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RUNNING HEAD: CONTEXTUAL ACCEPTANCE OF NOVEL AND UNFAMILIAR FOODS

Contextual acceptance of novel and unfamiliar foods: Insects, cultured meat, plant-based meat alternatives, and 3D printed foods

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ABSTRACT

Engineering healthy diets from sustainable food resources undoubtedly constitutes a major global challenge. One solution to the problem of developing healthy and sustainable diets involves the incorporation of various novel/unfamiliar foods into our diets (e.g., insect-based foods, cultured meats, plant-based meat alternatives, and 3D printed foods). However, the consumer acceptance of novel/unfamiliar foods still poses something of a challenge. Although a growing body of research has started to reveal that situational factors (e.g., social companions, eating venue) can influence food preferences, it remains unclear how exactly they influence the consumer's acceptance of novel/unfamiliar foods (including unfamiliar ingredients, food produced by novel processes/technologies). Across three studies, we examined the influence of social companions (alone, friend, family, acquaintance, partner) and venue (home, cafe, bar, pub, food festival, restaurant), on the anticipated willingness to try a number of novel/unfamiliar foods (insect-based foods, cultured meats, plant-based meat alternatives, and 3D printed foods). Using the category name and descriptions of novel/unfamiliar foods, our results demonstrated that situational factors influence anticipated acceptance differently depending on the type of novel/unfamiliar foods. Eating with friends and at food festivals plays an important role in the anticipated acceptance of insect-based foods, cultured meats, and 3D printed foods in a similar way. Moreover, expected positive and negative emotions might help to explain why these situational factors increase the anticipated acceptance of these foods. In contrast, the environmental situations that increase the anticipated acceptance of plant-based meat alternatives are similar to those increasing the acceptance of typical (rather than novel) foods. Taken together, these findings reveal the role of situational factors in the anticipated eating of a variety of novel/unfamiliar foods, thus providing practical implications on how/where to introduce such foods or engineer appropriate situations to increase the acceptance of, and exposure to, such novel/unfamiliar foods.

Keywords: Novel food; Unfamiliar food; Emotions; Venues; Social situations

HIGHLIGHTS

- The role of context in the anticipated acceptance of novel and unfamiliar foods was studied.
- Friends increased anticipated acceptance of eating insects, cultured meats, and 3D printed foods more than the other companions.
- Festivals increased anticipated acceptance of eating insects, cultured meats, and 3D printed foods more than the other venues.
- There were no specific situations that increased the anticipated acceptance of plant-based alternatives.

INTRODUCTION

There is a growing need for healthy and sustainable food systems, with current food solutions being argued to be both unhealthy and unsustainable thus putting both people and the planet at risk (Willett et al., 2019). More than 820 million people are thought to be at risk of the consequences of consuming an unhealthy diet leading to lifestyle diseases and ultimately morbidity (Willett et al., 2019). The world's population is also expected to grow to about 10 billion people by 2050, and this may result in insufficient amounts of animal proteins from current resources (livestock, poultry, and fish) and increased dietary risks to people and to the planet that they inhabit (Willett et al., 2019). Moreover, the current food production systems raise ethical questions as they can increase global environmental risks such as increased greenhouse-gas emissions, phosphorus pollution, loss of biodiversity, and problems of animal welfare.

Novel and unfamiliar foods as a potential solution

One potential solution to solve the issue of healthy and sustainable diets is to use more of those novel/unfamiliar foods. According to the European Commission, novel foods include foods that are newly developed, innovative, produced using new technologies and production processes, or not traditionally eaten within a given culture (https://ec.europa.eu/food/safety/novel_food_en). Novel/unfamiliar foods include insect-based foods, plant-based meat replacers, artificial meats, 3D printed foods, to name but a few (Tuorila & Hartmann, 2020). Under the appropriate conditions, such foods may represent a beneficial component of a healthy and sustainable diet. For example, many insect-based foods constitute a rich source of protein. What is more, production has been shown to involve less greenhouse-gas emissions and water/land use than the production of meat and poultry products (van Huis, 2013). Plant-based meat alternatives and artificial meat (i.e., cultured meats) potentially offer an alternative to red meat (beef, pork), which increases risk for morbidity and lifestyle diseases as well as being linked to problems of animal welfare. In comparison with red meat, plant-based meat alternatives and artificial meat are healthier and less ethically problematic (Santo et al., 2020). According to some (perhaps overoptimistic) commentators, 3D printed food may also play a role in promoting healthy and sustainable food systems by reducing food waste (Ramachandraiah, 2021). Although there has been much interest in the potential benefits of such novel foods, many consumers remain reluctant to those foods that they are unfamiliar with (Tuorila & Hartmann, 2020).

In this study, we selected insects, cultured meat, plant-based alternatives, and 3D printed food as novel/unfamiliar foods for further analysis. These foods have attracted the attention of many of those researchers interested in novel/unfamiliar foods. Recent systematic reviews of alternative proteins have commonly focused on insects, cultured meat, and plant-based alternatives (Hartmann & Siegrist, 2017; Onwezen et al., 2020). In addition, we also included 3D printed food which can, in some sense at least, be regarded as offering the consumer a novel/unfamiliar source of food (Tuorila & Hartmann, 2020). Consumer responses to 3D printed foods has also attracted the attention of scholars (e.g., Hartmann & Siegrist, 2020a). It should be noted that the aim of this study was not to include all possible novel/unfamiliar foods. The situation regarding other novel/unfamiliar foods is noted in the discussion section.

Factors affecting the acceptance of novel/unfamiliar foods

Previous research has investigated the determinants of the consumer acceptance of various novel and unfamiliar foods. The influence of individual characteristics, as well as various food-intrinsic and food-extrinsic factors on the acceptance of novel food have all been investigated (Bryant & Barnett, 2018; Hartmann & Siegrist, 2017; He et al., 2020; Mancini et al., 2019; Onwezen et al., 2020, for reviews). For example, personality dimensions such as food neophobia (Hartmann et al., 2015; Koning et al., 2020; Lombardi et al., 2019; Megido et al., 2014; Verbeke, 2015) and neophobia directed toward food technology (Brunner et al., 2018; Siegrist & Hartmann, 2020a), as well as individual characteristics such as gender (Bartkowicz, 2017; Verbeke, 2015; Wilks & Phillips, 2017) have been shown to influence the acceptance of various novel foods. Perhaps unsurprisingly a range of food-intrinsic factors including taste (Reipurth et al., 2019), flavour (Schouteten et al., 2016), texture (Tuorila & Hartmann 2020), and visual appearance (Tan, van den Berg, & Stieger 2016) have all been shown to influence the consumers' willingness to accept novel foods. Additionally, food-extrinsic factors such as information concerning environmental benefits (Bekker et al., 2017; Verbeke et al., 2015), food descriptions (e.g., organic meat, clean meat) (Bryant & Barnett, 2019; Siegrist et al., 2018), and price (Slade, 2018) can potentially also affect the likely acceptance of novel foods too (e.g., see The Guardian, 2019). Importantly, however, further research is still needed in order to clarify how situational factors influence the acceptance of novel and unfamiliar foods, as this is one of the factors that affect the consumers' response to foods (Cardello & Meiselman, 2018; Köster, 2009).

Potential role of environmental factors in the acceptance of novel/unfamiliar foods

Situational factors can be defined as anything that occurs in the surroundings of the consumer (Dacremont & Sester, 2019) and are regarded as essential factors influencing people's food choice, perception, and behaviour (Betancur et al., 2020; Köster, 2009). Situational factors include the social environment and physical surroundings (Spence, 2020a, for a review) such as social companions (Cardello et al., 2000; Herman, 2015), locations (Edwards et al., 2003), ambient temperature (Motoki et al., 2018, 2019a), and temporal aspects related to the time of the day or the season (Delarue et al., 2019; Ristic et al., 2019; see Spence, 2021a, b, for reviews). The present study tackles the role of two situational factors, namely social situations and the venue, on the acceptance of novel foods.

The role of social context on the willingness to try novel foods

The mere presence (or imaginary presence) of other people influences people's acceptance of food (Higgs, 2015). The presence of intimate individuals (e.g., friends, partner, family) encourages increased eating when compared to the presence of less intimidate ones (e.g., co-workers; De Castro, 1994). Some researchers have examined social influences on the expected acceptance of (or willingness to try) novel and unfamiliar foods (Elzerman et al., 2021; Jensen & Liebertoth, 2019; Menozzi et al., 2017; Michel et al., 2020; Motoki et al., 2020). Among them, the role of the presence of others (sometimes others who are merely imagined) has been investigated (Elzerman et al., 2021; Michel et al., 2020; Motoki et al., 2020). Motoki and his colleagues demonstrated that people anticipated being more willing to try insect-based foods with friends than when alone or with other companions (family, partner, acquaintance) (Motoki et al., 2020). In the case of plant-based meat alternatives (e.g., vegetarian nuggets), Michel et al. (2020) demonstrated that omnivores considered eating alone, with friends, or with family members on a weekday as more appropriate than with the family for Sunday dinner. Elzerman and colleagues suggest that omnivorous participants are more willing to try plant-based meat alternatives with vegetarians than with family, friends, or when dining alone (Elzerman et al., 2021), presumably assuming that participants' friends/family are not themselves vegetarians. These findings therefore suggest that what is considered an appropriate situation differs amongst different classes of novel food.

It is natural to expect that eating behaviours are influenced by the group (and related characteristics) with whom people eat considering that each group embodies a set of social norms, as well as emotions which may set the stage for eating (Higgs & Thomas, 2016; Obrist et al., 2019). This study therefore investigated how the presence of others with different characteristics (e.g., friends, partner, family) influences the expected acceptance of diverse novel food (insect-based foods, plant-based meats, cultured meats, and 3D printed foods).

The role of context (venues) on the willingness to try novel food

Earlier studies demonstrated that the context (venues) in which people eat can influence their preference and/or acceptance of foods (e.g., Edwards et al., 2003; Hersleth et al., 2005; Jaeger & Rose, 2008; Meiselman et al., 2000; Weber et al., 2004). A few researchers have examined the role of context on the acceptance of (or willingness to try) novel foods in particular (Alemu et al., 2017; Michel et al., 2020; Motoki et al., 2020). Motoki and his colleagues have demonstrated that people predict that they will be more willing to try insect-based foods at food festivals and pubs than at cafes and bars (Motoki et al., 2020). Here it is worth noting that 'pubs' refers, in this case, to *izakaya*, what one might consider to be the Japanese equivalent of a gastropub. Michel et al. investigated the role of context on the expected acceptance of plant-based meat alternatives (vegetarian nuggets), but no differences were found amongst contexts (venues) (e.g., a barbecue party, dinner in a restaurant, at a business meal) (Michel et al., 2020). These findings therefore suggest that appropriate situations may differ amongst novel foods. Actually, different drivers for acceptance/rejection have been suggested for different classes of novel food (Tuorila & Hartmann, 2020). For example, curiosity, which is a positively arousing emotion and seems to be relevant to specific venues (e.g., food festivals), might be a potential driver of acceptance of insect-based foods (but not plant-based meat alternatives; Tuorila & Hartmann, 2020). Moreover, to the best of our knowledge, no research has yet investigated which contexts may be most suitable for sampling cultured meat and 3D printed foods. Consequently, it remains unknown which contexts would differently influence the expected acceptance (i.e., willingness to try) of novel foods.

In the present study, we investigated whether specific contexts (such as a bar or restaurant) would influence people's anticipated willingness to try novel foods. Similar to what happens with social situations, one may expect that the appropriateness of a

given eating location may facilitate (or not) the acceptance of a specific food (Piqueras-Fiszman & Jaeger, 2014c).

The influence of emotion on food acceptance

Context-evoked (or associated) emotions have been shown to influence people's acceptance of food (Evers et al., 2013, 2018; Macht et al., 2002; Motoki et al., 2019b; Motoki & Sugiura, 2018). It is important to note that the emotions evoked differ as a function of the context in which people imagine consuming, or actually do consume, various food products (Piqueras-Fiszman & Jaeger, 2014a, b, c, 2015). Positive emotional terms are more often used when food products are consumed in appropriate situations (Piqueras-Fiszman & Jaeger, 2014a, b). For example, when people imagine consuming food in contexts that are more appropriate, they tend to expect that they will feel greater positive emotions (e.g., happy, loving, enthusiastic, peaceful) (Piqueras-Fiszman & Jaeger, 2014a, b).

Negative arousing emotions and the acceptance of novel and unfamiliar foods

Negative arousing emotions tend to be associated with a lower acceptance of novel foods. Humans show interest in novel/unfamiliar foods but often feel negative arousing emotions (e.g., fear and anxiety) at the same time (Rozin, 1976). Negative arousing emotions such as disgust are associated with the lower acceptance of cultured meat (Siegrist & Hartmann, 2020b). Negative arousing emotions including disgust, fear, and anxiety have also been associated with a lower acceptance of insect-based foods (Mancini et al., 2019). Meanwhile, participants tend to feel both positive (e.g., excited) and negative arousing emotions (e.g., disgust, unsafe) toward 3D printed foods (Manstan et al., 2020). The 'markedly interested' cluster reported less disgust, higher excitement, and more safety toward 3D printed foods than the 'moderately interested' and the 'not interested' clusters (Manstan & McSweeney, 2020). Additionally, lower disgust has been associated with the intent to purchase plant-based meat alternatives in the USA, though this was not the case in India and China (Bryant et al., 2019). The evidence therefore suggests that negative arousing emotions (such as fear and anxiety) might play an important role in the acceptance of novel foods. When situational factors increase the acceptance of novel foods, it might be possible that the situational factors also decrease expected negative arousing emotions.

238

239 *Positive arousing emotions and the acceptance of novel and unfamiliar food*

240 Positive arousing emotions are associated with the higher acceptance of novel and
241 unfamiliar foods. The research that has been published to date suggests that evoked or
242 expected positive arousing emotions increase the (expected) acceptance of novel foods
243 including insect-based, cultured meat, and 3D printed foods (Manstan & McSweeney,
244 2020; Motoki et al., 2020). For example, Motoki and his colleagues suggest the positive
245 arousing emotions (e.g., excitement) that may be evoked by specific situations (e.g.,
246 with friends, at food festivals) increases the willingness to try insect-based foods
247 (Motoki et al., 2020). Moreover, some people even report feeling positive arousing
248 emotions (i.e., excited) toward 3D printed food (Manstan et al., 2020). The 'markedly
249 interested' cluster reported higher exciting feelings toward 3D printed foods than the
250 'moderately interested' and the 'uninterested' clusters (Manstan & McSweeney, 2020).
251 Fun, which possibly involves positive arousing emotions, is a significant predictor of
252 positive attitude to 3D printed foods (Brunner et al., 2018). As for cultured and plant-
253 based meat alternatives are concerned, excitement is associated with a higher likelihood
254 of purchase (Bryant et al., 2019). This evidence suggests that positive arousing
255 emotions may play an important role in the acceptance of novel foods. Situational
256 factors increase the acceptance of novel foods possibly due to increased expected
257 positive arousing emotions.

258 No report of the relevant literature has, at least as far as we are aware, yet described a
259 study that has investigated how product-evoked emotions in a given context contribute
260 to the acceptance of novel and unfamiliar foods. Given that appropriate contexts elicit
261 positive (or at least less negative) emotions, it might be inferred that the influence of
262 social situations and venues on the acceptance of novel foods results from the positive
263 emotions experienced under those situations.

264

265 *Present study*

266 The present study was designed to investigate how situational factors influence the
267 expected acceptance of various classes of novel and unfamiliar food. Insect-based
268 foods, cultured meats, plant-based meat alternatives, and 3D printed foods were chosen
269 as the novel and unfamiliar foods. Each of these foods can be treated as
270 novel/unfamiliar as well as having captured the attention in the field of sensory and

consumer science (e.g., Bryant & Barnett, 2018; Mancini et al., 2019; Onwezen et al., 2020; Siegrist & Hartmann, 2020a; Tuorila & Hartmann, 2020).

