For the between-schools analyses, we compared FV choice, consumption and waste on the canteen level, i.e., treatment versus control schools. For the within-subject analyses, we compared individual choice of a portion of FVs in baseline, intervention and post-intervention phases. Further information on the timing of the experiment is detailed below.

3.2. Timing

The design of the six-week experiment was symmetric (see Table 1): Weeks 1 and 2 were baselines, the incentive was provided during Weeks 3 and 4, and the post-intervention effects were measured in Weeks 5 and 6.

During the first baseline week, Week 1, field workers measured food choice, consumption and waste on the aggregate canteen level in both the control and treatment schools. In Week 2, the field workers introduced the lunch ID card into all the treatment schools to enable the collection of individual choices of a portion of FVs and thus the within-subject analyses. At the beginning of Week 3, the smiley stamp was introduced as a classroom game and continued through Week 4. During this time, we measured whether the incentive had any effect on the choice, consumption and waste of FVs. The game finished at the end of Week 4, but the lunch ID card (without smileys) remained until the end of Week 5 in order to collect individual data for the within-subject analyses. During Week 6, the field workers collected data on the canteen level only – like in Week 1. These last two weeks thus provided post-intervention data against which to measure the incentive's effectiveness after its removal. In the control schools, only canteen-level data for the between-schools analyses were collected over the entire six weeks of the experiment.

3.3. The incentive

The smiley, stamped on a previously provided lunch ID card, was first introduced as a classroom game using pictures of setting-specific meals to explain the concept of a portion. The portion cards had to be setting-specific to account for the wide variations in food culture across the participating countries. Two sets of three portion cards each showed two different main meals on a plate with three different side servings of FVs: one too small, one exactly a portion (defined as roughly 80 g), and one larger than a portion. The latter two qualified for a smiley. The children were allowed a maximum of one smiley per day, totaling up to five smileys a week (see Fig. 1).

3.4. Measurements

For the between-schools analyses, we collected the daily canteen-level data on the choice, consumption and waste of FVs. The trained field workers measured the children's aggregate choice by weighing the offered FVs, adding any refills and deducting what was left after lunch on the buffet. Waste was measured by the FVs left on the children's plates. Here, the field workers scraped the FV waste from children's plates into a particular waste bin. To determine FV consumption, we used the plate-waste method, i.e., we deducted the amount of waste from the amount of FV choice. Weighing was done in kilograms (to two decimal points) using suitable kitchen scales. Field notes were taken daily that detailed the menu of the day and commented on that day's particulars, and the available food each day was recorded photographically. Data on all these variables were collected in both the control and treatment schools on a daily basis over the entire six weeks.

For the within-subject analyses, we collected children's individual data from Week 2 to Week 5 after distribution of the lunch ID cards, which were equipped with individual barcodes that could be scanned when the child went to lunch (see Fig. 1). Before card distribution in Week 2, the barcode was individualized by linking it to the child's demographic data: age in years, grade, and sex. Once children entered the canteen, their presence (or absence) was recorded together with a note about whether they took a portion of FVs.

To control for potentially influential stimuli and input in the three months prior to the experiment (e.g., healthy lifestyle campaigns or health-related posters, or school events), school administrators were asked to fill out a background questionnaire before the actual field phase. In addition to collecting information on educational programs, this survey asked about the school lunch provider, number of students, percentage of students eating lunch in the canteen, general study-group demographics and whether food delivery was self-service or family style (i.e., helping oneself from a large bowl on the table).

Table 1
Experimental Time Schedule.

Phase	t1 Baseline		t2 Intervention		t3 Post-Intervention	
	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
School: TREATMENT						
Action taken		ID card (but not yet the Smiley stamp)	Smiley stamp on ID card for a portion of fruits and vegetables		ID card (but no Smiley stamp anymore)	
Data collected: Between-subjects	Choice, consumption & waste (kg/day/canteen)	Choice, consumption & waste (kg/day/canteen)	Choice, consumption & waste (kg/day/canteen)		Choice, consumption & waste (kg/day/canteen)	Choice, consumption & waste (kg/day/canteen)
Within-subject Data collection		Portion yes/no (per day/child)	Portion yes/no (per day/child)		Portion yes/no (per day/child)	
School: CONTROL						
Type of analyses	Between-schools		Between-schools		Between-schools	
Data collected: Between-subjects	Choice, consumption & waste (kg/day/canteen)		Choice, consumption & waste (kg/day/canteen)		Choice, consumption & waste (kg/day/canteen)	

3.5. Empirical application

First, we tested for differences between control and treatment schools (between-schools) in choice, consumption and waste to identify any potential effect of the incentive during the intervention. After gathering the descriptive statistics of choice, consumption and waste at baseline, intervention and post-intervention by treatment and control school, we measured the between-schools incentive effects with a difference-in-differences model (with Ordinary Least Squares OLS estimators) using Stata 13. We used the difference-in-differences approach to assess whether the control versus treatment school differences at baseline compared to the differences in the intervention phase were random or not. We obtained a difference-in-differences estimation by employing an OLS regression estimator with wild-bootstrapped clustered standard errors to address the small number of clusters (10 schools) and to correct the potentially underestimated standard errors (see also Cameron and Miller, 2014).The regression model can formally be expressed as:

$$FV_{it} = \alpha_0 + \alpha_1 S_t T_i + \alpha_2 T_i + \alpha_3 S_t + \alpha_4 X_{it} + \alpha_5 C_i + \varepsilon_{it} \quad (1)$$

where FV_{it} is the FV choice, consumption or waste of school canteen i at day t. S_tT_i denotes interaction of the smiley (dummy) and the treatment school (dummy) in school i at day t, and $\alpha_1$is then the effect of the smiley. To isolate the smiley effect over time and setting, we included the treatment school dummy T_i for school i and the smiley dummy S_t at day t. The time-variant control variables – represented by X_{it} – include the types of FVs offered (raw vegetables/salad/fruits; cooked vegetables; pickled vegetables including cabbage; other vegetables including fried or grilled vegetables); and the time-invariant control variables are represented by C_i at school i comprising: country dummies, student numbers, percentage of students participating in lunch, number of students participating in experiment, type of food serving (self-service or family style), lunch provider (school, private under school contract, private under district contract) and finally, whether the school ran a nutritional campaign over the last three months before the experiment (dummy). ε_{it} is the error term.

