The Influence of Emotional Cues and Anthropomorphism on Product Temperature Expectations

Escobar, Francisco Barbosa; Velasco, Carlos; Byrne, Derek V.; Wang, Qian Janice

Document Version
Final published version

Published in:
Food Quality and Preference

DOI:
10.1016/j.foodqual.2024.105387

Publication date:
2025

Citation for published version (APA):
Escobar, F. B., Velasco, C., Byrne, D. V., & Wang, Q. J. (2025). The Influence of Emotional Cues and Anthropomorphism on Product Temperature Expectations. *Food Quality and Preference*, *126*, Article 105387. https://doi.org/10.1016/j.foodqual.2024.105387

Food Quality and Preference 126 (2025) 105387

Contents lists available at ScienceDirect

Food Quality and Preference

journal homepage: www.elsevier.com/locate/foodqual

The influence of emotional cues and anthropomorphism on product temperature expectations

Francisco Barbosa Escobar [a,b,*], Carlos Velasco [c], Derek V. Byrne [a], Qian Janice Wang [a,d]

[a] Department of Food Science, Faculty of Technical Sciences, Aarhus University, Denmark
[b] Department of Marketing, Copenhagen Business School, Denmark
[c] Centre for Multisensory Marketing, Department of Marketing, BI Norwegian Business, Norway
[d] Department of Food Science, Faculty of Science, University of Copenhagen, Denmark

ARTICLE INFO

Keywords:
Emotions
Temperature
Anthropomorphism
Negativity bias
Basic tastes

ABSTRACT

Throughout six online experiments (four pre-registered), in which participants were tasked to evaluate their temperature expectations of different beverages with or without emotional cues (i.e., emoji facial expressions) with specific temperature associations, we found that imbuing a product with emotional content can influence its expected temperature in online settings. A negative valence, low arousal (i.e., sad) expression on the receptacle of a hot beverage (e.g., hot chocolate milk, coffee) led to a lower expected temperature compared to a beverage with a positive valence, high arousal (i.e., happy) expression and a control condition without any expression. Notably, a happy expression did not result in any significant difference in expected temperature. In addition, there were no significant differences with cold beverages (i.e., iced chocolate milk, beer). We found that the influence of the sad emoji expression was enhanced with higher levels of anthropomorphism (i.e., making individuals focus on the emotions of the product). Our results suggest that the mechanism behind these effects is based on the product being imbued with the emotional connotation of the sad expression and, subsequently, its corresponding temperature association. Our research adds to the literature on consumer behaviour, food and anthropomorphism, and the relationship between temperature and emotions, and it has applications related to food expectations.

1. Introduction

Marketers widely use emotion-laden stimuli to influence consumer behaviour throughout the customer journey (Andrade, 2015). An aspect tightly linked to emotions that has received increased attention from academia and industry relates to temperature, which plays an important role in product evaluations (Cheema & Patrick, 2012; Hadi & Block, 2019; Park & Hadi, 2020; Zwebner et al., 2014). For instance, as Hadi and Block (2019) found, cooler, compared to warmer, temperatures can induce consumers to act less emotionally, which then influences purchasing behaviours. In addition, as Park and Hadi (2020) found, lower temperatures are associated with higher status and luxury, which the authors argue, it arises from the scarcity signalled by increased social distance triggered by cold temperatures. Nevertheless, associations between cold and high status or luxury may also have more culturally driven origins, potentially dating back to the beginnings of the air-conditioned office and its executive cachet (Heschong, 1979; Spence, 2022a). Relevant to the present research, temperature plays an important role in foodstuffs, as the physical temperature of food and drinks can influence their acceptance (Brown & Diller, 2008; Stokes et al., 2016), perceived flavour intensity and texture (Engelen et al., 2003), and consumers' emotional responses to them (Pramudya & Seo, 2018; Singh & Seo, 2020). Despite the importance and multidimensional impact of temperature on consumers' emotions and behaviours highlighted by the existing literature thus far, to the best of our knowledge, no research has examined how emotional cues may influence product temperature expectations. In the present research, we aimed to address this by building on the theory of grounded cognition (Barsalou, 2010; Lakoff & Johnson, 1980) to investigate the effects of the emotional content of stimuli on expected product temperature. In particular, we leverage people's associations between temperature and emotions concepts and their underlying affective dimensions (Barbosa Escobar et al., 2021), and we imbue products with emotional content through emoji facial expressions and anthropomorphism, a phenomenon that has

* Corresponding author at: Department of Marketing, Copenhagen Business School, Solbjerg Plads 3, 2000 Frederiksberg, Denmark.
E-mail address: fjbe.marktg@cbs.dk (F. Barbosa Escobar).

https://doi.org/10.1016/j.foodqual.2024.105387
Received 18 September 2024; Received in revised form 20 November 2024; Accepted 26 November 2024
Available online 28 November 2024
0950-3293/

gained increasing attention in research and practice (Epley, 2018).

We develop a new conceptualization of how emotional cues and anthropomorphism can be used in a novel context to influence consumers' expectations. This research contributes to these different areas by demonstrating that the associations between non-concrete (e.g., emotions) and concrete (e.g., temperature) concepts go beyond mere associations and can influence product expectations about concrete properties. Hence, this work represents a new understanding of the effects of emotions in a consumer context and the value that individuals can assign to products. Importantly, this research advances the long-standing and growing area of food and anthropomorphism, together with cuteness (Wang and Mukhopadhyay, 2015), which may have begun with the gingerbread man in the 16th century (Spence, 2023). See Mishra & Mehta, 2023, for a review of food anthropomorphism. Furthermore, the present study provides relevant insights for practitioners, as it presents a novel and surprising way for marketers to leverage emotional cues in products to influence expectations of sensory features and affective and behavioural reactions to products, especially in the competitive landscape of online food retailing.

2. Theoretical background

Previous literature has shown multiple causal effects between temperature and consumers' emotions. On the one hand, extreme temperatures negatively impact individuals' emotional states (Noelke et al., 2016); on the other, people's emotions can influence thermal perception of the environment and thermal comfort (Wang & Liu, 2020). Another link between temperature and emotions can be found in the concept of emotional warmth, defined as a "positive, mild, volatile emotion involving physiological arousal and precipitated by experiencing directly or vicariously a love, family, or friendship relationship" (Aaker et al., 1986). Relevant to the present study, people from different cultures associate different emotion adjectives with specific temperature concepts (Barbosa Escobar et al., 2021). The latter research found a positive linear relationship between temperature and arousal and an inverted U-shaped relationship between temperature and valence.

2.1. Proposed mechanisms

The theories of grounded cognition (Barsalou, 2010; Lakoff & Johnson, 1980), constructed emotions (Barrett, 2006), and sensation transference (Cheskin, 1957; Piqueras-Fiszman & Spence, 2012) provide a useful framework to explain the associations between temperature and emotions, as well as the potential effects of emotional cues and anthropomorphism on product temperature expectations. First, the theory of grounded cognition helps examine how individuals internalize abstract concepts through concrete ones. As this theory suggests, abstract concepts (e.g., emotions; although see Xu et al., 2017, who suggest emotions are a unique conceptual category different from both abstract and concrete concepts) are grounded in concrete experiences (e.g., temperature) through conceptual metaphors used to understand the world, as the latter helps unify reason and imagination (Kövecses, 2020). More specifically, metaphors help conceptualize abstract concepts, which are less easily accessible, as more tangible ones, which are more easily accessible. For instance, people often associate love and warmth, as exemplified in terms like "warm love." Furthermore, following the theory of constructed emotions, these associations seem to come from the creation of emotion categories based on embodied knowledge and past experiences to label sensations that occur together with specific temperatures (Barrett, 2006; Waggoner, 2010). Finally, building on sensation transference, initially posed by Cheskin (1957), and which gained increased attention in the literature after Piqueras-Fiszman and Spence's (2012) study that applied it to food packaging and oral-somatosensory food texture, the properties of extrinsic stimuli can transfer to objects and alter consumers' evaluations of said objects. Following this, emotion-temperature associations may transfer to a product and alter its expected sensory features.

A critical way in which emotions can be communicated and transferred relates to facial expressions (Lee et al., 2021). Facial expressions can communicate broad affective dimensions (e.g., valence, arousal), as well as complex emotion categories (Liu et al., 2022). One of the most predominant facial features used to judge others' warmth is the smile. People with smiling facial expressions are perceived as warm, and those with broader smiles are perceived as warmer (Wang et al., 2017). The communication of emotions through faces and facial expressions is not limited to human ones. For instance, emojis are an effective way to convey emotional information (Novak et al., 2015) and can do so better than human facial expressions (Cherbonnier & Michinov, 2021). Emojis are single graphic symbols that represent facial expressions, concepts, ideas, and emotions, and they are widely used in marketing communications (Das et al., 2019). Relevant to the present study, facial expressions from emojis can be used to imbue products with the emotions they represent and consequently transfer the temperature associations of these emotions to the product. Indeed, emojis have been shown to increase the inferential processing of emotions and consequently trigger empathy (Erle et al., 2022).

In recent decades, a tactic that has gained attention from marketers and academics to imbue products with emotions relates to anthropomorphism (Epley et al., 2007; Han et al., 2019). This refers to individuals' tendency to attribute human-like characteristics (e.g., having a rational mind and emotions) to nonhuman entities (Epley et al., 2007). Some examples of anthropomorphism in product design can be found in watches, cars, and computers' input/output (I/O) interfaces (e.g., USB slots), among other products (Spence, 2021). Some of the most predominant means by which anthropomorphism can be triggered are facial features and descriptions involving human-like features (Puzakova & Aggarwal, 2018). As Salgado-Montejo et al. (2015) found, subtle smile-like curved lines in products' packaging (e.g., orange juice, lotion, tea) can positively influence individuals' evaluations of said products, whereas subtle frown-like lines can negatively influence people's evaluations. As Epley (2018) suggested, an important mechanism behind anthropomorphism relates to the similarity of a target to a human agent based on observable features. This mechanism is based on the activation of a human schema (i.e., knowledge about human agents) when the target invokes a person. In other words, individuals can attribute emotional traits to anthropomorphized objects. For example, by assigning human-like characteristics to foods and making them potential targets of affiliation, higher anthropomorphism can increase their perceived warmth (Kim & Yoon, 2021). In other words, people may feel more connected to anthropomorphized food.

Given the associations between emotions and temperature, a product with anthropomorphic attributes (e.g., emoji facial expressions) that convey specific emotions and affective dimensions (e.g., valence and arousal) can embody the corresponding emotions and their associations with other dimensions (e.g., with temperature). Consequently, we propose that, regardless of the temperature at which individuals prefer to consume a specific product, these emotion-temperature associations will bias product sensory expectations toward the temperature associated with the specific emotion (see Fig. 1). For example, in our study, a hot beverage in a receptacle with a broad smile would be perceived as being happy/excited (i.e., positive valence, high arousal). Thus, the beverage would be expected to be at a higher physical temperature since positive valence, high arousal emotions are associated with high temperatures. Nevertheless, ceiling effects may be found, whereby the beverage is already hot, so the emoji expression does not impact temperature expectations. The extent of this temperature modulation effect may depend on how human-like the products are perceived by participants. Furthermore, convergence to the mean is another potential effect, where beverages at high temperatures may feel less hot, and those at low temperatures may feel less cold, both trending toward the average temperature at which they are typically consumed. More formally, we hypothesized that:

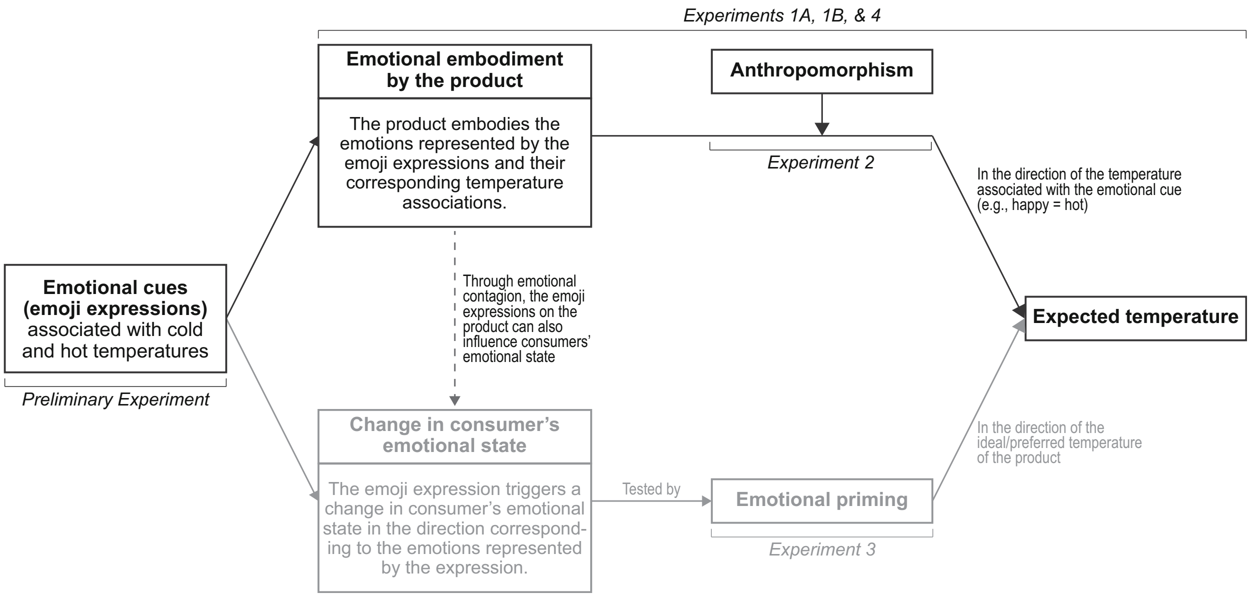

Fig. 1. Conceptual diagram of mechanisms and experiments flow.
Note. The proposed main mechanism (embodiment) is presented in black, and the alternative proposed mechanism is presented in grey. The proposed main mechanism is investigated in Experiments 1A, 1B, and 4. Hot and iced chocolate milk are used as the products in Experiment 1A. Experiment 1B is a partial replication of Experiment 1A using only the hot chocolate condition and with a higher statistical power. Experiment 4 expands on Experiment 1A using two different products (i.e., coffee and beer). In Experiment 3, the alternative proposed alternative is investigated using the hot and iced chocolate milk as products.