Across three studies, we examined the influences of social situations (alone, friend, family, acquaintance, romantic partner) and of venues (cafe, bar, pub, restaurants, food festival, home) on people's expected willingness to try various novel and unfamiliar foods. Specifically, our study aims to determine whether specific situations (i.e., with friends, at food festivals) would increase anticipated willingness to try novel/unfamiliar foods relative to the other situations where people usually eat foods. Specifically, situations such as friends and food festivals seem to be associated with more fun and feelings of excitement than the other situations. Recently, it has been shown that people expect to experience a greater liking for insect-based foods when they are with friends and at food festivals, possibly because they expect to be positively aroused (Motoki et al., 2020). In addition to the specific situations (i.e., with friends, at food festivals), we chose four social situations (alone, family, acquaintance, romantic partner) and five venues (cafe, bar, pub, restaurants, home). The choice of these situations was mainly based on previous research on the contextual acceptance of novel/unfamiliar foods (Michel et al., 2020; Motoki et al., 2020). These represent a selection of social situations and venues where people eat and might be associated with distinct expected emotions. We did not choose co-workers and the other outdoor venues (e.g., street food). This is because there is no evidence that co-workers increase the anticipated acceptance of novel/unfamiliar foods (Michel et al., 2020). Food festivals can, to a certain extent at least, be considered to partially overlap with the other outdoor venues (e.g., "street food festivals") especially in Japan where the present research was conducted.

Study 1 used the category name of novel/unfamiliar food (the name of each food; e.g., insect-based food, 3D printed food). Study 2 examined the role of expected emotions on the influence of situational factors on the expected acceptance of novel/unfamiliar food. Study 3 used specific descriptions of novel/unfamiliar foods (e.g., mealworm burger, 3D printed burger) and the evoked emotions, in order to try and replicate and expand the results obtained from Studies 1–2.

Study 1: The role of contexts on the anticipated acceptance of novel/unfamiliar foods (the category name)

METHODS

Participants

Data from 117 Japanese participants (47 females, mean age of 41.25 years, SD = 9.60) were collected. The participants in all of the experiments were recruited on Lancers (https://www.lancers.jp/). The participants completed a survey on Qualtrics (https://www.qualtrics.com/jp/). The appropriate sample size was calculated using G*Power (Faul et al., 2007). Given the difficulty of sample size calculations for complex experimental designs, we focused mainly on our post-hoc analyses (i.e., one-way repeated measures ANOVA, e.g., insects for five social situations, cultured meat for six venues). A priori power analyses indicated that the number of required participants in each study was sufficient to detect a small to medium effect size (f = 0.15) with 95% power at an alpha level of .05. Additionally, sample sizes of all studies were equivalent for a recent study examining the acceptance of novel food (insect-based food; Motoki et al., 2020). The participants received monetary compensation in return for completing the study (100-150 JPY: or about 1-1.5 USD, for each study). All of the studies described herein were approved by the ethics committee of Miyagi University and were conducted in accordance with the Declaration of Helsinki.

Design and procedure

The study for social situations followed a 5 (food: typical, insect-based, cultured meat, plant-based, 3D printed) × 5 (social situations: alone, friend, family, acquaintance, romantic partner) within-participants experimental design. The study for venues followed a 5 (food: typical, insect-based, cultured meat, plant-based, 3D printed) × 6 (venues: cafes, restaurants, bars, pubs, food festivals, home) within-participant experimental design. The dependent variable was the rating of the expected willingness to try.

Participants responded to the question about the influence of social situations on their willingness to try novel foods. The brief explanation of each novel food was as follows. “Plant-based meat alternatives are made from plant-based protein such as soybeans”, “3D printed food is created using 3D printing technology”, “Cultured meat is made from animal cells (e.g., from cattle, pigs) that are grown outside of the animal's body”. No instructions were provided for the typical and insect-based foods. The participants were asked to answer, ‘How much would you like to try eating [typical food/ insect-based food/ cultured meat/ plant-based meat alternative/ 3D printed food] in the

following situations (social situation: alone/with friend/family/acquaintance/romantic partner)?' The participants also responded to the question about the influence of venues on the willingness to try novel food ('How much would you like to try eating [typical food/ insect-based food/ cultured meat/ plant-based meat alternative/ 3D printed food] (venues: cafes/restaurants/bars/pubs/food festivals/home)?' All ratings were made on Likert scales ranging from 1 (not at all) to 7 (very much). The order of conditions (e.g., social situation-insect, social situation-cultured meat, venues-typical food) and items (e.g., alone, friend) was randomized within participants.

Statistical Analysis

Repeated measures analysis of variance (ANOVA) was applied to assess the effects of social situations and venues on willingness to try novel food. The analysis for social situations followed a 5 (food: typical, insect-based, cultured meat, plant-based meat alternatives, 3D printed) × 5 (social situations: alone, friend, family, acquaintance, romantic partner) within-participants experimental design. The analysis for venues followed a 5 (food: typical, insect-based, cultured meat, plant-based, 3D printed) × 6 (venue: cafes, restaurants, bars, pubs, food festivals, home) within-participants experimental design. The dependent variable was the rating of the anticipated willingness to try. ηG_2 (generalized eta squared) was used for effect size. If an interaction term was observed, post-hoc analysis was conducted to elucidate the details of the interaction. This analysis was conducted using Shaffer's modified sequentially rejective Bonferroni procedure (Shaffer, 1986). All of the ANOVAs and subsequent multiple comparison testing were carried out using anovakun (Iseki, 2016), a function of the R software.

Cluster analysis of food categories was carried out to evaluate whether novel/unfamiliar food would be grouped into clusters and to identify which novel food has similar associations when considering situations. Hierarchical cluster analysis was performed on the food categories × social and locational situations (mean ratings of willingness to try) matrix. Euclidean distance and Ward's aggregation method were applied to the data. The cluster analysis was performed using HAD software (Shimizu, 2016).

RESULTS

Influence of social situations on willingness to try

The analysis revealed main effects of food type and social situations (food type, $F_{4, 464} = 180.265$, $p < .001$, $\eta G_2 = 0.414$; social situation, $F_{4, 464} = 17.556$, $p < .001$, $\eta G_2 = 0.014$). As expected, insect-based food was rated as the least likely of the novel foods to be eaten. A significant interaction was documented between the type of food and the social situation ($F_{16, 1856} = 14.410$, $p < .001$, $\eta G_2 = 0.019$). The participants in Experiment 1 anticipated that they would be more willing to try insect-based foods and 3D printed foods with friends rather than in any of the other social situations that were assessed. They also reported anticipating being more willing to try cultured meat with friends than with their partner, their family, or with an acquaintance. Plant-based meat alternatives were more likely to be eaten with family, friends, and alone than with one's partner or an acquaintance. For typical food, the participants were more likely to eat with familiar individuals (family, partner, friends) and alone than with acquaintances. The results of Experiment 1 are summarized in Figure 1.

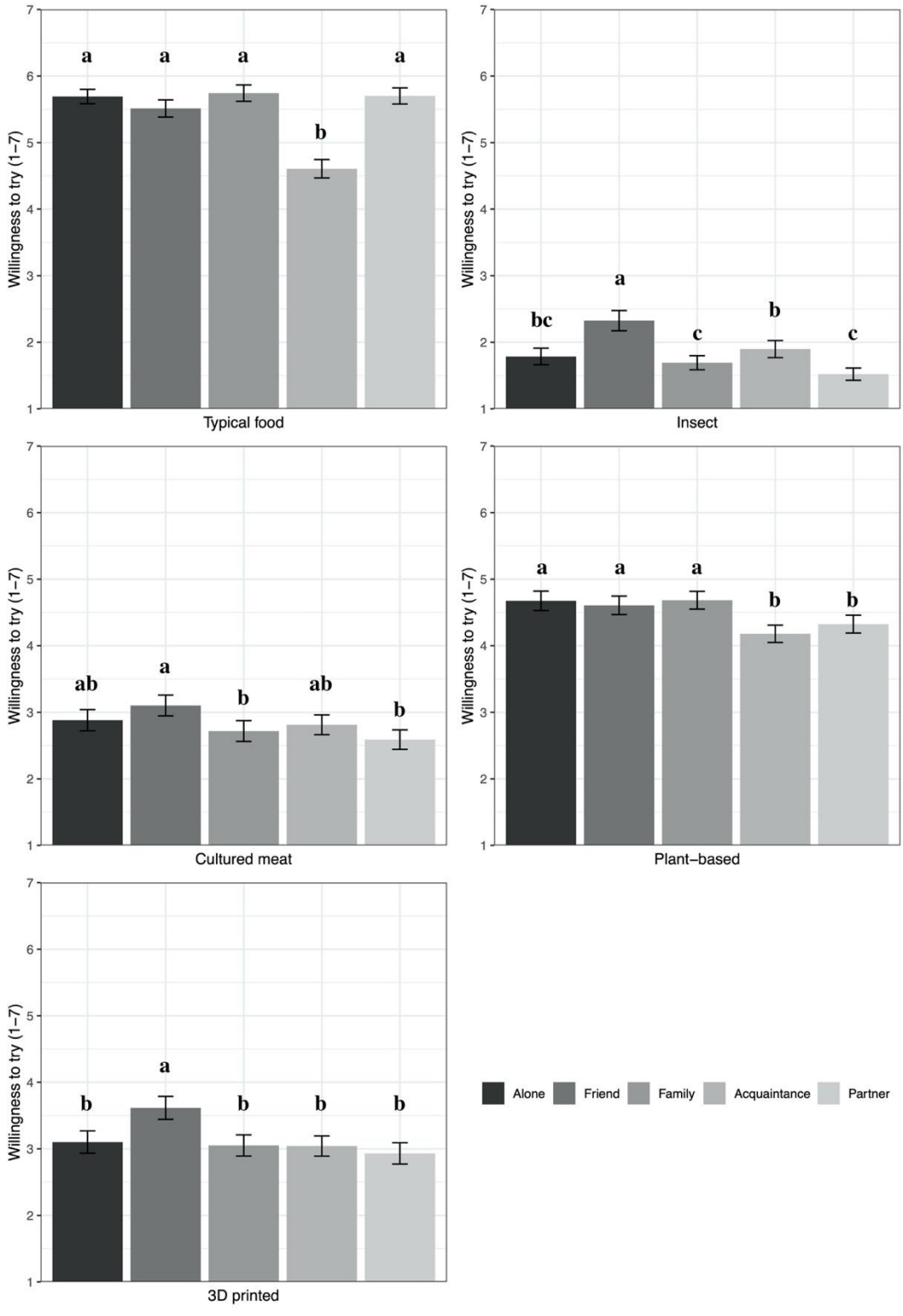
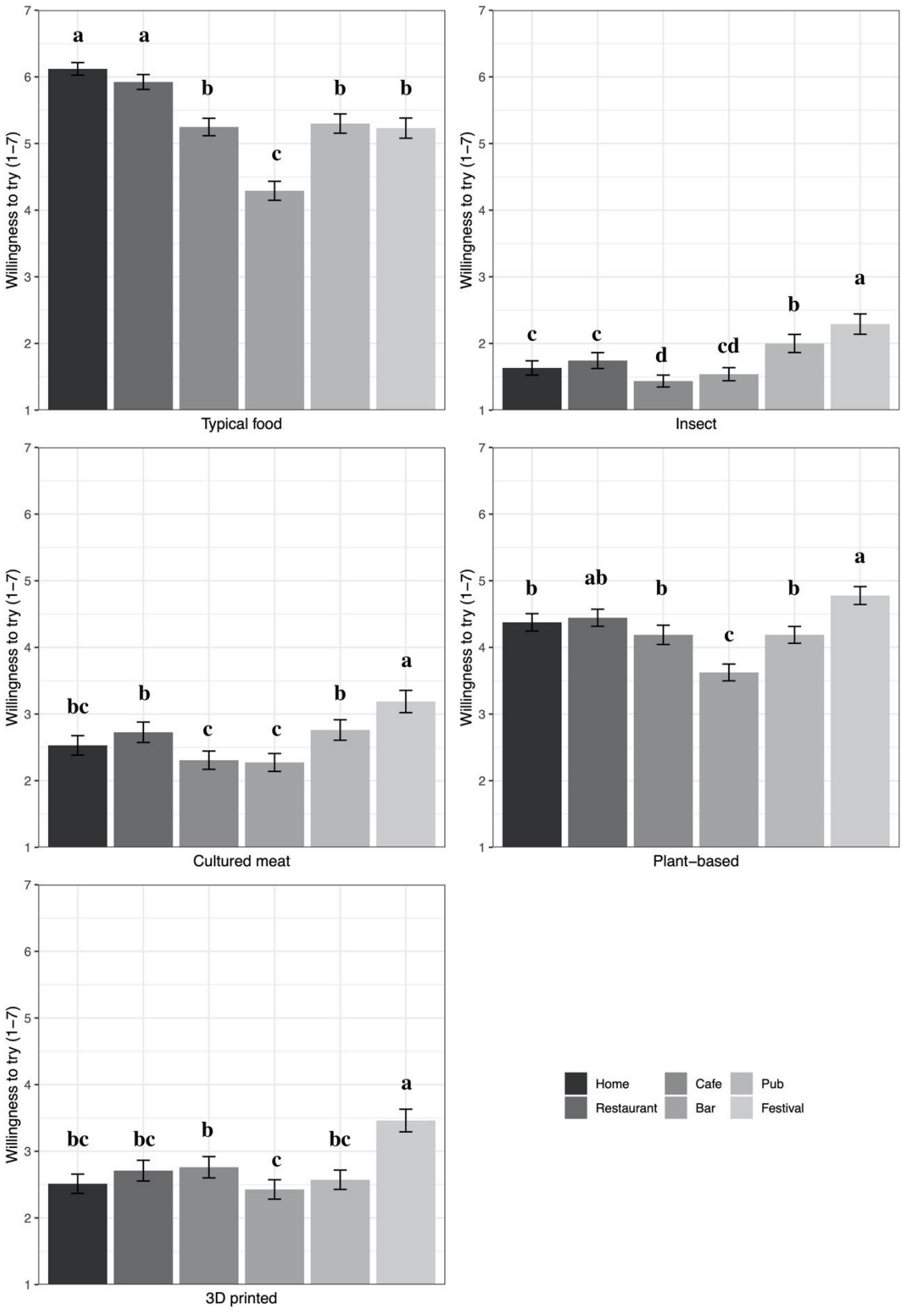


Figure 1. Results of Study 1 highlighting the influence of social situations on the participants' expected willingness to try. Ratings on a 1–7 scale ('not at all' to 'very much'). Each bar denotes mean and error bars represent the standard errors of the mean.

Different letters (e.g., a/b, b/c) indicate statistically significant differences among situations within each food type (adj. $p < .05$ with Shaffer's modified sequentially rejective Bonferroni procedure; Shaffer, 1986). Similar letters (e.g., a/a, a/ab) indicate no significant difference.

Influence of venues on willingness to try

The analysis revealed significant main effects of food type and social situation on the anticipated willingness to try (food type, $F_{4, 464} = 197.929$, $p < .001$, $\eta G_2 = 0.429$; venues, $F_{4, 464} = 37.723$, $p < .001$, $\eta G_2 = 0.038$). As expected, insect-based foods were rated as the least likely to be eaten as compared to the other types of novel food. A significant interaction was documented between the food types and social situations ($F_{16, 1856} = 18.454$, $p < .001$, $\eta G_2 = 0.029$). For insect-based foods, cultured meats, and 3D printed foods, participants anticipated that they would be more willing to try them at food festivals than at any of the other venues. They also tended to report being more willing to try plant-based meat alternatives at food festivals, restaurants, cafes, and in the home than when at the pub or bar. For typical food, participants expected that they would be more likely to eat them at home and in the context of a restaurant than in any of the other situations that were suggested. A visual summary of the results is presented in Figure 2. Additionally, all Study 1 pairwise comparisons are presented in the Appendix Tables.


Willingness to try (1–7)
Typical food
a a b c b b
Insect
c c d cd b a
Cultured meat
bc b c c b a
Plant–based
b ab b c b a
3D printed
bc bc b c bc a
Home
Restaurant
Cafe
Bar
Pub
Festival

410

Figure 2. Results of Study 1 highlighting the influence of venues on anticipated willingness to try. Ratings on a 1–7 scale (‘not at all’ to ‘very much’). Each bar denotes mean and error bars represent the standard errors of the mean. Different letters (e.g., a/b, b/c) indicate statistically significant differences among situations within each food type (adj. $p < .05$ with Shaffer's modified sequentially rejective Bonferroni procedure; Shaffer, 1986). Similar letters (e.g., a/a, a/ab) indicate no significant difference.

Results of cluster analysis

The dendrogram from the cluster analysis revealed that there are two clusters in food types (see Figure 3). One conventional food cluster contains typical foods and plant-based meat alternatives, the other novel food cluster includes insect-based foods, cultured meats, and 3D printed foods.

