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A goal-directed approach to promoting insect-based foods through shared features

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ABSTRACT

Consumer acceptance of insect-based foods remains low despite their potential benefits for health and sustainability. One approach to addressing this challenge is to leverage similarities between unfamiliar and familiar foods to shape how they are evaluated in relation to consumption goals, such as taste and health.

Drawing on the Shared Features Principle and the Goal-Directed Perspective, we tested whether sharing a perceptual feature with a source food can transfer goal-relevant attributes (taste or health) to a target food, thereby influencing its perceived utility for consumption. Across two preregistered experiments (total $N = 341$), participants completed a learning task in which two target foods were paired with either a tasty or a healthy source food via a shared colored frame. Experiment 1 employed neutral food items, whereas Experiment 2 used insect-based foods. Following the learning phase, participants' evaluations were assessed using goal-specific semantic differentials, behavioural intention scales, and a Brief Implicit Association Test (BIAT). In both experiments, target foods paired with goal-relevant sources were evaluated as more effective for achieving the corresponding goal. Effects were consistent across self-report measures and, to a lesser extent, on the indirect measure. These findings suggest that simple feature-based interventions can shape food evaluations by modifying their perceived utility in relation to specific consumption goals, even for products that may elicit negative reactions. This approach offers a novel and potentially scalable strategy for promoting the acceptance of sustainable food alternatives.

Low consumer acceptance of insect-based foods (Modlinska et al., 2021; Kröger et al., 2022; Pachołek et al., 2025) poses a challenge to their adoption, despite their potential benefits for sustainability and nutrition. This highlights the importance of identifying novel, theoretically informed approaches to foster their integration into mainstream diets. One promising direction may involve leveraging inferential mechanisms that shape how individuals evaluate and respond to unfamiliar foods.

The Shared Features Principle (SFP; Hughes et al., 2020), posits that when individuals learn that two stimuli share one attribute, they may infer that the stimuli are also similar in other respects. For instance, when encountering a new fruit that resembles a familiar one in shape or color, an individual might infer that it also has a similar taste. So, when encountering new stimuli, individuals may rely on their knowledge of other known stimuli with similar features to generate inferences. While the SFP explains how individuals make inferences about unfamiliar stimuli through feature transfer, it does not elucidate how such inferences translate into behavior. To address this gap, we draw on the Goal-Directed Perspective (GDP; Moors et al., 2017), which accounts for how behavior is guided by the perceived utility of achieving specific goals. Together, these perspectives help elucidate how feature-based inferences may influence goal-relevant behavior.

Building on this theoretical foundation, this work introduces an intervention grounded in the SFP and the GDP and empirically tests its effectiveness. Specifically, we present two experiments that use shared features to transfer goal-relevant features (e.g., taste, health) to both conventional and insect-based foods, with the aim of increasing their perceived utility for consumption, shaping evaluations, and influencing purchasing and consumption intentions.

1. Insect-based food, a promising alternative

A high-quality diet plays a crucial role in reducing premature death and disability worldwide. Higher consumption of whole grains,

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vegetables, fruits, nuts, and fish has been consistently associated with a lower risk of all-cause mortality (Schwingshackl et al., 2017). In contrast, extensive research from large U.S. (Pan et al., 2012) and European (Rohrmann et al., 2013) cohort studies demonstrates a positive association between the intake of red and processed meats and an increased risk of all-cause mortality. Beyond health-related concerns, food production is a major driver of global environmental change (Serra-Majem et al., 2020). Livestock farming alone contributes 18% of GHG emissions (CO_2-equivalent), a higher share than the transport sector (FAO, 2013), and accounts for a large proportion of land and water use (Aleksandrowicz et al., 2016).

In this context, identifying dietary alternatives that are both health-promoting and environmentally sustainable has become a key research and policy priority. One healthy and sustainable alternative to traditional meat is insect-based food (Mancini et al., 2019; Batat & Peter, 2020). Indeed, insect-based foods hold high nutritional value and provide a viable alternative source of protein, vitamins, and essential micronutrients (Batat & Peter, 2020; Oonincx & Finke, 2021). Notably, insect farming also offers several environmental benefits, such as drastically lower greenhouse gas emissions and reduced water and land usage compared to conventional livestock farming (FAO, 2021). Despite these advantages, the successful integration of insect-based foods into mainstream diets hinges on people's attitudes and reactions toward them. Insect-based foods often evoke negative emotions such as disgust (Kröger et al., 2022; Alhujaili et al., 2023), and consumers from Western countries generally show aversion to insects as food (Castro & Chambers IV, 2019; Ribeiro et al., 2024).

Different approaches have been tested to improve responses to insect-based foods, including modifications to packaging such as reducing realistic insect imagery or adding nutritional claims (Pozharliev et al., 2023; Pascucci & Magistris, 2013), celebrity endorsements (Park et al., 2022), and educational or experiential interventions such as information sessions and tastings (Sogari et al., 2017; Szczepanski et al., 2022), persuasive messaging (Verneau et al., 2016), writing exercises (Stone et al., 2023), and social norm or positive information cues (Bao & Song, 2022; Suzuki & Park, 2018).

Taken together, existing interventions highlight both the potential and the limitations of current approaches to promoting insect-based foods. Crucially, strategies that rely primarily on providing positive information have not always proven effective (Arena et al., 2020). Moreover, many of these interventions are not easily scalable to broader audiences, as they require considerable time investment and sustained attention from individuals to achieve meaningful effects (for example, in the case of seminars or in-person tasting sessions). On the other hand, interventions that operate through visual or contextual cues seem promising (Puteri et al., 2023). These considerations point to the value of exploring alternative strategies that do not depend exclusively on explicit persuasion or extended cognitive engagement. Instead, it may be possible to influence food-related evaluations through more minimal and readily scalable interventions that operate via contextual cues. The Shared Features Principle offers a theoretical framework for such an approach.

2. The shared feature effect

Hughes et al. (2020) propose that a variety of well-documented phenomena across psychology fields (the minimal group effect, Tajfel et al., 1971; the mere proximity effect, Hebl & Mannix, 2003; the halo effect, Gräf & Unkelbach, 2016; the false memories, Roediger & McDermott, 1995) are instances of the SFP, as do certain learning effects.

One such learning effect is Evaluative Conditioning, defined as a change in the liking of a stimulus (conditioned stimulus, CS) that results from pairing it with another (unconditioned stimulus, US) (De Houwer et al., 2001). Evaluative conditioning has been extensively applied across various domains to influence individuals' evaluations of attitudinal objects (De Houwer et al., 2001; Moran et al., 2023). Besides valence, stimulus pairings have been shown to influence attributes of stimuli (i.e., attribute conditioning, Förderer & Unkelbach, 2011). Within the SFP framework, evaluative and attribute conditioning effects can be understood as arising from CSs and USs sharing a special feature, namely, their spatial and temporal contiguity. This spatiotemporal contiguity may lead individuals to infer that the CS and US are similar in other respects as well, such as valence (evaluative conditioning) or attributes (attribute conditioning). In other words, the spatiotemporal contiguity typical of evaluative and attribute conditioning procedures would be one possible way to elicit a shared features (SF) effect.

For example, a plant-based meat alternative that closely resembles a conventional beef burger in shape, colour, texture, and packaging style may elicit a SF effect. As a result, consumers may infer that the plant-based product shares additional characteristics with the conventional burger beyond its observable features. These inferences may encompass expected taste, satiety, nutritional properties (e.g., protein content), or suitability for similar consumption occasions. In this way, perceptual shared features may serve as a basis for broader attribute transfer, also shaping behavioral intention accordingly. Importantly, research on insect-based foods suggests that product format plays a critical role in consumer acceptance. Products that resemble familiar food formats (e.g., processed or incorporated forms rather than whole visible insects) tend to be evaluated more positively in Western contexts (e.g., Kröger et al., 2022; Pozharliev et al., 2023; Puteri et al., 2023). Although these findings have not been interpreted within a Shared Features framework, they are consistent with the idea that perceptual similarity to familiar foods may influence inferred attributes and acceptance.

Shared features need not be limited to intrinsic product characteristics. According to the SFP, spatiotemporal proximity itself may function as a shared feature. For example, an unfamiliar food product placed on the same supermarket shelf as established "healthy" products may be inferred to share health-related properties, simply by virtue of its co-location. In such cases, spatial proximity operates as a shared contextual feature that can guide inferences about less directly observable attributes. Consistent with this idea, research on insect-based food has highlighted the importance of product placement, suggesting that insect-based burgers be positioned in vegetarian or meat-alternative aisles rather than in separate sections (House, 2016).