H_{1A}: A cold beverage with a positive valence, high arousal (vs. negative valence, low arousal) emoji expression will be expected to be at a higher (vs. lower) temperature.
H_{1B}: A hot beverage with a positive valence, high arousal (vs. negative valence, low arousal) emoji expression will be expected to be at a higher (vs. lower) temperature.
H_2: Higher (vs. lower) anthropomorphism will increase (vs. reduce) the effect of emoji expressions on the expected temperature of the beverage.

While individuals can imbue an anthropomorphized object with emotions, an object can also evoke emotions in an observer, as in emotional contagion (Peters & Kashima, 2015). Based on this, the expected temperature of the beverage can alternatively be influenced by a change in individuals' emotional state triggered by the emoji expressions or the product itself and not by the product embodying the emotions per se. In this case, the direction of the change in expected temperature would be in line with the desired/ideal temperature of the beverage and not the temperature associated with the emoji expression, so the direction of the change in temperature in the hot beverage would differ from the cold one. All in all, in the case of the hot beverage, the two mechanisms align in the predicted temperature direction, whereas they diverge in the case of the cold beverage. Here, we tested these paths experimentally by using the emoji expressions as emotional primes instead of in the receptacle of the beverage in a subsequent experiment.

2.2. Emotions and tastes

Individuals' emotions can also impact the sensory evaluations of foodstuffs (Noel & Dando, 2015; Spence, 2022c). According to the sensation transference theory (Cheskin, 1957; Piqueras-Fiszman & Spence, 2012), the properties of stimuli in one sensory modality can transfer to stimuli in another modality and influence consumers' hedonic judgements and consequently impact the perceived sensory properties of products. For instance, positively valenced emotional stimuli can enhance sweetness perception, whereas negatively valenced stimuli can enhance bitterness (Reinoso-Carvalho et al., 2020). Therefore, we also expected the positive emoji expression to increase expected liking and sweetness and reduce bitterness and the opposite to occur with the negative expressions.

2.3. Overview of experiments

We tested the hypotheses related to these mechanisms through six online experiments. In the Preliminary Experiment, we uncovered emoji facial expressions associated with cold and hot temperature concepts. In Experiment 1A, we investigated whether imbuing a product with emotional content associated with low and high temperatures could influence its expected temperature. To this end, we incorporated the two emoji expressions most strongly associated with cold and hot temperatures in the receptacle of hot and cold chocolate beverages. We additionally evaluated the expected liking, sweetness, and bitterness of the beverages. Experiment 1B replicated the findings of the previous experiment under the hot beverage condition, where significant results were found, with a higher statistical power. In Experiment 2, we manipulated the anthropomorphism of the beverage. In Experiment 3, we aimed to dissociate the potential effect of a change in consumers' emotional state from that of the emotion-temperature associations by using the emoji expressions as emotional primes instead of using them in the receptacle of the beverage. In Experiment 4, we investigated the generalizability of our findings on temperature expectations online and examined two different products with slightly modified emoji expressions.

2.3.1. Transparency and openness

We report exact details on required sample sizes, data cleaning procedures, manipulations, and measures in all the studies, following JARS (Kazak, 2018). All data, analysis scripts, research materials, and preregistrations are openly available on the project's Open Science Framework (OSF) page (https://osf.io/53bfs/). Further details on each of the experiments are presented in the Supplementary Material. Experiments 1A and 2–4 were preregistered. Required sample sizes were calculated using G*Power (Faul et al., 2007) and are detailed in the Supplementary Material. All participants were recruited from Prolific (https://www.prolific.com/). All experiments were programmed and conducted in Qualtrics (https://www.qualtrics.com/). Except for the mediation analysis (conducted via the PROCESS macro for SPSS; Hayes, 2022), all the analyses were conducted in R (R Core Team, 2023). The data from participants with total completion times two standard deviations above or below the mean were excluded from the analysis (details are presented in the Supplementary Material).

3. Preliminary experiment: Emoji-temperature associations

3.1. Methods

A total of 207 native English speakers from the UK (154 females, 53 males), aged 18–40 years ($M_{age} = 28.66$ years, $SD_{age} = 5.61$) took part in the Preliminary Experiment. The stimuli consisted of the facial expressions (i.e., eyebrows, eyes, and mouth) of four specific emojis extracted from the EmojiGrid (Toet et al., 2018). We selected the emojis in the four corners of the EmojiGrid: lowest valence, lowest arousal (V1A1), lowest valence, highest arousal (V1A5), highest valence, lowest arousal (V5A1), highest valence, highest arousal (V5A5). The stimuli can be found in the Supplementary Materials.

The experiment followed a one-way between-participants design. Participants first indicated their affective state through the valence and arousal dimensions of the 9-point Self-Assessment Manikin (SAM; Bradley & Lang, 1994). Then, they were presented with general instructions and were asked to pay attention to the screen, as the expressions would only be visible for a few seconds. Subsequently, participants were exposed to an emoji expression for three seconds. Then, they completed the SAM again. Afterward, participants were presented with the same emoji expression they saw earlier and indicated with what temperature they associated it on a 9-point visual analogue scale (VAS) from 1 (*cold*) to 9 (*hot*). Finally, participants indicated their age and gender.

To analyse the temperature associations of each of the emoji expressions, a one-way ANOVA with temperature as the dependent variable and emoji expression as the independent variable was conducted. To analyse the effect of the emoji expressions on the affective state of participants, independent one-way ANOVAs on the change in valence ($\Delta_{Valence}$) and arousal ($\Delta_{Arousal}$) of each participant with emoji expression as the independent variable were conducted. Furthermore, we conducted one-sample one-sided *t*-tests to examine whether there were significant changes in valence and arousal generated by the emoji expressions.

3.2. Results

The ANOVA results revealed a significant effect of emoji expression on temperature association, $F(3,203) = 63.56$, $p < .001$, $\eta_p^2 = 0.48$. Consistent with our expectations, the post hoc tests showed that the emoji expression with the highest temperature association was the highest valence, highest arousal one (V5A5; $M = 6.92$, $SD = 1.40$), whereas the emoji expression with the lowest temperature association was the lowest valence, lowest arousal one (V1A1; $M = 2.33$, $SD = 1.29$). Detailed results of all the analyses are presented in the Supplementary Materials.

The results also revealed a significant effect of emoji expression on the change in the valence, $F(3, 203) = 30.02$, $p < .001$, $\eta_p^2 = 0.31$, and arousal, $F(3, 203) = 4.06$, $p = .008$, $\eta_p^2 = 0.06$, states of participants. The post hoc tests showed significant differences in the expected direction in the valence and arousal affective states of participants after being exposed to the V1A1 compared to the V5A5 emoji expression, in which the former resulted in negative changes in both dimensions and the latter in positive changes. The one-sample one-sided *t*-tests revealed that the changes in valence, $t(50) = -4.15$, $p < .001$, and arousal, $t(50) = -1.82$, $p = .037$, of the V1A1 emoji expression were significantly less than 0. In addition, the changes in valence, $t(51) = 6.31$, $p < .001$, and arousal, $t(51) = 3.02$, $p = .002$, of the V5A5 emoji expression were significantly greater than 0.

4. Experiment 1A

4.1. Methods

Based on a preliminary experiment, the main emotional stimuli in the experiments conducted here related to the facial expressions of the lowest valence, lowest arousal (V1A1; henceforth called *sad*) and the highest valence, highest arousal (V5A5; henceforth called *happy*) emojis from the EmojiGrid (Toet et al., 2018), as they presented the strongest associations with low and high temperatures, respectively.

The final sample of Experiment 1 comprised 591 participants (296 females, 291 males, 4 unreported), aged 18–40 years ($M_{age} = 28.60$ years, $SD_{age} = 6.11$). The stimuli consisted of photographs of a chocolate beverage in a paper cup—with or without an emoji expression on it. To enhance the mental simulation of drinking the chocolate beverage generated by the stimuli and consequently increase the reliability of responses on the expectations of the beverage and emotional reactions, we developed ecologically valid stimuli comprising real physical elements and included a first-person perspective view of the beverage and a hand reaching for the cup (see Fig. 2). First-person-perspective images increase mental simulation of the actions portrayed (Elder & Krishna, 2012), and they enhance representations of bodily sensations, emotional reactions, and psychological states (Libby & Eibach, 2011). Furthermore, there is a stronger link between imagination and consumption with first-person, compared to third-person perspective imagery, which results in increased mental representation, actual consumption, and willingness to pay for desired products (Christian et al., 2016). Nevertheless, these effects are nuanced, as extant literature has found that they occur when viewing unhealthy food, increasing activity in brain regions underlying rewarding eating experiences and food intake, but not when viewing unhealthy foods (Basso et al., 2018).

The experiment followed a 2 (beverage temperature: cold, hot) × 3 (emoji expression: sad, control, happy) between-participants design. Each participant evaluated one chocolate beverage, either cold or hot, in either a cup with an emoji expression or in a plain cup. To maintain consistency across the stimuli and prevent other factors, such as steam, from biasing the results, the beverage temperature was manipulated solely by specifying the temperature in the experiment instructions and in the related questions. In the cold condition, the stimulus was referred to as an *iced chocolate beverage*, as this is a familiar name in the product category. In the hot condition, the stimulus was referred to as a *hot chocolate beverage*.

Participants first assessed the valence and arousal of their current emotional state. Then, they evaluated how cold or hot they felt at that moment, as in Chinazzo et al's (2021) study. Subsequently, participants were presented with the stimuli and were asked to imagine they were about to drink the *iced/hot* chocolate beverage shown. Later, participants were asked to evaluate the temperature at which they expected the *iced/hot* chocolate beverage to be. Afterward, they were asked to evaluate how much they expected to like the *iced/hot* chocolate beverage and how sweet and bitter they expected it to be. Subsequently, participants evaluated the extent to which they assigned human-like characteristics to the *iced/hot* chocolate beverage following the questions on anthropomorphism tendencies used in Chen et al.'s (2018) study. More specifically, participants indicated their level of agreement to five items about the chocolate beverage (i.e., *this [iced/hot] chocolate beverage…* "seems humanlike," "seems alive," "has its own emotions," "has its own intentions," and "has its own personality"). The stimulus was visible when these questions were presented. Then, participants evaluated the valence and arousal of their emotional state and thermal sensation again. They also indicated the temperature at which they prefer to drink chocolate beverages. Next, those participants who were exposed to a chocolate beverage with an emoji expression were shown the same emoji expression alone and were asked to evaluate how much they liked it and to state the three words they most associated the expression with. Finally, participants indicated their age and gender. All the questions

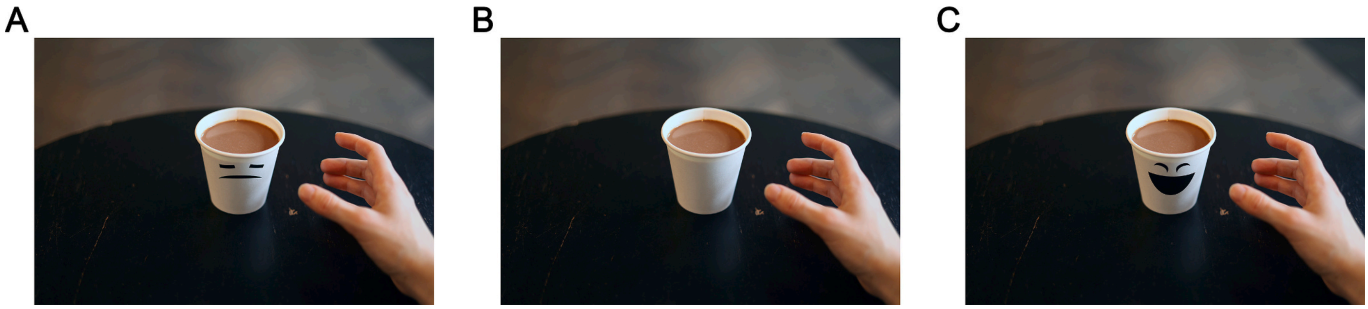

Fig. 2. Stimuli used in Experiment 1A.
Note. The stimuli consisted of a chocolate beverage with either a sad emoji expression (A), no emoji expression (control; B), or a happy emoji expression (C).

involving temperature were answered on a 9-point VAS from 1 (*cold*) to 9 (*hot*), all the other questions were answered on a 9-point VAS from 1 (*not at all*) to 9 (*very much*).