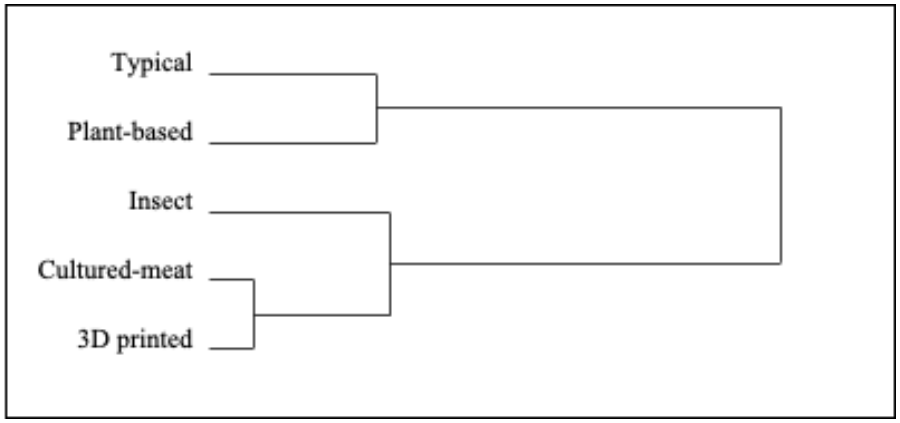


Figure 3. The dendrogram of cluster analysis used in Study 1.

Discussion

The results of Study 1 revealed that associations between situations and willingness to eat novel/unfamiliar food were dependent on the food type. Similar findings were observed for insect-based, cultured meat, and 3D printed foods. Friends and festivals increased the consumers’ expected acceptance of three novel foods (insect-based, cultured meat, and 3D printed foods) as compared with other social situations/venues. Similar findings were observed for plant-based meat alternatives and for typical foods. Participants expected that they would be less willing to try plant-based meat alternatives and typical foods with acquaintances and at bars than in other situations.

Study 2: The role of contexts on the anticipated acceptance of novel/unfamiliar foods and anticipated emotions (the category name)

Study 2 was designed to replicate the main findings of Study 1 and to further investigate the role of evoked emotions associated with the relations between situations and the expected acceptance of novel food.

METHODS

Participants, design, and procedure

Data were collected from 108 Japanese participants (46 females, mean age of 41.33 years, SD = 10.49). The study followed a 5 (food: typical, insect-based, cultured meat, plant-based, 3D printed) × 5 (social situations: alone, friend, family, acquaintance, partner) within-participants experimental design. The study for location followed a 5 (food: typical, insect-based, cultured meat, plant-based, 3D printed) × 6 (venues: cafes, restaurants, bars, pubs, food festivals, home) within-participants experimental design. The main dependent variable was the rating of expected willingness to try. Expected emotions were also used as additional dependent variables.

Participants responded to the same questions as in Study 1. After that, they responded to the questions concerning the expected emotions. The questions were “Imagine you are eating [typical food/ insect-based food/ cultured meat/ plant-based meat alternatives / 3D printed food] in the following situations (social situation: alone/ with friend/ family/ acquaintance/ partner and venues: cafes/ restaurants/ bars/ pubs/ food festivals). How much would you expect to be [energetic and excited/ enthusiastic and inspired/ secure and at ease/ relaxed and calm/ jittery and nervous/ tense and bothered/ blue and uninspired/ dull and bored]?” The order of conditions (e.g., social situation-insect, social situation-cultured meat, location-typical food) and items of emotions (e.g., ‘energetic and excited’) was randomized within participants. All ratings were made on Likert scales ranging from 1 (not at all) to 7 (very much).

The measures of emotions were derived from a single-response emotion word questionnaire inspired by a circumplex model of core affect (Jaeger et al., 2020), which is itself based on a 12-point circumplex model of core affect (Yik et al., 2011). We created four dimensions of affect: positive arousal, positive calming, negative arousal,

and negative calming. Positive arousal was a mean rating of 'energetic and excited' and 'enthusiastic and inspired'. Positive calming was a mean rating of 'secure and at ease' and 'relaxed and calm'. Negative arousal was a mean rating of 'jittery and nervous' and 'tense and bothered'. Negative calming was a mean rating of 'blue and uninspired' and 'dull and bored'.

Statistical Analysis

Similar to Study 1, an ANOVA was used to assess the effects of social situations and venues on people's willingness to try novel food. We also assessed the effects of social situations and venues on anticipated emotions (positive arousal, positive calming, negative arousal, and negative calming).

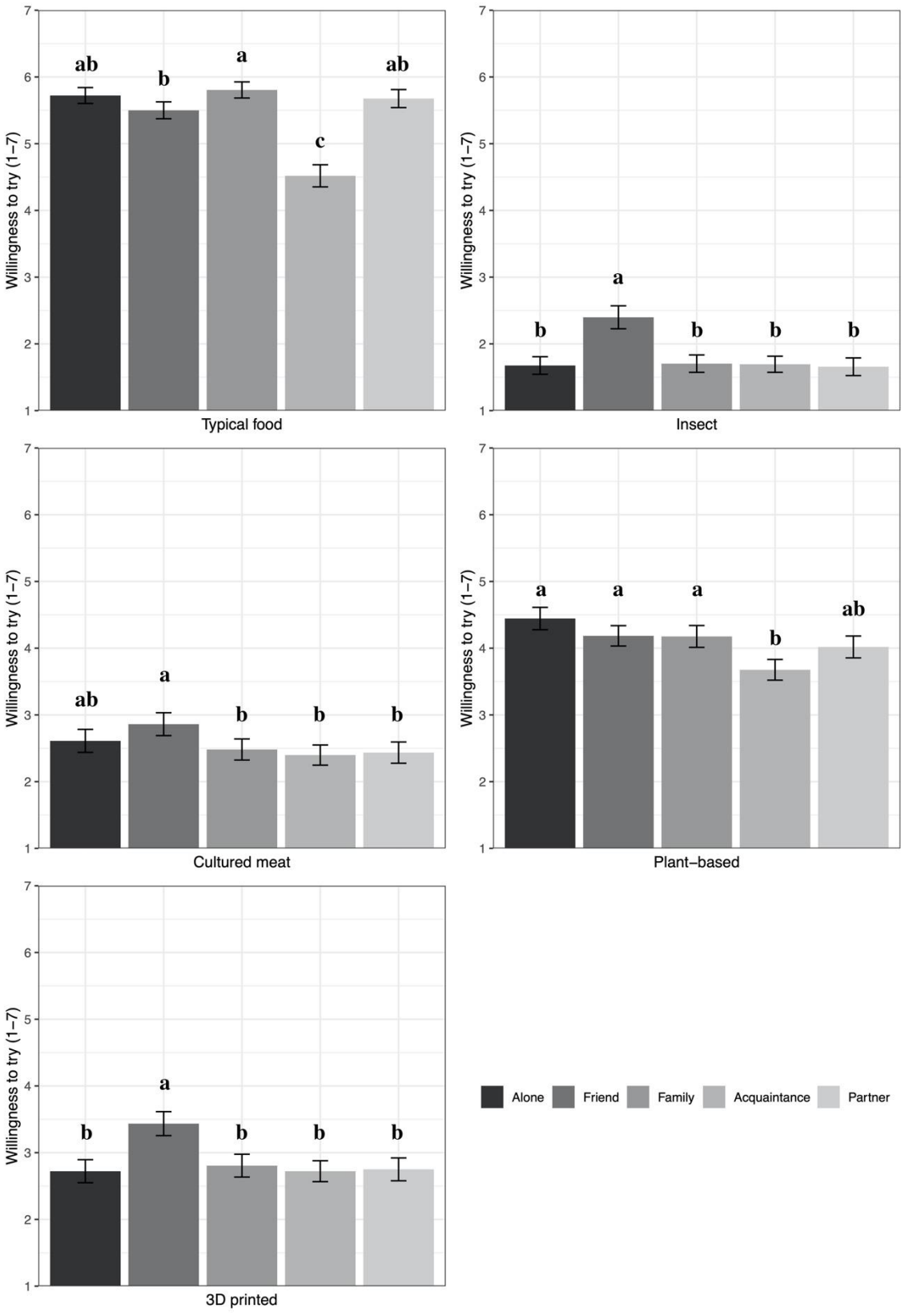
In order to try and elucidate the relations between expected willingness to try and expected emotions when eating novel food (insect-based, cultured meats, plant-based, and 3D printed foods) with friends and at food festivals, Pearson correlations were calculated for each of novel food (insect-based, cultured meats, plant-based, and 3D printed foods). Additionally, multiple regression analyses were conducted. Willingness to try insect-based food [cultured meat, plant-based, 3D printed] was used as a predictor, expected emotions (positive arousal, positive calming, negative arousal, and negative calming) when eating insect-based food [cultured meat, plant-based, 3D printed] as explanatory variables. All the statistical analyses were conducted using the R software.

RESULTS

Influence of social situations on willingness to try

The analysis revealed significant main effects of food type and social situations (food type, $F_{4, 428} = 163.711$, $p < .001$, $\eta G_2 = .390$; social situation, $F_{4, 428} = 15.238$, $p < .001$, $\eta G_2 = .018$). As expected, the insect-based foods were rated as the least likely to be eaten as compared to the other novel foods. A significant interaction was found between the food types and social situations ($F_{16, 1712} = 11.980$, $p < .001$, $\eta G_2 = .018$). The participants thought that they would be more willing to try insect-based foods and 3D printed foods with friends than in any of the other social situations that were mentioned. The

participants also reported being more willing to try cultured meat with friends than with their partner, family, and acquaintances. Plant-based meat alternatives were more likely to be eaten with family, friends, and alone than with acquaintances. In the case of typical foods, the participants would be more likely to eat with familiar individuals (family, partner, friends) and alone than with acquaintances. Figure 4 provides a visual summary of the results.

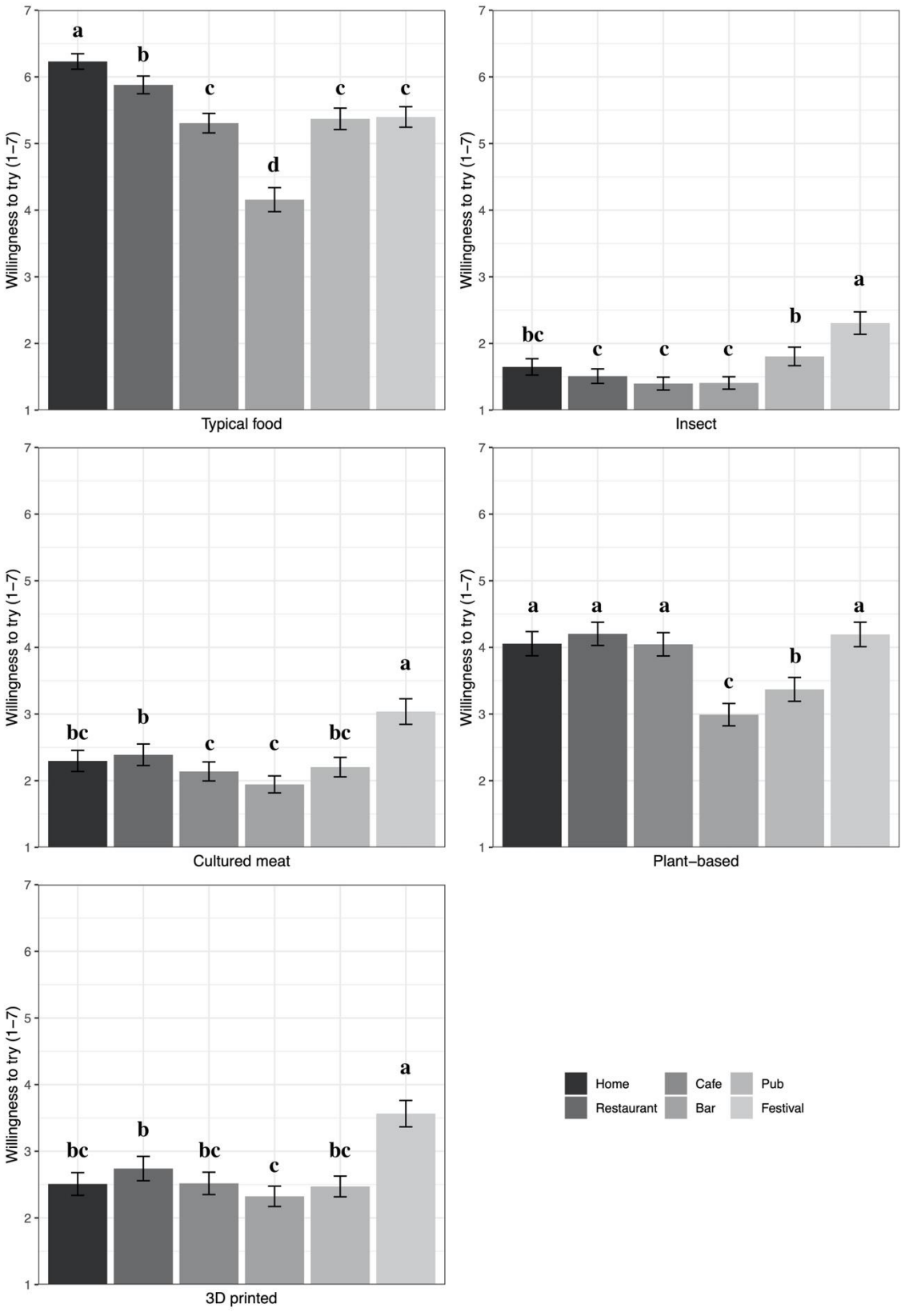

Willingness to try (1–7)
Typical food
ab
b
a
c
ab
Insect
b
a
b
b
b
Cultured meat
ab
a
b
b
b
Plant–based
a
a
a
b
ab
3D printed
b
a
b
b
b
Alone
Friend
Family
Acquaintance
Partner

506

Figure 4. Results of Study 2. Graphs highlight the influence of social situations on expected willingness to try. Ratings on a 1–7 scale (‘not at all’ to ‘very much’). Each bar denotes mean and error bars represent the standard errors of the mean. Different letters (e.g., a/b, b/c) indicate statistically significant differences among situations within each food type (adj. $p < .05$ with Shaffer's modified sequentially rejective Bonferroni procedure; Shaffer, 1986). Similar letters (e.g., a/a, a/ab) indicate no significant difference.

Influence of venues on willingness to try

The analysis revealed main effects of food type and social situation (food type, $F_{4, 428} = 171.750$, $p < .001$, $\eta G_2 = .392$; venues, $F_{5, 535} = 35.798$, $p < .001$, $\eta G_2 = .044$). As expected, insect-based food was rated as less likely to be eaten than any of the other foods. A significant interaction between the food types and social situations ($F_{20, 2140} = 18.120$, $p < .001$, $\eta G_2 = .030$) revealed that for insect-based foods, cultured meat, and 3D printed foods, the participants thought that they would be more willing to try at food festivals than in other venues. They also tended to report being more willing to try plant-based meat alternatives at food festivals, restaurants, cafes, and home than pubs and bars. For typical food, participants would be more likely to eat at home and restaurants than at the other venues. Figure 5 provides a visual summary of the results. Additionally, all pairwise comparisons of Study 2 are presented in Appendix Tables.


Willingness to try (1–7)
Typical food
a b c d c c
Insect
bc c c c b a
Cultured meat
bc b c c bc a
Plant–based
a a a c b a
3D printed
bc b bc c bc a
Home
Restaurant
Cafe
Bar
Pub
Festival

526

Figure 5. Results of Study 2 highlighting the influence of venues on expected willingness to try. Ratings on a 1–7 scale (‘not at all’ to ‘very much’). Each bar denotes mean and error bars represent the standard errors of the mean. Different letters (e.g., a/b, b/c) indicate statistically significant differences among situations within each food type (adj. $p < .05$ with Shaffer's modified sequentially rejective Bonferroni procedure; Shaffer, 1986). Similar letters (e.g., a/a, a/ab) indicate no significant difference.

Each result of the influence of venues on expected emotions is shown in Table 1.

Social situations

Anticipating eating insect-based food, cultured meat, and 3D printed food with friends increased expected positive arousal as compared with the other conditions. Anticipating eating the novel/unfamiliar foods with friends also increased expected positive calming as compared with acquaintances. Moreover, anticipating eating the foods with friends decreased expected negative arousal and negative calming as compared with partner and acquaintance.

Venue

Anticipating eating insect-based food, cultured meat, and 3D printed food at festivals increased expected positive arousal and decreased negative calming as compared with the other conditions. Thinking about eating these novel foods with friends also increased expected positive calming as compared with some of venues. Moreover, anticipating eating these novel foods with friends decreased negative arousal as compared with most of the conditions.