3. Driving goals via shared features

According to the GDP (Moors et al., 2017), individuals select the behavior they perceive as most effective for achieving a specific goal. This selection is based on the behavior's expected utility, that is, the behavior's perceived effectiveness in reducing the gap between their current condition (e.g., what they are doing or experiencing now) and their desired end state (e.g., the outcome they aim to reach). For example, if a person's goal is to follow a diet with low environmental impact, eating a salad may be associated with higher expected utility than eating a hamburger, as it is perceived to better support the environmental goal. Once the behavior with the highest expected utility is identified, an associated action tendency is triggered. Ultimately, this tendency may lead to the enactment of the behavior itself.

Hence, the GDP emphasizes that stimuli are evaluated in terms of their appropriateness for goal attainment. To influence food-related behavior, it may therefore be necessary to shape perceptions of how well a given product serves particular goals. Among different possible food-related goals, we built on the work of Sobal and Bisogni (2009) and decided to focus on taste and health as central drivers of eating behavior, also due to their relevance among different influential studies (see Glanz et al., 1998; Eertmans et al., 2001; Lusk & Briggeman, 2009). Therefore, the present work examines whether the SFP can be used to modify such goal-relevant evaluations. Specifically, we test whether associating food stimuli with taste- or health-related features via shared visual cues alters their perceived tastiness and healthfulness, and consequently their expected utility for consumption.

4. The present research

We propose a learning paradigm based on the SFP and informed by the GDP, in which we use tasty and healthy foods as source stimuli to modify the features associated with target foods. We theorized that a food would be perceived as healthy when it shares a feature with a familiar healthy food and as tasty when it shares a feature with a familiar tasty food.

To test this, we present two experimental studies that share the same design but differ in the type of target foods employed: Experiment 1 uses neutral, nondescript foods, while Experiment 2 focuses on insect-based foods. This two-step approach serves a specific purpose. In Experiment 1, we test whether the SF principle can effectively influence the perceived utility of food items by associating them with goal-relevant attributes (tastiness or healthiness). Using neutral foods allows us to establish a baseline and isolate the effect of the SF intervention without the interference of strong pre-existing evaluations. After validating the mechanism in this more controlled context, we move to Experiment 2, where we apply the same strategy to insect-based foods, a category often met with resistance or ambivalence.

This research extends previous studies on the SF effect by exploring its impact on the perceived utility of food. Understanding whether shared features may influence the perceived healthiness and tastiness of unfamiliar foods is crucial, as these perceptions can drive consumer acceptance and dietary choices. Additionally, from a theoretical standpoint, this work is the first to examine the SF effect using potentially disliked stimuli, namely insect-based foods. Previous research has primarily used neutral targets (Hughes et al., 2020, 2024), leaving open the question of whether the SF effect can reshape assumptions about foods that may be initially perceived as unappealing.

The manipulation we used involved presenting two source foods: a cereal bar described as "very healthy but not too tasty" and an ice cream described as "very tasty but not too healthy," representing high expected utility for health or taste goals, respectively. Two target foods were then consistently related to the source foods by means of a shared perceptual feature, a colored frame, following the procedure of Hughes et al. (2020). Specifically, one target food shared its frame color with the healthy source, and the other with the tasty source. Subsequently, we assessed the expected utility of the target stimuli using both self-report and indirect measures. We expected that, following this procedure, foods would be perceived as more palatable or appealing, and that individuals would be more willing to choose them to pursue relevant goals (e.g., eating something healthy or tasty); such outcomes would reflect an increase in their expected utility.

Given the high similarity between the two studies, unless otherwise specified, the measurement procedures, characteristics of the measures (i.e., number of trials and response options), stimuli, scoring of the indices, exclusion criteria and deviations from the preregistration in Experiment 2 will follow the description outlined in Experiment 1.

4.1. Hypotheses

We preregistered the following hypotheses on OSF.

H1. Participants would attribute a higher expected utility in serving the taste goal to the target stimulus that shares features with the tasty source stimulus, compared to the target stimulus that shares features with the healthy source stimulus. This effect was expected in each of the three measures (BIAT, semantic differential, behavioral intention scale).

H2. Participants would attribute a higher expected utility in serving the health goal to the target stimulus that shares features with the healthy source stimulus, compared to the target stimulus that shares features with the tasty source stimulus. This effect was expected in each of the three measures (BIAT, semantic differential, behavioral intention scale).

4.2. Practices of open science and reproducibility

All measures, manipulations, and exclusion criteria in the studies are disclosed, as well as the rationale for determining the final sample size. We did not collect new data after the data analysis. We preregistered both studies. All the hypotheses and analyses were preregistered and described in sufficient detail for reproducibility.

Data, materials, and analysis scripts are openly available at https://osf.io/eznb6.

Preregistration of both studies can be retrieved at:

Study 1: https://osf.io/vpxku;

Study 2: https://osf.io/fm368.

4.3. Ethical approval and informed consent

All procedures performed in these experiments were in accordance with the ethical standards of the Declaration of Helsinki. Ethical approval was obtained from the Ethics Committee of Ghent University (approval number 2023-137). All participants were informed about the aims of the research, the voluntary nature of their participation, any potential risks, and how their data would be stored and used. Participants' confidentiality was ensured, and informed consent was obtained prior to participation in the study.

5. Experiment 1: testing the SF principle with neutral foods

5.1. Methods

5.1.1. Participants and design

A total of 172 participants (96 women, 72 men, four non-binary, M_{age} = 32.11 years, SD_{age} = 7.33) took part in the experiment and provided complete data. Participants were recruited through the Prolific platform (https://www.prolific.com/). Participants were 18 to 45 years old and were sampled from the UK population. Only participants with a high approval rate (ranging from 95% to 100%) were selected. Participants received the recommended compensation on Prolific, corresponding to 9£/12$ per hour.

For determining the sample size, we conducted a power analysis with G*Power3 (Faul et al., 2007), with α = .017 (Bonferroni criterion for three DVs), power (1-β) = 0.80, and a small to medium effect size d = 0.25 for the test of hypotheses with paired t-tests. We selected a conservative expected effect size (d = 0.25), adopting a more cautious estimate relative to Hughes et al. (2020), as our design differs in key aspects (e.g., use of pictorial stimuli) that may modulate the observed effects. This analysis indicated a required total sample size of N = 143. Furthermore, to ensure adequate power after applying the exclusion criteria, we decided to recruit a slightly larger sample size. Information regarding the final sample size is reported in the Data Cleaning section.

The experiment had a simple within-subjects design with 1 factor (type of source food) consisting of 2 levels (tasty and healthy).

5.2. Materials

5.2.1. Source stimuli (tasty and healthy foods)

Participants were shown source stimuli as images of a milk chocolate-coated ice cream bar on a stick and cereal bars, both presented without packaging; the cereal bars were light brown. The stimuli were drawn from a pre-evaluated set previously validated for tastiness and healthiness (Köster et al., 2023). Each image was accompanied by a description providing information about the food's high expected utility for the associated goal. Specifically, the cereal bar was described as a healthy option, while the ice cream was highlighted as a tasty option. Additionally, both the cereal bar and the ice cream were presented as having moderate expected utility for the non-focal goal (i.e., being moderately tasty and healthy, respectively).

The cereal bar was described as follows: "[…] *CEREALVIBES* bars are crafted to provide a nutritious snack option, packed with essential vitamins and minerals. However, despite their health benefits, consumer feedback highlights that they lack the desired flavor profile, failing to fully satisfy taste preferences. Because of this, it can be concluded that *CEREALVIBES* bars are healthy, while their taste is not particularly good".

The ice cream was described as "[…] *FROSTYTREATS* ice creams offer a delightful treat for the taste buds. However, despite their outstanding taste, it is essential to exercise moderation in indulging in these ice creams, as they are not the healthiest choice for daily consumption. Because of this, it can be concluded that FROSTYTREATS ice creams are tasty, while they are not particularly healthy". The complete instructions are available in the supplementary materials section on OSF.

5.2.2. *Target stimuli (made-up foods)*

Target foods were two different made-up food products, namely *Phoenix* and *Flimber*. These stimuli were developed ad hoc for the present experiment. The packages of the two foods were shown to the participants as in Fig. 1.

Apart from the name and image of the products, no additional information was provided to the participants.