To analyse the main dependent variables (expected temperature, expected liking, expected sweetness, and expected bitterness), we ran a set of models consisting of separate ANOVAs on the main dependent variables with the main and interaction effects of beverage temperature and emoji expression. Furthermore, as a robustness check, we ran a second set of models comprised of independent ANCOVAs on the main dependent variables, adding participants' initial emotional state (SAM's values on positivity/negativity and intensity of emotion), their initial thermal sensation, age, and gender as covariates to the ANOVA models. The results of the robustness checks are presented in the Supplementary Material. Participants' affective states were added as covariates due to the emotional nature of the study, as people's emotional states could alter the impact of the emoji expressions and their evaluation of the chocolate beverage itself. For instance, the emoji expressions could result in higher or lower product evaluations if participants were experiencing heightened levels of emotional valence, in which cases emoji expressions could exert larger regulatory or enhancing effects (positively or negatively) than under more valence-neutral emotional states. We also controlled for participants' initial thermal sensation since people's regulatory behaviours to achieve physical-psychological homeostasis (Lee et al., 2014) could also influence the results. In addition, age could influence how the emotional cues (i.e., emoji expressions) were processed (Kutsuzawa et al., 2022). Older people (over 30 years) tend to interpret emojis literally or do not understand their function (Herring & Dainas, 2020). Furthermore, gender could influence the processing of the emotional cues. For instance, negativity bias in the processing of emoji expressions is more common in females than males (Jones et al., 2020). All the models for each dependent variable were tested via likelihood ratio tests (LRTs). Subsequently, Bonferroni-corrected pairwise comparisons for all the dependent variables were computed. Descriptive statistics and correlations for all the key variables in all the experiments are presented in the Supplementary Material.

We tested the reliability of the five items of the anthropomorphism index using McDonald's omega (ω), and we computed an overall anthropomorphism index by averaging the scores of the five items. Moreover, we computed participants' change in emotional state in terms of valence (Δ_{Valence}) and arousal (Δ_{Arousal}) and tested for significant differences from zero through one-sided one-sample *t*-tests.

To explore the semantic associations of the emoji expressions, we conducted a word frequency analysis coupled with a sentiment analysis using the Bing lexicon (Liu, 2012) and the NRC VAD lexicon. Subsequently, we ran two separate linear mixed models (LMMs) on both valence and arousal values with beverage temperature and emoji expression as fixed factors, along with their interaction, and participants' ID as random factor. Subsequently, Bonferroni-corrected pairwise comparisons were computed.

4.2. Results

Expected temperature. The results revealed a significant main effect of beverage temperature on temperature expectations, $F(1, 585) = 1505.83$, $p < .001$, $\eta_p^2 = 0.72$. Under the cold beverage temperature condition, the chocolate beverages were expected to be colder than under the hot condition ($M_{cold} = 2.09$ vs. $M_{hot} = 7.14$; $p < .001$). The results revealed a significant main effect of emoji expression on the expected temperature of the chocolate beverages, although with a small effect size, $F(1, 585) = 3.04$, $p = .049$, $\eta_p^2 = 0.01$. Nevertheless, the difference in expected temperature between the sad beverages and the control was not statistically significant ($M_{sad} = 4.39$ vs. $M_{control} = 4.74$; $p = .088$). Similarly, the difference between the sad beverages and the happy ones was not significant ($M_{happy} = 4.72$; $p = .104$) or between the control and the happy beverages ($p > .999$).

Expected liking. There was a significant main effect of beverage temperature, $F(1, 585) = 51.18$, $p < .001$, $\eta_p^2 = 0.08$, and emoji expression, $F(2, 585) = 5.50$, $p = .004$, $\eta_p^2 = 0.02$. Overall, the hot chocolate beverages were expected to be liked more than the cold ones ($M_{hot} = 4.81$ vs. $M_{cold} = 6.20$; $p < .001$), and participants expected to like the happy chocolate beverages more than the sad ones ($M_{happy} = 5.84$ vs. $M_{sad} = 5.08$; $p = .003$).

Taste expectations. The results revealed a significant main effect of beverage temperature, $F(1, 585) = 10.55$, $p = .001$, $\eta_p^2 = 0.02$. Overall, the cold chocolate beverages were expected to be sweeter than the hot ones ($M_{cold} = 6.89$ vs. $M_{hot} = 6.49$; $p = .001$). In addition, the results revealed a significant effect of the interaction between beverage temperature and emoji expression on expected sweetness, $F(2, 585) = 3.19$, $p = .042$, $\eta_p^2 = 0.01$. In the hot beverage condition, as expected, the happy beverage was expected to be sweeter compared to sad one ($M_{happy} = 6.82$ vs. $M_{sad} = 6.16$; $p = .006$). There were no significant effects of beverage temperature or emoji expression on expected bitterness.

Pertaining to anthropomorphism ($\omega = 0.89$, 95% CI = 0.87, 0.91), the chocolate beverages under the hot temperature condition presented significantly higher levels of anthropomorphism than the ones in the cold condition ($M_{hot} = 2.21$ vs. $M_{cold} = 1.82$; $p < .001$). Moreover, both the sad ($M_{sad} = 2.26$; $p < .001$) and the happy ($M_{happy} = 2.29$; $p < .001$) chocolate beverages presented higher levels of anthropomorphism than the control ($M_{control} = 1.51$). Nevertheless, the nominal anthropomorphism levels across conditions were relatively low. Moreover, the *t*-tests revealed that, as reported by participants, none of the chocolate beverages triggered a significant change in their emotional state.

The word frequency analysis revealed that the top three words associated with the sad emoji expression were sad ($n = 92$), sadness ($n = 82$), and unhappy ($n = 29$). The top three words associated with the happy emoji expression were happy ($n = 94$), happiness ($n = 56$), and joy ($n = 56$). A frequency table with the top ten keywords per emoji expression is presented in the Supplementary Material. As expected, the analysis of the affective loadings of the word associations revealed a significant main effect of emoji expression on valence, $F(1, 384.62) = 1619.39$, $p < .001$, $\eta_p^2 = 0.81$, so that the happy emoji expression presented a significantly higher valence than the sad one ($M_{happy} = 0.84$ vs. $M_{sad} = 0.16$; $p < .001$). Emoji expression also had a significant effect on arousal, $F(1, 379.70) = 450.59$, $p < .001$, $\eta_p^2 = 0.54$; the happy emoji expression presented a significantly higher arousal than the sad one ($M_{happy} = 0.68$ vs. $M_{sad} = 0.45$; $p < .001$).

Overall, the results in Experiment 1A provided initial support for our main argument that imbuing a product with emotional content by incorporating emoji expressions on it can influence the expected temperature of the product. Importantly, this effect was conditional on the initial temperature of the product and the emoji expression used. Under the hot, but not the cold beverage condition, the sad emoji expression reduced the expected temperature of the beverage compared to the happy expression, providing support for H_{1B}.

5. Experiment 1B

5.1. Methods

The final sample comprised 445 participants (228 females, 215 males, 2 unreported), aged 18–55 years ($M_{age} = 29.91$ years, $SD_{age} = 6.17$). The stimuli were the same as in Experiment 1A, except that here participants were only exposed to the hot beverage condition. The experiment followed a one-way between-participants design with emoji expression as a three-level factor (sad, control, happy). As in the previous experiment, we analysed the main dependent variables through two separate ANOVA models on the main dependent variables with emoji expression as the main factor. In addition, we ran a similar robustness check (reported in the Supplementary Material). Bonferroni-corrected pairwise comparisons for all the dependent variables were then computed. The remaining analyses were identical to Experiment 1A.

5.2. Results

Expected temperature. The results revealed a significant main effect of emoji expression on the expected temperature of the chocolate beverages, $F(2, 442) = 7.08$, $p = .001$, $\eta^2 = 0.03$. The sad chocolate beverage ($M_{sad} = 6.50$) was expected to be significantly less hot than the happy one ($M_{happy} = 7.08$; $p = .003$) and the control ($M_{control} = 7.09$; $p = .004$). In other words, sadness is associated with coldness, driving the expected temperature down, although still above the middle of the scale. However, happiness is not necessarily associated with warmth, failing to exert any influence on the expected temperature.

Expected liking. The results showed a significant main effect of emoji expression, $F(2, 442) = 3.64$, $p = .027$, $\eta^2 = 0.02$. The sad chocolate beverage ($M_{sad} = 5.76$) was expected to be liked less than the happy one ($M_{happy} = 6.40$; $p = .023$) but not less than the control ($M_{control} = 6.13$; $p = .327$).

Taste expectations. There was a significant main effect of emoji expression on expected sweetness, $F(2, 442) = 5.09$, $p = .007$, $\eta^2 = 0.02$. The sad chocolate beverage ($M_{sad} = 6.07$) was expected to be less sweet than the happy one ($M_{happy} = 6.62$; $p = .008$) and the control ($M_{control} = 6.51$; $p = .046$). Furthermore, the results revealed a significant main effect of emoji expression on expected bitterness, $F(2, 442) = 3.41$, $p = .034$, $\eta^2 = 0.02$. The sad chocolate beverage ($M_{sad} = 3.12$) was expected to be more bitter than the happy one ($M_{happy} = 2.61$; $p = .029$) but not the control ($M_{control} = 2.83$; $p = .421$). Consistent with the results on temperature in the previous experiments, the effects of the emoji expressions on taste here are evident with the sad expression but not with the happy one, as the sad beverages are significantly different from the rest, but the happy ones and the control seem to be equivalent.

The anthropomorphism index presented a high internal consistency ($\omega = 0.92$, 95% CI = 0.91, 0.94). The sad ($M_{sad} = 2.67$) and the happy ($M_{happy} = 2.57$) chocolate beverages presented higher levels of anthropomorphism than the control ($M_{control} = 1.55$; $ps < 0.001$). In terms of change in participants' emotional state, the *t*-tests revealed that the only significant effects were a positive change in valence ($\Delta_{Valence} > 0$) with the happy chocolate beverage, $t(144) = 2.54$, $p = .006$, and a negative change in arousal ($\Delta_{Arousal} > 0$) with the sad chocolate beverage, $t(143) = 2.70$, $p = .004$.

In sum, Experiment 1B replicated the findings in Experiment 1A under the hot temperature condition with a higher statistical power, further supporting H_{1B}. The sad emoji expression reduced the expected temperature of the hot beverage compared to the happy expression and the control.

6. Experiment 2

6.1. Methods

The final sample comprised 603 participants (298 females, 294 males, 11 unreported), aged 18–40 years ($M_{age} = 29.26$ years, $SD_{age} = 6.10$). Participants received GBP 0.42 for their participation. The stimuli were the same as Experiment 1B, where only the hot beverage condition was used. The experiment followed a 3 (Emoji expression: sad, control, happy) × 2 (Anthropomorphism: low, high) between-participants design. The procedure was similar to Experiment 1A, but the instructions and phrasing of the questions were modified to manipulate anthropomorphism. Under the high anthropomorphism condition, we aimed to make participants think of the chocolate beverage as a person and focus on its emotions (Chen et al., 2017). To this end, similar to earlier studies (e.g., Tam et al., 2013), we gave the chocolate beverage a name with a gendered title (i.e., *Mr. Cocoa*) and referred to it by this name as if it were a person in the questionnaire (Wang & Basso, 2019). In addition, we instructed participants to focus on the emotions of the chocolate beverage (Chen et al., 2017). On the other hand, under the low anthropomorphism condition, we aimed to make participants think of the chocolate beverage as an object and focus on its functional and physical characteristics (i.e., taste). The specific phrasing under both conditions is presented in the Supplementary Material.