549

550 Table 1. Results of the influence of social situations and venues on expected emotions.

Positive arousal										
Social situations	Typical		Insect		Cultured meat		Plant-based		3D printed	
Alone	3.54 (1.39)	d	2.68 (1.63)	c	3.00 (1.48)	c	3.26 (1.42)	c	3.27 (1.53)	e
Friend	4.75 (1.42)	b	3.30 (1.85)	a	3.67 (1.54)	a	3.92 (1.41)	a	4.03 (1.64)	a
Family	4.13 (1.39)	c	2.91 (1.74)	b	3.26 (1.39)	b	3.61 (1.35)	b	3.63 (1.61)	c
Acquaintance	4.00 (1.17)	c	2.76 (1.62)	bc	3.14 (1.34)	bc	3.35 (1.28)	c	3.46 (1.49)	cd
Partner	5.04 (1.31)	a	3.00 (1.82)	b	3.39 (1.50)	b	3.79 (1.46)	ab	3.83 (1.68)	b
Venue										
Festival	5.10 (1.37)	a	5.10 (1.37)	a	3.96 (1.72)	a	4.23 (1.49)	a	4.28 (1.76)	a
Pub	4.54 (1.35)	c	4.54 (1.35)	c	3.39 (1.45)	b	3.62 (1.34)	bc	3.74 (1.54)	b
Cafe	4.42 (1.22)	c	4.42 (1.22)	c	3.16 (1.38)	c	3.62 (1.35)	bc	3.60 (1.56)	b
Bar	4.13 (1.44)	d	4.13 (1.44)	d	3.05 (1.44)	c	3.29 (1.34)	cd	3.39 (1.58)	c
Restaurant	4.81 (1.23)	b	4.81 (1.23)	b	3.32 (1.48)	b	3.78 (1.40)	b	3.72 (1.67)	b
Home	3.70 (1.40)	e	3.70 (1.40)	e	2.93 (1.35)	c	3.35 (1.39)	c	3.23 (1.51)	c
Positive calming										

Social situations	Typical		Insect		Cultured meat		Plant-based		3D printed	
Alone	6.22 (1.01)	a	1.94 (1.35)	a	3.34 (1.72)	a	1.94 (1.35)	a	3.44 (1.63)	a
Friend	5.19 (1.47)	c	1.87 (1.17)	ab	3.12 (1.33)	a	1.87 (1.17)	a	3.18 (1.37)	b
Family	5.81 (1.25)	b	1.82 (1.17)	ab	3.22 (1.46)	a	1.82 (1.17)	ab	3.25 (1.49)	ab
Acquaintance	4.27 (1.57)	d	1.67 (0.97)	b	2.75 (1.24)	b	1.67 (0.97)	b	2.92 (1.29)	c
Partner	5.28 (1.57)	c	1.65 (0.97)	bc	3.04 (1.34)	a	1.65 (0.97)	bc	3.02 (1.41)	bc
Venue										
Festival	4.52 (1.54)	c	1.86 (1.17)	ab	3.16 (1.38)	ab	1.86 (1.17)	ab	3.21 (1.45)	ab
Pub	4.70 (1.53)	bc	1.77 (1.12)	abc	2.94 (1.34)	c	1.77 (1.12)	abc	2.98 (1.29)	cd
Cafe	4.97 (1.33)	b	1.72 (1.03)	bc	2.96 (1.30)	bc	1.72 (1.03)	bc	3.06 (1.30)	bc
Bar	4.12 (1.66)	d	1.65 (0.97)	c	2.65 (1.29)	d	1.65 (0.97)	c	2.79 (1.33)	d
Restaurant	5.07 (1.37)	b	1.76 (1.00)	abc	3.03 (1.37)	bc	1.76 (1.00)	abc	3.06 (1.36)	bc
Home	6.43 (0.80)	a	1.96 (1.37)	a	3.40 (1.71)	a	1.96 (1.37)	a	3.50 (1.71)	a
Negative arousal										
Social situations	Typical		Insect		Cultured meat		Plant-based		3D printed	
Alone	1.59 (1.00)	e	5.62 (1.80)	b	4.22 (1.88)	b	5.62 (1.80)	bc	4.12 (1.90)	b
Friend	2.35 (1.36)	c	5.55 (1.64)	bc	4.29 (1.65)	b	5.55 (1.64)	c	4.22 (1.61)	b

Family	1.92 (1.20)	d	5.67 (1.62)	b	4.44 (1.63)	ab	5.67 (1.62)	bc	4.23 (1.74)	b
Acquaintance	3.08 (1.61)	a	5.90 (1.37)	ab	4.61 (1.57)	a	5.90 (1.37)	ab	4.53 (1.54)	a
Partner	2.55 (1.52)	b	5.90 (1.43)	a	4.60 (1.54)	a	5.90 (1.43)	a	4.48 (1.65)	a
Venue										
Festival	2.69 (1.43)	b	5.55 (1.56)	c	4.31 (1.66)	c	5.55 (1.56)	d	4.25 (1.61)	c
Pub	2.67 (1.44)	b	5.76 (1.51)	b	4.53 (1.58)	b	5.76 (1.51)	bc	4.51 (1.52)	ab
Cafe	2.61 (1.39)	b	5.85 (1.41)	ab	4.56 (1.52)	b	5.85 (1.41)	ab	4.48 (1.48)	b
Bar	3.36 (1.67)	a	6.00 (1.32)	a	4.73 (1.53)	a	6.00 (1.32)	a	4.67 (1.58)	a
Restaurant	2.56 (1.38)	b	5.85 (1.41)	ab	4.52 (1.58)	b	5.85 (1.41)	ab	4.51 (1.55)	ab
Home	1.50 (0.83)	c	5.52 (1.79)	c	4.21 (1.86)	bc	5.52 (1.79)	cd	4.06 (1.91)	c
Negative calming										
Social situations	Typical		Insect		Cultured meat		Plant-based		3D printed	
Alone	2.25 (1.35)	b	5.50 (1.89)	ab	4.59 (1.81)	a	5.50 (1.89)	ab	4.26 (1.85)	ab
Friend	2.17 (1.25)	b	5.25 (1.83)	b	4.20 (1.73)	b	5.25 (1.83)	b	3.86 (1.73)	c
Family	2.23 (1.28)	b	5.51 (1.84)	ab	4.54 (1.63)	a	5.51 (1.84)	ab	4.19 (1.79)	ab
Acquaintance	3.05 (1.55)	a	5.61 (1.59)	a	4.70 (1.54)	a	5.61 (1.59)	a	4.43 (1.55)	a
Partner	1.96 (1.15)	c	5.54 (1.77)	a	4.50 (1.67)	a	5.54 (1.77)	a	4.09 (1.85)	b

Venue										
Festival	2.22 (1.30)	bc	5.06 (1.95)	b	4.00 (1.70)	c	5.06 (1.95)	b	3.69 (1.78)	b
Pub	2.37 (1.40)	b	5.55 (1.63)	a	4.42 (1.60)	b	5.55 (1.63)	a	4.22 (1.63)	a
Cafe	2.26 (1.19)	bc	5.61 (1.61)	a	4.51 (1.57)	b	5.61 (1.61)	a	4.20 (1.75)	a
Bar	2.86 (1.64)	a	5.65 (1.65)	a	4.69 (1.61)	a	5.65 (1.65)	a	4.42 (1.74)	a
Restaurant	2.10 (1.15)	c	5.58 (1.68)	a	4.49 (1.59)	b	5.58 (1.68)	a	4.24 (1.79)	a
Home	2.11 (1.28)	bc	5.51 (1.87)	a	4.62 (1.75)	ab	5.51 (1.87)	a	4.31 (1.82)	a

Note: Means and SDs of expected emotions are shown in each cell. Different letters (e.g., a/b, b/c) indicate statistically significant differences among situations within each food type (adj. $p < .05$ with Shaffer's modified sequentially rejective Bonferroni procedure; Shaffer, 1986).

Results of correlation analyses

We conducted Pearson correlation analyses for each of novel/unfamiliar foods (insect-based food, cultured meat, plant-based, 3D printed food). Results of the correlation analyses are shown in Table 2. The results of correlation analyses revealed that all expected emotions (positive arousal, positive calming, negative arousal, and negative calming) from eating each of novel food with friends and at festivals significantly correlated with the anticipated willingness to try novel food. Specifically, expected positive arousal and calming from eating each of novel food with friends and at festivals positively correlated with the anticipated willingness to try novel food. In contrast, expected negative arousal and calming from eating each novel food with friends and at festivals negatively correlated with the anticipated willingness to try novel food.

Results of regression analyses

Multiple regression analyses were conducted for three novel/unfamiliar foods (insect-based food, cultured meat, plant-based, 3D printed food), given that specific situations (i.e., friends, festivals) increase anticipated willingness to try and influence expected emotions for these foods. To check multicollinearity, we calculated variance inflation factor (VIF). The VIF in all models were below the conservative threshold (i.e., 3.3) (see Kock & Lynn, 2012).

The results of the regression analysis for insect-based food revealed that only expected negative calming from eating insect-based food with friends and at food festivals contributed significantly to the anticipated willingness to try. The results of the analyses for cultured meat revealed that only expected negative calming from eating cultured meat with friends and at food festivals contributed significantly to the anticipated willingness to try. The results of the analyses for 3D printed food revealed that expected positive arousal and negative calming from eating 3D printed food with friends and at festivals contribute significantly to the anticipated willingness to try those foods. Each of the results from the regression analyses are shown in Table 3.

584 Table 2. Results of the correlation analyses in Study 2.

	Friend						Festival				
Insect	(1)	(2)	(3)	(4)	(5)	*Insect*	(1)	(2)	(3)	(4)	(5)
1. Willingness-to-try	–					1. Willingness-to-try	–				
2. Positive arousal	**.51****	–				2. Positive arousal	**.47****	–			
3. Positive calming	**.51****	**.50****	–			3. Positive calming	**.45****	**.52****	–		
4. Negative arousal	**-.55****	**-.51****	**-.66****	–		4. Negative arousal	**-.52****	**-.47****	**-.70****	–	
5. Negative calming	**-.66****	**-.60****	**-.66****	**.78****	–	5. Negative calming	**-.62****	**-.66****	**-.64****	**.77****	–
Cultured meat	(1)	(2)	(3)	(4)	(5)	*Cultured meat*	(1)	(2)	(3)	(4)	(5)
1. Willingness-to-try	–					1. Willingness-to-try	–				
2. Positive arousal	**.50****	–				2. Positive arousal	**.47****	–			
3. Positive calming	**.46****	**.63****	–			3. Positive calming	**.44****	**.59****	–		
4. Negative arousal	**-.52****	**-.53****	**-.62****	–		4. Negative arousal	**-.49****	**-.48****	**-.70****	–	
5. Negative calming	**-.59****	**-.62****	**-.61****	**.78****	–	5. Negative calming	**-.56****	**-.64****	**-.60****	**.76****	–
Plant-based	(1)	(2)	(3)	(4)	(5)	*Plant-based*	(1)	(2)	(3)	(4)	(5)
1. Willingness-to-try	–					1. Willingness-to-try	–				
2. Positive arousal	**.43****	–				2. Positive arousal	**.35****	–			
3. Positive calming	**.37****	**.55****	–			3. Positive calming	**.24***	**.43****	–		

4. Negative arousal	**-.29****	**-.40****	**-.62****	–		4. Negative arousal	**-.21***	**-.38****	**-.68****	–	
5. Negative calming	**-.36****	**-.60****	**-.56****	**.66****	–	5. Negative calming	**-.28****	**-.61****	**-.52****	**.66****	–
3D printed	(1)	(2)	(3)	(4)	(5)	*3D printed*	(1)	(2)	(3)	(4)	(5)
1. Willingness-to-try	–					1. Willingness-to-try	–				
2. Positive arousal	**.62****	–				2. Positive arousal	**.58****	–			
3. Positive calming	**.51****	**.51****	–			3. Positive calming	**.44****	**.51****	–		
4. Negative arousal	**-.55****	**-.60****	**-.61****	–		4. Negative arousal	**-.53****	**-.53****	**-.70****	–	
5. Negative calming	**-.67****	**-.70****	**-.52****	**.69****	–	5. Negative calming	**-.61****	**-.74****	**-.53****	**.70****	–

Note: Bold indicates statistical significance ($p < .01$**, $p < .05$*).

587 Table 3. Results of the multiple regression analyses. The relations between expected emotions and anticipated willingness to try.

		Insect				Cultured meat				Plant-based				3D printed			
Friend		β (SE)	t	p	adj. R^2	β (SE)	t	p	adj. R^2	β (SE)	t	p	adj. R^2	β (SE)	t	p	adj. R^2
	Positive arousal	.154 (.092)	1.685	.095	.44	.185 (.108)	1.713	.090	.36	**.286 (.119)**	**2.411**	**.018***	.19	**.255 (.097)**	**2.618**	**.010***	.50
	Positive calming	.090 (.103)	0.876	.383		.063 (.111)	0.565	.574		.150 (.122)	1.225	.223		.150 (.089)	1.689	.094	
	Negative arousal	-.018 (.122)	- 0.146	.884		-.110 (.130)	- 0.846	.399		-.022 (.128)	- 0.174	.862		-.055 (.104)	- 0.528	.599	
	Negative calming	**-.497 (.129)**	**-3.860**	**<.001***		**-.351 (.135)**	**-2.606**	**.011***		-.087 (.136)	- 0.638	.525		**-.380 (.110)**	**-3.462**	**.001***	

		Insect				Cultured meat				Plant-based				3D printed			
Festivals		β	t	p	adj. R	β	t	p	adj. R	β	t	p	adj. R	β	t	p	adj. R
	Positive arousal	.105 (.105)	1.002	.319	.24	.170 (.113)	1.501	.136	.32	**.272 (.118)**	**2.307**	**.023***	.10	**.272 (.113)**	**2.409**	**.018***	.41
	Positive calming	.046 (.113)	0.407	.685		.073 (.123)	0.593	.554		.095 (.129)	0.740	.461		.032 (.108)	0.292	.771	

Negative arousal	-.093 (.133)	- 0.701	.485	-.113 (.142)	- 0.799	.426	.004 (.145)	0.024	.981	-.185 (.125)	- 1.482	.141
Negative calming	**-.446 (.141)**	**- 3.162**	**.002***	**-.319 (.140)**	**- 2.269**	**.025***	-.064 (.142)	- 0.449	.654	**-.263 (.131)**	**- 2.015**	**.047***

Note: Bold indicates statistical significance ($p < .05$*).

Discussion

The results of Study 2 largely replicated the main findings of Study 1. That is, in both Studies 1 and 2, the participants anticipated that they would be more willing to try insect-based, cultured meat, and 3D printed food with friends and at food festivals than in most of the other social situations and venues. Moreover, the results of correlation analyses revealed that expected positive emotions (positive arousal/calming) positively correlated with anticipated acceptance of three novel foods (insect-based, cultured meat, and 3D printed food), while expected negative emotions (negative arousal/calming) negatively correlated with their anticipated acceptance. However, some of the findings obtained from multiple regression analyses were unexpected. For instance, less negative calming was associated with more anticipated acceptance.

Study 3: The role of contexts on the anticipated acceptance of novel/unfamiliar foods and anticipated emotions (the actual product descriptions)

To confirm the generalizability of our findings, Study 3 was designed to replicate the main findings of Study 2 using the actual product descriptions of novel/unfamiliar foods (e.g., mealworm burger). Although Study 2 used the category name (e.g., insect-based foods), it did not constrain which product descriptions (e.g., burger, chocolate) participants might have been thinking about. By using ‘burger’, which can be applied to all of novel/unfamiliar food used here, we aimed to extend our findings by using the actual product descriptions.

Participants, design, procedure, and statistical analyses

Data were collected from 120 Japanese participants (56 females, mean age of 41.23 years, SD = 9.17). The study followed a 5 (food: typical, insect-based, cultured meat, plant-based, 3D printed) × 5 (social situations: alone, friend, family, acquaintance, partner) within-participant design. The study for location followed a 5 (food: typical, insect-based, cultured meat, plant-based, 3D printed) × 6 (venues: cafe, restaurant, bar, pub, food festival, home) within-participants experimental design. The main dependent variable was ratings of willingness to try. Expected emotions were also used for additional dependent variables.

The questions were the same as for Study 2 except for the novel food stimuli. We used the actual product descriptions of novel food: beef burger (typical food), mealworm burger (insect-based food), cultured meat burger, plant-based meat burger, and 3D printed burger. “Burger” was chosen for the product descriptions because all of the novel foods used here would seem appropriate for a burger format (Le-Bail et al., 2020; Motoki et al., 2020; Slade, 2018). Similar statistical analyses were conducted as for Studies 1 and 2.