Second, we used the children's individual data to explore the within-subject incentive effects, i.e., FV choice at baseline, intervention and post-intervention. Children's individual data were gathered only in the treatment schools – hence, we investigated the smiley effect in those

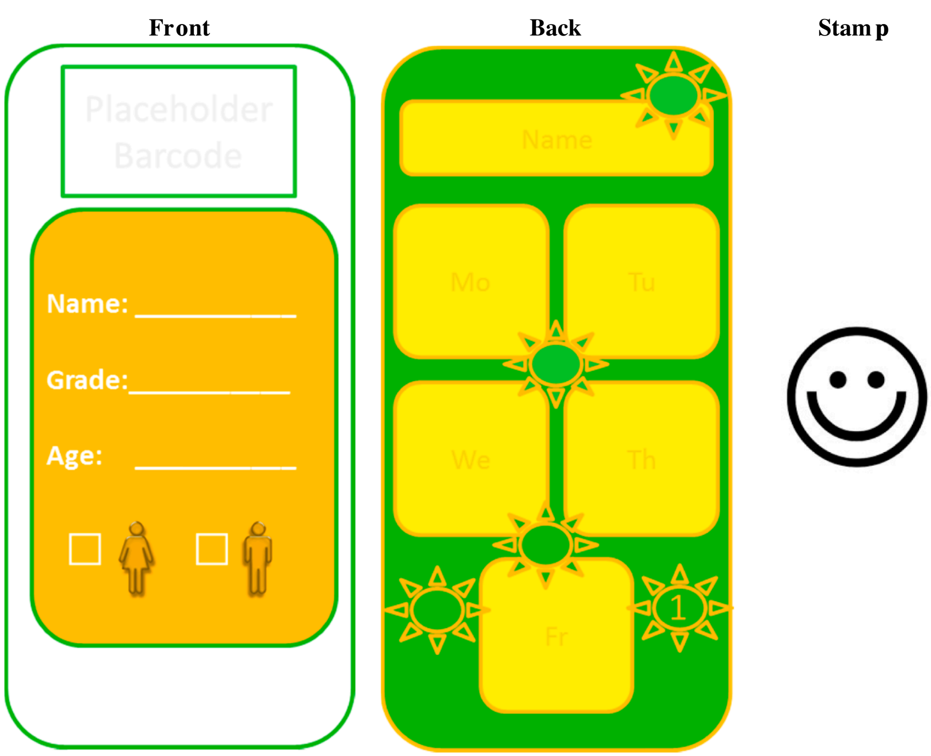

Fig. 1. Example Lunch ID Card and a Smiley Stamp.

five schools. The data have a nested structure with three levels because days (level 3) were nested within individual children (level 2) who were nested within schools (level 1). Because the daily observations are not independent of the individual children who are not independent of the school (Hox, 2002), we employed a three-level random intercept hierarchical general logistic modeling (HLM) to identify the smiley effect after gathering the descriptive statistics. The model was of the following form:

$$C_{ijk} = \alpha_{0jk} + \alpha_1 S_{ijk} + \alpha_2 X_{ijk} + \varepsilon_{ijk}$$

$$\alpha_{0jk} = \alpha_{0k} + \mu_{0jk}(childlevel) \quad (2)$$

$$\alpha_{0k} = \gamma_0 + \vartheta_{0k}(schoollevel)$$

whereC_{ijk} is the measure for choice of a portion of FVs at day *i* of child *j* in school *k*.α_{0jk} is the average outcome of child *j* and school *k,* which is equal to the sum of the population average (γ_0), a school-specific effect (ϑ_{0k}) and a child-specific effect (μ_{0jk}). S_{ijk}captures the smiley intervention (dummy). X_{ijk} captures the control variables at day *i* of child *j* in school *k* including child age (in years), sex (dummy), grade (0[1]–6) and dummies for week (Week 2 to Week 5) and weekday (Monday to Friday). $\varepsilon_{ijk}$is the error term on the daylevel. The composite model thus becomes:

$$C_{ijk} = \gamma_0 + \alpha_1 S_{ijk} + \alpha_2 X_{ijk} + \mu_{0jk} + \vartheta_{0k} + \varepsilon_{ijk} \quad (3)$$

Finally, we analyzed the within-individual effects of the smiley by country to explore potential variations in the incentive effect across cultures. To do that we employed the same HLM analyses described above, but split the sample by country. Hence, the mixed-effects generalized logit model is a two-level random intercept with day (level 2) being nested in child (level 1).

4. Results

To determine whether the smiley actually increased children's choice, and eventually consumption, of FVs, we first investigated whether the choice, consumption and waste in kg was higher in the treatment schools than in the control schools during the smiley phase on the canteen level (between-schools) for all countries pooled. Then we focused on the change in the number of children choosing a portion of FVs because of the smiley incentive on the individual level (within-subject) for all countries pooled. Finally, we looked at the country differences on the between-schools and within-subject levels.

4.1. The smiley effects: Treatment versus control schools (between-schools)

Because data could not be collected on public holidays or on weekdays when no FVs were served, the six weeks of daily canteen data covered n = 124 days in the treatment schools and n = 133 days in the control schools. In some countries, the entire primary school participated (e.g., Poland); in others, only one grade participated (e.g., grade 5 in Germany). Although we tried to match the pairs of schools within a country as closely as possible, the student numbers differed. Who participated depended on the school authorities as much as on the school canteen. The most important criterion for participation was that children could serve themselves – which was the case in all participating schools.

We began our assessment of the smiley effect by comparing the treatment and control schools before the intervention in Week 3. Table 2 summarizes the choice, consumption and waste of FVs in the treatment and control schools by experiment phase: (t1–t3) entire experiment, (t1) before introduction of the smiley, (t2) during the smiley intervention, and (t3) after smiley removal.

[1] 0 = preschool

Over the entire six weeks, the children took an average of 9.04 kg per day of FVs in the treatment schools and 6.81 kg per day in the control schools. Of these choices, they consumed 7.78 kg per day and 5.95 kg per day, respectively. The resulting waste was 1.26 kg per day in the treatment schools and 0.67 kg per day in the control schools, giving an average treatment-versus control-school difference in waste of about 0.57 kg per day, which peaked during the intervention with 1.37 kg per day more waste in the treatment schools. This difference can be explained by the increased choice in the treatment schools during the intervention (t2), when the treatment- versus control-school differences were4.62 kg per day in FV choice and 3.26 kg per day in consumption. Group comparisons between treatment and control schools during the intervention indicate statistically significant higher choice, consumption and waste at the treatment schools (see Table 2). We also find this difference between treatment and control schools post-intervention, but not at baseline.

Before drawing any conclusions, we employed difference-in-differences analyses with interaction effects (smiley × treatment school) to calculate whether such differences in choice, consumption and waste are random or not (see Table 3).[2] For example, we tested whether the choice difference for treatment (7.55 kg per day) versus control schools (6.88 kg per day) at baseline of 0.67 kg per day is statistically significantly different from the difference of 4.62 kg per day (11.16 – 6.54 kg per day) in choice between treatment and control schools during the intervention.