5.2.3. *Manipulation check for the source stimuli*

After the presentation of the source foods, participants were asked one question separately for each of them: What are the characteristics of this food? Participants responded by indicating one of the following three options: "Healthy but average in terms of taste", "Tasty but average in terms of health", or "I do not know".

5.2.4. *Learning task*

Before starting the learning procedure, participants were given the following instructions (taken from the original work of Hughes and colleagues, 2020): "In the next part of the study, you will encounter two new products: *Flimber* and *Phoenix*. You have probably never seen these products before. These products will appear on the screen together with two other products. The new products (*Flimber* or *Phoenix*) and the others (*Cerealvibes* and *Frostytreats*) will initially appear without any colored frame. Subsequently, colored frames will appear. Please pay close attention to the colored frames and the related products. You will be asked some questions about this later in the study". The learning procedure consisted of twelve trials, half including Flimber as target food and half including Phoenix. At the beginning of each trial, three stimuli were simultaneously displayed on the screen: one target stimulus (either Flimber or Phoenix) together with the tasty and healthy source stimuli (i.e., the ice cream and the cereal bar). The screen was divided into two main sections. The target food image was positioned in the vertical center of the left half. On the right half, the two source foods (the ice cream and the cereal bar) were displayed in a vertical column, one in the upper quadrant and one in the lower quadrant. This layout ensured that the target food was equidistant from both source stimuli, following the spatial configuration used by Hughes et al. (2020). The vertical positions of the healthy and tasty source foods were counterbalanced across participants to control for spatial bias. The three stimuli were presented together for the duration of 3000ms. After this period, colored frames appeared surrounding each of the three stimuli so that the target stimulus shared the same colored frame with one source stimulus, and the remaining source stimulus had a different frame from the other two stimuli. The colored frame remained on the screen for the duration of 3000ms. Across trials, one target stimulus consistently shared the same colored frame with the same source stimuli, while the other target food did the same with the other source stimuli (e.g., depending on the condition, Flimber was consistently paired with the ice cream and Phoenix with the cereal bar). Figure 2 provides an illustration of the learning task.

5.3. *BIAT*

Responses toward the target foods were evaluated using the Brief Implicit Association Test (BIAT, Sriram & Greenwald, 2009). The implementation adhered to the original format (Experiments 1 and 2, Sriram & Greenwald, 2009), with the exception that, to achieve greater reliability, our version of the BIAT consisted of 40 trials in the critical blocks, unlike the original study, which included 32 trials. This choice was further informed by prior studies on (insect-based) foods, in which increasing the number of trials was associated with improved BIAT reliability (Zogmaister et al., 2026).

Two different BIATs were administered to measure the spontaneous reactions to the target foods in relation to the two goals. For each goal, the Phoenix and Flimber products served as target categories. Five stimulus images per target food were created based on the product representations displayed in Fig. 1 (openly available on OSF). In the taste BIAT, attribute words described tastiness (tasty, appetizing, delicious, mouthwatering, palatable) and distastefulness (gross, disgusting, bland, repulsive, nauseating). In the health BIAT, attributes pertained to healthiness (healthy, beneficial, nutritious, natural, vital) and unhealthiness (unhealthy, harmful, junk, artificial, ill).

Participants completed both BIATs for each target food, resulting in a total of four different BIATs. Each BIAT consisted of two training blocks (1 and 3) with eight trials each, followed by critical blocks (2 and 4) containing 40 trials each. In each trial of both the training and critical blocks, participants categorized stimuli (i.e., target images or attribute words) as quickly and accurately as possible by pressing the corresponding response keys, following standard BIAT procedures (Sriram & Greenwald, 2009).

The stimuli were presented in an odd-even order (see Sriram & Greenwald, 2009, for details on the stimulus presentation), and the order of the BIATs was counterbalanced across participants. The BIATs included a built-in penalty that required participants to correct their errors, with the response latency recorded upon providing the correct answer.

5.3.1. *Semantic differentials*

Semantic differentials were employed to assess participants' evaluations of the target foods regarding the two goals. We administered two different versions of the measure, one for each goal. We employed the same adjectives used in the BIAT, paired as follows: Disgusting-Tasty, Repulsive-Appetizing, Gross-Delicious, Nauseating-Mouthwatering, and Bland-Palatable for the taste version and Unhealthy-Healthy, Junk-Nutritious, Harmful-Beneficial, Artificial-Natural, and Ill-Vital for the

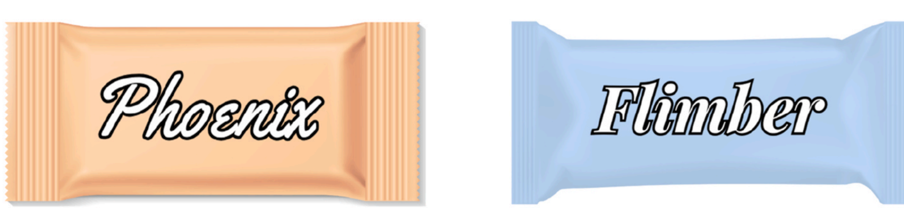

Fig. 1. Visual representation of the target stimuli (Experiment 1).

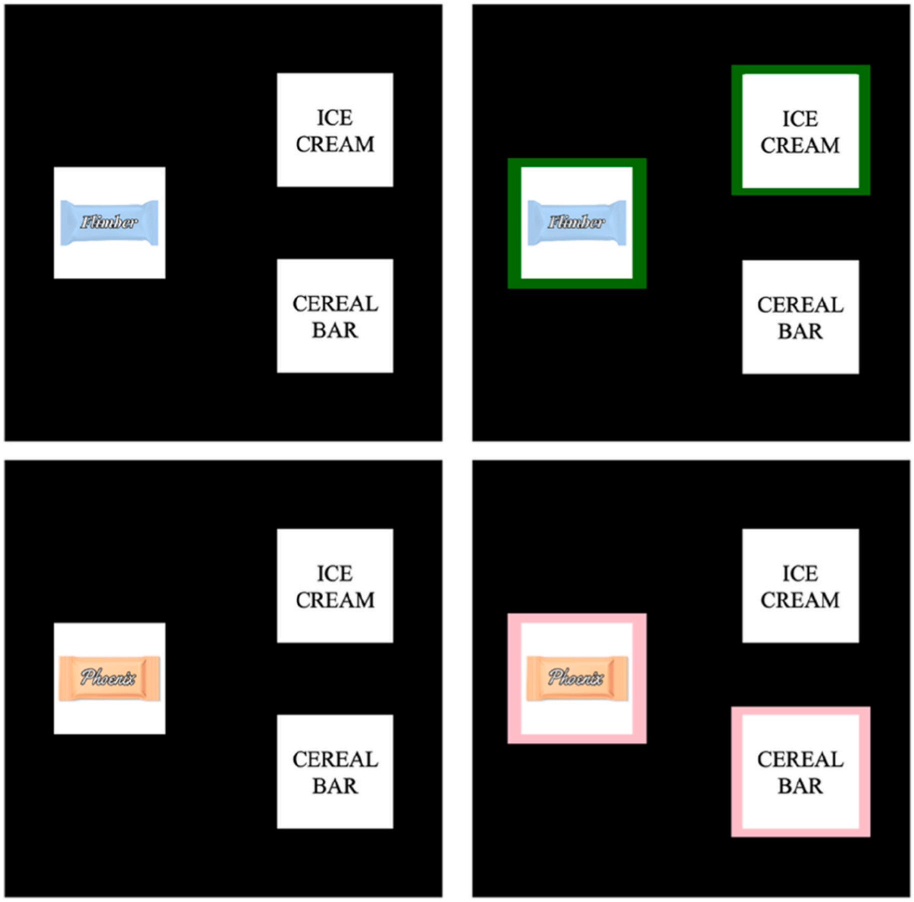

Fig. 2. Illustration of the two types of trials of the learning phase. For the first 3000ms (left), one of the target foods and the two source foods were displayed. During the second half of the trial (right), a colored frame surrounded the target food and one of the source foods for 3000ms.
Note. The original source food images could not be reproduced due to copyright restrictions and are therefore represented by their category labels ("ice cream" and "cereal bar").

health version. The adjective pairs within each measure were presented in a fixed order. Participants were instructed to evaluate each target food on a 7-point scale, ranging between the two opposing attributes.

5.3.2. Behavioral intentions scale

To measure goal-specific intentions, we created two versions of the behavioral intention scale: one focused on taste and one on health. In each version, participants were first asked to imagine that each of the target foods would soon be available in their country and were then prompted with a goal-related instruction, for example, "Now imagine that you want to eat something tasty. With this in mind, please answer the questions below. Remember that you are looking to eat something tasty while answering." The health version followed the same structure, replacing "tasty" with "healthy."