RESULTS

Influence of social situations on willingness to try

The analysis revealed significant main effects of food type and social situations (food type, $F_{4, 476} = 161.860$, $p < .001$, $\eta G_2 = .414$; social situation, $F_{4, 476} = 17.955$, $p < .001$, $\eta G_2 = .010$). As expected, the insect-based food was rated as the least likely to be eaten. A significant interaction was found between the type of food and the social situation ($F_{16, 1904} = 4.636$, $p < .001$, $\eta G_2 = .005$). The participants anticipated being more willing to try insect-based foods, cultured meats, and 3D printed foods with friends than in any other social situation. They also reported being more willing to try plant-based meat alternatives and typical foods with friends, family and alone than with acquaintances. Figure 6 presents a visual summary of the results.

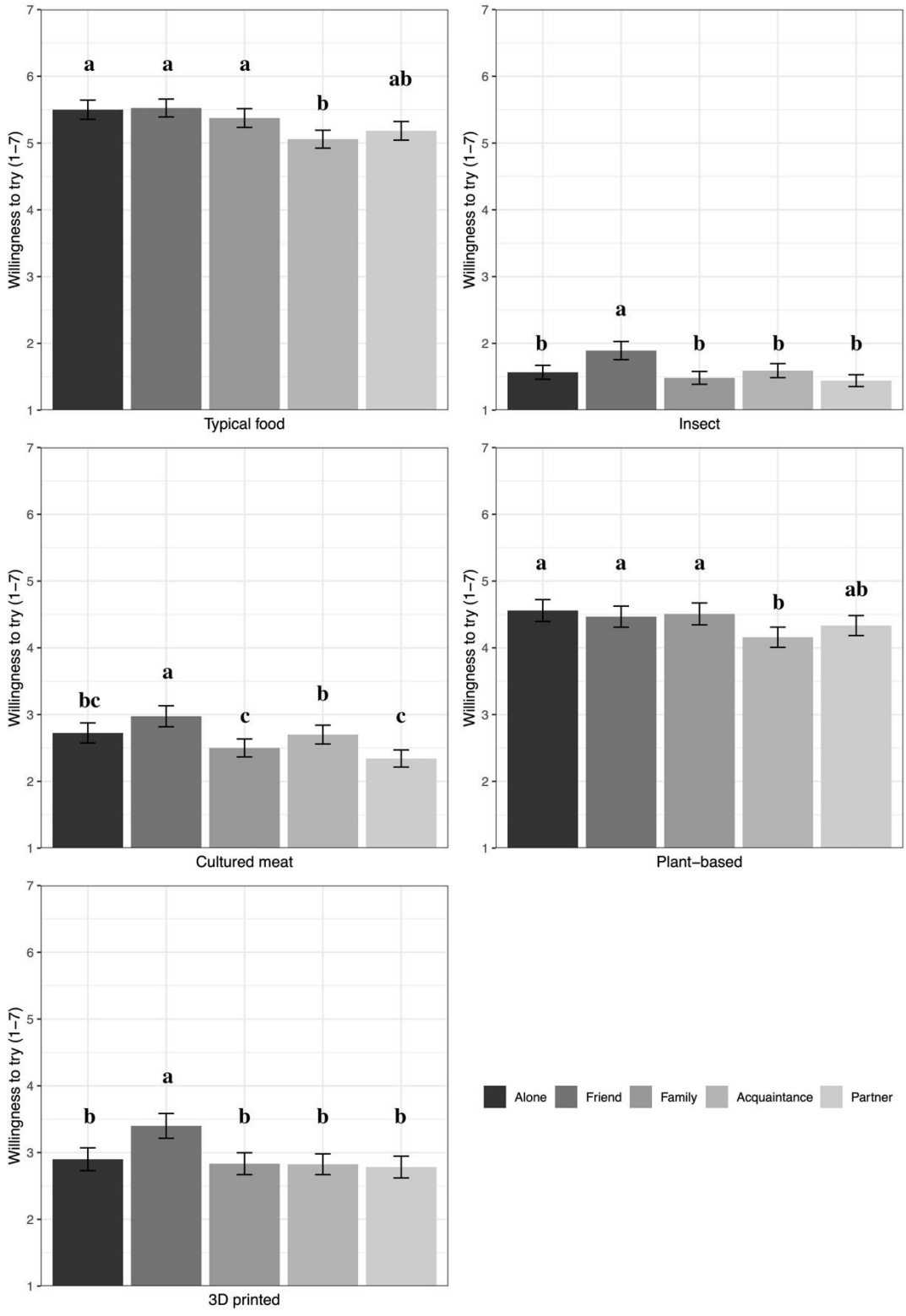


Figure 6. Results of Study 3. Graphs highlight the influence of social situations on anticipated willingness to try. Ratings on a 1–7 scale (‘not at all’ to ‘very much’). Each

bar denotes mean and error bars represent the standard errors of the mean. Different letters (e.g., a/b, b/c) indicate statistically significant differences among situations within each food type (adj. $p < .05$ with Shaffer's modified sequentially rejective Bonferroni procedure; Shaffer, 1986).

Influence of venues on willingness to try

The analysis revealed main effects of food type and social situations (food type, $F_{4, 476} = 146.686$, $p < .001$, $\eta G_2 = .355$; venues, $F_{5, 595} = 64.197$, $p < .001$, $\eta G_2 = .061$). As expected, insect-based food was rated as less likely to be eaten than any of the other foods. A significant interaction was found between the food types and social situations ($F_{20, 2380} = 20.535$, $p < .001$, $\eta G_2 = .027$). For the insect-based food, culture meat and 3D printed food, the participants anticipated being more willing to try them at food festivals than in any of the other venues. They also tended to report being more willing to try plant-based meat alternatives and typical food at a food festival, restaurant, cafe, or at home than at a pub or bar. Figure 7 presents a visual summary of the results. Additionally, all Study 3 pairwise comparisons are presented in the Appendix Tables.

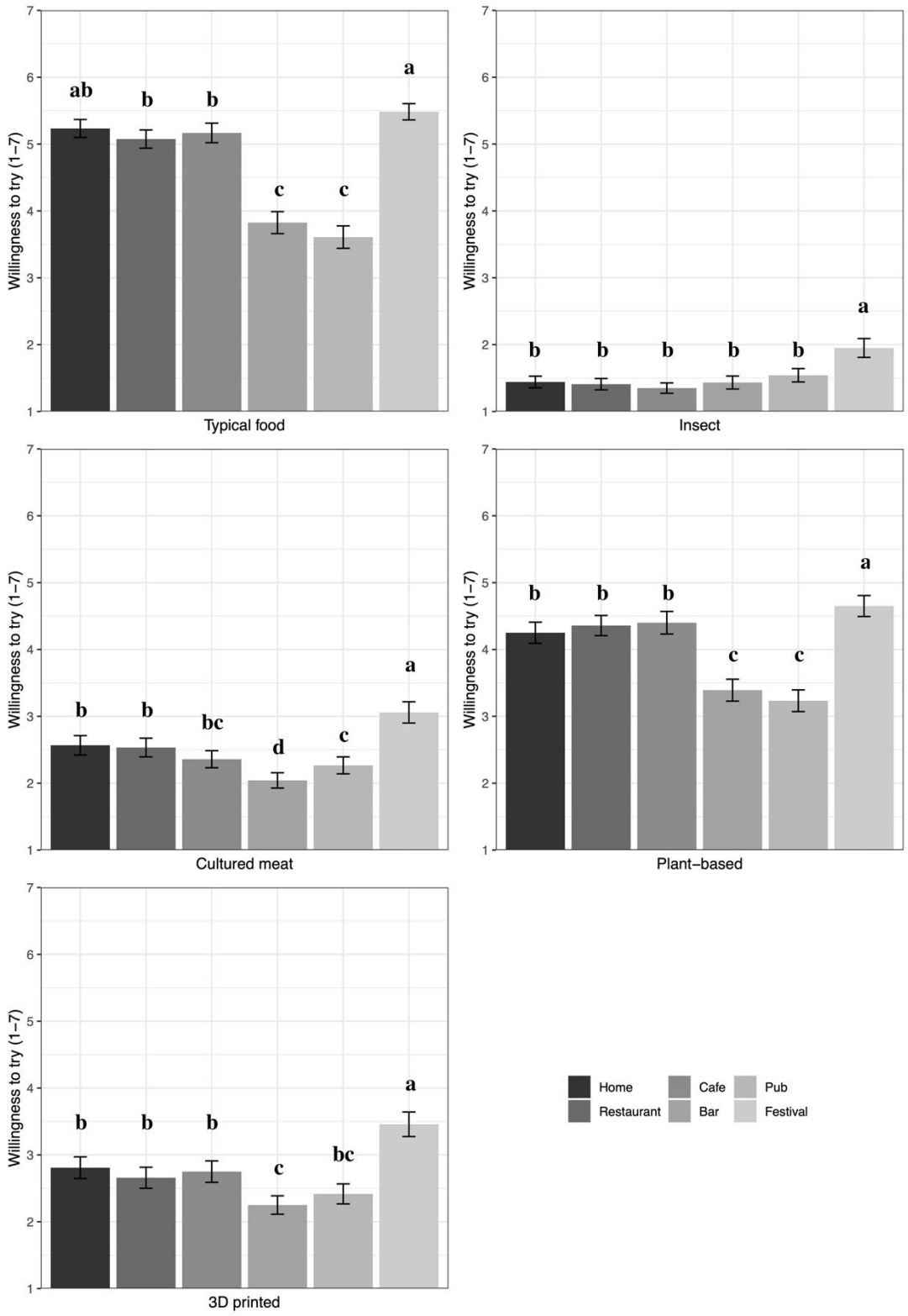


Figure 7. Results of Study 3. Graphs highlight the influence of venues on anticipated willingness to try. Ratings on a 1–7 scale ('not at all' to 'very much'). Error bars

represent the standard errors of the mean. Different letters (e.g., a/b) indicate statistically significant differences among situations within each food type (adj. $p < .05$ with Shaffer's modified sequentially rejective Bonferroni procedure; Shaffer, 1986). Similar letters (e.g., a/ab) indicate no significant difference.

669 Results of the influence of social situations and venues on expected emotion are shown
670 in Table 4.

671 *Social situations*

672 Anticipating eating insect-based, cultured meat, and 3D printed food with friends
673 increased expected positive arousal and decreased expected negative calming compared
674 with other conditions. Anticipating eating insect-based food, cultured meat, and 3D
675 printed food with friends also increased expected positive calming and decreased
676 negative arousal as compared with acquaintance and partner. Eating insect-based food,
677 cultured meat, and 3D printed food with friends also increased the expected positive
678 calming and decreased negative arousal as compared with an acquaintance and a
679 romantic partner.

680

681 *Venue*

682 Anticipating eating insect-based food, cultured meat, and 3D printed food at a festival
683 increased expected positive arousal and positive calming as compared with most of
684 other conditions. Anticipating eating insect-based food, cultured meat, and 3D printed
685 food at a festival also decreased expected negative arousal and negative calming
686 compared with the majority of the other conditions.

687

688 Table 4. Results of the influence of social situations and venues on expected emotions in Study 3.

Positive arousal										
Social situation	Typical		Insect		Cultured meat		Plant-based		3D printed	
Alone	4.49 (1.52)	ab	2.23 (1.35)	bc	2.98 (1.31)	b	3.55 (1.35)	b	3.28 (1.59)	b
Friend	4.71 (1.53)	a	2.75 (1.65)	a	3.40 (1.51)	a	3.83 (1.46)	a	3.84 (1.78)	a
Family	4.58 (1.58)	ab	2.37 (1.46)	b	3.05 (1.41)	b	3.56 (1.49)	b	3.39 (1.70)	b
Acquaintance	4.42 (1.45)	a	2.50 (1.46)	b	3.13 (1.36)	b	3.61 (1.34)	b	3.42 (1.56)	b
Partner	4.61 (1.50)	ab	2.32 (1.45)	b	3.08 (1.40)	b	3.59 (1.42)	b	3.36 (1.64)	b
Venue										
Festival	5.02 (1.63)	a	2.88 (1.72)	a	3.65 (1.65)	a	4.07 (1.65)	a	3.97 (1.88)	a
Pub	4.00 (1.49)	c	2.43 (1.55)	b	2.89 (1.39)	c	3.35 (1.29)	c	3.21 (1.58)	bc
Cafe	4.53 (1.48)	b	2.34 (1.43)	b	2.96 (1.31)	bc	3.61 (1.41)	b	3.33 (1.64)	b
Bar	4.03 (1.47)	c	2.35 (1.49)	b	2.85 (1.29)	c	3.34 (1.31)	c	3.09 (1.51)	c
Restaurant	4.58 (1.48)	b	2.37 (1.47)	b	3.10 (1.45)	b	3.63 (1.34)	b	3.32 (1.63)	b
Home	4.51 (1.48)	b	2.25 (1.36)	b	2.98 (1.36)	bc	3.55 (1.39)	bc	3.25 (1.55)	bc
Positive calming										

Social situation	Typical		Insect		Cultured meat		Plant-based		3D printed	
Alone	5.65 (1.39)	a	1.73 (1.17)	ab	3.13 (1.63)	ab	1.73 (1.17)	ab	3.19 (1.68)	ab
Friend	5.33 (1.39)	b	1.79 (1.16)	a	3.18 (1.48)	a	1.79 (1.16)	a	3.30 (1.55)	a
Family	5.49 (1.50)	ab	1.68 (1.07)	ab	3.11 (1.55)	ab	1.68 (1.07)	ab	3.13 (1.60)	ab
Acquaintance	4.97 (1.43)	c	1.67 (1.02)	b	2.95 (1.34)	bc	1.67 (1.02)	b	3.05 (1.40)	b
Partner	5.14 (1.52)	bc	1.57 (0.92)	b	2.88 (1.40)	c	1.57 (0.92)	b	2.95 (1.47)	b
Venue										
Festival	5.18 (1.51)	b	1.79 (1.05)	a	3.17 (1.45)	a	1.79 (1.05)	a	3.18 (1.55)	a
Pub	4.69 (1.46)	c	1.58 (0.93)	b	2.84 (1.30)	b	1.58 (0.93)	b	2.81 (1.28)	b
Cafe	5.07 (1.51)	b	1.51 (0.85)	bc	2.85 (1.30)	b	1.51 (0.85)	bc	2.88 (1.40)	b
Bar	4.50 (1.55)	c	1.48 (0.79)	bc	2.68 (1.21)	c	1.48 (0.79)	bc	2.66 (1.23)	c
Restaurant	5.10 (1.43)	b	1.55 (0.90)	b	2.88 (1.30)	b	1.55 (0.90)	b	2.90 (1.44)	b
Home	5.68 (1.36)	a	1.70 (1.18)	ab	3.20 (1.59)	a	1.70 (1.18)	ab	3.21 (1.65)	a
Negative arousal										
Social situation	Typical		Insect		Cultured meat		Plant-based		3D printed	
Alone	1.78 (1.20)	b	5.93 (1.45)	ab	4.32 (1.87)	ab	5.93 (1.45)	ab	4.45 (1.79)	b
Friend	1.86 (1.17)	b	5.75 (1.46)	c	4.19 (1.64)	b	5.75 (1.46)	bc	4.26 (1.67)	b