For all phases combined (t1–t3, Table 3), our comparison of the smiley effect in the control versus treatment schools shows that the difference in choice is statistically significantly higher in the treatment schools, even when school differences are accounted for. The differences in consumption and waste are not statistically significant.

Most important of course is whether we find an increase in choice and consumption (but not in waste) from baseline to the intervention phase. For baseline and intervention phase (Table 3, t1–t2), we find a significant increase of choice and consumption, but not in waste in the treatment schools compared to the control schools (+3.70 kg per day for choice and + 2.70 kg per day for consumption). After removal of the smiley, the difference between treatment and control group becomes less pronounced but remains statistically significant (Table 2). This is largely owing to a non-significant drop in FV choice, consumption and waste in the treatment group (Table 3).Hence, choice and consumption of FVs increase in response to the smiley and do not fully bounce back to baseline once the incentive is removed. Waste is higher during the intervention compared to baseline in the descriptive statistics (Table 2), but this does not seem to be attributable to the incentive based on the insignificant smiley effect for waste (see Table 3, t1-t2).

4.2. The smiley effect on children's individual choice (within-subject)

We next explored the smiley effect within individuals – that is, how the children changed their personal FV choices once the smiley was introduced and then removed. Because this part of the analysis relied on individual data, we could only include data gathered in the treatment schools from Weeks 2–5 – that is, baseline (Week 2),intervention (Weeks 3 and 4) and post-intervention (Week5). The resulting sample included n = 655 children and 10,227 observations of days nested in children (n = 2,646 at baseline, n = 4,954 during intervention and n = 2,631 post-intervention). All the demographic variables for participating children (average age of 8.03 years; 49.2% females) are presented by country in Table 4. The sample of the field experiments encompassed grades 0 to 6 frequencies are depicted in Table 4.

The percentage of children choosing a portion of FVs increases from

[2] To exclude any potential effects of introducing the lunch ID card in Week 2, we compared Weeks 1 and 2 but found no significant differences. Thus, we exclude any effect of the ID card on children's food choices.

Table 2
Fruit and Vegetable Choice, Consumption and Waste: A Comparison of Control and Treatment School by Experimental Period (All Countries).

		t1–t3 All Phases		t1 Baseline		t2 Intervention		t3 Post-Intervention	
School		Treatment	Control	Treatment	Control	Treatment	Control	Treatment	Control
Choice (kg)	M	9.04	6.62	7.55	6.88	11.16	6.54	8.44	6.46
	(SD)	(5.38)	(6.24)	(5.38)	(6.30)	(4.59)	(6.41)	(5.57)	(6.15)
	z-value				−1.47		−4.31***		−2.60**
Consumption (kg)	M	7.78	5.95	6.87	6.37	9.13	5.87	7.36	5.62
	(SD)	(5.42)	(6.29)	(5.39)	(6.40)	(4.86)	(6.48)	(5.80)	(6.11)
	z-value				−1.64		−3.82***		−3.03**
Waste (kg)	M	1.26	0.67	0.69	0.51	2.03	0.66	1.08	0.84
	(SD)	(1.26)	(0.97)	(0.71)	(0.61)	(1.57)	(0.97)	(0.95)	(1.21)
	z-value				−1.00		−4.82***		−1.99*
n (days)		124	133	38	44	32	43	44	46

Notes: t_1 = baseline, t_2 = intervention, t_3 = post-intervention; mean choice, consumption and waste are presented in kg/day, Standard Deviations are in parentheses, n depicts the number of days that choice, consumption and waste were measured.
z-values from Wilcoxon-rank-sum-test for comparison of choice, consumption and waste between treatment and control schools,
p-values * ≤ 0.05; ** ≤ 0.01; *** ≤ 0.001 (Results Shapiro-Wilk test for normality: choice, consumption and waste are not normally distributed at any experimental period)

Table 3
Estimations of the Smiley Effect on Fruit and Vegetable Choice, Consumption and Waste – Between-Schools.

		t1–t3 All Phases		t1–t2 Baseline–Intervention		t2–t3 Intervention–Post-Intervention	
		Smiley effect	*p*-value	Smiley effect	*p*-value	Smiley effect	*p*-value
Choice	α_1	3.250***	0.000	3.696**	0.002	−2.873	0.090
	95%-CI	[1.821;4.871]		[1.932;5.375]		[-4.689; −1.160]	
	SE	0.760		0.794		0.789	
Consumption	α_1	2.198	0.060	2.695*	0.010	−1.820	0.190
	95%-CI	[0.474;3.962]		[0.952;4.383]		[-3.873; 0.193]	
	SE	0.763		0.795		0.785	
Waste	α_1	1.052	0.052	1.001	0.120	−1.053	0.062
	95%-CI	[0.389;1.710]		[0.245;1.724]		[-1.189; 0.305]	
	SE	0.643		0.656		0.663	
n (days)			257		167		175

Notes: * ≤ 0.05; ** ≤ 0.01; *** ≤ 0.001
Regression analyses coefficients (α_1) are interaction effects of smiley (dummy)*school (dummy, where treatment school = 1);
robust standard errors (SE) are clustered at the school level.
Standard errors, confidence intervals (95%-CI) and p-values are wild-bootstrapped due to the low number of clusters (n = 10); bootstrap repetitions n = 1,000 based on Cameron and Miller (2014).
Control variables are the number of students, the percentage of students eating at the canteen (in categories), the number of students participating in the experiment, school participation in recent nutritional campaigns (dummy), style of food service, lunch provider, food category dummy (raw vegetables/salad/fruit, cooked vegetables, pickled vegetables, cabbage, or other) and country dummy (with Estonia as the reference category).
The coefficients and 95%-confidence intervals for all controls are available upon request.

Table 4
Demographics of the Children in the Treatment Schools.

	All	Estonia	Poland	Sweden	Germany	Hungary
Age (years)	8.0 (1.603)	7.5 (0.501)	8.1 (2.227)	7.4 (1.148)	10.4 (0.584)	7.3 (0.759)
Sex (% female)	49.2%	49.0%	49.1%	54.0%	46.5%	44.7%
Grade (Grade – Number of Children)	0 – 85		0 – 42	0 – 43		
	1 – 193	1 – 74	1 – 19	1 – 42		1 – 58
	2 – 176	2 – 82	2 – 5	2 – 44		2 – 45
	3 – 51		3 – 6	3 – 45		
	4 – 11		4 – 11			
	5 – 126		5 – 12		5 – 114	
	6 – 11		6–11			
n (children)	655	156	106	174	115	104

Notes: means and standard deviations (in parentheses) are presented for age, percentages for sex, and frequencies for school grade. n describes the total number of children participating in the intervention.

40.1% (SD = 49.01, n = 2,646) at baseline to 76.7% (SD = 42.29, n = 4,954) during the intervention then decreases to 53.4% (SD = 49.89, n = 2,631) after smiley removal. Despite the post-smiley drop, a larger share of children opted for a portion of FVs in the post-intervention period than at baseline.