The analysis was similar to Experiment 1A. The main dependent variables were analysed via two sets of models. The first set (M_1) comprised independent ANOVAs on the main dependent variables with the factors emoji expression and anthropomorphism, as well as their interaction.

6.2. Results

Manipulation check. Anthropomorphism presented a high level of internal consistency ($\omega = 0.89$, 95% CI = 0.87, 0.90). The chocolate beverages in the high anthropomorphism condition presented significantly higher levels than those under the low condition ($M_{high} = 2.91$ vs. $M_{low} = 2.52$; $p = .011$).

Expected temperature. The results revealed a significant main effect of emoji expression on expected temperature, $F(2, 597) = 28.69$, $p < .001$, $\eta_p^2 = 0.09$. Overall, participants expected the sad chocolate beverages ($M_{sad} = 6.09$) to be significantly less hot than the happy ones ($M_{happy} = 7.01$; $p < .001$) and the control ($M_{control} = 7.29$; $p < .001$). The analysis also revealed a significant interaction effect between emoji expression and anthropomorphism, $F(2, 597) = 6.64$, $p = .001$, $\eta_p^2 = 0.02$. Table 1 presents the estimated marginal means for the different dependent variables. The sad chocolate beverage in the high anthropomorphism condition was expected to be significantly less hot than the happy chocolate beverage ($p < .001$) and the control ($p < .001$) in the high anthropomorphism conditions, as well as the happy chocolate beverage ($p < .001$) and the control ($p < .001$) in the low anthropomorphism condition. In addition, participants expected the sad chocolate beverage under the high anthropomorphism condition to be significantly less hot than the sad chocolate beverage in the low anthropomorphism condition ($p < .001$). There were no significant differences between the happy chocolate beverages and the control in either of the anthropomorphism conditions. In line with the results of

Table 1
Estimated marginal means of key variables in Experiment 2.

	Low anthropomorphism			High anthropomorphism		
	Sad	Blank	Happy	Sad	Blank	Happy
Expected temperature	6.43 [6, 6.86]	7.20 [6.73, 7.68]	6.79 [6.36, 7.21]	5.74 [5.32, 6.17]	7.38 [6.9, 7.85]	7.23 [6.8, 7.66]
Expected liking	5.71 [5.19, 6.22]	6.1 [5.54, 6.67]	6.23 [5.72, 6.74]	5.15 [4.64, 5.65]	6.60 [6.03, 7.17]	6.77 [6.25, 7.29]
Expected sweetness	5.99 [5.57, 6.41]	6.40 [5.93, 6.86]	6.6 [6.18, 7.02]	5.74 [5.33, 6.16]	7.07 [6.6, 7.54]	6.68 [6.25, 7.1]
Expected bitterness	3.02 [2.56, 3.47]	2.97 [2.47, 3.46]	2.70 [2.25, 3.15]	3.70 [3.25, 4.15]	2.66 [2.15, 3.16]	2.64 [2.18, 3.09]

Note. Expected temperature values are based on 9-point VAS from 1 (*cold*) to 9 (*hot*). Expected liking, sweetness, and bitterness values are based on a 9-point VAS from 1 (*Not at all*) to 9 (*Very much*). 95% Confidence intervals are presented below each mean.

the previous experiments, it was the sad emoji expression driving the effects on temperature expectations. Only the sad, but not the happy, emoji expression that results in significant differences in expected temperature.

Expected liking. The results revealed a significant main effect of emoji expression on expected liking, $F(2, 597) = 17.73$, $p < .001$, $\eta^2_p = 0.06$. Overall, the sad chocolate beverages ($M_{sad} = 5.43$) were expected to be liked significantly less than the happy ones ($M_{happy} = 6.50$; $p < .001$) and the control ($M_{control} = 6.35$; $p < .001$). There were no significant differences between the happy chocolate beverages and the control. The analysis also revealed a significant interaction effect between emoji expression and anthropomorphism, $F(2, 597) = 5.03$, $p = .007$, $\eta^2_p = 0.02$. The sad chocolate beverage in the high anthropomorphism condition was expected to be liked less than the happy chocolate beverage ($p < .001$) and the control ($p < .001$) in the high anthropomorphism condition, as well as the happy chocolate beverage ($p = .001$) and the control ($p = .014$) in the low anthropomorphism condition. In addition, participants expected to like the sad chocolate beverage under the low anthropomorphism condition less than the happy chocolate beverage ($p = .002$) and the control ($p = .034$) under the high anthropomorphism condition.

Taste expectations. There was a significant main effect of emoji expression on sweetness, $F(2, 597) = 17.15$, $p < .001$, $\eta^2_p = 0.05$. Participants expected the sad chocolate beverages ($M_{sad} = 5.87$) to be significantly less sweet than the ones ($M_{happy} = 6.64$; $p < .001$) and the control ($M_{control} = 6.73$; $p < .001$). The analysis also revealed a significant interaction effect between emoji expression and anthropomorphism, $F(2, 597) = 3.81$, $p = .023$, $\eta^2_p = 0.01$. The sad chocolate beverage in the high anthropomorphism condition was expected to be significantly less sweet than the happy chocolate beverage ($p < .001$) and the control ($p < .001$) in the high anthropomorphism condition, as well as the happy chocolate beverage in the low anthropomorphism condition ($p < .001$). In terms of expected bitterness, the results revealed a significant main effect of emoji expression, $F(2, 597) = 9.04$, $p < .001$, $\eta^2_p = 0.03$. The sad chocolate beverages were expected to be significantly more bitter than the happy ones ($p < .001$) and the control ($p = .007$). There was also a significant interaction between emoji expression and anthropomorphism, $F(2, 597) = 4.27$, $p = .014$, $\eta^2_p = 0.01$. The sad beverage in the high anthropomorphism condition was expected to be more bitter than the happy chocolate beverage in the low ($p < .001$) and high ($p < .001$) anthropomorphism conditions, as well as the control in the high anthropomorphism condition ($p < .001$).

The results of Experiment 2 showed that the influence of the emoji expressions on expected product temperature was enhanced by higher anthropomorphic perception, supporting H_2. The sad emoji expression reduced the expected temperature of the chocolate beverage compared to the happy one and the control condition. This reduction in expected temperature was greater under the high anthropomorphism condition than the low one.

7. Experiment 3

7.1. Methods

The final sample comprised 402 participants (205 females, 196 males, 1 unreported), aged 18–40 ($M_{age} = 30.39$, $SD_{age} = 5.67$). The experiment followed a 2 (beverage temperature: cold, hot) × 3 (emoji expression: sad, happy) between-participants design. The procedure was similar to Experiment 1A, but here participants were first presented with emotional primes consisting of either the happy or the sad emoji expression. The emoji expressions were presented in isolation, for three seconds. Next, participants were presented with the chocolate beverage in a plain cup and answered the same set of questions as in Experiment 1A. As a manipulation check, we conducted separate one-sample, one-sided *t*-tests on participants' changes in valence and arousal for each beverage temperature and emoji expression condition. The analyses for all key variables were identical to those in Experiment 1A.

7.2. Results

Manipulation check. The results revealed that the only significant change in participants' affective state was generated by the sad emoji expression and the cold chocolate beverage. The one-sample, one-sided *t*-tests revealed that participants reported a significant and negative change in valence after being exposed to the sad emoji expression prime and the cold chocolate beverage, $t(99) = -2.54$, $p = .006$, $d = 0.25$; $M = -0.19$, $SD = 0.75$. Detailed results of all the one-sample, one-sided *t*-tests are presented in the Supplementary Material. Furthermore, the results revealed that participants' tendency to anthropomorphize the beverage after being exposed to the sad ($M_{sad} = 1.40$, $SD_{sad} = 1.07$) and the happy ($M_{happy} = 1.58$, $SD_{happy} = 0.83$) emoji primes in this experiment was similar in magnitude as the control conditions (i.e., no emoji) in the previous experiments, which is lower than the beverages with emoji expressions in their receptacles.

Expected temperature. The results revealed a significant main effect of beverage temperature on expected temperature, $F(1, 398) = 786.64$, $p < .001$, $\eta^2_p = 0.66$. Overall, the chocolate beverages in the hot temperature condition were expected to be hotter than the ones under the cold beverage condition ($M_{hot} = 6.93$ vs. $M_{cold} = 2.15$; $p < .001$). There were no significant effects of emoji expression or its interaction with beverage temperature.

Expected liking. The results revealed significant main effects of beverage temperature, $F(1, 398) = 73.80$, $p < .001$, $\eta^2_p = 0.16$, and emoji expression, $F(1, 398) = 8.61$, $p = .004$, $\eta^2_p = 0.02$. Overall, the hot chocolate beverages were expected to be liked more than the cold ones ($M_{hot} = 5.55$ vs. $M_{cold} = 3.74$; $p < .001$). Moreover, participants expected to like the chocolate beverage more when exposed to the happy emoji expression prime than when exposed to the sad one ($M_{happy} = 4.95$ vs. $M_{sad} = 4.33$; $p = .004$).

Taste expectations. There were no significant effects of beverage temperature or emoji expression on expected sweetness or bitterness.

In sum, the results of Experiment 3 revealed that using emoji expressions as primes did not influence the temperature expectations of the chocolate beverages, failing to provide support for the proposed alternative mechanism, although they influenced expected liking in the hypothesized direction, showing the effectiveness of the primes.

8. Experiment 4

8.1. Methods

The final sample comprised 601 participants (303 females, 292 males, 6 unreported), aged 18–35 years (M_{age} = 28.33 years, SD_{age} = 4.08. Similar to the previous experiments, the stimuli consisted of photographs of real beverages, with or without an emoji expression, from a first-person perspective and a hand reaching for it. To examine the generalizability of our findings, here we used beer and coffee, as they belong to different product categories than chocolate milk and the preferred sensory properties differed from those of chocolate milk. Beer (especially lager) is generally preferred cold and slightly bitter, although most beer drinkers in many countries do not like their beers cold, and the best serving temperature for beer can range between 5.5 °C and 12.7 °C (42 °F and 55 °F) depending on the type of beer (Oliver, 2013). As for coffee, it is mostly consumed hot, prepared with different hot brewing methods (e.g., V60, AeroPress, French Press, automatic dripper), but it can also be served cold, as drinks such as cold brew and iced coffee have gained popularity in recent years (Fuller & Rao, 2017). We used the same sad and happy emoji expressions as before, but we made the corners of the emoji expressions slightly more rounded to increase generalizability. Fig. 3 presents the stimuli used in Experiment 4. Further details on the development of the stimuli can be found in the Supplementary Material.

The experiment followed a 2 (product: beer, coffee) × 3 (emoji expression: sad, control, happy) between-participants design. Each participant evaluated either a glass of beer or a cup of coffee with or without an emoji expression. Furthermore, we used a high anthropomorphism setting similar to Experiment 2. We assigned names and genders to the products (i.e., *Mr. Hops* to the beer and *Mr. Java* to the coffee) and referred to them by their names in the questionnaire. In addition, we asked participants to focus on the product's emotions.

The procedure of Experiment 4 was similar to previous experiments with a few exceptions. To control for the possibility that arousal might drive the effects on temperature expectations given that arousal can intensify current feelings (Bradley & Lang, 1994), we directly asked participants to evaluate the valence and arousal induced by the products through two separate 9-point VASs at the end of the experiment, instead of asking for their emotional state at the beginning and at the end of the experiment through the SAM (see the Supplementary Material for exact wording). Furthermore, instead of asking participants about their temperature expectations of the products through a VAS, we asked them to give a point estimate of the temperature at which they expected the product to be degrees Fahrenheit (°F). To reduce noise in the data, we provided participants with temperature anchor points for each of the products (phrased as a normal serving temperature for either hot or cold beverages). We determined the temperature anchor point for each of the products by computing the median of their ideal serving temperature ranges, specifically 47 °F for the beer (Betancur et al., 2020) and 145 °F for the coffee (Abraham & Diller, 2019). Finally, given that the thermal sensation did not exert any effect on any of the key variables, we removed the questions related to it. The remaining questions (i.e., expected liking, sweetness, bitterness, and the anthropomorphism index) were identical to the previous experiments.