Family	1.85 (1.24)	b	5.87 (1.40)	b	4.35 (1.63)	a	5.87 (1.40)	b	4.38 (1.73)	b
Acquaintance	2.13 (1.29)	a	5.88 (1.40)	b	4.38 (1.55)	a	5.88 (1.40)	b	4.51 (1.60)	ab
Partner	2.15 (1.34)	a	6.07 (1.27)	a	4.51 (1.60)	a	6.07 (1.27)	a	4.62 (1.67)	a
Venue										
Festival	1.93 (1.22)	b	5.70 (1.48)	c	4.21 (1.68)	c	5.70 (1.48)	c	4.28 (1.70)	c
Pub	2.29 (1.41)	a	6.01 (1.32)	ab	4.53 (1.58)	b	6.01 (1.32)	ab	4.70 (1.53)	a
Cafe	1.99 (1.29)	b	6.08 (1.28)	ab	4.53 (1.60)	b	6.08 (1.28)	ab	4.63 (1.67)	ab
Bar	2.37 (1.45)	a	6.12 (1.27)	a	4.73 (1.51)	a	6.12 (1.27)	a	4.82 (1.55)	a
Restaurant	1.95 (1.24)	b	5.98 (1.33)	b	4.53 (1.61)	b	5.98 (1.33)	ab	4.62 (1.63)	ab
Home	1.68 (1.08)	c	5.96 (1.39)	ab	4.22 (1.78)	c	5.96 (1.39)	ab	4.38 (1.78)	c
Negative calming										
Social situation	Typical		Insect		Cultured meat		Plant-based		3D printed	
Alone	2.25 (1.41)	b	5.66 (1.67)	a	4.34 (1.69)	a	5.66 (1.67)	a	4.21 (1.74)	a
Friend	2.13 (1.28)	bc	5.21 (1.78)	c	4.05 (1.52)	b	5.21 (1.78)	c	3.75 (1.70)	b
Family	2.21 (1.38)	b	5.53 (1.71)	ab	4.25 (1.56)	a	5.54 (1.71)	ab	4.09 (1.77)	a
Acquaintance	2.46 (1.34)	a	5.42 (1.71)	b	4.28 (1.53)	a	5.42 (1.71)	b	4.00 (1.59)	a

Partner	2.33 (1.34)	ab	5.61 (1.72)	a	4.38 (1.59)	a	5.61 (1.72)	a	4.10 (1.74)	a
Venue										
Festival	2.18 (1.36)	b	5.17 (1.88)	c	3.88 (1.62)	c	5.17 (1.88)	c	3.61 (1.74)	c
Pub	2.68 (1.43)	a	5.53 (1.67)	ab	4.38 (1.53)	ab	5.53 (1.67)	b	4.26 (1.63)	ab
Cafe	2.28 (1.38)	b	5.69 (1.58)	a	4.37 (1.52)	b	5.69 (1.58)	a	4.13 (1.71)	b
Bar	2.57 (1.46)	a	5.63 (1.64)	a	4.56 (1.50)	a	5.63 (1.64)	a	4.33 (1.64)	a
Restaurant	2.23 (1.32)	b	5.62 (1.67)	ab	4.35 (1.55)	b	5.62 (1.67)	ab	4.21 (1.73)	ab
Home	2.14 (1.28)	b	5.61 (1.68)	ab	4.28 (1.64)	b	5.61 (1.68)	ab	4.08 (1.76)	b

Note: Means and SDs of expected emotions are shown in each cell. Different letters (e.g., a/b) indicate statistically significant differences among situations within each food type (adj. $p < .05$ with Shaffer's modified sequentially rejective Bonferroni procedure; Shaffer, 1986).

Results of correlation analyses

We conducted Pearson correlation analyses for each of novel/unfamiliar foods (insect-based food, cultured meat, plant-based, 3D printed food). Results of the correlation analyses are shown in Table 5. The results of correlation analyses demonstrated that all expected emotions (positive arousal, positive calming, negative arousal, and negative calming), from eating each of novel food with friends and at festivals significantly correlated with the anticipated willingness to try novel food. In particular, expected positive arousal and calming from eating each of novel food with friends and at festivals positively correlated with the anticipated willingness to try novel food. In contrast, expected negative arousal and calming from eating each of novel food with friends and at festivals negatively correlated with the anticipated willingness to try novel food.

Regression analyses

We conducted multiple regression analyses for three novel/unfamiliar foods (insect-based food, cultured meat, 3D printed food) because specific situations (i.e., friends, festivals) have been shown to increase the anticipated acceptance and influence expected emotions for these foods. To check multicollinearity, we calculated VIF. The VIFs in all models were below the conservative threshold (i.e., 3.3; see Kock & Lynn, 2012).

The results of the regression analysis for the insect-based food reveal that expected positive arousal and negative arousal from eating insect-based food with friends contributes significantly to the anticipated willingness to try insect-based foods. The results of the analysis also revealed that expected positive arousal and negative calming from eating insect-based food at festivals contribute significantly to the anticipated willingness to try insect-based food.

The results of the regression analysis for cultured meat show that expected positive arousal and negative arousal from eating cultured meat with friends contribute significantly to the anticipated willingness to try cultured meat. The results of the analysis also show that expected positive arousal from eating cultured meat at festivals contribute significantly to the anticipated willingness to try cultured meat.

The results of the regression analysis for 3D printed food show that expected positive arousal, positive calming, and negative arousal from eating 3D printed food with friends

contribute significantly to the anticipated willingness to try insect-based food. The results of the regression analysis also reveal that expected positive arousal, positive calming, negative arousal, and negative calming from eating 3D printed food at festivals contribute significantly to anticipated willingness to try 3D printed food. The results of the regression analyses are shown in Table 6.

730 Table 5. Results of the correlation analyses in Study 3.

	Friend						Festivals				
Insect	(1)	(2)	(3)	(4)	(5)	*Insect*	(1)	(2)	(3)	(4)	(5)
1. Willingness-to-try	–					1. Willingness-to-try	–				
2. Positive arousal	**.56****	–				2. Positive arousal	**.56****	–			
3. Positive calming	**.52****	**.59****	–			3. Positive calming	**.49****	**.54****	–		
4. Negative arousal	**-.55****	**-.48****	**-.65****	–		4. Negative arousal	**-.48****	**-.52****	**-.66****	–	
5. Negative calming	**-.46****	**-.41****	**-.46****	**.70****	–	5. Negative calming	**-.51****	**-.49****	**-.49****	**.69****	–
Cultured meat	(1)	(2)	(3)	(4)	(5)	*Cultured meat*	(1)	(2)	(3)	(4)	(5)
1. Willingness-to-try	–					1. Willingness-to-try	–				
2. Positive arousal	**.61****	–				2. Positive arousal	**.62****	–			
3. Positive calming	**.60****	**.67****	–			3. Positive calming	**.50****	**.68****	–		
4. Negative arousal	**-.64****	**-.51****	**-.77****	–		4. Negative arousal	**-.60****	**-.57****	**-.74****	–	
5. Negative calming	**-.57****	**-.52****	**-.63****	**.69****	–	5. Negative calming	**-.55****	**-.62****	**-.60****	**.75****	–
Plant-based	(1)	(2)	(3)	(4)	(5)	*Plant-based*	(1)	(2)	(3)	(4)	(5)
1. Willingness-to-try	–					1. Willingness-to-try	–				
2. Positive arousal	**.58****	–				2. Positive arousal	**.57****	–			
3. Positive calming	**.58****	**.53****	–			3. Positive calming	**.59****	**.54****	–		

4. Negative arousal	**-.38****	-.16	**-.60****	–		4. Negative arousal	**-.40****	**-.25***	**-.65****	–	
5. Negative calming	**-.50****	**-.37****	**-.51****	**.62****	–	5. Negative calming	**-.48****	**-.46****	**-.55****	**.64****	–
3D printed	(1)	(2)	(3)	(4)	(5)	*3D printed*	(1)	(2)	(3)	(4)	(5)
1. Willingness-to-try	–					1. Willingness-to-try	–				
2. Positive arousal	**.67****	–				2. Positive arousal	**.65****	–			
3. Positive calming	**.70****	**.62****	–			3. Positive calming	**.67****	**.62****	–		
4. Negative arousal	**-.74****	**-.56****	**-.71****	–		4. Negative arousal	**-.69****	**-.54****	**-.73****	–	
5. Negative calming	**-.65****	**-.63****	**-.58****	**.68****	–	5. Negative calming	**-.65****	**-.65****	**-.57****	**.66****	–

Note: Bold indicates statistical significance ($p < .01$**, $p < .05$*).

Table 6. Results of the multiple regression analyses in Study 3. The relations between expected emotions and anticipated willingness to try.

	Insect				Cultured meat				Plant-based				3D printed			
Friend	β (SE)	t	p	adj. R^2	β (SE)	t	P	adj. R^2	β (SE)	t	p	adj. R^2	β (SE)	t	p	adj. R^2
Positive arousal	**.337 (.089)**	**3.787**	**<.001**	.41	**.344 (.088)**	**3.882**	**<.001**	.50	**.362 (.085)**	**4.267**	**<.001**	.46	**.260 (.076)**	**3.416**	**<.001**	.65
Positive calming	.109 (.102)	1.066	.289		.019 (.116)	0.166	.869		**.262 (.101)**	**2.596**	**.011**		**.214 (.083)**	**2.587**	**.011**	

	Negative	**-.259**				**-.355**				-.045				**-.360**			
	arousal	**(.115)**	**-2.25**	**.026**		**(.111)**	**-3.191**	**.002**		(.100)	-0.45	.653		**(.086)**	**-4.2**	**<.001**	
	Negative	-.092				-.134				**-.201**				-.118			
	calming	(.099)	-0.93	.356		(.094)	-1.427	.156		**(.091)**	**-2.21**	**.030**		(.080)	-1.47	.146	

		Insect				Cultured meat				Plant-based				3D printed			
Festival		β	t	p	adj. R^2	B	t	p	adj. R^2	β	t	p	adj. R^2	β	t	p	adj. R^2
	Positive	**.340**				**.450**				**.330**				**.250**			
	arousal	**(.090)**	**3.774**	**<.001**	.39	**(.098)**	**4.583**	**<.001**	.47	**(.088)**	**3.74**	**<.001**	.43	**(.083)**	**3.003**	**.003**	.60
	Positive	.172				-.134				**.327**				**.203**			
	calming	(.100)	1.722	.088		(.112)	-1.197	.234		**(.106)**	**3.072**	**.003**		**(.092)**	**2.215**	**.029**	
	Negative	-.026				**-.404**				-.017				**-.279**			
	arousal	(.116)	-0.23	.822		**(.121)**	**-3.356**	**.001**		(.106)	-0.16	.870		**(.094)**	**-2.98**	**.004**	
	Negative	**-.235**				-.053				-.135				**-.192**			
	calming	**(.102)**	**-2.31**	**.023**		(.108)	-0.487	.627		(.098)	-1.38	.170		**(.087)**	**-2.2**	**.030**	

735 Note: Bold indicates statistical significance (p<.05).

736

Discussion

The results of Study 3 generally replicated the main findings of the previous two studies. Even when the actual descriptions of a specific novel food were used, similar findings were observed compared with Studies 1 and 2. Across Studies 1-3, specific situations such as friends and festivals increased the anticipated willingness to try insect-based foods, cultured meats, and 3D printed foods as compared with the majority of the other social situations and venues that were studied. Moreover, the results of both Studies 2 and 3 indicated that expected emotions contribute to the relations between situations and anticipated acceptance of three novel food (insect-based foods, cultured meats, and 3D printed foods). The results of the correlation analyses indicated that expected positive (negative) emotions increased (decreased) the anticipated acceptance of the three novel/unfamiliar foods in both the category name (Study 2) and the actual descriptions (Study 2). Moreover, the results of multiple regression analyses in Study 3 suggest that positive arousal was specifically associated with the anticipated acceptance of the three novel/unfamiliar foods. This finding differs somewhat from those of the category name (Study 2), which showed that less negative calming was associated with more anticipated acceptance.

GENERAL DISCUSSION

Summary of findings

By using the category name and descriptions of novel/unfamiliar food, the results of three studies demonstrated contextual acceptance of novel/unfamiliar food (see Table 7). Specifically, the findings revealed that situations of eating with friends and at food festivals play an important role in the anticipated acceptance of insect-based, culture meat, and 3D printed food in a similar way. Moreover, expected positive and negative emotions might explain why these environmental situations increase the anticipated acceptance of these novel/unfamiliar foods, suggesting that the more (less) people expect positive (negative) emotion, the more likely they are willing to try these novel/unfamiliar foods. In contrast, the environmental situations that appear to increase the anticipated acceptance of plant-based meat alternatives are similar to those which

increase the anticipated acceptance of typical food. Taken together, these findings reveal situational factors influencing the anticipated acceptance of novel/unfamiliar food, and can provide practical implications on how/where to try and introduce such food or create appropriate situations to increase the acceptance of eating novel/unfamiliar food.

Table 7. Summary of the main findings from Studies 1-3.

Study 1		
N = 117	Dependent variables: Anticipated willingness to try	Stimuli: Category name (e.g., insect-based foods)
Results of social situations	<u>Insect-based food, cultured meat, and 3D printed food</u> − Friends increased anticipated willingness to try compared with most of other social situations. <u>Plant-based meat alternatives</u> − Plant-based meat alternatives were more likely to be eaten with family, friends, and alone than with one's partner or an acquaintance.	
Results of venue	<u>Insect-based food, cultured meat, and 3D printed food</u> − Festivals increased anticipated willingness to try compared with any of the other venues. <u>Plant-based meat alternatives</u> − Plant-based meat alternatives were more likely to be eaten at food festivals, restaurants, cafes, and in the home than when at the pub or bar.	
Study 2		
N = 108	Dependent variables: Anticipated willingness to try, Expected emotions	Stimuli: Category name (e.g., insect-based foods)

Results of social situations	<u>Insect-based food, cultured meat, and 3D printed food</u> − Friends increased anticipated willingness to try compared with most of the other social situations. − Friends increased expected positive arousal/calming and decreased expected negative arousal/calming compared with most of other companions. − Expected negative calming from eating with friends specifically associated with the anticipated willingness to try. <u>Plant-based meat alternatives</u> − Plant-based meat alternatives were more likely to be eaten with family, friends, and alone than with acquaintances.	
Results of venue	<u>Insect-based food, cultured meat, and 3D printed food</u> − Festivals increased anticipated willingness to try compared with any of the other venues. − Festivals increased expected positive arousal/calming and decreased negative arousal/calming compared with most of other venues. − Expected negative calming from eating at festivals specifically associated with the anticipated willingness to try. <u>Plant-based meat alternatives</u> − Food festivals, restaurants, cafes, and home increased anticipated willingness to try plant-based meat alternatives compared with pubs and bars.	
Study 3		
N = 120	Dependent variables: Anticipated willingness to try, Expected emotions	Stimuli: Product description (e.g., mealworm burger)
Results of social situations	<u>Insect-based food, cultured meat, and 3D printed food</u>	

	− Friends increased anticipated willingness to try compared with any other social situation. − Friends increased expected positive arousal/calming and decreased expected negative arousal/calming compared with most of other companions. − Expected positive arousal and negative arousal from eating with friends specifically contribute to the anticipated willingness to try. <u>Plant-based meat alternatives</u> − Friends, family and alone increased willingness to try compared with acquaintances.
Results of venues	<u>Insect-based food, cultured meat, and 3D printed food</u> − Festivals increased anticipated willingness to try compared with any of the other venues. − Festivals increased expected positive arousal/calming and decreased negative arousal/calming compared with most of other venues. − Expected positive arousal from anticipating eating at festivals specifically contribute to the anticipated willingness to try. <u>Plant-based meat alternatives</u> − Festivals, restaurants, cafes, and home increased anticipated willingness to try plant-based meat alternatives compared with pubs and bars.

Situational influences on novel/unfamiliar food

It is still unclear how environmental situations, which are regarded as essential factors influencing food choice and behaviours (Betancur et al., 2020; Köster, 2009), influence novel food acceptance. A recent review of the acceptance of novel foods failed to provide much coverage of the role of environmental variables (Onwezen et al., 2020).

To the best of our knowledge, no report of the relevant literature has described a study examining the influence of environmental factors on the consumer acceptance of various types of novel food. Together, these findings reinforce the importance of environmental variables in research on sensory and consumer science.

The present study shows how social situations and venues influence consumer novel food acceptance and how similar and different the effects are across novel food. In particular, anticipating eating with friends or at food festivals increases the expected acceptance of insect-based foods, cultured meats, and 3D printed foods when compared to other social situations/venues. Anticipating eating with family and friends and alone increases the anticipated acceptance of plant-based meat alternatives more than it does with acquaintances. Moreover, anticipating eating plant-based meat alternatives gives rise to a higher willingness to eat at home, restaurants, cafes, and festivals than at pubs and bars. Furthermore, insect-based, cultured meat, and 3D printed food are in the same cluster, while plant-based meat alternatives and typical foods are in the same cluster. Together, these results provide evidence that environmental variables such as social companions and venues affect the anticipated acceptance of novel food, and the similar and different effects of environmental variables on the various novel food.