In a subsequent step, we tested the smiley effect using the HLM odds ratios (OR) of the smiley on children's FV choice (dummy variable). Over all phases (baseline, intervention, post-intervention), the odds of

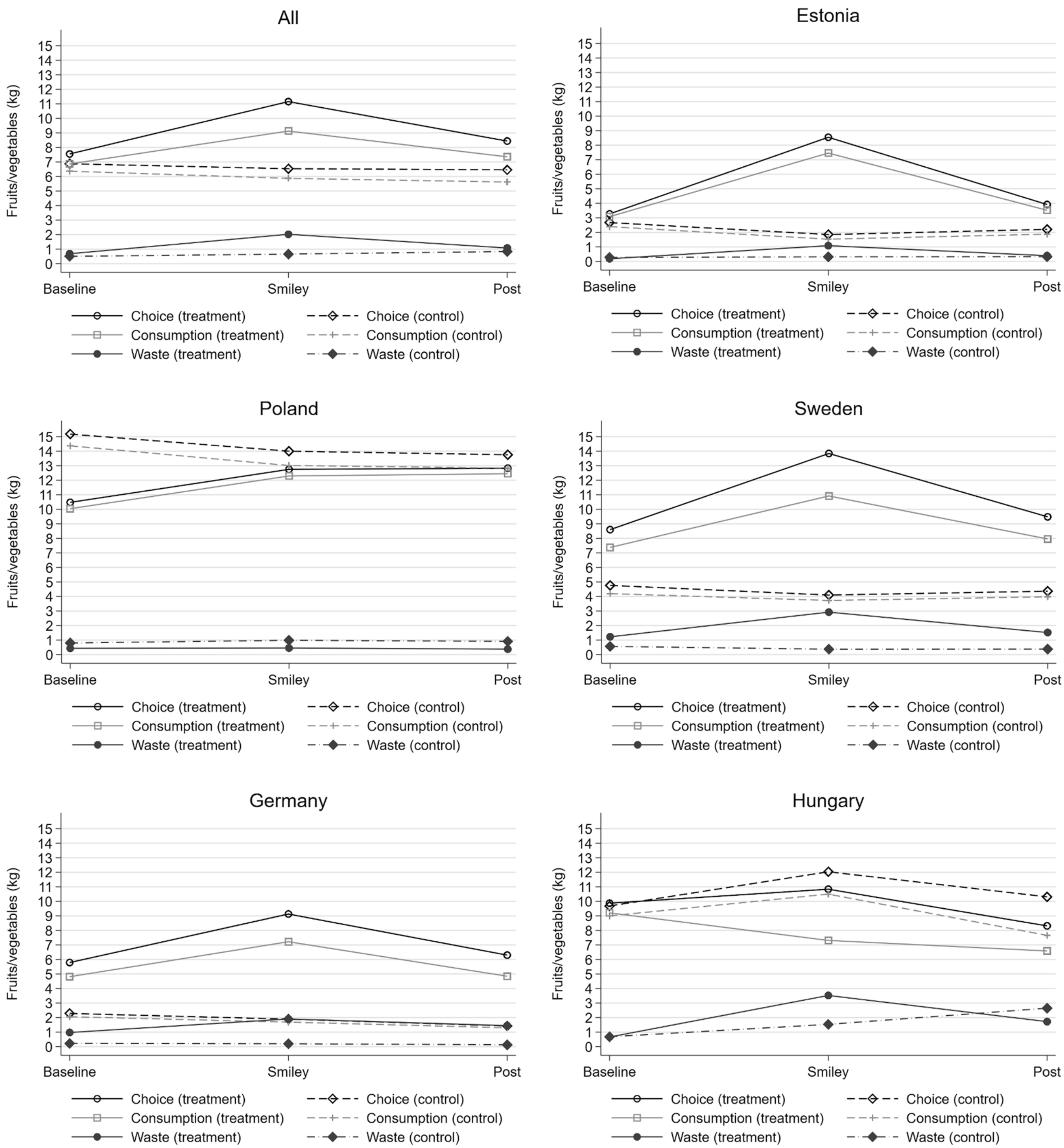

Fig. 2. Fruit & Vegetable Choice, Consumption and Waste: A Comparison of Control and Treatment School by Country and by Experimental Phase.

choosing a portion of FVs were 4.2:1(95%-CI 2.6; 6.9, n = 10,227). Once we focus only on baseline (t1) and intervention phases (t2), these odds rise to 9.0 (95%-CI 4.3; 19.0, n = 7,597). Exploring the effect of the intervention (t2) versus the post-intervention phase (t3), we find a statistically significant smiley effect with OR = 4.6 (95%-CI 2.3; 7.4, n = 7,581), which is in line with the descriptive results presented above. All control variables – age, sex, grade, week, and weekday – are insignificant. We thus identify a strong effect of the smiley on the children's FV choice.

4.3. *The smiley effects by country*

Finally, we ran analyses stratified by country where we identify differences in the smiley effect. Again, we compared treatment versus control schools in a first step (between-schools), followed by an investigation of the change in the percentage of children choosing a portion of FVs because of the smiley (within-subject). Results are presented accordingly.

Fig. 2 depicts choice, consumption and waste by country for the three experimental phases: baseline, intervention and post-intervention. The corresponding numbers are presented in the appendix (Table A1). Mean comparisons show that the treatment and control schools in

Table 5
Estimations of the Smiley Effect on Fruit and Vegetable Choice, Consumption and Waste – Between-Schools.