To analyse the effect of the emoji expressions on the key variables (expected temperature, expected liking, expected sweetness, and expected bitterness), we ran a set of separate ANOVAs on each of these variables with the main and interaction effects of product and emoji expression. We ran similar robustness checks as in the other experiments (reported in the Supplementary Material). Furthermore, to examine the potential presence of liking-spillover effects in the influence of the emoji expressions on expected temperature, we ran two types of analyses with the products for which the emoji expressions significantly influenced expected temperature. First, we conducted a bootstrapped mediation analysis with 10,000 iterations using the PROCESS macro for SPSS (Hayes, 2022) on expected temperature with emoji expression as the (categorical) independent variable and liking as mediator. Next, we ran

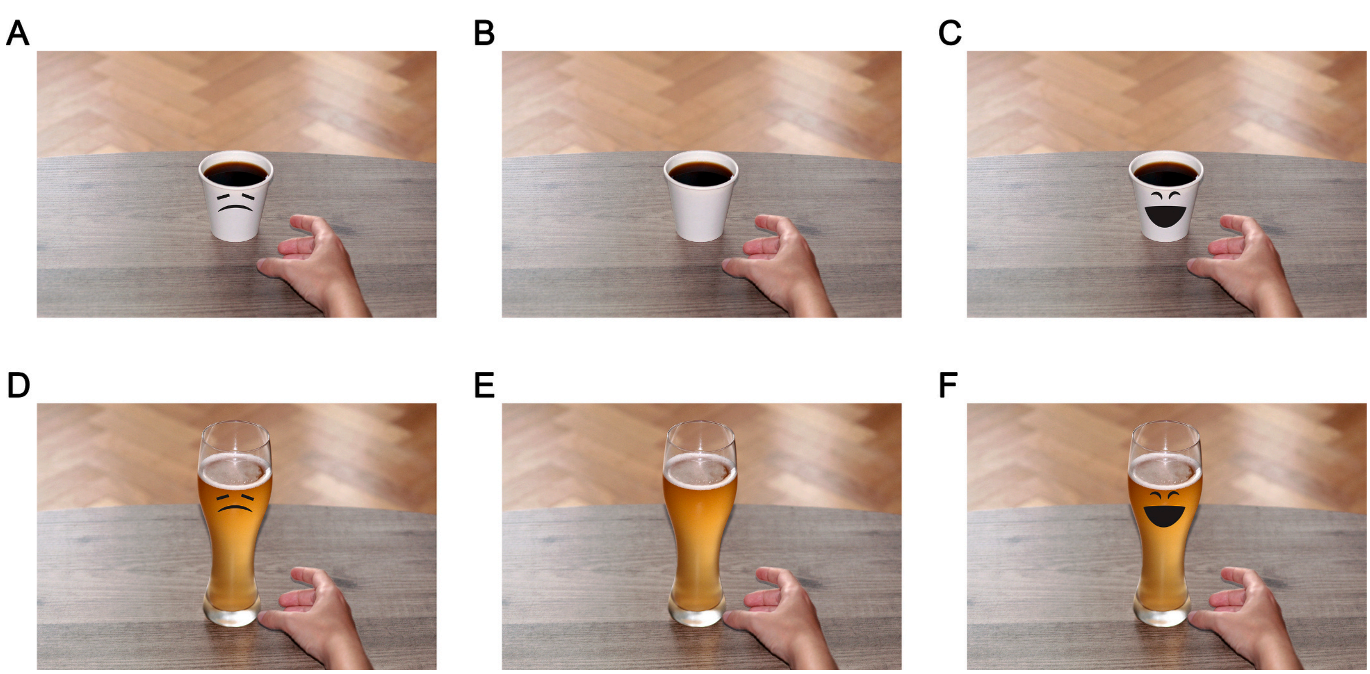

Fig. 3. Stimuli used in Experiment 4.
Note. The stimuli consisted of a cup of coffee (A–C) and glass of beer (D–E), with either the sad emoji expression (A, D), no emoji expression (B, E), or the happy emoji expression (C, F).

separate one-way ANOVAs on sweetness and bitterness with emoji expression as single factors to examine whether the effect on temperature moved in the same direction as the desired properties of the beverage when the hypothesized effect on temperature would suggest a change in the opposite direction.

8.2. Results

Expected temperature. The results revealed significant main effects of product, $F(1, 595) = 3362.24$, $p < .001$, $\eta_p^2 = 0.85$. The beer was expected to be colder than the coffee ($M_{beer} = 48.5$ °F vs. $M_{coffee} = 129.7$ °F; $p < .001$). There was also a significant main effect of emoji expression, $F(2, 595) = 11.41$, $p < .001$, $\eta_p^2 = 0.04$. The products with the sad emoji expression were expected to be colder than the control ($M_{sad} = 84.8$ °F vs. $M_{control} = 89.7$ °F; $p = .013$) and colder than the ones with the happy emoji expression ($M_{happy} = 92.7$ °F; $p < .001$). Furthermore, the results revealed a significant interaction effect of product and emoji expression on expected temperature, $F(2, 595) = 27.21$, $p < .001$, $\eta_p^2 = 0.08$. Table 2 presents the estimated marginal means for the different variables. The sad coffee was expected to be less hot than the control ($p < .001$) and than the happy coffee ($p = .015$). In addition, the happy coffee was expected to be hotter than the control ($p < .001$). There were no significant differences in the beers with the different emojis.

Expected liking. The results revealed significant main effects of product, $F(1, 595) = 4.06$, $p = .044$, $\eta_p^2 = 0.01$, and emoji expression, $F(2, 595) = 46.63$, $p < .001$, $\eta_p^2 = 0.14$. The beers were expected to be liked more than the coffees ($M_{beer} = 5.49$ vs. $M_{coffee} = 5.16$; $p = .038$). The products with the happy emoji expression were expected to be liked more than the control products ($M_{happy} = 6.12$ vs. $M_{control} = 5.58$; $p = .017$) and more than the ones with the sad emoji expression ($M_{sad} = 4.29$; $p < .001$). In addition, the products with the sad emoji expression were expected to be liked less than the control ones ($p < .001$).

Taste expectations. The results revealed significant main effects of product, $F(1, 595) = 6.59$, $p = .010$, $\eta_p^2 = 0.01$, and emoji expression, $F(2, 595) = 28.54$, $p < .001$, $\eta_p^2 = 0.08$, on expected sweetness. The beers were expected to be sweeter than the coffees ($p = .009$). The products with the happy emoji expression were expected to be sweeter than the control products ($p < .001$) and those with the sad emoji expression ($p < .001$). Furthermore, the results revealed significant main effects of product, $F(1, 595) = 6.19$, $p = .013$, $\eta_p^2 = 0.01$, and emoji expression, $F(2, 595) = 26.86$, $p < .001$, $\eta_p^2 = 0.08$, on expected bitterness. The coffees were expected to be more bitter than the beers ($p = .012$). The products with the happy emoji expression were expected to be less bitter than the control products ($p < .001$) and those with the sad emoji expression ($p < .001$).

Anthropomorphism presented a high level of internal consistency ($\omega = 0.92$, 95% CI = 0.91, 0.93). Across products, participants tended to anthropomorphize those with the sad emoji expressions than the control ($M_{sad} = 3.31$ vs. $M_{control} = 1.83$; $p < .001$) and the ones with the happy emoji expressions more than the control ($M_{happy} = 3.35$; $p < .001$). Considering solely the glass of beer, participants tended to anthropomorphize the happy more than the sad one ($M_{happy} = 3.68$ vs. $M_{sad} = 3.02$; $p = .041$) and the happy more than the control ($M_{control} = 1.96$; $p < .001$), as well as the sad one more than the control ($p < .001$). As for the coffee, participants tended to anthropomorphize more the sad one than the control ($M_{sad} = 3.61$ vs. $M_{control} = 1.92$; $p < .001$), as well as the happy one more than the control ($M_{happy} = 3.04$; $p < .001$). The results of the mediation analysis revealed that neither the interaction effect of the sad emoji expression and anthropomorphism, $\beta = 0.96$, SE = 2.04, 95% CI = [−3.054, 4.976], nor the interaction effect of the happy expression and anthropomorphism were significant, $\beta = 3.26$, SE = 2.02, 95% CI = [−0.709, 7.229]; although the effect of anthropomorphism for the control condition was significant, $\beta = -4.52$, SE = 1.713, 95% CI = [−7.890, −1.146].

Given that the emoji expressions only significantly influenced the expected temperature of coffee, we conducted the analysis to examine the presence of liking-spillover effects only with coffee. The mediation analysis of the effect of the emoji expressions on the expected temperature of coffee with liking as a mediator revealed that the relative indirect effects of the sad, $\beta = -3.85$, SE = 1.243, 95% CI = [−6.585, −1.720], and the happy, $\beta = 2.20$, SE = 0.100, 95% CI = [0.527, 4.424], emoji expression were significant. As per the relative effects, that of the happy emoji expression was not significant, $\beta = 4.60$, SE = 3.180, 95% CI = [−1.657, 10.861]. However, the relative direct effect of the sad emoji expression was significant, $\beta = -9.59$, SE = 3.253, 95% CI = [−15.988, −3.185]. Furthermore, the one-way ANOVA for coffee on expected sweetness and bitterness with emoji expression as single factor revealed a significant effect of emoji expression on the expected sweetness of coffee, $F(2,302) = 11.97$, $p < .001$, $\eta_G^2 = 0.07$. The coffee with the happy emoji expression was expected to be sweeter than the control ($M_{happy} = 3.32$ vs. $M_{control} = 2.46$; $p = .002$) and the sad coffee ($M_{sad} = 2.16$; $p < .001$). However, there was no difference between the sad coffee and the control ($p = .690$). The one-way ANOVA on bitterness revealed a significant effect of emoji expression, $F(2, 302) = 15.71$, $p < .001$, $\eta_G^2 = 0.09$. The coffee with the happy emoji expression was expected to be less bitter than the control ($M_{happy} = 5.31$ vs. $M_{control} = 6.38$; $p < .001$) and the sad coffee ($M_{sad} = 6.77$; $p < .001$). However, there was no difference between the sad coffee and the control ($p = .424$). Altogether, the results of the mediation analysis based on liking of the sad emoji expression on expected temperature, as well as the presence of an effect of the sad emoji expression on liking but lack of effect on desirable properties of the product (i.e., sweetness, bitterness) suggest that while a hedonic mechanism may have partly driven the effect of the sad emoji expression on temperature, it did not fully account for it.

In summary, the results of Experiment 4, using two different products, revealed that the emoji expressions significantly influenced the expected temperature of the coffee but not the beer. Supporting H_{1B}, the sad emoji expression decreased the expected temperature of the coffee, whereas the happy emoji expression increased its expected temperature. Importantly, our analyses examining the presence of liking-spillover effects suggest that the effects of the happy emoji expression on the expected temperature of the coffee are partly, but not entirely, driven by

Table 2
Estimated marginal means of key variables in Experiment 4.

	Coffee			Beer		
	Sad	Blank	Happy	Sad	Blank	Happy
Expected temperature	118.43 [114.35, 122.51]	131.87 [127.77, 135.97]	138.68 [134.6, 142.75]	51.12 [47.02, 55.22]	47.51 [43.32, 51.69]	46.77 [42.61, 50.93]
Expected liking	4.11 [3.64, 4.57]	5.34 [4.87, 5.81]	6.04 [5.57, 6.51]	4.47 [4, 4.93]	5.81 [5.34, 6.29]	6.2 [5.73, 6.68]
Expected sweetness	2.16 [1.75, 2.57]	2.46 [2.04, 2.87]	3.32 [2.91, 3.73]	2.45 [2.03, 2.86]	2.8 [2.38, 3.22]	3.79 [3.37, 4.2]
Expected bitterness	6.77 [6.31, 7.24]	6.38 [5.91, 6.84]	5.31 [4.85, 5.78]	6.38 [5.91, 6.84]	5.85 [5.37, 6.32]	5.03 [4.56, 5.51]

Note. Expected temperature values are in degrees Fahrenheit (°F). Expected liking, sweetness, and bitterness values are based on a 9-point VAS from 1 (*Not at all*) to 9 (*Very much*). 95% Confidence intervals are presented below each mean.

liking.

9. General discussion

Through six experiments, we document that the use of emotional cues, operationalized via the use of emoji expressions associated with cold and hot temperatures, can influence product temperature expectations in online settings. Fig. 4 presents a graphical summary of the results on expected temperature in all the experiments reported here. Taken together, our results provide support to our hypothesized main mechanism for the influence of emotional cues (i.e., emoji expressions) on product temperature expectations, namely, the embodiment of the emotions evoked by the emoji expressions and, subsequently, their congruent temperature associations. The influence of the emotional cues was found only when they were used on the product's receptacle but not when they were used as emotional primes (as indicated by the proposed alternative mechanism). Furthermore, the impact of the emoji expressions was enhanced by higher levels of anthropomorphism, suggesting that the more individuals thought of the product as having human-like characteristics, the more they believed the product was imbued with the emotions (and the temperatures associated with them).