The present findings extend previous research on contextual acceptance of novel/unfamiliar foods. Previous research has demonstrated that friends and festivals increase the anticipated acceptance of insect-based foods as compared with the other social situations/venues (Motoki et al., 2020). We successfully replicated the findings and demonstrate that friends and festivals also increased the anticipated acceptance of other novel/unfamiliar food (i.e., cultured meat and 3D printed food) as compared with the other social situations/venues. Michel and colleagues showed similar appropriateness ratings for plant-based meat alternatives among social situations (alone, with friends, with family on a weekday) as well as among venues (dinner in a restaurant, business meal, barbecue party) (Michel et al., 2020). In line with the findings, our results also revealed that no differences in anticipated willingness to eat plant-based meat alternatives among three social situations (alone, friends, family) and some of venues (home, restaurants, cafes). Our findings also extend the previous research in that participants were less willing to try plant-based meat alternatives with perhaps unfamiliar individuals (acquaintance) than the most of other social situations. They were also less willing to try plant-based meat alternatives at bars and pubs than at the other venues.

Situational factors and emotions

Our results suggest the roles of the emotions associated with specific environmental situations on anticipated eating novel food. Previous research has shown that food acceptance and preferences differ in terms of whom people eat with and where the food is served and (Cardello et al., 1996; Edwards et al., 2003; García-Segovia et al., 2015; Giacalone et al., 2015; Giacalone & Jaeger, 2019; Heide, 2010; Meiselman et al., 2000). An earlier study revealed that appropriate situations when eating food elicit a range of positive emotions (e.g., excitement, joy, peace, happiness) and suppress a range of negative emotions (e.g., embarrassed, anxious, lonely) (Piqueras-Fiszman & Jaeger, 2015). A few studies have also shown that preferences for, and appropriateness of, venues where novel/unfamiliar food are served (Alemu et al., 2017; Michel et al., 2020; Motoki et al., 2020). However, the roles of the emotions that are associated with specific situations on eating various novel food remain largely unstudied. Based on the circumplex model of core affect (Jaeger et al., 2020; Russell, 1980), our findings extend those of earlier studies of associations between situations and emotions. Our findings show that increased positive arousing and calming expectations and decreased negative arousal and calming expectations are associated with specific environmental situations for novels food such as insect-based, cultured meat, and 3D printed food, though the effects of emotion might be different between the category name (e.g., cultured meat) and the specific descriptions (e.g., cultured meat burger).

Practical implications

The present findings have a number of practical implications for marketing communications for novel food. Given the current findings, marketing communications of novel/unfamiliar food should consider appropriate environments as usage / consumption situations on which to position novel foods. Portraying novel food in one of the appropriate contexts in an ad might, for example, help to enhance the consumers' willingness to try eating the novel food. For example, if marketers or people in the public sector want to promote insect-based, cultured meat, and 3D printed food, advertisements that depict eating the novel food with friends/festivals might evoke positive emotion (and decrease negative emotion), and this might be effective in terms of promoting these novel foods. Additionally, selling insect-based, culture meat, and 3D

printed food at food festivals might be expected to elicit higher volumes of sales than other placements. Apparently, tasting events at food festivals might attract consumer motivations to eat insect-based, culture meat, and 3D printed food.

Limitations and future research

One relevant limitation of this study is that actual situations were not used, though the results of imagined and actual situations would appear to be similar in some cases (Cavazza et al., 2017; Young et al., 2019 but see Jaeger & Porcherot, 2017). In an online survey, participants imagined being with companions or at venues. Although this type of manipulation has been used in earlier research on situational appropriateness (e.g., Michel et al., 2020; Versluis et al., 2015), this condition might engender some practical difficulties and might not reflect the actual effects of environments on the acceptance of novel foods. The reason why we used imaginary scenarios is that imaginary scenarios have the advantage that they can readily create various environmental situations. The experiments considering various actual interpersonal situations (e.g., friends, partners, family) and locational situations (e.g., food festivals, pubs, restaurants, bars) are by no means impossible to conduct but are undoubtedly difficult to perform (especially in the era of Covid-19). Consequently, further studies should investigate whether the current findings can be replicated using actual environments.

Another limitation with the present study is the kinds of novel/unfamiliar foods and situations used as well as sensory/cognitive factors that remain unstudiedinvestigated. Although our aim in this research was not to comprehensively investigate the contextual effects on all of novel/unfamiliar food, there are a greater number of novel/unfamiliar food which this research did not cover (e.g., jellyfish, pulses, algae, blue food, food produced by nanotechnology, new fusion foods, see Onwezen et al., 2020; Siegrist & Hartmann, 2020a; Spence, 2018, 2020b; Youssef, Keller, & Spence, 2019). There are, of course, also a number of situations that we did not cover in our research. For example, the effects of co-workers and outdoor venues (e.g., camping, picnic, street food) on the anticipated acceptance of novel/familiar food were not investigated. Moreover, we did not consider the impact of sensory/cognitive factors on consumer behaviour. For example, the price (cultured meat burger is still expensive), textures (as in cultured meat) and shape (as in 3D printed food) might also influence anticipated willingness to try. Further research needs to test for whether and how the other

884 unexamined novel/unfamiliar food, situations and sensory/cognitive factors influence
885 anticipated acceptance of novel/familiar food.

886 One of the other limitations with the present study relates to culinary differences
887 associated with different cultures. Given that all of the studies reported here were
888 conducted in Japan, it is still possible that different conclusions might have been
889 obtained had the study been conducted in other cultural settings (e.g., Wan et al., 2016).
890 Differences in the acceptance of novel/unfamiliar foods (insect-based foods) between
891 cultures has previously been reported (e.g., Tan et al., 2017). Moreover, the emotions
892 that are associated with novel/unfamiliar foods and contexts might be different as a
893 function of culture. Thus, the influence of contexts on the consumer response to the
894 novel/unfamiliar food may be moderated by cultural differences. The additional
895 limitation is the analyses of the relations between emotions and anticipated willingness
896 to eat novel/unfamiliar foods in a given context. Considering the repeated within-
897 participants design, we did not conduct a formal mediation analysis. Further research
898 should therefore consider using a between-participants experimental design in order to
899 reveal how emotions mediate the relations between contexts and willingness to eat
900 novel/unfamiliar foods.

901 The final limitation that is worth mentioning here concerns the wording of 'willingness
902 to try'. Previous research has suggested that different influence of 'willingness to buy
903 once' and 'willingness to buy regularly' on expected acceptance of insect-based foods
904 (mealworm products) such that consumers are more reluctant to buy insect-based foods
905 regularly rather than once (Tan et al., 2017). Although we observed the effects of
906 contexts on anticipated willingness to try novel and unfamiliar foods, this might be
907 limited to 'willingness to buy once'. Further study should be needed to investigate the
908 effects of contexts on 'willingness to buy regularly'

909

910 *Conclusions*

911 In summary, the findings presented here demonstrate how situational factors influence
912 the anticipated acceptance of novel foods. The results show that anticipating eating with
913 friends and food festivals play an important role in the expected acceptance of insect-
914 based, culture meat, and 3D printed food. Moreover, increased positive and decreased
915 negative emotion might explain why these environmental situations increase the
916 anticipated acceptance of insect-based, cultured meat, and 3D printed food. In contrast,

the environmental situations which increase the anticipated acceptance of plant-based meat alternatives are similar ones which increase the anticipated acceptance of typical food. Together, these findings can provide evidence that contextual factors contribute to novel food acceptance and expected emotions. Food industry professionals can use the findings reported here to capitalize on creating appropriate situations to promote the repeated consumption of a range of novel/unfamiliar foods.

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Appendix Table A. Influence of social situations/venues on the willingness to try eating novel/unfamiliar food in Studies 1-3. Each cell indicates mean (and SD).

Study 1		Typical	Insects	Cultured meat	Plant-based	3D printed
Social	Alone	5.69 (1.17)	1.79 (1.34)	2.88 (1.72)	4.68 (1.58)	3.10 (1.81)
	Friend	5.51 (1.39)	2.32 (1.64)	3.10 (1.69)	4.61 (1.50)	3.62 (1.87)
	Family	5.74 (1.33)	1.69 (1.15)	2.72 (1.68)	4.68 (1.45)	3.05 (1.72)
	Acquaintance	4.60 (1.49)	1.90 (1.39)	2.81 (1.61)	4.18 (1.41)	3.04 (1.64)
	Partner	5.70 (1.31)	1.52 (1.00)	2.59 (1.59)	4.32 (1.46)	2.93 (1.73)
Venue	Cafe	5.25 (1.41)	1.44 (0.97)	2.31 (1.48)	4.19 (1.56)	2.76 (1.73)
	Bar	4.29 (1.54)	1.54 (1.06)	2.27 (1.45)	3.62 (1.36)	2.43 (1.57)
	Pub	5.30 (1.57)	2.00 (1.47)	2.76 (1.66)	4.19 (1.36)	2.57 (1.57)
	Festival	5.23 (1.64)	2.29 (1.65)	3.19 (1.80)	4.78 (1.45)	3.46 (1.84)
	Home	6.12 (1.02)	1.63 (1.16)	2.53 (1.58)	4.38 (1.41)	2.51 (1.56)
	Restaurant	5.92 (1.20)	1.74 (1.29)	2.73 (1.66)	4.44 (1.39)	2.71 (1.68)

Study 2		Typical	Insects	Cultured meat	Plant-based	3D printed
Social	Alone	5.72 (1.24)	1.68 (1.37)	2.61 (1.79)	4.44 (1.74)	2.72 (1.79)
	Friend	5.50 (1.31)	2.40 (1.79)	2.86 (1.78)	4.19 (1.58)	3.44 (1.87)
	Family	5.81 (1.26)	1.70 (1.36)	2.48 (1.64)	4.18 (1.70)	2.81 (1.78)
	Acquaintance	4.52 (1.72)	1.69 (1.26)	2.40 (1.57)	3.68 (1.61)	2.72 (1.63)
	Partner	5.68 (1.41)	1.66 (1.38)	2.44 (1.65)	4.02 (1.70)	2.75 (1.78)
Venue	Cafe	5.31 (1.52)	1.40 (1.00)	2.14 (1.48)	4.05 (1.82)	2.52 (1.74)

	Bar	4.16 (1.88)	1.41 (0.97)	1.94 (1.32)	2.99 (1.74)	2.32 (1.59)
	Pub	5.37 (1.67)	1.81 (1.44)	2.20 (1.52)	3.37 (1.85)	2.47 (1.61)
	Festival	5.40 (1.60)	2.31 (1.75)	3.04 (1.99)	4.19 (1.91)	3.56 (2.06)
	Home	6.23 (1.20)	1.65 (1.28)	2.30 (1.65)	4.06 (1.89)	2.51 (1.77)
	Restaurant	5.88 (1.38)	1.51 (1.13)	2.39 (1.68)	4.20 (1.81)	2.74 (1.90)

Study 3		Typical	Insects	Cultured meat	Plant-based	3D printed
Social	Alone	5.50 (1.57)	1.57 (1.14)	2.73 (1.65)	4.56 (1.80)	2.90 (1.87)
	Friend	5.53 (1.47)	1.89 (1.49)	2.98 (1.72)	4.47 (1.73)	3.40 (2.03)
	Family	5.38 (1.54)	1.48 (1.05)	2.50 (1.47)	4.51 (1.80)	2.83 (1.79)
	Acquaintance	5.06 (1.47)	1.59 (1.15)	2.70 (1.55)	4.16 (1.66)	2.83 (1.70)
	Partner	5.18 (1.53)	1.44 (0.97)	2.34 (1.41)	4.33 (1.64)	2.78 (1.79)
Venue	Cafe	5.17 (1.61)	1.35 (0.85)	2.36 (1.40)	4.40 (1.85)	2.75 (1.75)
	Bar	3.83 (1.80)	1.43 (1.07)	2.04 (1.25)	3.39 (1.80)	2.25 (1.51)
	Pub	3.61 (1.84)	1.54 (1.09)	2.27 (1.39)	3.23 (1.78)	2.42 (1.64)
	Festival	5.48 (1.33)	1.95 (1.54)	3.06 (1.75)	4.65 (1.71)	3.46 (2.01)
	Home	5.23 (1.48)	1.44 (0.95)	2.57 (1.59)	4.25 (1.74)	2.81 (1.77)
	Restaurant	5.08 (1.50)	1.41 (0.93)	2.53 (1.53)	4.36 (1.65)	2.66 (1.72)

Appendix Table B. Main effects of types of novel/unfamiliar food on the willingness to try in Studies 1-3. Each cell indicates mean (and SD).

		Typical	Insects	Cultured meat	Plant-based	3D printed
Study 1	Social	5.45 (1.41)	1.84 (1.34)	2.82 (1.66)	4.49 (1.49)	3.15 (1.77)
	Venue	5.35 (1.53)	1.77 (1.32)	2.63 (1.63)	4.27 (1.46)	2.74 (1.69)
Study 2	Social	5.44 (1.47)	1.83 (1.46)	2.56 (1.69)	4.10 (1.68)	2.88 (1.79)
	Venue	5.39 (1.68)	1.68 (1.32)	2.33 (1.65)	3.81 (1.89)	2.69 (1.83)
Study 3	Social	5.33 (1.52)	1.60 (1.18)	2.65 (1.57)	4.41 (1.73)	2.95 (1.85)
	Venue	4.73 (1.76)	1.52 (1.11)	2.47 (1.52)	4.05 (1.83)	2.72 (1.78)

Appendix Table C. Influence of social situations on the willingness to try eating novel food in Studies 1-3. Statistical summaries of pairwise comparisons.

Willingness-to-try	Study 1			Study 2				Study 3			
	Pair	Diff	t-value	adj. p	Pair	Diff	t-value	adj. p	Pair	Diff	t-value	adj. p
Typical	Partner-Acquaintance	1.094	8.673	<.001*	Family-Acquaintance	1.287	8.482	<.001*	Friend-Acquaintance	0.467	6.240	<.001*
	Friend-Acquaintance	0.906	7.824	<.001*	Partner-Acquaintance	1.157	7.204	<.001*	Friend-Partner	0.342	4.653	<.001*
	Family-Acquaintance	1.137	7.500	<.001*	Friend-Acquaintance	0.982	7.050	<.001*	Alone-Acquaintance	0.442	3.813	.001*
	Alone-Acquaintance	1.086	6.787	<.001*	Alone-Acquaintance	1.204	5.984	<.001*	Family-Acquaintance	0.317	3.070	.016*
	Partner-Friend	0.188	2.214	.173	Family-Friend	0.306	2.748	.042*	Alone-Partner	0.317	2.474	.089
	Family-Friend	0.231	1.861	.261	Partner-Friend	0.176	1.954	.213	Family-Partner	0.192	1.764	.321
	Alone-Friend	0.180	1.238	.873	Alone-Friend	0.222	1.480	.568	Friend-Family	0.150	1.684	.379
	Family-Partner	0.043	0.366	1.000	Family-Partner	0.130	1.038	.905	Partner-Acquaintance	0.125	1.380	.510
	Family-Alone	0.051	0.365	1.000	Family-Alone	0.083	0.573	1.000	Alone-Family	0.125	1.129	.523
	Partner-Alone	0.009	0.061	1.000	Alone-Partner	0.046	0.292	1.000	Friend-Alone	0.025	0.221	.826

Insect	Friend-Partner	0.803	6.818	<.001*	Friend-Partner	0.741	5.796	<.001*	Friend-Partner	0.450	4.875	<.001*
	Friend-Family	0.633	5.992	<.001*	Friend-Family	0.694	5.375	<.001*	Friend-Family	0.408	4.674	<.001*
	Friend-Acquaintance	0.427	4.460	<.001*	Friend-Alone	0.722	5.036	<.001*	Friend-Alone	0.325	3.802	.001*
	Friend-Alone	0.539	4.219	<.001*	Friend-Acquaintance	0.704	4.858	<.001*	Friend-Acquaintance	0.300	3.564	.003*
	Acquaintance-Partner	0.376	3.851	.001*	Family-Partner	0.046	0.482	1.000	Acquaintance-Partner	0.150	1.747	.500
	Acquaintance-Family	0.205	2.591	.043*	Acquaintance-Partner	0.037	0.373	1.000	Alone-Family	0.083	1.552	.500
	Alone-Partner	0.265	2.348	.082	Family-Alone	0.028	0.281	1.000	Alone-Partner	0.125	1.548	.500
	Family-Partner	0.171	2.218	.085	Alone-Partner	0.019	0.148	1.000	Acquaintance-Family	0.108	1.530	.500
	Acquaintance-Alone	0.111	0.955	.683	Acquaintance-Alone	0.019	0.141	1.000	Family-Partner	0.042	0.584	1.000
	Alone-Family	0.094	0.919	.683	Family-Acquaintance	0.009	0.075	1.000	Acquaintance-Alone	0.025	0.303	1.000
Cultured meat	Friend-Partner	0.513	5.566	<.001*	Friend-Partner	0.426	4.281	<.001*	Friend-Partner	0.633	5.807	<.001*
	Friend-Family	0.385	4.443	<.001*	Friend-Family	0.380	3.832	.001*	Friend-Family	0.475	5.464	<.001*
	Friend-Acquaintance	0.291	3.691	.002*	Friend-Acquaintance	0.463	3.742	.002*	Acquaintance-Partner	0.358	4.167	<.001*