	t1–t3 All Phases		t1–t2 Baseline–Intervention		t2–t3 Intervention–Post-Intervention	
	Smiley effect	*p*-value	Smiley effect	*p*-value	Smiley effect	*p*-value
Estonia						
Choice	5.195*** [3.073;7.317]	0.000	5.778*** [3.358;8.199]	0.000	4.561** [1.925;7.197]	0.001
Consumption	4.473*** [2.413;6.532]	0.000	5.041*** [2.683;7.400]	0.000	3.948** [1.462;6.433]	0.003
Waste	0.722*** [0.381;1.063]	0.000	0.737*** [0.356;1.118]	0.00	0.613* [0.162;1.065]	0.010
n (days)		55		37		175
Poland						
Choice	3.536 [-1.415;8.487]	0.157	3.897 [-2.476;10.271]	0.220	3.449 [-3.777;10.675]	0.337
Consumption	3.627 [-1.488;8.742]	0.160	3.949 [-2.642;10.539]	0.230	3.632 [-3.822;11.087]	0.327
Waste	-0.091 [-0.587;0.405]	0.713	-0.051 [-0.767;0.664]	0.884	-0.183 [-0.759;0.393]	0.519
n (days)		56		36		36
Sweden						
Choice	5.060*** [2.637;7.483]	0.000	5.746*** [2.886;8.605]	0.000	4.624** [1.898;7.350]	0.001
Consumption	3.501** [1.370;5.631]	0.002	3.953** [1.412;6.495]	0.003	3.213* [0.812;5.615]	0.010
Waste	1.559*** [1.037;2.081]	0.000	1.792*** [1.207;2.378]	0.000	1.411*** [0.843;1.979]	0.000
n (days)		55		35		40
Germany						
Choice	2.54** [0.834;4.263]	0.005	3.613** [1.514;5.711]	0.002	1.927* [0.123;3.731]	0.037
Consumption	4.473* [0.289;3.581]	0.022	2.603** [0.736;4.470]	0.008	1.668 [-0.270;3.607]	0.088
Waste	0.722** [0.185;1.039]	0.006	1.010*** [0.587;1.433]	0.000	0.259 [-0.364;0.884]	0.398
n (days)		47		31		31
Hungary						
Choice	-0.287 [-4.188;3.613]	0.882	−1.731 [-7.241;3.778]	0.521	0.637 [-3.031;4.304]	0.723
Consumption	−2.945 [-6.750;0.860]	0.125	−3.757 [-9.356;1.841]	0.177	−2.450 [-5.948;1.047]	0.161
Waste	2.658** [0.830;4.486]	0.006	2.026* [0.171;3.881]	0.034	3.087** [0.915;5.258]	0.007
n (days)		44		28		32

Notes: * ≤ 0.05; ** ≤ 0.01; *** ≤ 0.001
Presented are the unstandardized regression coefficients, the corresponding p-values and in parentheses the 95%-CI's.
Regression analyses coefficients are interaction effects of smiley (dummy) * school (dummy, where treatment school = 1);
robust standard errors are clustered at the school level.
Standard errors, confidence intervals and p-values are wild-bootstrapped due to the low number of clusters (n = 10); bootstrap repetitions n = 1,000 based on Cameron and Miller (2014).
Control variables are the number of students, the percentage of students eating at the canteen (in categories), the number of students participating in the experiment, school participation in recent nutritional campaigns (dummy), style of food service, lunch provider, food category dummy (raw vegetables/salad/fruit, cooked vegetables, pickled vegetables, cabbage, or other).
The coefficients and 95%-confidence intervals for all controls are available upon request.

Estonia, Poland and Hungary are not statistically different in all three outcome variables at baseline t1, while we find higher numbers in the treatment schools for Sweden and Germany. We also measured differences between the treatment and controls schools by country for the smiley intervention and the post-intervention phase. While there were statistically significant differences between treatment and control schools in Estonia, Sweden and Germany, there were none for Poland and Hungary during and post-intervention.

Identifying a potential smiley effect on choice, consumption and waste, we ran a difference-in-differences analysis to compare the differences between treatment and control schools before and during intervention and during and post-intervention (Table 5). Comparing baseline to intervention, it is apparent that the smiley had a positive effect on choice, consumption and waste in Estonia, Sweden and Germany. Despite the fact that choice, consumption and waste were already higher in Sweden and Germany at baseline, all three outcome variables further increased during the intervention. There is no smiley effect in Poland and Hungary except for increased waste in the latter. Post-intervention, choice, consumption and waste dropped in Estonia, Sweden and Germany. Again, there is no such effect for Poland and Hungary except for FV waste in Hungary. To sum up, the volumes of selected and consumed but also wasted FVs increase due to the smiley in Estonia, Sweden and Germany, but not in Poland and Hungary.

Looking at the changes in the share of children choosing a portion of FVs (within-subject), it becomes obvious that the point at which children chose a portion of FVs varies greatly among the five countries (Table 6). Whereas in Hungary and Poland, the majority already chose a portion before the smiley was even introduced (78.9% and 57.1%, respectively), only a minority of children were opting for a portion at baseline in Estonia (15.2%), Sweden (28.8%)or Germany (36.9%).

Table 6
Fruit and Vegetable Choice: Baseline, Intervention and Post-Intervention by Country – Within-Subject.

	t1 Baseline	t2 Intervention	t3 Post-Intervention
Estonia			
% of children	15.2	52.4	17.7
(SD)	(35.93)	(49.97)	(38.18)
N	520	1,041	594
Poland			
% of children	57.1	88.8	84.7
(SD)	(49.54)	(31.52)	(36.04)
n	485	770	490
Sweden			
% of children	28.8	80.4	49.0
(SD)	(45.29)	(39.75)	(50.02)
n	821	1,506	758
Germany			
% of children	36.9	82.3	60.0
(SD)	(48.30)	(38.17)	(49.05)
n	426	860	410
Hungary			
% of children	78.9	83.9	70.7
(SD)	(40.83)	(36.08)	(45.57)
n	394	777	379

Note: SD = standard deviation, n = number of observations (days).

Table 7
Odds Ratios for Choosing a Portion of Fruits and Vegetables When Incentivized by a Smiley by Country – Within-Subject.

	t1–t3 All Phases	t1–t2 Baseline–Intervention	t2–t3 Intervention–Post-intervention
Estonia			
OR	7.390***	9.026***	7.105***
95% CI	[5.305;10.295]	[6.290;12.954]	[5.118;9.865]
n (days)	2,155	1,556	1,635
n (children)	156	155	156
Poland			
OR	2.026**	9.568***	2.216**
95% CI	[1.247;3.290]	[5.962;15.354]	[1.312;3.744]
n (days)	1,745	1,251	1,253
n (children)	106	106	106
Sweden			
OR	5.194***	14.071***	5.450***
95% CI	[3.880;6.952]	[9.888;20.022]	[4.018;7.392]
n (days)	3,085	2,327	2,255
n (children)	174	174	173
Germany			
OR	5.734***	24.240***	7.046***
95% CI	[3.765;8.735]	[12.499;49.010]	[4.373;11.350]
n (days)	1,695	1,286	1,266
n (children)	114	114	114
Hungary			
OR	1.754**	1.064	1.812**
95% CI	[1.244;2.473]	[0.739;1.531]	[1.258;2.608]
n (days)	1,536	1,155	1,144
n (children)	103	103	103

Notes: t_1 = baseline, t_2 = intervention, t_3 = post-intervention;
p-value: * ≤ 0.05; ** ≤ 0.01; *** ≤ 0.001
OR = Odds ratios, 95% CI = 95%-confidence intervals, n = number of observations.
Estimates are of a mixed-effects generalized logit model (a two-level random intercept model of day in child) with robust standard errors. The 95%-confidence intervals (CI) are in parentheses. All variables are dummies. None of the controls (age, sex, grade, week and weekday) are statistically significant.
The coefficients and 95%-confidence intervals for all controls are available upon request.