Regarding the hypothesized potential alternative mechanism, even though happy emojis have been found to induce positive changes in consumers' affective state (Smith & Rose, 2020), the results of Experiment 3 revealed that participants reported experiencing a change in valence (i.e., a decrease) only when exposed to the sad emoji expression. However, there were no significant effects on the beverage's expected temperature under this condition. The results further support our hypothesized main mechanism that the effects of emotional cues on product expected temperature come from embodiment account and not from an individual's change in emotional state triggered by the emoji expressions. That being said, it is worth considering the effect of the emoji expressions on participants' emotional states may not have been large enough to begin with for effects on expected temperature to occur, if any.

It is worth highlighting that the influence of the emotional cues on expected temperature was only found in the hot beverages (i.e., hot chocolate and coffee), which could have been caused by a general difference in people's sensitivity to hot temperatures compared to cold ones or by differences in the hedonic levels of chocolate beverages at the

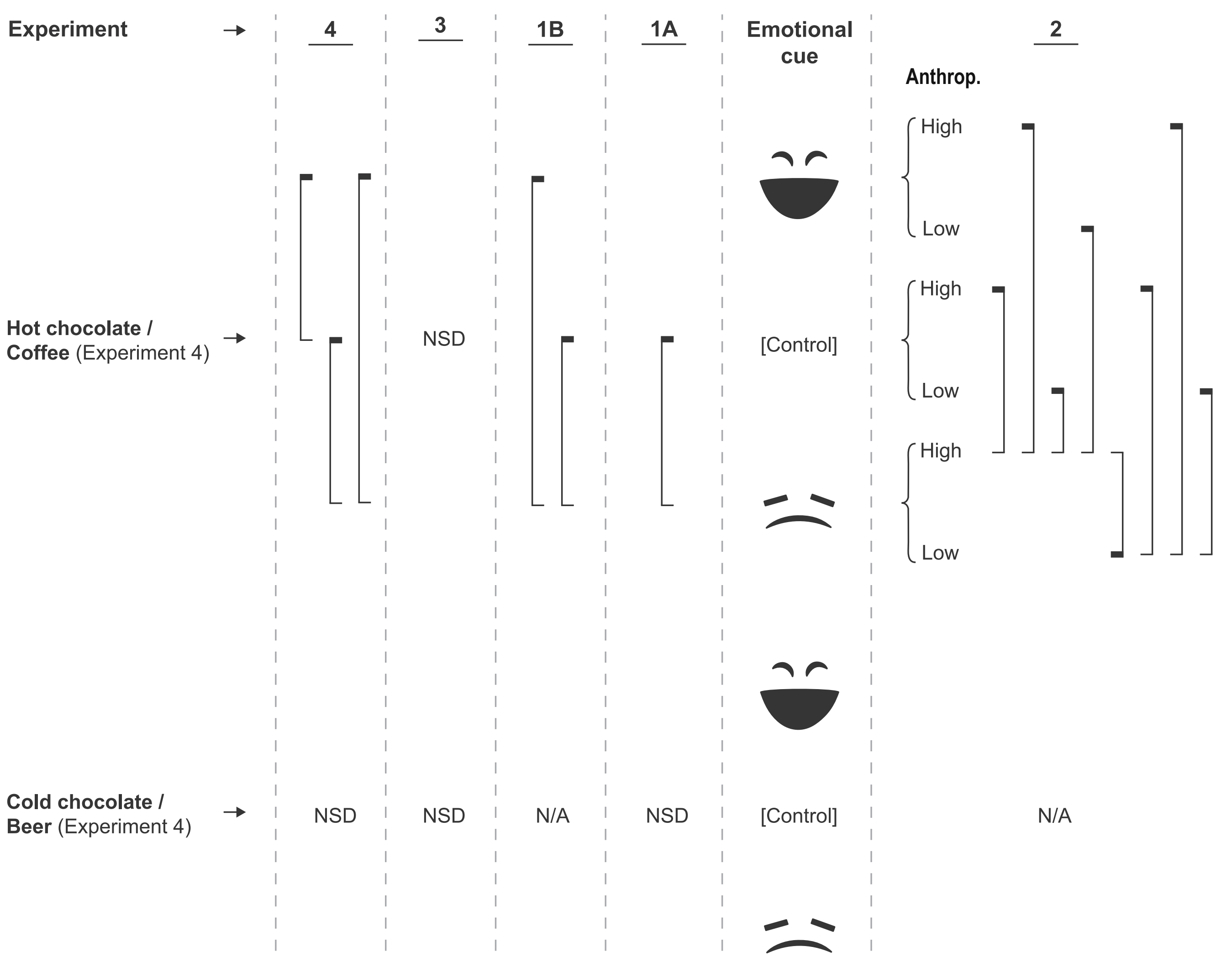

Fig. 4. Graphical summary of key results on expected temperature.
Note. The figure presents a summary of the differences in temperature expectations of the stimuli under the different conditions in all the experiments. The column with the emotional stimuli serves as the core of the figure to illustrate how each specific stimulus compared to all the other stimuli in every experiment. All other columns relate to one of the experiments. The upper panel relates to the hot chocolate/coffee, and the lower panel relates to the cold chocolate/beer. Square brackets indicate statistically significant differences between conditions in each experiment, and the thicker end indicates the condition with the higher estimated marginal mean. The different anthropomorphism conditions in Experiment 2 (right-hand-side) are represented by the curly brackets stemming from each emotional cue. *Anthrop.* = anthropomorphism condition (Experiment 2). N/A = condition not tested. NSD = no significant difference.

two temperatures. In the former case, it is possible that as people are more sensitive to changes in temperature at higher ranges than at lower ones (Bunk et al., 2018), due to repeated exposure, they may be prone to expect wider changes in temperature for hot foodstuffs than for cold ones. Related to the hedonic levels of products, Zhou et al. (2021) found that extrinsic factors (e.g., food shape) may exert a higher influence on the evaluation of hedonic food products than on utilitarian ones. Moreover, emojis used in product advertisements have been shown to trigger changes in consumers' emotions only in hedonic products and not in utilitarian ones (Das et al., 2019). Here, it is possible that differences in hedonic levels between the chocolate beverages may have influenced the results. Even though chocolate milk is overall a hedonic product (Shen et al., 2016), hot chocolate tends to be more hedonic than iced/cold chocolate, as the former evokes feelings of warmth and coziness (Phillips, 2000). That being said, the differences in hedonic levels may not be large enough to meaningfully interact with the effects of extrinsic factors. Thus, consumers may have been more susceptible to the effects of the sad emoji expression with the hot chocolate beverage than the cold one. It is also possible that since hot chocolate tends to be more hedonic than cold chocolate, individuals imbued it with emotions more easily, which seems to be supported by the overall higher levels of anthropomorphism under the hot beverage condition than the cold one.

Importantly, with the hot chocolate, significant effects on temperature expectations were only found with the sad emoji expression but not with the happy one. This may be the result of asymmetries between positive and negative information. All else equal, people tend to assign higher weight to negative information than to positive information. Research has shown that negative information has stronger effects across a wide array of psychological phenomena than positive information of equal magnitude, an effect termed negativity bias (Norris, 2021). In our study, the negative valence of the sad emoji expression may have had a higher weight and, consequently, a higher impact on participants' evaluations than the happy one. Relatedly, it is possible that given that people are continuously exposed to positive emotional stimuli like happy faces on food packaging and in advertising, the happy facial expression was not salient enough, leading to no significant effect. Conversely, as sad stimuli in food packaging are more unusual, the sad facial expression here could have been more salient, leading to a significant effect. Alternatively, the temperature associations of the sad expression might have been stronger than the happy one. Furthermore, it is possible that these results are driven by the incongruence between the sad emoji expression and the chocolate beverage, which is inherently positively valenced (Shen et al., 2016).

It is important to consider alternative explanations for the effects found here. It is possible that the effects of the emoji expressions on expected temperature could have been the product of liking-spillover effects. The results of the mediation analysis in Experiment 4 revealed that the effects of the happy emoji expression on the expected temperature of coffee were the result of halo effects based on liking. However, while the effects of the sad emoji expression were partly influenced by liking, they did not fully account for their effect, as revealed by the mediation analysis. Furthermore, the analysis of the sensory evaluation of the coffee revealed results in line with this point. The happy emoji expression increased sensory properties preferred in coffee compared to the control condition. More specifically, it increased sweetness and reduced bitterness. However, the sad emoji expression did not result in significant differences in sweetness or bitterness with respect to the control. These results indicate a transference of liking to the preferred characteristics of coffee in the case of the happy emoji expression. However, this was not the case for the sad emoji expression, suggesting the absence of spillover effects. In sum, the effect of the sad emoji expression is not driven by a transference of liking. These results also highlight the asymmetry between positive and negative emotions. The magnitude of the difference between the sad coffee and the control coffee was larger than that between the happy coffee and the control. It is possible that a higher emotional weight of the negative emoji (vs. the happy one) results in higher levels of embodiment, as evidenced by participants' higher tendency to anthropomorphize the sad coffee than the happy one.

An additional potential alternative explanation of the findings here relates to signalling. Individuals may have construed that the sad emoji expression was signalling that something was wrong with the product. However, the results on the sensory properties of the chocolate beverage and the coffee provide support against this alternative explanation. Neither the sad chocolate beverage nor the sad coffee was expected to be less sweet or more bitter than their respective control conditions. This suggests that participants may not have thought that either the hot chocolate or the coffee were subpar products.

In addition, given the existence of colour-temperature associations, as evidenced by extant literature (Ho, Iwai, et al., 2014; Ho, Van Doorn, et al., 2014), the expected temperature of the products could have been influenced by the larger proportion of black in the stimuli with the happy facial expression, with a wide open smile, compared to the other stimuli. However, the direction of these potential influences is not clear.

Overall, the results indicated that participants tended to like the beverages with the sad emoji expressions less than those with the happy expressions and the controls. Even though these results might seem unremarkable, they are more complex than apparent at first sight. People tend to seek negative emotional stimuli, as they enjoy and value them (Levinson, 2014), as evidenced by how sadness in art (Taruffi & Koelsch, 2014). In business contexts, research has shown that negative emotional cues can trigger positive emotions and behaviours, as they can generate feelings of empathy and help develop connections (Van Kleef & Côté, 2022). Importantly, negatively valenced emojis in marketing communications have been shown to trigger higher levels of consumer satisfaction and repurchase intention compared to positively valenced emojis (Ma & Wang, 2021). In our study, although it was not the case, based on the literature introduced above, the sad emoji expression could increase the liking of beverages due to perceptions of cuteness and feelings of empathy (Kringelbach et al., 2016). This latter effect could be more prevalent in younger individuals since they interpret emojis differently (Herring & Dainas, 2020; Chen et al., 2024). Hence, our results add to the literature on negative emotions.

In terms of taste expectations, the sad emoji expression on the cup increased the expected bitterness, whereas the happy emoji expression increased the expected sweetness of the beverages. These findings are in line with a study conducted by Wang and Spence (2018) in which the authors found that people perceived fruit juice to be more sweet than sour when they looked at a picture of a laughing child compared to a crying one while drinking the juice. Nevertheless, in the absence of a control condition, it is not clear whether the effects on taste perception were driven by either the laughing face or the crying one. Furthermore, our results are consistent with previous literature on associations between taste words and emotion words showing that sweetness is associated with happiness, whereas bitterness is associated with sadness (Zhou & Tse, 2020).

9.1. Theoretical contributions

The present work contributes to the growing literature on the rich relationships between emotions and temperature in multiple domains, especially consumer products and foodstuffs. While previous studies have documented that exposure to specific physical or visually-induced temperatures can impact product evaluations (Park & Hadi, 2020; Zwebner et al., 2014), the present work extends this line of research by investigating an understudied direction of this relationship. More specifically, we show that imbuing a product with specific emotional content can influence expectations of a concrete sensory dimension of products, namely temperature. We show that individuals' associations between emotions and temperature (Barbosa Escobar et al., 2021) can be operationalized in a straightforward way through emoji expressions and anthropomorphism and leveraged to influence product-temperature expectations. Importantly, we show that not all emotions are created equal, such that negative emotions may exert a greater impact on product temperature expectations. We consistently found that the effects were driven by the sad emoji expression and not the happy one. That is, the sad beverages were expected to be significantly colder than the rest, but the happy beverages were equivalent to the control. Although under different contexts (e.g., processes, direction of effects, study target—human vs. object), these findings contribute to the literature on potential connections between physical and emotional warmth, including recent studies failing to find significant effects of physical warmth on social warmth judgment of others (e.g., Chabris et al., 2019; Koppang et al., 2024; Lynott et al., 2014). Furthermore, our work contributes to the expanding literature on affective touch, as temperature is an important factor in the pleasure derived from touch (Spence, 2022b). We show another way in which touch and emotions are connected, and our work opens possibilities for a new line of research investigating the effects of temperature-associated emotional cues on product perception and the pleasure derived from these products.