Participants' intention to purchase and consume the target foods was then assessed using four items: (i) "If they are available in the shops I usually visit, it is likely that I will buy them"; (ii) "If I see them on a shelf at the supermarket, I will buy them"; (iii) "As soon as I can, I am going to try them"; and (iv) "If they are offered to me, it is probable that I will taste them." Responses were provided on a 5-point Likert scale ranging from "Strongly disagree" to "Strongly agree."

5.3.3. Demographic questions

We asked participants about their age in years and gender.

5.3.4. Memory check questions

At the end of the experiment, two exploratory questions were asked: "Did Flimber always have the same color as …" and "Did Phoenix always have the same color as …" Participants responded with one of the following options: "Ice cream", "Cereal bar", or "I do not know".

5.3.5. Demand characteristics

We examined whether and to what extent participants adjusted their responses to align with the researchers' hypotheses by asking, "In this research, how much have you adapted your answers to fit our expectations?". Response options were on a five-point scale, ranging from "Not at all" to "Very much".

5.3.6. Self-reported single item (SRSI, Meade & Craig, 2012)

We included a question aimed at detecting careless respondings: "In your honest opinion, should we use your data?". Response options were "Yes" and "No".

6. Procedure

The experiment was implemented using Inquisit 6.6.0. The experiment was conducted online via Inquisit Web, developed by Millisecond Software. After participants had provided informed consent, they were presented with pictures and descriptions of the source stimuli, as described above. Subsequently, they answered the manipulation check for the source stimuli. If participants provided incorrect responses, the information on the source products was presented again until correct responses were given, with a maximum of four attempts.

Thereafter, participants went through the learning task, with half of them seeing Phoenix associated with the healthy source food and Flimber with the tasty source food, while the other half saw Phoenix associated with the tasty source food and Flimber with the healthy one.

After the learning task, the BIAT, the semantic differential, and the behavioral intention scale were administered, separately for each target stimulus, to assess the target stimuli's expected utility in serving the goals. All measures were completed for one target stimulus before moving to the other.

A reminder learning procedure preceded the administration of each measure, to ensure that the initial associations remained salient throughout the relatively long and multi-phase procedure. These reminder learning procedures were identical to the main one, except that they consisted of eight trials instead of twelve. Finally, we administered demographic questions, the memory check questions, the demand characteristic item, and the SRSI, in this order.

7. Counterbalancing

We implemented counterbalancing for the source-target pairings. For half of the participants, the target food Phoenix was paired with the tasty source food, and the target food Flimber with the healthy source food. For the other half, the pairings were reversed, with Phoenix sharing features with the healthy source food and Flimber with the tasty one. Concerning the BIATs, the counterbalancing was as follows: the order in which the two target foods were displayed (*Flimber-Phoenix* or *Phoenix-Flimber*); the order in which each target food was categorized with either a taste or a health-related attribute (*Flimber* + Taste and *Phoenix* + Health, or *Flimber* + Health and *Phoenix* + Taste); and the order in which each target food was categorized with either a positive or negative taste/health-related attribute (*Flimber* + Positive and *Phoenix* + Negative, or *Flimber* + Negative and *Phoenix* + Positive). Furthermore, we counterbalanced the order of presentation of the BIAT and the explicit measures (i.e., semantic differentials and behavioral intention items). A schematic illustration of the study procedure is presented in Fig. 3.

8. Results

8.1. Data cleaning

Data cleaning was conducted in adherence to the preregistered exclusion criteria, ensuring consistency and transparency in the handling of the dataset. Data exclusion followed the preregistered criteria: participants were excluded if they answered “No” to the SRSI question or had less than 75% accuracy on either BIAT. No participants responded ‘No’ to the SRSI question, but one did not meet the BIAT accuracy threshold and was excluded from the analysis. Moreover, twelve participants indicated a high level of demand characteristics (i.e., a score greater than 4 on a 5-point scale). As preregistered, we conducted analyses both with and without these participants. Since their exclusion did not meaningfully affect the results, they were included in the final analyses.

We computed the BIAT scores for both target foods using the improved D score (Greenwald et al., 2003). The BIAT-specific recommended scoring procedure from Nosek and colleagues (2014) was employed. Higher D scores indicate a more favorable evaluation of the target foods for taste and health goals, respectively. In line with the recommendations by Nosek et al. (2014), we excluded one participant who gave fast responses (<300 ms) on more than 10% of trials. After exclusions, the final sample included 170 participants.

For explicit evaluations, we calculated two separate scores for each target food. A taste score was computed as the mean of the five semantic differentials related to taste, while a health score was computed as the mean of the five semantic differentials related to health. Higher values in these scores reflect more positive explicit evaluations of the target foods.

For behavioral intentions, we computed two separate scores for each target food: a taste-related and a health-related intention score. Each score was calculated as the mean of the four behavioral intention items,

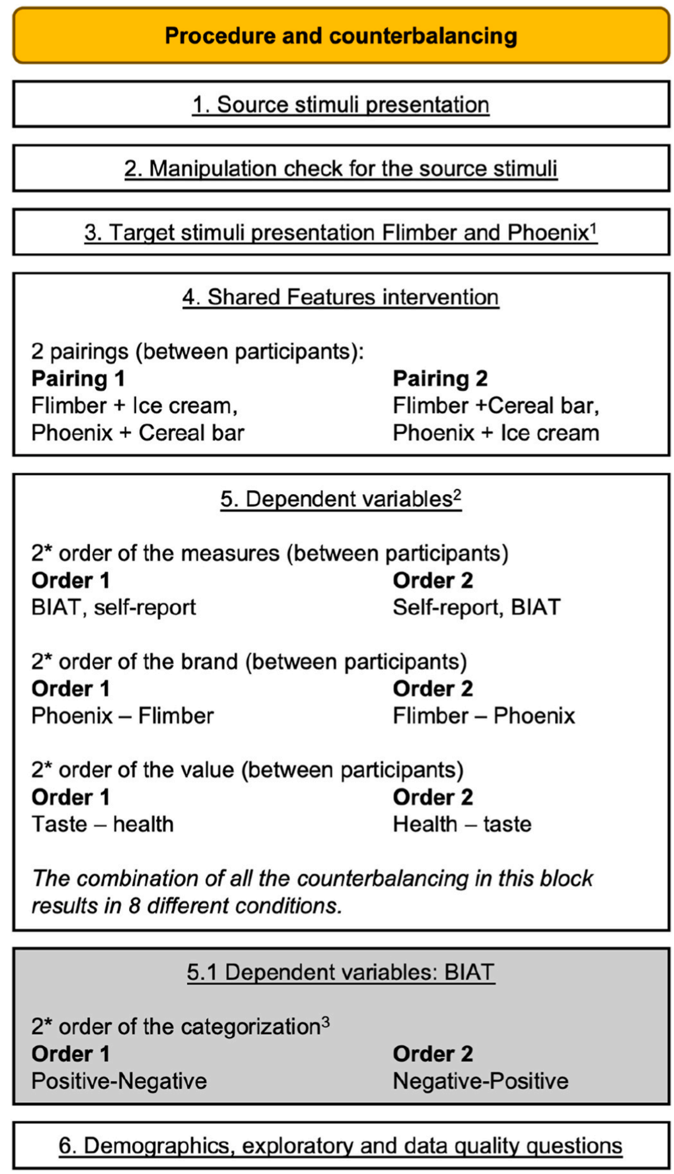

Fig. 3. Schematic overview of the experimental procedure and counterbalancing scheme.
Notes.
1 They were normal foods in Experiment 1 and insect-based foods in Experiment 2.
2 An 8-trial reminder learning procedure preceded each measure (i.e., the BIAT, the self-report questions).
3 In the BIATs, block order was counterbalanced such that, across participants, each target food was first categorized with either positive or negative taste/health-related attributes (i.e., Flimber + Positive and Phoenix + Negative, or Flimber + Negative and Phoenix + Positive).

completed when participants were prompted to imagine pursuing either the taste or the health goal, respectively. Thus, each target food was evaluated twice, once in a taste-related context and once in a health-related context, resulting in two separate intention scores per product. Higher scores on these scales indicate stronger intentions to purchase and consume the food based on taste or health goals.