Given the high share of children initially opting for FVs in Hungary and Poland, it does not come as a surprise that we observe only a relatively small increase in Hungary (from 78.9% to 83.9%, Table 6). More interesting is that the proportion of children opting for a portion post-intervention is even lower than at baseline. These descriptive findings are supported by the results of the regression analyses presented in Table 7 and predicted proportion of children choosing a portion of FVs shown in Fig. 3. The similarity of the ORs in baseline–intervention and intervention–post-intervention –1.1 (Table 7, t1–t2) and 1.8 (Table 7, t2–t3), respectively – indicates that the proportion of children choosing a portion of FVs dropped below intervention (and baseline) level in Hungary (see also Fig. 3).

We identify no such crowding-out effect in Poland; rather, the share of children choosing a portion after smiley removal resembles that during its presence (84.7% vs. 88.8%). Not only are these effects clearly illustrated in Fig. 3, we see that Table 7 (t2–t3) shows a significant, albeit rather small, effect (OR = 2.2) once the smiley is removed. Because this effect is significantly smaller than the effect at baseline–intervention (OR = 9.6, with no overlap in the 95%-CI), we conclude that no crowding-out effect is occurring in Poland. On the contrary, the proportion of children choosing a portion of FVs remains rather high after the smiley removal.

When we focus on Estonia and Sweden, the number of children choosing a portion once the smiley is given increases markedly and in a similar manner, from 15.2% to 52.4% and from 28.8% to 80.4%, respectively (see Table 6). This observation is supported by the regressions in Table 7 (t1–t2, and visually in Fig. 3), in which the ORs are 9.0 and 14.1, respectively. After smiley removal, however, this number falls back to baseline levels in Estonia while remaining relatively high in Sweden (see Table 7 and Fig. 3), with 49.0% of the children, versus 28.8% at baseline, still opting for a portion of FVs even when no longer receiving a smiley. This finding that the smiley effect weakens yet is maintained in Sweden is further indicated by the ORs for baseline–intervention (14.1) and intervention–post-intervention (5.5) (shown in Table 7, t1–t2 and t2–t3, respectively, with no 95%-CI overlap). In Estonia, the OR confidence intervals do overlap, so we cannot exclude full dissipation of the smiley effect after its removal.

In Germany, on the other hand, the number of children choosing a portion when awarded the smiley increases from 36.9% to 82.3%but then decreases to 60.0%after smiley removal (Table 7). Here also, the share choosing a portion after smiley removal is greater than before its implementation, as also illustrated in Table 7 by the strong smiley effect (OR = 24.2), which drops after the smiley's removal (OR = 7.0) but remains higher than before its introduction (with no 95%-CI overlap).

5. Discussion and conclusion

5.1. Discussion

This investigation into whether a motivational incentive (here, a smiley stamp) can increase FV consumption among primary school children took the form of a field experiment conducted in five European countries using one treatment versus one control school in each country. Our general argument that the smiley works as an incentive to promote FV intake holds true. Across treatment and control schools, we identify increased FV choice and consumption among the primary school children exposed to the smiley incentive (compared to the unexposed control), a finding that holds independently of school characteristics. Once the smiley is removed, choice and consumption as well as waste decrease significantly in the treatment schools. During the actual intervention phase, however, the smiley increases the children's FV choices and consumption but also leads to unintended waste generation.Other studies mention the challenge with increasing waste when incentivizing FV consumption (e.g., Kessler, 2016). Whereas experimental results by Hudgens et al. (2017) on the effect of small prizes on food selection in school cafeterias in the United States show no such waste increase, other studies mention a similar unintended effect (see, e.g., Just and Price, 2013). If the smiley accomplishes the goal of getting children to try new FVs, and the repeated exposure increases

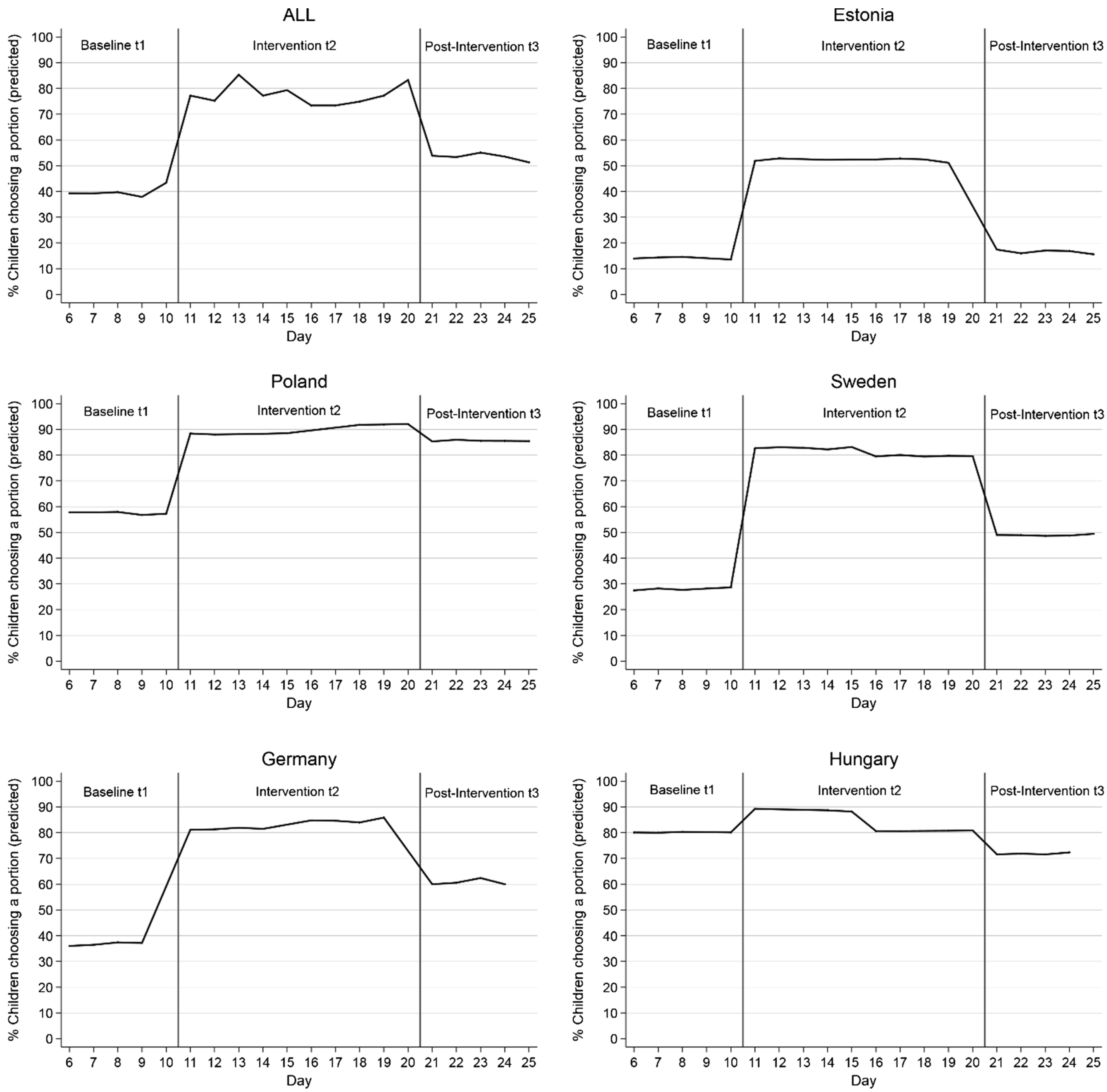

Fig. 3. Percentage of Children Choosing a Portion of Fruits and Vegetables by Experimental Period and Country (Predicted Probabilities Based on the Regressions Reported in Table 7).