9.2. Implications for industry

Our findings reveal that emotional cues, such as emoji facial expressions, can influence foodstuffs' expected temperature, which can expand the utility of emotional cues in marketing (Andrade, 2015; Bagozzi et al., 1999). The use of expressive facial cues (e.g., cute facial expressions as in *Kawaii*, and *Kindchenschema*) in marketing, already a growing research area (Dydynski, 2020), can positively impact consumers' perceptions and behaviours and enhance the appeal and taste perception of food products (Schnurr, 2019). Subtle smile- and frown-like cues can similarly affect consumer expectations (Salgado-Montejo et al., 2015). For marketers, this means using emoji expressions may highlight specific dimensions of sensory expectations and emotional responses to food. These strategies are particularly relevant for the booming online food delivery market (Kaur et al., 2021) and may enhance experiences in augmented reality (Fritz et al., 2023).

9.3. Limitations

Various limitations of the present study are worth noting. We tested a limited number of product categories. It is, therefore, not guaranteed that the effects of emotional stimuli on the product expected temperature found here will necessarily extend to every other food category. Furthermore, the emotional stimuli used here related to happy and sad emotions. The effects of stimuli conveying other emotions with temperature associations (e.g., anger; Barbosa Escobar et al., 2021) may differ. In addition, low-level features of the emoji expressions (e.g., curvature) or their different arousal evocations may play a role in the effects. Moreover, we did not use a neutral-temperature control condition, given that we aimed to use ecologically valid products for which temperature was a key dimension and hence consumed either hot or cold. While we used emoji facial expressions to operationalize emotional content and imbue a product with emotions, other ways to convey emotions, such as text and audio, are possible.

Ethical statement

- Ethical approval for the experiments reported here was granted by Aarhus University's Research Ethics Committee as institutional review board under approval No. 2021-101.
- Participants provided their informed written consent before participating in each of the experiments reported here.

CRediT authorship contribution statement

Francisco Barbosa Escobar: Writing – review & editing, Writing – original draft, Visualization, Resources, Project administration, Methodology, Investigation, Formal analysis, Conceptualization. **Carlos Velasco:** Writing – review & editing, Writing – original draft, Supervision, Resources, Methodology, Conceptualization. **Derek V. Byrne:** Writing – review & editing, Supervision, Resources, Funding acquisition. **Qian Janice Wang:** Writing – review & editing, Writing – original draft, Supervision, Resources, Methodology, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The data is publicly available on its OSF page: https://osf.io/53bfs/

Acknowledgement

This research was supported by a Carlsberg Young Researcher Fellowship received by Qian Janice Wang. The authors thank the Basic Research Fund at BI Norwegian Business School for partly funding this research. Francisco Barbosa Escobar thanks Signe Lund Mathiesen, Line Pedersen, Johanne Juhl, and Margot Brichet for their help in the development of stimuli.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.foodqual.2024.105387.

References

Aaker, D. A., Stayman, D. M., & Hagerty, M. R. (1986). Warmth in advertising: Measurement, impact, and sequence effects. *Journal of Consumer Research, 12*(4), 365–381. https://doi.org/10.1086/208524

Abraham, J., & Diller, K. (2019). A review of hot beverage temperatures—Satisfying consumer preference and safety. *Journal of Food Science, 84*(8), 2011–2014. https://doi.org/10.1111/1750-3841.14699

Andrade, E. B. (2015). Consumer emotions. In M. I. Norton, D. D. Rucker, & C. Lamberton (Eds.), *The Cambridge handbook of consumer psychology* (pp. 90–121). Cambridge University Press. https://doi.org/10.1017/CBO9781107706552.004.

Bagozzi, R. P., Gopinath, M., & Nyer, P. U. (1999). The role of emotions in marketing. *Journal of the Academy of Marketing Science, 27*(2), 184–206. https://doi.org/10.1177/0092070399272005

Barbosa Escobar, F., Velasco, C., Motoki, K., Byrne, D. V., & Wang, Q. J. (2021). The temperature of emotions. *PLOS One, 16*(6), Article e0252408. https://doi.org/10.1371/journal.pone.0252408

Barrett, L. F. (2006). Solving the emotion paradox: Categorization and the experience of emotion. *Personality and Social Psychology Review, 10*(1), 20–46. https://doi.org/10.1207/s15327957pspr1001_2

Barsalou, L. W. (2010). Grounded cognition: Past, present, and future. *Topics in Cognitive Science, 2*(4), 716–724. https://doi.org/10.1111/j.1756-8765.2010.01115.x

Basso, F., Petit, O., Le Bellu, S., Lahlou, S., Cancel, A., & Anton, J.-L. (2018). Taste at first (person) sight: Visual perspective modulates brain activity implicitly associated with viewing unhealthy but not healthy foods. *Appetite, 128*, 242–254. https://doi.org/10.1016/j.appet.2018.06.009

Betancur, M. I., Motoki, K., Spence, C., & Velasco, C. (2020). Factors influencing the choice of beer: A review. *Food Research International, 137*, Article 109367. https://doi.org/10.1016/j.foodres.2020.109367

Bradley, M., & Lang, P. J. (1994). Measuring emotion: The self-assessment semantic manikin and the semantic differential. *Journal of Behavior Therapy and Experimental Psychiatry, 25*(1), 49–59. https://doi.org/10.1016/0005-7916(94)90063-9

Brown, F., & Diller, K. R. (2008). Calculating the optimum temperature for serving hot beverages. *Burns, 34*(5), 648–654. https://doi.org/10.1016/j.burns.2007.09.012

Bunk, S. F., Lautenbacher, S., Rüsseler, J., Müller, K., Schultz, J., & Kunz, M. (2018). Does EEG activity during painful stimulation mirror more closely the noxious stimulus intensity or the subjective pain sensation? *Somatosensory & Motor Research, 35*(3–4), 192–198. https://doi.org/10.1080/08990220.2018.1521790

Chabris, C. F., Heck, P. R., Mandart, J., Benjamin, D. J., & Simons, D. J. (2019). No evidence that experiencing physical warmth promotes interpersonal warmth: Two failures to replicate. *Social Psychology, 50*(2), 127–132. https://doi.org/10.1027/1864-9335/a000361

Cheema, A., & Patrick, V. M. (2012). Influence of warm versus cool temperatures on consumer choice: A resource depletion account. *Journal of Marketing Research, 49*(6), 984–995. https://doi.org/10.1509/jmr.08.0205

Chen, F., Sengupta, J., & Adaval, R. (2018). Does endowing a product with life make one feel more alive? The effect of product anthropomorphism on consumer vitality. *Journal of the Association for Consumer Research, 3*(4), 503–513. https://doi.org/10.1086/698493

Chen, R. P., Wan, E. W., & Levy, E. (2017). The effect of social exclusion on consumer preference for anthropomorphized brands. *Journal of Consumer Psychology, 27*(1), 23–34. https://doi.org/10.1016/j.jcps.2016.05.004

Chen, Y., Yang, X., Howman, H., & Filik, R. (2024). Individual differences in emoji comprehension: Gender, age, and culture. *PLOS ONE, 19*(2), Article e0297379. https://doi.org/10.1371/journal.pone.0297379

Cherbonnier, A., & Michinov, N. (2021). The recognition of emotions beyond facial expressions: Comparing emoticons specifically designed to convey basic emotions with other modes of expression. *Computers in Human Behavior, 118*, Article 106689. https://doi.org/10.1016/j.chb.2021.106689

Cheskin, L. (1957). *How to predict what people will buy*. Liveright.

Chinazzo, G., Chamilothori, K., Wienold, J., & Andersen, M. (2021). Temperature–color interaction: Subjective indoor environmental perception and physiological responses in virtual reality. *Human Factors, 63*(3), 474–502. https://doi.org/10.1207/s15327957pspr1001_2

Christian, B. M., Miles, L. K., Kenyeri, S. T., Mattschey, J., & Macrae, C. N. (2016). Taming temptation: Visual perspective impacts consumption and willingness to pay for unhealthy foods. *Journal of Experimental Psychology: Applied, 22*(1), 85–94. https://doi.org/10.1037/xap0000067

Das, G., Wiener, H. J. D., & Kareklas, I. (2019). To emoji or not to emoji? Examining the influence of emoji on consumer reactions to advertising. *Journal of Business Research, 96*, 147–156. https://doi.org/10.1016/j.jbusres.2018.11.007

Dydynski, J. M. (2020). Modeling cuteness: Moving towards a biosemiotic model for understanding the perception of cuteness and kindchenschema. *Biosemiotics, 13*(2), 223–240. https://doi.org/10.1007/s12304-020-09386-9

Elder, R. S., & Krishna, A. (2012). The "Visual Depiction Effect" in advertising: Facilitating embodied mental simulation through product orientation. *Journal of Consumer Research, 38*(6), 988–1003. https://doi.org/10.1086/661531

Engelen, L., de Wijk, R. A., Prinz, J. F., Janssen, A. M., Weenen, H., & Bosman, F. (2003). The effect of oral and product temperature on the perception of flavor and texture attributes of semi-solids. *Appetite, 41*, 273–281. https://doi.org/10.1016/S0195-6663(03)00105-3

Epley, N. (2018). A mind like mine: The exceptionally ordinary underpinnings of anthropomorphism. *Journal of the Association for Consumer Research, 3*(4), 591–598. https://doi.org/10.1086/699516

Epley, N., Waytz, A., & Cacioppo, J. T. (2007). On seeing human: A three-factor theory of anthropomorphism. *Psychological Review, 114*(4), 864–886. https://doi.org/10.1037/0033-295X.114.4.864

Erle, T. M., Schmid, K., Goslar, S. H., & Martin, J. D. (2022). Emojis as social information in digital communication. *Emotion, 22*(7), 1529–1543. https://doi.org/10.1037/emo0000992

Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods, 39*(2), 175–191. https://doi.org/10.3758/BF03193146

Fritz, W., Hadi, R., & Stephen, A. (2023). From tablet to table: How augmented reality influences food desirability. *Journal of the Academy of Marketing Science, 51*(3), 503–529. https://doi.org/10.1007/s11747-022-00919-x

Fuller, M., & Rao, N. Z. (2017). The effect of time, roasting temperature, and grind size on caffeine and chlorogenic acid concentrations in cold brew coffee. *Scientific Reports, 7*(1), Article 17979. https://doi.org/10.1038/s41598-017-18247-4

Hadi, R., & Block, L. (2019). Warm hearts and cool heads: Uncomfortable temperature influences reliance on affect in decision-making. *Journal of the Association for Consumer Research, 4*(2), 102–114. https://doi.org/10.1086/701820

Han, N. R., Baek, T. H., Yoon, S., & Kim, Y. (2019). Is that coffee mug smiling at me? How anthropomorphism impacts the effectiveness of desirability vs. feasibility appeals in sustainability. *Journal of Retailing and Consumer Services, 51*, 352–361. https://doi.org/10.1016/j.jretconser.2019.06.020

Hayes, A. F. (2022). *Introduction to mediation, moderation, and conditional process analysis: Third edition: A regression-based approach* (3rd ed.). The Guilford Press.

Herring, S. C., & Dainas, A. R. (2020). Gender and age influences on interpretation of emoji functions. *ACM Transactions on Social Computing, 3*(2), 2469–7818. https://doi.org/10.1145/3375629

Heschong, L. (1979). *Thermal delight in architecture*. MIT Press.

Ho, H.-N., Iwai, D., Yoshikawa, Y., Watanabe, J., & Nishida, S. (2014). Combining colour and temperature: A blue object is more likely to be judged as warm than a red object. *Scientific Reports, 4*(1), 5527. https://doi.org/10.1038/srep05527

Ho, H.-N., Van Doorn, G. H., Kawabe, T., Watanabe, J., & Spence, C. (2014). Colour-temperature correspondences: When reactions to thermal stimuli are influenced by colour. *PLoS One, 9*(3), Article e91854. https://doi.org/10.1371/journal.pone.0091854

Jones, L. L., Wurm, L. H., Norville, G. A., & Mullins, K. L. (2020). Sex differences in emoji use, familiarity, and valence. *Computers in Human Behavior, 108*, Article 106305. https://doi.org/10.1016/j.chb.2020.106305

Kaur, P., Dhir, A., Talwar, S., & Ghuman, K. (2021). The value proposition of food delivery apps from the perspective of theory of consumption value. *International Journal of Contemporary Hospitality Management, 33*(4), 1129–1159. https://doi.org/10.1108/IJCHM-05-2020-0477

Kazak, A. E. (2018). Editorial: Journal article reporting standards. *American Psychologist, 73*(1), 1–2. https://doi.org/10.1037/amp0000263

Kim, D. J. M., & Yoon, S. (2021). Guilt of the meat-eating consumer: When animal anthropomorphism leads to healthy meat dish choices. *Journal of Consumer Psychology, 31*(4), 665–683. https://doi.org/10.1002/jcpy.1215

Koppang, H., Harem, T., Mayiwar, L., & Pineda, J. (2024). Physical and social warmth. *Royal Society Open Science, 11*(5), Article 231575. https://doi.org/10.1098/rsos.231575

Kövecses, Z. (2020). A brief outline of "standard" conceptual metaphor theory and some outstanding issues. In Z. Kövecses (Ed.), *Extended conceptual metaphor theory* (pp. 1–21). Cambridge University Press. https://doi.org/10.1017/9781108859127.