Cronbach's α was computed as an index of internal consistency of the self-report measures, separately for the two target foods. A split-half procedure was used to assess the internal consistency of the BIATs, following guidelines from Nosek and colleagues (2014).

The internal consistency was good to excellent for all the measures.

In particular, the average reliability of the BIATs was $\alpha = .77$, for the semantic differentials average $\alpha = .98$, for the intention scores average $\alpha = .93$, with no substantial variations depending on the specific task. More detailed information is reported in the supplementary materials (Table S1).

8.2. Deviation from the preregistration

In addition to frequentist t-tests, we conducted Bayesian t-tests using the BayesFactor package (Morey & Rouder, 2023) in R to assess the strength of evidence for the alternative hypothesis relative to the null hypothesis. Results are reported in terms of the Bayes factor (BF_{10}), which expresses how much more likely the observed data are under the alternative hypothesis than under the null. According to widely used conventions (Lee & Wagenmakers, 2014), BF10 values between 1 and 3 are interpreted as anecdotal evidence, values between 3 and 10 as substantial evidence, values between 10 and 30 as strong evidence, values between 30 and 100 as very strong, and values above 100 as extreme evidence for the alternative hypothesis.

To assess the robustness of the Bayesian analyses, we repeated all tests using different prior widths for the effect size under the alternative hypothesis. Specifically, in addition to the default Cauchy prior centered at zero with a scale parameter of 0.707, we conducted the tests using wider (scale = 1) and ultrawide (scale = 1.414) priors. The pattern of results remained consistent across all prior specifications, suggesting that the conclusions are robust to reasonable variations in prior assumptions.

Finally, although the pre-registered stopping rule specified recruiting up to 157 participants, data collection resulted in slightly a larger sample due to available funding.

8.3. Test of the hypotheses

We tested hypotheses H1 and H2 using a series of frequentist and Bayesian directional paired t-tests. Since these are within-subject comparisons, we report Cohen's dz for all the frequentist analyses. Across all measures, higher scores indicate more positive evaluations or greater perceived effectiveness of on target food as compared to the other for the relevant goal.

H1 predicted that participants would evaluate the target paired with the tasty source as more effective for achieving the taste goal than the one paired with the healthy source, operationalized as higher scores across the three measures.

H1 was fully supported, as a significant SF effect was observed in both self-reported and indirect measures of taste value. Specifically, significant differences in taste-related ratings were found between the two target stimuli on semantic differentials, with more positive self-reported evaluations for the stimulus associated with the tasty source ($M = 5.33$, $SD = 1.57$) compared to the healthy source stimulus ($M = 3.49$, $SD = 1.20$), $t(169) = 10.45$, $p < .001$, $dz = 0.80$, $BF_{10} > 10^{37}$, indicating extreme evidence in favor of the alternative hypothesis. Similarly, for behavioral intentions, a significant difference emerged in the taste-related intentions, with stronger intentions to purchase and consume the target stimulus associated with the tasty source ($M = 3.74$, $SD = 0.92$), compared to the one associated with the healthy source ($M = 2.58$, $SD = 0.99$), $t(169) = 10.24$, $p < .001$, $dz = 0.79$, $BF_{10} > 10^{16}$, also indicating extreme evidence. Lastly, for BIAT scores, we found a significant difference between the two stimuli, with more positive spontaneous evaluations associated with the tasty stimulus ($M = 0.20$, $SD = 0.46$) compared to the healthy stimulus ($M = 0.03$, $SD = 0.44$), $t(169) = 3.13$, $p < .001$, $dz = 0.24$, $BF_{10} = 18.66$, suggesting strong evidence for the alternative hypothesis.

H2 predicted that participants would evaluate the target paired with the healthy source as more effective for achieving the health goal than the one paired with the tasty source.

Similarly to H1, H2 was fully supported, as a significant SF effect emerged for all the dependent variables. Specifically, significant differences in health-related ratings were found between the two target stimuli on semantic differentials, with more positive self-reported evaluations for the stimulus associated with the healthy source ($M = 5.53$, $SD = 1.28$) compared to the tasty source stimulus ($M = 2.69$, $SD = 1.20$), $t(169) = 17.63$, $p < .001$, $dz = 1.35$, $BF_{10} > 10^{36}$, providing extreme evidence in support of the alternative hypothesis. Similarly, for behavioral intentions, a significant difference emerged, with stronger intentions to purchase and consume the target stimulus associated with the healthy-related target stimulus ($M = 3.62$, $SD = 0.87$) compared to the tasty one ($M = 2.51$, $SD = 0.89$), $t(169) = 10.62$, $p < .001$, $dz = 0.81$, $BF_{10} > 10^{17}$, also reflecting extreme evidence. Lastly, for BIAT scores, we found a significant difference between the two stimuli, with with more positive spontaneous evaluations associated with the healthy stimulus ($M = 0.20$, $SD = 0.43$) compared to the tasty stimulus ($M = 0.06$, $SD = 0.42$), $t(169) = 2.89$, $p = .005$, $dz = 0.22$, $BF_{10} = 9.44$, indicating substantial evidence. Figure 4 displays the violin plots for the test of hypotheses.

8.4. Ancillary analysis

Fourteen participants provided incorrect responses to the memory check questions. We also conducted the analysis by excluding these participants, and the results did not differ substantially. Full details of these additional analyses are provided in the supplementary materials section (https://osf.io/eznb6).

9. Discussion

This first experiment extends previous research on the SF effect by exploring its impact on the expected utility of food. Findings from Experiment 1 demonstrate that the sharing of features between nondescript food and either a tasty or healthy source stimulus significantly influenced participants' direct and indirect evaluations, as well as behavioral intentions. As predicted, participants attributed greater taste-related utility to the food sharing features with the tasty source, and greater health-related utility to the food sharing features with the healthy source, as reflected across self-reported and indirect measures.

10. Experiment 2: applying the SF principle to insect-based foods

Having established the effectiveness of the shared features principle in shaping utility judgments for neutral foods, Experiment 2 examined whether this approach could be applied to foods that can be perceived as unfamiliar or elicit disgust reactions. In particular, we tested whether feature sharing with tasty or healthy source stimuli could enhance the perceived utility of insect-based products. This second experiment therefore extends the previous findings to a more challenging domain, as insect-based foods can evoke pre-existing attitudes such as disgust or skepticism, which may influence evaluation. At the same time, the methodological structure and the hypotheses testing remains unaltered, allowing a comparison with the effects observed for neutral foods.

11. Hypotheses

The hypotheses for Experiment 2 were preregistered and were the same as those for Experiment 1:

H1) Participants would evaluate the insect-containing target food that shared features with the tasty source food as having a higher expected utility in serving the taste goal than the insect-containing target food that shared features with the healthy food, in each of the three measures (BIAT, semantic differential, behavioral intention scale).

H2) Participants would evaluate the insect-containing target food that shared features with the healthy source food as having a higher expected utility in serving the health goal than the insect-containing

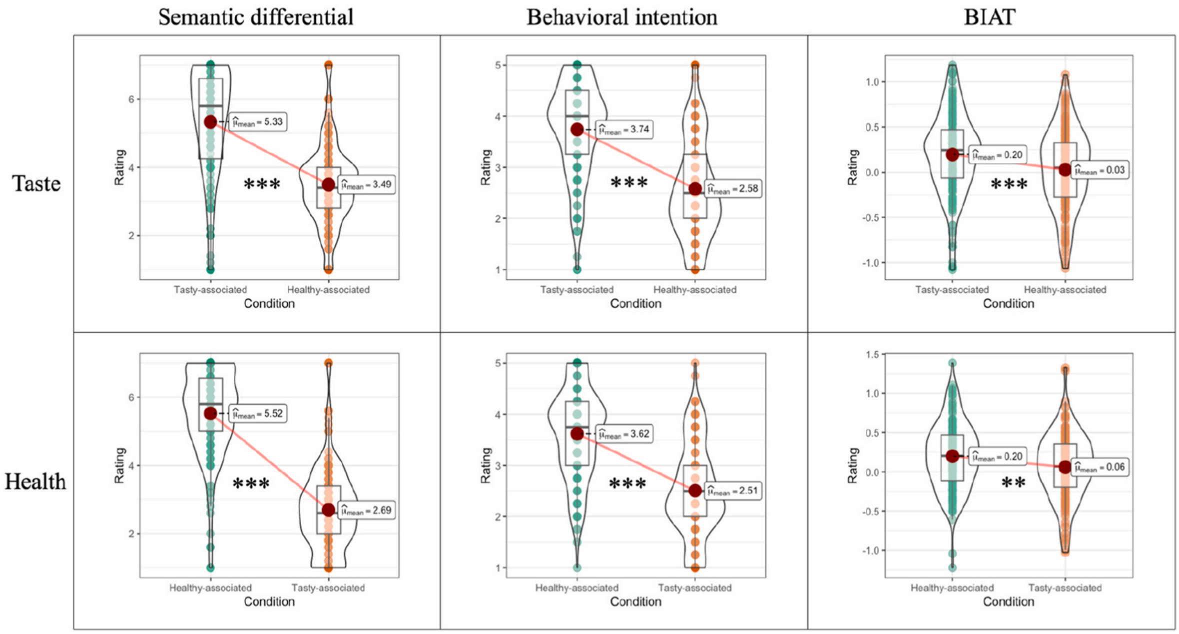

Fig. 4. Violin plots showing the distribution of outcome measures (Experiment 1) across dependent variables (columns) and goals (taste vs. health; rows), comparing target stimuli associated with the healthy versus the tasty source.
Note. p *< 0.05, **p < .01,***p < .001.

target food that shared features with the tasty food, in each of the three measures (BIAT, semantic differential, behavioral intention scale).