familiarity while the smiley conveys feedback on a portion size, then waste should decrease once children know the FV they like as well as the portion size. An indication that the smiley achieves the effect of children successfully trying new foods could be a decrease in waste after the smiley removal while retaining higher choice and thus consumption levels.

Evidence that the smiley works is also offered by the analyses of baseline, intervention and post-intervention data for children from the treatment schools (within-subject), which all show a strong smiley effect on the children's choices of FVs. The share of children choosing a portion of FVs increased from 40% at baseline to 77% during the intervention. This result is similar to those of many other field experiments aimed at increasing more healthful food choices among children but using other types of incentives (e.g., Wansink et al., 2005; Raju et al., 2010; Wansink et al., 2012; Just and Price, 2013; Belot et al., 2016; Loewenstein et al., 2016). Overall, therefore, we find support for the claim that the smiley affects children's food choices.

In the background section, we cited three possible reactions by children after the incentive is removed: (1) back to baseline, (2) habit formation and (3) crowding-out of motivation (see List and Samek, 2014). According to the canteen-level analyses (between-schools), once the incentive is taken away, the amount of FV consumption and waste no longer differs from that in the control schools, meaning that the smiley effect disappears. However, in the individual children's analyses (within-subject), although the share of children choosing a portion of FVs levels off, it is still significantly higher than before the smiley intervention. Moreover, the 40% of children choosing a portion of FVs before the intervention increases to 53% after smiley removal. Nevertheless, it seems rational to assume that, as suggested by standard economic theory, the effect will slowly return to baseline (List and Samek, 2014) because our relatively short smiley intervention was insufficient for habit formation (Becker and Murphy, 1988).

Perhaps the most interesting findings are the observed country differences, such as the initially low levels of FV choices in Estonia and Sweden compared to the initially high levels in Hungary and Poland, with German children showing baseline choice levels somewhere in-between. According to analyses on children's individual choice, the smiley effect acted as expected in Sweden and Germany: an increase during the smiley intervention followed by a slight decrease after its removal but to levels that were still higher than before smiley implementation. In Estonia, on the other hand, although the number of children choosing a portion of FVs increased during the smiley intervention, after the smiley's removal, it decreased to virtually a pre-smiley level. In Poland, the effect continued after smiley removal for the week in which data were collected. The initial amounts in Hungary were already much higher than in the other countries, which might explain the smiley's non-existing effect (i.e., the existing levels left little room for improvement).

Irrespective of the volume of FVs, the number of children choosing a portion of FVs increased during the incentive phase in all countries but Hungary. Behavior after smiley removal varied, with the choice of FVs either dropping slightly (Sweden and Germany), leveling off to close to baseline (Estonia and Hungary) or dropping slightly but remaining similar to the intervention level (Poland).

These country differences, although somewhat addressed by our controls for food menu, service style, nutritional campaigns, and so on, could be explained by numerous other factors, ranging from values, food culture and taste preferences to the time of eating and the setting for the meal. These possible alternatives raise interesting avenues for future study based on various lines of argument. The differences in initial FV choice and the varying effects of the smiley, for example, could potentially be explained in two ways:

1. The smiley effect may be lower when initial FV choice is high, implying sufficient satiation to impose an upper limit on the good (Georgescu-Roegen, 1954; Pascinetti, 1981), which in this case is food. In the presence of such a saturation point, demand growth slows and finally ceases when the marginal utility of more FVs is zero or even negative (Moneta and Chai, 2014). Thus, when FV consumption has already become saturated, the effect of an incentive like the smiley might be minimal to nonexistent. Accordingly, the higher initial levels of FV consumption in Hungary and Poland, relative to Estonia, Germany and Sweden, would lead to a lower or no smiley effect.
2. According to Hofstede's masculinity dimension (2001), masculinity versus femininity is a deeply ingrained social value system whose importance for competitiveness, achievement and the material rewards of success is already recognized by school children. Assuming that the number of smileys collected each week as a reward for choosing FVs has a competitive angle, the degree of the society's masculinity dimension could influence the smiley's effect on the children's choices. We would therefore expect children in Hungary – ranked by Hofstede (2001) as the most masculine society – to be the most competitive and thus subject to the largest smiley effect. In fact, our findings do not support this expectation at all. A counter-argument might be that the smiley has too little value or is too easily achieved for it to rate highly as a reward in a masculine society. For instance, more than half the Hungarian children (58%) collected five smileys per week during the intervention, a majority trend unlikely to signal success in a society with a value system that emphasizes "being the best."

Either or both of these two arguments might account for the observed intercountry differences in initial FV choice or in the smiley effect, which this present study is unable to explain. What our analysis does throw light on, however, is the need to take intercountry differences into account when designing programs and campaigns aimed at increasing healthy food choices. One major lesson is that even though an incentive works in one context, it may not automatically work in another.

A second shortcoming is that the maximum ten intervention days in the field experiment was too short for habit formation. The study thus offers no information about the incentive effect after a longer period. The study design did not intend to measure eventual long-term effects from the experimental intervention. Such a measurement would require longitudinal data on the children's choice behavior a few weeks and/or months after the intervention. We also fail to observe any potential "ripple" effects, i.e., negatively affecting food choice outside the school canteen (see, e.g., Toossi, 2017). Nevertheless, the current experimental design could be expanded to assess such effects, ideally by ascertaining how many repeated exposures to selected foods are necessary in the presence of an incentive before habit formation can be established, how much time is optimal between the repeated incentive phases and whether potential negative effects of the incentive exist outside the school setting.