Kringelbach, M. L., Stark, E. A., Alexander, C., Bornstein, M. H., & Stein, A. (2016). On cuteness: Unlocking the parental brain and beyond. *Trends in Cognitive Sciences, 20*(7), 545–558. https://doi.org/10.1016/j.tics.2016.05.003

Kutsuzawa, G., Umemura, H., Eto, K., & Kobayashi, Y. (2022). Age differences in the interpretation of facial emojis: Classification on the arousal-valence space. *Frontiers in Psychology, 13*, Article 915550. https://doi.org/10.3389/fpsyg.2022.915550

Lakoff, G., & Johnson, M. (1980). *Metaphors we live by*. University of Chicago Press.

Lee, R., Flavell, J. C., Tipper, S. P., Cook, R., & Over, H. (2021). Spontaneous first impressions emerge from brief training. *Scientific Reports, 11*(1), Article 15024. https://doi.org/10.1038/s41598-021-94670-y

Lee, S. H.(M.), Rotman, J. D., & Perkins, A. W. (2014). Embodied cognition and social consumption: Self-regulating temperature through social products and behaviors. *Journal of Consumer Psychology, 24*(2), 234–240. https://doi.org/10.1016/j.jcps.2013.09.006

Levinson, J. (2014). *Suffering art gladly: The paradox of negative emotion in art*. Palgrave Macmillan.

Libby, L. K., & Eibach, R. P. (2011). Visual perspective in mental imagery: A representational tool that functions in judgment, emotion, and self-insight. In J. M. Olson, & M. P. Zanna (Eds.), *Vol. 44. Advances in experimental social psychology* (pp. 185–245). Academic Press. https://doi.org/10.1016/B978-0-12-385522-0.00004-4.

Liu, B. (2012). Sentiment analysis and opinion mining. *Synthesis Lectures on Human Language Technologies, 1*. https://doi.org/10.1007/978-3-031-02145-9

Liu, M., Duan, Y., Ince, R. A. A., Chen, C., Garrod, O. G. B., Schyns, P. G., & Jack, R. E. (2022). Facial expressions elicit multiplexed perceptions of emotion categories and dimensions. *Current Biology, 32*(1), 200–209.e6. https://doi.org/10.1016/j.cub.2021.10.035

Lynott, D., Corker, K. S., Wortman, J., Connell, L., Donnellan, M. B., Lucas, R. E., & O'Brien, K. (2014). Replication of "Experiencing physical warmth promotes interpersonal warmth" by Williams and Bargh (2008). *Social Psychology, 45*(3), 216–222. https://doi.org/10.1027/1864-9335/a000187

Ma, R., & Wang, W. (2021). Smile or pity? Examine the impact of emoticon valence on customer satisfaction and purchase intention. *Journal of Business Research, 134*, 443–456. https://doi.org/10.1016/j.jbusres.2021.05.057

Mishra, R., & Mehta, R. (2023). The effects of food anthropomorphism on consumer behavior: A systematic literature review with integrative framework and future research directions. *Appetite*. , Article 107035. https://doi.org/10.1016/j.appet.2023.107035

Noel, C., & Dando, R. (2015). The effect of emotional state on taste perception. *Appetite, 95*, 89–95. https://doi.org/10.1016/j.appet.2015.06.003

Noelke, C., McGovern, M., Corsi, D. J., Jimenez, M. P., Stern, A., Wing, I. S., & Berkman, L. (2016). Increasing ambient temperature reduces emotional well-being. *Environmental Research, 151*, 124–129. https://doi.org/10.1016/j.envres.2016.06.045

Norris, C. J. (2021). The negativity bias, revisited: Evidence from neuroscience measures and an individual differences approach. *Social Neuroscience, 16*(1), 68–82. https://doi.org/10.1080/17470919.2019.1696225

Novak, P. K., Smailović, J., Sluban, B., & Mozetič, I. (2015). Sentiment of emojis. *PLoS One, 10*(12), Article e0144296. https://doi.org/10.1371/journal.pone.0144296

Oliver, G. (2013). Serving beer. In G. Oliver (Ed.), *The Oxford companion to beer*. Oxford University Press. https://doi.org/10.1093/acref/9780195367133.001.0001/acref-9780195367133-e-1011.

Park, J., & Hadi, R. (2020). Shivering for status: When cold temperatures increase product evaluation. *Journal of Consumer Psychology, 30*(2), 314–328. https://doi.org/10.1002/jcpy.1133

Peters, K., & Kashima, Y. (2015). A multimodal theory of affect diffusion. *Psychological Bulletin, 141*(5), 966–992. https://doi.org/10.1037/bul0000020

Phillips, D. M. (2000). How does it make me feel?: A consumer's satisfaction response to food products. *Journal of Food Products Marketing, 6*(2), 15–33. https://doi.org/10.1300/J038v06n02_03

Piqueras-Fiszman, B., & Spence, C. (2012). The influence of the feel of product packaging on the perception of the oral-somatosensory texture of food. *Food Quality and Preference, 26*(1), 67–73. https://doi.org/10.1016/j.foodqual.2012.04.002

Pramudya, R. C., & Seo, H. S. (2018). Influences of product temperature on emotional responses to, and sensory attributes of, coffee and green tea beverages. *Frontiers in Psychology, 8*, 2264. https://doi.org/10.3389/fpsyg.2017.02264

Puzakova, M., & Aggarwal, P. (2018). Brands as rivals: Consumer pursuit of distinctiveness and the role of brand anthropomorphism. *Journal of Consumer Research, 45*(4), 869–888. https://doi.org/10.1093/jcr/ucy035

R Core Team. (2023). R: A language and environment for statistical computing [Computer software]. https://www.r-project.org/.

Reinoso-Carvalho, F., Gunn, L., Molina, G., Narumi, T., Spence, C., Suzuki, Y., ter Horst, E., & Wagemans, J. (2020). A sprinkle of emotions vs a pinch of crossmodality: Towards globally meaningful sonic seasoning strategies for enhanced multisensory tasting experiences. *Journal of Business Research, 117*, 389–399. https://doi.org/10.1016/j.jbusres.2020.04.055

Salgado-Montejo, A., Tapia Leon, I., Elliot, A. J., Salgado, C. J., & Spence, C. (2015). Smiles over frowns: When curved lines influence product preference. *Psychology & Marketing, 32*(7), 771–781. https://doi.org/10.1002/mar.20817

Schnurr, B. (2019). Too cute to be healthy: How cute packaging designs affect judgments of product tastiness and healthiness. *Journal of the Association for Consumer Research, 4*(4), 363–375. https://doi.org/10.1086/705029

Shen, H. A. O., Zhang, M., & Krishna, A. (2016). Computer interfaces and the "direct-touch" effect: Can iPads increase the choice of hedonic food? *Journal of Marketing Research, 53*(5), 745–758. https://doi.org/10.1509/jmr.14.0563

Singh, A., & Seo, H.-S. (2020). Sample temperatures can modulate both emotional responses to and sensory attributes of tomato soup samples. *Food Quality and Preference, 86*, Article 104005. https://doi.org/10.1016/j.foodqual.2020.104005

Smith, L. W., & Rose, R. L. (2020). Service with a smiley face: Emojional contagion in digitally mediated relationships. *International Journal of Research in Marketing, 37*(2), 301–319. https://doi.org/10.1016/j.ijresmar.2019.09.004

Spence, C. (2021). *Sensehacking: How to use the power of your senses for happier, heathier living.* Viking Penguin.

Spence, C. (2022a). Experimental atmospherics: A multi-sensory perspective. *Qualitative Market Research: An International Journal, 25*(5), 662–673. https://doi.org/10.1108/QMR-04-2022-0070

Spence, C. (2022b). Multisensory contributions to affective touch. *Current Opinion in Behavioral Sciences, 43*, 40–45. https://doi.org/10.1016/j.cobeha.2021.08.003

Spence, C. (2022c). What is the link between personality and food behavior? *Current Research in Food Science, 5*, 19–27. https://doi.org/10.1016/j.crfs.2021.12.001

Spence, C. (2023). Ginger: The pungent spice. *International Journal of Gastronomy and Food Science, 33*, Article 100793. https://doi.org/10.1016/j.ijgfs.2023.100793

Stokes, C. N., O'Sullivan, M. G., & Kerry, J. P. (2016). Assessment of black coffee temperature profiles consumed from paper-based cups and effect on affective and descriptive product sensory attributes. *International Journal of Food Science and Technology, 51*(9), 2041–2048. https://doi.org/10.1111/ijfs.13176

Tam, K.-P., Lee, S.-L., & Chao, M. M. (2013). Saving Mr. Nature: Anthropomorphism enhances connectedness to and protectiveness toward nature. *Journal of Experimental Social Psychology, 49*(3), 514–521. https://doi.org/10.1016/j.jesp.2013.02.001

Taruffi, L., & Koelsch, S. (2014). The paradox of music-evoked sadness: An online survey. *PLoS One, 9*(10), Article e110490. https://doi.org/10.1371/journal.pone.0110490

Toet, A., Kaneko, D., Ushiama, S., Hoving, S., Kruijf, I.d., Brouwer, A. M., … van Erp, J. B. F. (2018). EmojiGrid: A 2D pictorial scale for the assessment of food elicited emotions. *Frontiers in Psychology, 9*, 2396. https://doi.org/10.3389/fpsyg.2018.02396

Van Kleef, G. A., & Côté, S. (2022). The social effects of emotions. *Annual Review of Psychology, 73*(1), 629–658. https://doi.org/10.1146/annurev-psych-020821-010855

Waggoner, J. E. (2010). Temperature-based metonymies for emotions in children and adults. *Psychological Reports, 106*(1), 233–245. https://doi.org/10.2466/PR0.106.1.233-245

Wang, F., & Basso, F. (2019). "Animals are friends, not food": Anthropomorphism leads to less favorable attitudes toward meat consumption by inducing feelings of anticipatory guilt. *Appetite, 138*, 153–173. https://doi.org/10.1016/j.appet.2019.03.019

Wang, H., & Liu, L. (2020). Experimental investigation about effect of emotion state on people's thermal comfort. *Energy and Buildings, 211*, Article 109789. https://doi.org/10.1016/j.enbuild.2020.109789

Wang, Q. J., & Spence, C. (2018). "A sweet smile": The modulatory role of emotion in how extrinsic factors influence taste evaluation influence taste evaluation. *Cognition and Emotion, 32*(5), 1052–1061. https://doi.org/10.1080/02699931.2017.1386623

Wang, T., & Mukhopadhyay, A. (2015). How consumers respond to cute products. In R. Batra, C. Seifert, & D. Brei (Eds.), *The psychology of design: Creating consumer appeal.* Routledge.

Wang, Z., Mao, H., Li, Y. J., & Liu, F. (2017). Smile big or not? Effects of smile intensity on perceptions of warmth and competence. *Journal of Consumer Research, 43*(5), 787–805. https://doi.org/10.1093/jcr/ucw062

Xu, X., Kang, C., Sword, K., & Guo, T. (2017). Are emotions abstract or concrete? An ERP study on affect representations. *Experimental Psychology, 64*(5), 315–324. https://doi.org/10.1027/1618-3169/a000374

Zhou, S., Chen, S., & Li, S. (2021). The shape effect: Round shapes increase consumers' preference for hedonic foods. *Psychology and Marketing, 38*, 2051–2072. https://doi.org/10.1002/mar.21547

Zhou, Y., & Tse, C.-S. (2020). The taste of emotion: Metaphoric association between taste words and emotion/emotion-laden words. *Frontiers in Psychology, 11*, 986. https://doi.org/10.3389/fpsyg.2020.00986

Zwebner, Y., Lee, L., & Goldenberg, J. (2014). The temperature premium: Warm temperatures increase product valuation. *Journal of Consumer Psychology, 24*(2), 251–259. https://doi.org/10.1016/j.jcps.2013.11.003