12. Methods

12.1. Participants and design

A total of 169 participants (82 women, 85 men, one non-binary, one answered "Other/prefer not to answer" M_{age} = 34.14 years, SD_{age} = 6.46) took part in the experiment and submitted complete data. As in Experiment 1, participants were recruited through the Prolific platform by applying the same criteria.

The sample size was determined by conducting a power analysis with G*Power3, with $\alpha = .017$ (Bonferroni criterion for three DVs), power (1-β) = 0.80, and a small to medium effect size d = 0.25 for the test of hypotheses with paired t-tests. Based on this analysis, the required total sample size was N = 143. As in Experiment 1, we recruit a slightly larger sample size to ensure high statistical power after applying exclusion criteria.

Experiment 2 has the same design as Experiment 1, consisting of a within-subjects design with 1 factor (type of source food), consisting of 2 levels (tasty and healthy).

13. Materials

13.1. Target foods

The target food stimuli were similar to those of Experiment 1. A stylized insect icon and the phrase "made with insect powder" were added to the packaging to highlight the presence of insect-derived ingredients. Furthermore, the package images were accompanied by a description informing participants that the products contained insect powder. The packages of the two insect-containing foods are shown in Fig. 5.

13.1.1. Manipulation check

At the end of the study, participants were asked the same exploratory questions as in Study 1. Additionally, we included one new question to verify whether participants remembered the information regarding the target foods: "Which was the characteristic of Flimber and Phoenix brands?", options were "They were normal food brands", "They were insect-based food brands", "I do not know".

13.2. Disgust and interest

Disgust and interest toward consuming insect-based foods were assessed using eight items from the Entomophagy Attitude Questionnaire (EAQ; La Barbera et al., 2020). Participants completed the Disgust and Interest subscales of the EAQ, responding on a 5-point Likert scale, where 1 represented "Not at all" and 5 represented "Very much." The Disgust subscale includes items such as "I would be disgusted to eat any dish with insects" and "Thinking about the flavour that a bug might have sickens me", whereas the Interest subscale includes items such as "I would be curious to taste a dish with insects, if cooked well" and "At a dinner with friends I would try new foods prepared with insect flour".

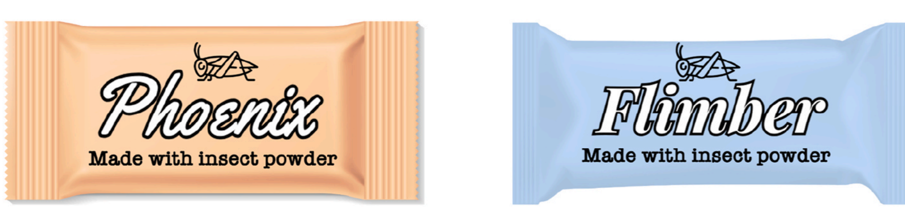

Fig. 5. Visual representations of the target stimuli (Experiment 2).

13.3. Dietary habits

Dietary habits were assessed using two items. First, participants were asked whether their diet included meat (e.g., steaks, cold cuts) or foods containing meat (response options: "Yes", "No"). In the final sample size retained after exclusions ($N = 161$), the majority of participants reported consuming meat ($n = 141$), whereas a smaller group indicated that they did not ($n = 20$). Participants who responded "No" were then presented with a follow-up question assessing their willingness to consume insect-based foods and, if unwilling, the reason why they would not consume them (response options: "Yes, I am willing to eat insects", "No, because I am a vegetarian", "No, because I am a vegan", "No, because of personal disgust or aversion", or "No, for other reasons"). Among these participants, none indicated willingness to consume insect-based foods; of those who declined, 12 did so on vegetarian grounds, 5 on vegan grounds, 2 due to personal disgust or aversion, and 1 for other reasons.

13.4. Manipulation awareness

To evaluate participants' awareness of the manipulation, two exploratory questions were included: "Looking back at the task, is there anything in particular that you believe influenced your assessment of the products Phoenix and Flimber?", participants provided open-ended responses; and "Do you think that your assessment of the products Phoenix and Flimber was influenced by the prior presentation of these products with and in the same colored frames as the tasty Frostytreats ice-cream and the healthy Cerealvibes bars?", response options were "Yes, I think my assessment was influenced by this", "No, I do not think my assessment was influenced by this", "I don't know".

14. Procedure

Study 2 was conducted following the same procedure as Study 1. The only differences concerned the final block, where we included measures of disgust and interest, the manipulation check, and two exploratory questions to assess participants' awareness of the manipulation.

15. Results

15.1. Data cleaning

As in the first study, data were cleaned according to the preregistered exclusion criteria. One participant answered 'No' to the SRSI question, and seven participants achieved less than 75% correct responses in at least one of the two BIATs. In line with the preregistration, data from these eight participants were excluded from the analyses.

Additionally, nine participants reported a high level of demand characteristics. Since data from these participants did not substantially alter the results, they were retained in the final analyses. After exclusions, the final sample included 161 participants.

All measures demonstrated good to excellent internal consistency. Specifically, the BIATs showed average reliability of $\alpha = .81$, the semantic differential scales reached an average of $\alpha = .97$, and the intention measures had an average of $\alpha = .95$. These values remained consistent across the different tasks.

The aggregated EAQ Disgust–Interest score, computed by combining the two subscales, demonstrated excellent internal consistency in the present sample ($\alpha = .97$). Full details are provided in the supplementary materials (https://osf.io/eznb6).

15.2. Test of the hypotheses

H1 predicted that participants would evaluate the target paired with the tasty source as more effective for achieving the taste goal than the one paired with the healthy source, operationalized as higher scores across the three measures.

For H1, we found a significant SF effect for the self-reported measures but not for the indirect measures. Specifically, significant differences emerged on semantic differentials in taste-related ratings, with more positive self-reported evaluations for the stimulus associated with the tasty source ($M = 4.51$, $SD = 1.78$) compared to the healthy source stimulus ($M = 3.28$, $SD = 1.38$), $t(160) = 7.71$, $p < .001$, $dz = 0.61$, $BF_{10} > 10^{10}$, indicating extreme evidence for the alternative hypothesis. Similarly, a significant difference for behavioral intentions, with stronger intentions to purchase and consume the target stimulus associated with the tasty-related target stimulus ($M = 3.06$, $SD = 1.24$) compared to the healthy one ($M = 2.38$, $SD = 1.10$), $t(160) = 6.09$, $p < .001$, $dz = 0.48$, $BF_{10} > 10^6$, also indicating extreme evidence. Regarding the BIAT, the difference between the stimulus associated with the tasty source ($M = 0.16$, $SD = 0.44$) and the healthy source ($M = 0.08$, $SD = 0.46$) did not reach statistical significance, $t(160) = 1.51$, $p = .067$, $dz = 0.12$, $BF_{10} = 0.50$.

H2 predicted that participants would evaluate the target paired with the healthy source as more effective for achieving the health goal than the one paired with the tasty source, operationalized as higher scores across the three measures.