5.2. Conclusion

The main message of the present study is that a smiley stamp as a motivational incentive potentially works for primary school children in various, but not all, countries to increase FV consumption. Although the smiley's effect largely disappeared after the incentive phase, longer exposure might help establish the habit of higher FV intake. In addition, the smiley incentive has the advantage of not tying healthy food choice to material incentives like toys, which could shape children's expectations of receiving such remuneration for desirable behavior. Even though this simple incentive works, however, it needs to be tailored to the food culture, canteen design, lunch provider and other endogenous and exogenous factors of the school lunch setting, which can and will influence its effect on the children's food choices (e.g., Weible et al., 2013). It is also a prerequisite that more healthful foods be available, which is far from the reality in some of the countries studied. Even in Sweden, where most children regularly eat lunch in school and healthy school lunches are high on the political agenda, there is room for improvement.

At the same time, although in principle children are capable of choosing healthy options from a range of foods (Hakim and Meissen, 2013), schools and other actors could support children by making more healthful food choices available and easy. Choice architecture, for example, in any canteen could be designed to facilitate the amendment of food preferences (Wansink, 2014). Schools could also be seriously concerned with the role that age-specific dietary guidelines play in the preselection of available foods, as was recently suggested by WHO (2017). Learning early to select their own foods not only socializes children to choose more healthful foods and reduces food waste; it more generally increases individual and societal well-being. Above all, however, this study demonstrates the advantages of using an inexpensive, effective, scalable and simple-to-handle incentive like a smiley stamp because of its ease of implementation. Such an incentive can easily be combined with other nutritional educational campaigns and programs and perform even better, which makes it appealing not only to school administrators and school authorities, but also to health educators, health marketers and public policy makers.

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Appendix

See Table A1.

Table A1
Fruit and Vegetable Choice, Consumption and Waste: A Comparison of Control and Treatment Schools by Experimental Period (By Country).

		t1–t3 All Phases		t1 Baseline		t2 Intervention		t3 Post-intervention	
		Treatment	Control	Treatment	Control	Treatment	Control	Treatment	Control
Estonia									
Choice (kg)	M	5.17	2.25	3.27	2.68	8.55	1.85	3.92	2.21
	(SD)	(2.95)	(1.04)	(1.38)	(1.30)	(2.41)	(.58)	(1.55)	(1.05)
	z-value				-.90		-3.55***		-2.13*
Consumption (kg)	M	4.62	1.94	3.08	2.40	7.46	1.53	3.52	1.88
	(SD)	(2.58)	(.96)	(1.32)	(1.19)	(2.34)	(.55)	(1.30)	(.93)
	z-value				-.90		-3.55***		-2.49*
Waste (kg)	M	.54	.31	.19	.28	1.09	.32	.40	.33
	(SD)	(.47)	(.21)	(.14)	(.17)	(.32)	(.28)	(.32)	(.16)
	z-value				-1.14		-3.20***		-.27
n (days)		25	30	9	10	8	10	8	10
Poland									
Choice (kg)	M	11.97	14.33	10.48	15.18	12.75	14.00	12.83	13.76
	(SD)	(8.63)	(5.86)	(9.19)	(6.36)	(7.92)	(5.58)	(9.28)	(6.10)
	z-value				1.29		.53		.41
Consumption (kg)	M	11.55	13.44	10.04	14.37	12.29	13.01	12.45	12.84
	(SD)	(8.91)	(6.54)	(9.33)	(7.18)	(8.34)	(6.36)	(9.64)	(6.61)
	z-value				1.44		.32		.61
Waste (kg)	M	.42	.90	.44	.81	.46	.99	.38	.92
	(SD)	(.62)	(.81)	(.90)	(.86)	(.45)	(.93)	(.42)	(.75)
	z-value				.20		1.12		1.72
n (days)		28	28	10	10	8	8	10	10
Sweden									
Choice (kg)	M	1.71	4.41	8.60	4.77	13.84	4.10	9.48	4.37
	(SD)	(3.09)	(1.89)	(1.98)	(1.54)	(2.17)	(2.30)	(2.13)	(1.88)
	z-value				-3.35**		-3.78****		-3.63***
Consumption (kg)	M	8.80	3.97	7.38	4.20	10.92	3.73	7.96	3.99
	(SD)	(2.28)	(1.82)	(1.71)	(1.55)	(1.65)	(2.23)	(1.76)	(1.78)
	z-value				-3.10**		-3.78***		-3.40***
Waste (kg)	M	1.91	.44	1.23	.57	2.93	.37	1.52	.38
	(SD)	(.90)	(.25)	(.32)	(.24)	(.69)	(.18)	(.44)	(.29)
	z-value				-3.18**		-3.78***		-3.70***
n (days)		25	30	5	10	10	10	10	10
Germany									
Choice (kg)	M	7.07	1.87	5.79	2.29	9.13	1.90	6.30	1.43
	(SD)	(2.26)	(1.19)	(2.52)	(1.37)	(1.37)	(1.46)	(1.06)	(.55)
	z-value				-2.84**		-3.24**		-3.61***
Consumption (kg)	M	5.63	1.68	4.81	2.06	7.22	1.69	4.85	1.30
	(SD)	(1.94)	(1.07)	(2.18)	(1.25)	(1.50)	(1.29)	(.98)	(.52)
	z-value				-2.63**		-3.24**		-3.61***
Waste (kg)	M	1.44	.19	.98	.23	1.91	.20	1.45	.13
	(SD)	(.55)	(.17)	(.39)	(.22)	(.37)	(.18)	(.45)	(.10)
	z-value				-3.15**		-3.24**		-3.61***
n (days)		24	23	8	8	8	7	8	8
Hungary									
Choice (kg)	M	9.66	10.77	9.88	9.68	10.84	12.04	8.31	10.31
	(SD)	(3.66)	(6.02)	(1.88)	(5.75)	(4.61)	(6.86)	(3.58)	(5.93)
	z-value				.00		.42		.84
Consumption (kg)	M	7.57	9.06	9.21	9.00	7.31	10.50	6.59	7.66
	(SD)	(4.39)	(7.29)	(2.74)	(6.59)	(5.54)	(8.34)	(4.28)	(7.35)
	z-value				.16		1.05		-.79
Waste (kg)	M	2.09	1.71	.67	.68	3.53	1.54	1.73	2.65
	(SD)	(2.12)	(1.78)	(1.04)	(1.10)	(2.43)	(1.77)	(1.62)	(1.89)
	z-value				.00		-1.66		1.22
n (days)		22	22	6	6	8	8	8	8

Notes: t_1 = baseline, t_2 = intervention, t_3 = post-intervention; mean choice, consumption and waste are presented in kg/day, Standard Deviations are in parentheses, n depicts the number of days choice, consumption and waste were measured.
z-values from Wilcoxon-rank-sum-test for comparison of choice, consumption and waste between treatment and control schools, p-values * ≤ .05; ** ≤ .01; *** ≤ .001 (Results Shapiro-Wilk test for normality: choice, consumption and waste are not normally distributed at any experimental period).

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