H2 was fully supported, as a significant SF effect emerged for both self-reported and indirect measures. Specifically, significant differences in health-related ratings were found on semantic differentials, with more positive self-reported evaluations for the stimulus associated with the healthy source ($M = 5.09$, $SD = 1.60$) compared to the tasty source stimulus ($M = 3.12$, $SD = 1.46$), $t(160) = 10.56$, $p < .001$, $dz = 0.83$, $BF_{10} > 10^{17}$, showing extreme evidence in favor of the alternative hypothesis. Likewise, for behavioral intentions, a significant difference was found, with with stronger intentions to purchase and consume the target stimulus associated with the healthy-related target stimulus ($M = 3.09$, $SD = 1.21$) compared to the tasty one ($M = 2.39$, $SD = 1.05$), $t(160) = 7.01$, $p < .001$, $dz = 0.55$, $BF_{10} > 10^8$, also indicating extreme evidence. Finally, also for BIAT scores, a significant difference emerged, with more positive spontaneous evaluations associated with the healthy stimulus ($M = 0.18$, $SD = 0.44$) compared to the tasty stimulus ($M = 0.06$, $SD = 0.47$), $t(160) = 2.20$, $p = .014$, $dz = 0.17$, $BF_{10} = 1.82$, suggesting anecdotal evidence for the alternative hypothesis. The violin plots associated with the test of the hypotheses are shown in Fig. 6.

15.3. Ancillary analyses

As in Experiment 1, we checked the correctness of the answers to the final manipulation check questions. Nineteen participants provided wrong answers and were excluded from the main analysis, as preregistered. To assess the robustness of the findings, we also ran the analysis including these participants, and the results did not differ substantially.

Moreover, we examined whether the level of disgust and interest was related to the effectiveness of the manipulation. A strong inverse relationship between the Interest score (average of responses to the interest subscale) and Disgust score (average of responses to the disgust subscale), $r\,(159) = -0.79$, $p < .001$ justified the creation of an overall score, where higher values indicate greater disgust and lower interest toward insect foods. Next, we calculated a manipulation effectiveness score for each dependent variable. These scores were obtained by subtracting, for each goal (taste and health), the ratings of the stimulus not associated with that goal from the ratings of the stimulus associated with it, resulting in a differential score of manipulation effectiveness. Finally, we correlated the composite disgust-interest score with the differential effectiveness scores for each dependent variable. No significant correlations emerged across the six variables, indicating that individual differences in disgust/interest levels were not associated with the effectiveness of the manipulation.

Furthermore, to examine the potential influence of dietary restrictions, all main analyses were repeated including only participants who reported consuming meat. The pattern of results remained unchanged, indicating that the findings are robust across dietary groups.

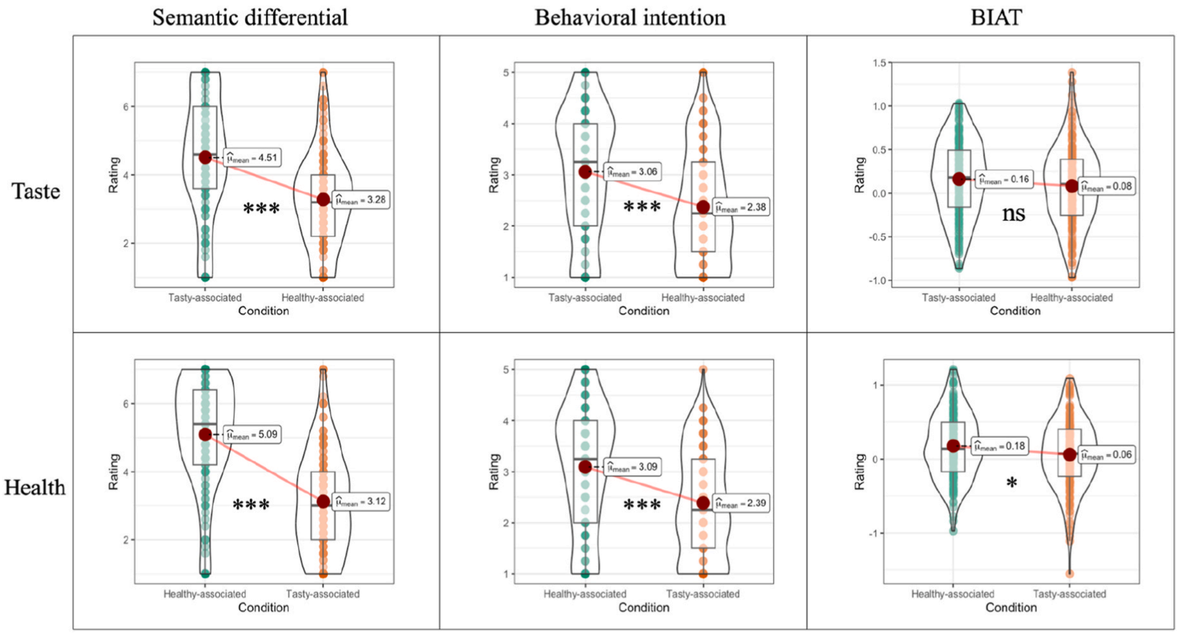

Fig. 6. Violin plots showing the distribution of outcome measures (Experiment 2) across dependent variables (columns) and goals (taste vs. health; rows), comparing target stimuli associated with the healthy versus the tasty source.
Note. p *< 0.05, **p < .01,***p < .001.

The code used to perform these analyses is openly available in the materials on OSF.

We also examined whether participants' awareness of the manipulation (coded as “Yes” vs. “No/I don't know”) was related to its effectiveness. Independent-sample t-tests revealed that participants who reported being aware of the manipulation scored significantly higher on the taste-related intention scale and on both semantic differential measures, compared to those who were unaware of the manipulation. When restricting the analysis to participants who were unaware of the manipulation, the manipulation remained effective across most outcome measures, with the exception of the BIAT health. These findings suggest that, although the manipulation was more effective among participants who were aware of it, SF effects did not depend entirely on participants' awareness.

Full details for all the analyses are reported in the supplementary materials section.

16. Discussion

Experiment 2 extended the effects observed in Experiment 1 with neutral foods to the domain of insect foods. However, here the SF effect emerged for self-reported measures (semantic differentials and behavioral intentions) and for the indirect measure (BIAT) concerning the health goal. For taste-related BIAT scores, the expected pattern of results emerged but the results were not statistically significant. Moreover, the magnitude of the effects was smaller compared to Experiment 1.

17. General discussion

The present research examined whether shared perceptual features can shape the perceived utility of foods, with a particular focus on insect-based products, a category known to elicit ambivalent or negative reactions (Castro & Chambers IV, 2019; Kroger et al., 2022). Across two experiments, we found that shared features can effectively transfer goal-relevant attributes, specifically healthiness and tastiness, from known source foods to unfamiliar target foods, thereby shaping the expected utility of the linked consumption behavior. This effect emerged consistently across multiple self-report measures and, to a lesser extent, on an indirect measure, the BIAT.

In Experiment 1, where neutral foods were employed as targets, we found consistent and substantial effects across all dependent variables. The SF manipulation significantly increased both direct and indirect evaluations of the target foods in line with the goal-relevant attribute (taste or health) of the associated source. In Experiment 2, we extended the paradigm to a more challenging domain: insect-based foods. Findings from Experiment 2 demonstrate that the Shared Features effect successfully generalizes to insect-based foods, extending its applicability beyond neutral target stimuli. This represents a significant advancement, as it suggests a pragmatic approach to increasing consumer acceptance of sustainable food alternatives by making them relevant to specific consumption goals such as pursuing taste or health objectives. However, the effects observed in Experiment 2 were notably smaller in magnitude and emerged primarily through direct rather than indirect measures.

One possible explanation for the differing effects observed between Experiment 1 and Experiment 2 is that two distinct psychological processes may have influenced participants’ evaluations of expected utility: forming new evaluations versus modifying pre-existing ones. Specifically, Experiment 1 focused on the expected utility of consuming entirely unknown foods, items that participants had never encountered before and toward which they had no prior evaluative expectations. Following the manipulation involving the shared features, participants were able to form favorable evaluations of these foods, perceiving them as tastier or healthier. In contrast, Experiment 2 involved foods that, although also new, contained insect-based ingredients, an element likely to activate pre-existing beliefs or prejudices (Kroger et al., 2022). Such evaluations tend to be stable and deeply rooted, and changing them is generally more effortful and less successful than forming new ones (Fazio & Olson, 2003; Moran et al., 2025). Forming expected utility judgments related to consuming unfamiliar, neutral stimuli might involve minimal resistance, allowing manipulations to operate effectively. By contrast, modifying expected utility for behaviors that are already associated with prior evaluations might be considerably more difficult, making the manipulation less effective.

The limited effectiveness of the intervention in Experiment 2 can also be understood from a GDP perspective in terms of competing goals.

Consuming insect-based foods may activate multiple, potentially conflicting goals, such as maintaining health and safety (Alhujaili et al., 2023), and adhering to social norms (Berger & Wyss, 2020; Stremmel et al., 2021). For example, Berger & Wyss (2020) shows that consumers' willingness to consume insect-based foods is influenced by descriptive social norms, such that individuals are more likely to engage in entomophagy when they believe that other do so. Existing beliefs about these foods connect them to this broader set of goals, whereas the intervention targeted only a subset of goal-relevant attributes (e.g., taste or health). As a result, the manipulation may have been less effective because it addressed only part of the utility assessment landscape, leaving other goal-driven evaluations unaltered.

One consistent finding across both studies is that the effects of the SF manipulation were consistently stronger on self-reported measures than on the BIAT. This result may be attributed to several factors. Firstly, the BIATs exhibited lower reliability, which can potentially reduce observed effect sizes (Nunnally & Bernstein, 1994). Moreover, self-report measures are generally considered more susceptible to demand characteristics than indirect measures (e.g., Fazio & Olson, 2003). Therefore, it is possible that the stronger effects observed in direct measures simply reflect participants' responses to these cues. Although this possibility cannot be entirely ruled out, it should be noted that participants in both studies were asked to report the extent to which they adjusted their responses to the demand characteristics, and the pattern of results, including the stronger impact of the manipulations on self-report measures, remains stable even after excluding participants who reported adapting to demand characteristics. Secondly, the observed difference between the impact of the manipulation on the two types of measures may also reflect theoretical considerations. Specifically, this pattern aligns well with early dual-attitude models (e.g., Wilson et al., 2000), which posited that implicit reactions change more slowly and require more prolonged or intensive exposure to manipulations. However, subsequent research shows that implicit evaluations can shift rapidly, challenging this assumption (Gawronski & Bodenhausen, 2011) and suggesting that different types of learning situations may differentially influence the cognitions captured by indirect versus direct measures (Gawronski & Bodenhausen, 2006). Finally, since we relied on a single indirect measure, the BIAT, we cannot exclude that the pattern we observed is partially due to the characteristics of this instrument. Specifically, the BIAT may be optimized to capture evaluations such as positive or negative valence (Sriram & Greenwald, 2009), whereas expected utility represents a more complex construct that integrates beliefs about goal attainment and outcomes within a hierarchical goal system. The limited correspondence between the construct and the measure may reduce the sensitivity to small shifts in utility-related associations, particularly when stimuli are complex or when participants hold strong pre-existing associations. Alternative indirect measures that capture more explicitly propositional content, such as the Implicit Relational Assessment Procedure (Barnes-Holmes et al., 2006), may be better suited to detect goal-relevant inferences about utility. More broadly, Moors and Köster (2022) suggest that, in order to predict behavior, indirect measures may need to target the value of behavior itself rather than attitudes toward the target of the behavior. Taken together, these considerations indicate that there are several potential explanations for the difference we observed between direct and indirect SF effects. We, therefore, believe that this is an interesting result that deserves further investigation in future research.

A central contribution of the present research lies in identifying a novel strategy through which (insect-based) food-related evaluations can be shaped, complementing existing strategies in the literature (see Kröger et al., 2022; Okaiyeto et al., 2024). Most previous approaches (e.g., Park et al., 2022; Sogari et al., 2017; Szczepanski et al., 2022; Verneau et al., 2016), although typically effective, may be limited in their scalability. In the present work, we sought to contribute to this literature by providing a proof of concept that (insect-based) food evaluations can be influenced through a brief and minimal intervention relying on shared features with familiar food products, offering a potentially scalable approach to promoting acceptance of foods products.

The GDP and SFP offer complementary insights, providing a comprehensive framework for understanding expected utility modification of goal-directed behaviors. In food consumption contexts, GDP is particularly useful for identifying which attributes are relevant for achieving current goals, such as taste or health. Experimental findings further show that SF interventions can successfully transfer these goal-relevant attributes from source to target foods, thereby modifying the perceived utility of consuming them. Taken together, this demonstrates how GDP can inform interventions, while SF provides a tool to shape expectations in line with goal-directed evaluations. By integrating SF and GDP, this framework links cognitive inferences about stimulus features to the expected utility of the associated behavior, thus providing a proof of concept for a systematic method to experimentally manipulate expected utilities in a controlled setting.

Limitations of the present research should be acknowledged. The external validity of the experimental paradigm employed in this research remains to be established. The current research follows a modelling approach, meaning that one phenomenon is studied in order to gain insights into another phenomenon (Boddez et al., 2023). In this case, behavior in the laboratory procedure (including the stimuli, measurements, and sample under investigation) is used to gain information about everyday behaviors such as purchasing and consuming specific food products. At present, we do not know whether these laboratory findings generalize to the target phenomenon. To validate a laboratory procedure, one can examine whether variables that affect outcomes in the laboratory also affect outcomes in the target phenomenon (e.g., actually buying and eating food products). The underlying idea is that the more variables show parallel effects across the laboratory procedure and the target phenomenon, the more likely it is that the effect of a new variable studied in the lab will translate to the real-world context, even when there are substantial surface differences between the model and the target phenomenon (Boddez et al., 2023). Although we did not explicitly adopt this validation approach, the difference observed between Experiment 1 and Experiment 2 may be of interest here. The nature of the stimuli (non-insect-based foods vs. insect-based foods) appears to influence behavior both in the laboratory procedure and in real life. Indeed, in real-world contexts, people are generally less willing to buy and consume insect-based foods compared to conventional alternatives (e.g., Hartmann & Siegrist, 2017). This convergence suggests that the laboratory procedure may capture at least some relevant aspects of the target phenomenon. Nevertheless, this is only a first step, and further validation studies are clearly warranted. Another point related to this concerns the specific presentation format of the insect-based products used in Experiment 2. In the present study, we employed packaged products, without directly showing the food, and used a stylized cartoon logo of an insect. Prior research indicates that the visual presentation of insect-based foods can substantially influence consumer responses (Puteri et al., 2023), with products that do not display whole insects and that rely on abstract or stylized representations generally eliciting more favorable evaluations than those showing realistic insect images (Hémar-Nicolas et al., 2025). As such, the use of packaging and cartoon cues in the present study may have attenuated negative reactions and facilitated acceptance. Future research should systematically vary the level of insect visibility and realism to better understand how these factors interact with the SF interventions in shaping food evaluations. A further limitation concerns the absence of a measure assessing participants' prior experience with insect-based foods, as such previous exposure may moderate the effectiveness of the manipulation. Future research should include this variable to better account for individual differences in familiarity and prior consumption.

Future research could further clarify the mechanisms and boundary conditions of GDP-SF interventions. One avenue is to examine whether the magnitude of the effects depends on the contextual salience of the targeted goal dimension, for example, whether effects are stronger when specific goal considerations are already prioritized. Individual differences, such as personality traits or openness to new foods, may also moderate the intervention's impact. Additionally, it would be valuable to compare changes in expected utility induced by the integrated GDP-SF with traditional attitude-change interventions to assess their relative influence on behavior. Importantly, investigating whether expected utility modifications translate into actual food choices or consumption patterns, potentially through longitudinal designs, could provide insights into the persistence and real-world applicability of the GDP-SF interventions. For instance, such interventions could be implemented in real-world settings by pairing novel or sustainable food products with other foods through shared perceptual features (e.g., packaging, placement, or visual cues) that highlight goal-relevant attributes such as taste or health, thereby increasing their perceived utility for consumption goals.

Ethical approval and informed consent

All procedures performed in these experiments were conducted in accordance with the ethical standards of the Declaration of Helsinki. Ethical approval was obtained from the Ethics Committee of Ghent University (approval number 2023-137). All participants were informed about the aims of the research, the voluntary nature of their participation, any potential risks, and how their data would be stored and used. Participants' confidentiality was ensured, and informed consent was obtained prior to participation in the study.

CRediT authorship contribution statement

Francesco Fedeli: Writing – review & editing, Writing – original draft, Formal analysis, Data curation, Conceptualization. **Yannick Boddez:** Writing – review & editing, Writing – original draft, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Patrizia Steca:** Writing – review & editing, Writing – original draft, Funding acquisition, Data curation. **Cristina Zogmaister:** Writing – review & editing, Writing – original draft, Formal analysis, Data curation, Conceptualization.

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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.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.appet.2026.108605.

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