	Acquaintance-Partner	0.222	2.756	.041*	Friend-Alone	0.250	1.959	.317	Friend-Acquaintance	0.275	3.428	.005*
	Alone-Partner	0.291	2.727	.044*	Alone-Partner	0.176	1.674	.583	Alone-Partner	0.383	3.286	.008*
	Family-Partner	0.128	1.797	.300	Alone-Acquaintance	0.213	1.459	.590	Friend-Alone	0.250	2.842	.021*
	Friend-Alone	0.222	1.737	.340	Alone-Family	0.130	1.271	.826	Acquaintance-Family	0.200	2.652	.036*
	Alone-Family	0.162	1.535	.383	Family-Partner	0.046	0.869	1.000	Alone-Family	0.225	2.281	.073
	Acquaintance-Family	0.094	1.291	.399	Family-Acquaintance	0.083	0.640	1.000	Family-Partner	0.158	2.116	.073
	Alone-Acquaintance	0.068	0.723	.471	Partner-Acquaintance	0.037	0.300	1.000	Alone-Acquaintance	0.025	0.261	.795
Plant-based	Friend-Acquaintance	0.427	4.733	<.001*	Alone-Acquaintance	0.769	4.220	.001*	Friend-Acquaintance	0.308	4.130	.001*
	Family-Acquaintance	0.504	4.598	<.001*	Friend-Acquaintance	0.509	3.982	.001*	Alone-Acquaintance	0.400	4.117	.001*
	Family-Partner	0.359	3.935	<.001*	Family-Acquaintance	0.500	3.379	.006*	Family-Acquaintance	0.350	3.519	.004*
	Alone-Acquaintance	0.496	3.781	.002*	Alone-Partner	0.426	2.893	.028*	Partner-Acquaintance	0.175	1.982	.299
	Alone-Partner	0.350	3.089	.015*	Partner-Acquaintance	0.343	2.248	.160	Alone-Partner	0.225	1.860	.392
	Friend-Partner	0.282	2.885	.019*	Alone-Family	0.269	1.924	.228	Family-Partner	0.175	1.512	.533

	Partner-Acquaintance	0.145	1.459	.589	Alone-Friend	0.259	1.835	.277	Friend-Partner	0.133	1.367	.697
	Family-Friend	0.077	0.703	1.000	Family-Partner	0.157	1.657	.302	Alone-Friend	0.092	0.900	1.000
	Alone-Friend	0.068	0.576	1.000	Friend-Partner	0.167	1.324	.376	Alone-Family	0.050	0.488	1.000
	Family-Alone	0.009	0.077	1.000	Friend-Family	0.009	0.081	.936	Family-Friend	0.042	0.420	1.000
3D printed	Friend-Partner	0.684	5.821	<.001*	Friend-Family	0.630	5.399	<.001*	Friend-Partner	0.617	5.748	<.001*
	Friend-Acquaintance	0.573	5.626	<.001*	Friend-Partner	0.685	5.354	<.001*	Friend-Family	0.567	5.431	<.001*
	Friend-Family	0.564	4.861	<.001*	Friend-Acquaintance	0.713	5.238	<.001*	Friend-Acquaintance	0.575	5.131	<.001*
	Friend-Alone	0.513	3.682	.002*	Friend-Alone	0.713	4.156	<.001*	Friend-Alone	0.500	3.546	.003*
	Family-Partner	0.120	1.378	1.000	Family-Acquaintance	0.083	0.630	1.000	Alone-Partner	0.117	0.767	1.000
	Alone-Partner	0.171	1.329	1.000	Family-Alone	0.083	0.537	1.000	Family-Partner	0.050	0.669	1.000
	Acquaintance-Partner	0.111	1.311	1.000	Family-Partner	0.056	0.533	1.000	Alone-Acquaintance	0.075	0.621	1.000
	Alone-Acquaintance	0.060	0.449	1.000	Partner-Acquaintance	0.028	0.209	1.000	Alone-Family	0.067	0.506	1.000
	Alone-Family	0.051	0.432	1.000	Partner-Alone	0.028	0.190	1.000	Acquaintance-Partner	0.042	0.361	1.000
	Family-Acquaintance	0.009	0.078	1.000	Alone-Acquaintance	0.000	0.000	1.000	Family-Acquaintance	0.008	0.079	1.000

Note: Bold denote significant difference (adj. $p < .05$*). P value adjusted by Shaffer's modified sequentially rejective Bonferroni procedure (Shaffer, 1986).

Appendix Table D. Influence of venue on the willingness to try eating novel food in Studies 1-3. Statistical summaries of pairwise comparisons.

Willingness-to-try	Study 1				Study 2				Study 3			
	Pair	Diff	t-value	adj. p	Pair	Diff	t-value	adj. p	Pair	Diff	t-value	adj. p
Typical	Restaurant-Bar	1.633	12.349	<.001*	Home-Bar	2.074	10.861	<.001*	Festival-Pub	1.875	11.359	<.001*
	Home-Bar	1.829	11.580	<.001*	Restaurant-Bar	1.722	10.767	<.001*	Home-Pub	1.625	10.498	<.001*
	Cafe-Bar	0.957	8.906	<.001*	Pub-Bar	1.213	8.024	<.001*	Festival-Bar	1.658	10.488	<.001*
	Pub-Bar	1.009	7.329	<.001*	Festival-Bar	1.241	7.890	<.001*	Cafe-Bar	1.342	9.812	<.001*
	Festival-Bar	0.940	6.175	<.001	Cafe-Bar	1.148	7.573	<.001*	Restaurant-Pub	1.467	9.769	<.001*
	Festival-Restaurant	0.692	6.133	<.001*	Home-Cafe	0.926	6.380	<.001	Cafe-Pub	1.558	8.985	<.001*
	Restaurant-Cafe	0.675	6.075	<.001*	Home-Pub	0.861	5.446	<.001*	Home-Bar	1.408	8.785	<.001*
	Restaurant-Pub	0.624	6.027	<.001*	Home-Festival	0.833	5.363	<.001*	Restaurant-Bar	1.250	8.396	<.001*
	Home-Cafe	0.872	5.893	<.001*	Restaurant-Festival	0.482	4.827	<.001*	Festival-Restaurant	0.408	3.531	.004*

	Home-Pub	0.821	5.300	<.001*	Restaurant-Cafe	0.574	4.784	<.001*	Festival-Café	0.317	2.717	.045*
	Home-Festival	0.889	5.260	<.001*	Restaurant-Pub	0.509	3.920	.001*	Festival-Home	0.250	2.262	.102
	Home-Restaurant	0.197	1.626	.427	Home-Restaurant	0.352	2.784	.025*	Bar-Pub	0.217	1.691	.374
	Pub-Festival	0.068	0.526	1.000	Festival-Cafe	0.093	0.702	1.000	Home-Restaurant	0.158	1.338	.550
	Pub-Cafe	0.051	0.391	1.000	Pub-Cafe	0.065	0.413	1.000	Cafe-Restaurant	0.092	0.698	.973
	Cafe-Festival	0.017	0.118	1.000	Festival-Pub	0.028	0.238	1.000	Home-Café	0.067	0.531	.973
Insects	Festival-Cafe	0.855	7.032	<.001*	Festival-Bar	0.898	7.322	<.001*	Festival-Café	0.600	5.303	<.001*
	Festival-Bar	0.752	6.764	<.001*	Festival-Cafe	0.907	6.181	<.001*	Festival-Home	0.508	5.248	<.001*
	Festival-Restaurant	0.547	5.892	<.001*	Festival-Restaurant	0.796	5.804	<.001*	Festival-Bar	0.517	5.182	<.001*
	Pub-Cafe	0.564	5.462	<.001*	Festival-Pub	0.500	5.348	<.001*	Festival-Restaurant	0.542	5.089	<.001*
	Festival-Home	0.658	5.444	<.001*	Festival-Home	0.657	4.920	<.001*	Festival-Pub	0.408	4.632	<.001*

	Pub-Bar	0.462	5.102	<.001*	Pub-Bar	0.398	4.371	<.001*	Pub-Café	0.192	2.617	.100
	Restaurant -Cafe	0.308	4.141	.001*	Pub-Cafe	0.407	3.462	.005*	Pub-Restaurant	0.133	1.934	.388
	Pubs-Home	0.368	3.505	.005*	Pub-Restaurant	0.296	2.926	.029*	Pub-Bar	0.108	1.838	.480
	Festival-Pub	0.291	3.383	.007*	Home-Bar	0.241	2.763	.047*	Restaurant-Café	0.058	1.711	.627
	Pub-Restaurant	0.256	2.925	.025*	Restaurant-Cafe	0.111	2.313	.136	Home-Café	0.092	1.690	.627
	Home-Cafe	0.197	2.768	.026*	Home-Cafe	0.250	2.286	.136	Pub-Home	0.100	1.382	.679
	Restaurant -Bar	0.205	2.267	.101	Restaurant-Bar	0.102	1.520	.526	Bar-Café	0.083	1.105	1.000
	Bar-Cafe	0.103	1.615	.327	Pub-Home	0.157	1.471	.526	Home-Restaurant	0.033	0.553	1.000
	Restaurant -Home	0.111	1.129	.523	Home-Restaurant	0.139	1.336	.526	Bar-Restaurant	0.025	0.336	1.000
	Home-Bar	0.094	1.064	.523	Bar-Cafe	0.009	0.142	.887	Home-Bar	0.008	0.102	1.000
Cultured meat	Festival-Bar	0.915	7.666	<.001*	Festival-Bar	1.093	7.383	<.001*	Festival-Bar	1.017	8.118	<.001*
	Festival-Cafe	0.880	7.434	<.001*	Festival-Pub	0.833	6.138	<.001*	Festival-Café	0.700	6.548	<.001*

Festival-Home	0.658	5.096	<.001*	Festival-Cafe	0.898	6.036	<.001*	Festival-Pub	0.792	6.214	<.001*
Pub-Bar	0.487	4.810	<.001*	Festival-Home	0.741	5.111	<.001*	Home-Bar	0.525	5.194	<.001*
Restaurant-Cafe	0.419	4.409	<.001*	Festival-Restaurant	0.648	4.824	<.001*	Festival-Restaurant	0.525	5.158	<.001*
Pubs-Cafe	0.453	4.295	<.001*	Restaurant-Bar	0.444	3.892	.002*	Restaurant-Bar	0.492	4.863	<.001*
Restaurant-Bar	0.453	4.267	<.001*	Restaurant-Cafe	0.250	2.861	.036*	Festival-Home	0.492	4.533	<.001
Festival-Pub	0.427	3.811	.002*	Pub-Bar	0.259	2.602	.074	Cafe-Bar	0.317	3.904	.001*
Festival-Restaurant	0.462	3.737	.002*	Home-Bar	0.352	2.594	.076	Pub-Bar	0.225	3.445	.006*
Pub-Home	0.231	2.388	.111	Cafe-Bar	0.194	2.041	.263	Home-Pub	0.300	2.878	.029*
Home-Bar	0.256	2.237	.111	Restaurant-Pub	0.185	2.008	.263	Restaurant-Pub	0.267	2.679	.034*
Home-Cafe	0.222	2.112	.147	Home-Cafe	0.157	1.380	.682	Home-Café	0.208	2.376	.076
Restaurant-Home	0.197	1.932	.167	Restaurant-Home	0.093	0.832	1.000	Restaurant-Café	0.175	2.238	.081
Cafe-Bar	0.034	0.515	1.000	Pub-Cafe	0.065	0.786	1.000	Cafe-Pub	0.092	1.085	.561

	Pub-Restaurant	0.034	0.407	1.000	Home-Pub	0.093	0.779	1.000	Home-Restaurant	0.033	0.416	.679
Plant-based	Festival-Bar	1.154	9.249	<.001*	Festival-Bar	1.204	7.882	<.001*	Festival-Pub	1.417	9.247	<.001*
	Restaurant-Bar	0.821	6.546	<.001*	Restaurant-Bar	1.213	7.791	<.001*	Restaurant-Pub	1.125	8.843	<.001*
	Home-Bar	0.752	5.165	<.001*	Cafe-Bar	1.056	6.428	<.001*	Festival-Bar	1.258	8.265	<.001*
	Pub-Bar	0.564	4.638	<.001*	Festival-Pub	0.824	5.629	<.001*	Cafe-Bar	1.008	8.106	<.001*
	Cafe-Bar	0.564	4.570	<.001*	Home-Bar	1.065	5.277	<.001*	Restaurant-Bar	0.967	7.790	<.001*
	Festival-Pub	0.590	4.396	<.001*	Restaurant-Pub	0.833	5.234	<.001*	Cafe-Pub	1.167	7.761	<.001*
	Festival-Cafe	0.590	4.258	<.001*	Cafe-Pub	0.676	3.719	.002*	Home-Pub	1.017	7.564	<.001*
	Festival-Home	0.402	3.112	.016*	Home-Pub	0.685	3.686	.003*	Home-Bar	0.858	6.479	<.001*
	Festival-Restaurant	0.333	2.732	.051	Pub-Bar	0.380	2.904	.031*	Festival-Home	0.400	3.443	.006*
	Restaurant-Cafe	0.256	2.177	.189	Restaurant-Cafe	0.157	1.246	1.000	Festival-Restaurant	0.292	2.732	.044*
	Restaurant-Pub	0.256	2.041	.189	Festival-Cafe	0.148	1.100	1.000	Festival-Cafe	0.250	2.188	.123

	Home-Cafe	0.188	1.386	.674	Restaurant-Home	0.148	0.908	1.000	Bar-Pub	0.158	1.451	.597
	Home-Pub	0.188	1.334	.674	Festival-Home	0.139	0.706	1.000	Cafe-Home	0.150	1.331	.597
	Restaurant-Home	0.068	0.504	1.000	Restaurant-Festival	0.009	0.061	1.000	Restaurant-Home	0.108	1.038	.603
	Cafe-Pub	0.000	0.000	1.000	Home-Café	0.009	0.051	1.000	Cafe-Restaurant	0.042	0.446	.657
3D printed	Festival-Bar	1.034	7.878	<.001*	Festival-Bar	1.241	8.121	<.001*	Festival-Bar	1.208	7.613	<.001*
	Festival-Home	0.949	6.832	<.001*	Festival-Pub	1.093	7.187	<.001*	Festival-Pub	1.042	7.537	<.001*
	Festival-Pub	0.889	6.379	<.001*	Festival-Cafe	1.046	6.689	<.001*	Festival-Restaurant	0.800	6.181	<.001*
	Festival-Café	0.701	5.221	<.001*	Festival-Home	1.056	5.934	<.001*	Festival-Café	0.708	5.621	<.001*
	Festival-Restaurant	0.752	5.201	<.001*	Festival-Restaurant	0.824	4.939	<.001*	Cafe-Bar	0.500	4.979	<.001*
	Cafe-Bar	0.333	3.637	.004*	Restaurant-Bar	0.417	3.075	.027*	Festival-Home	0.650	4.733	<.001*
	Restaurant-Bar	0.282	2.686	.058	Restaurant-Cafe	0.222	2.271	.176	Restaurant-Bar	0.408	4.169	<.001*

Cafe-Home	0.248	1.994	.340	Restaurant-Pub	0.269	1.950	.377	Home-Bar	0.558	4.079	.001*
Cafe-Pub	0.188	1.550	.868	Pub-Bar	0.148	1.664	.694	Home-Pub	0.392	2.682	.059
Restaurant-Home	0.197	1.542	.868	Cafe-Bar	0.194	1.618	.694	Cafe-Pub	0.333	2.506	.081
Pub-Bar	0.145	1.459	.868	Restaurant-Home	0.232	1.616	.694	Restaurant-Pub	0.242	1.993	.194
Restaurant-Pub	0.137	1.252	.868	Home-Bar	0.185	1.086	1.000	Pub-Bar	0.167	1.552	.493
Home-Bar	0.086	0.761	1.000	Cafe-Pub	0.046	0.359	1.000	Home-Restaurant	0.150	1.227	.666
Cafe-Restaurant	0.051	0.661	1.000	Home-Pub	0.037	0.232	1.000	Cafe-Restaurant	0.092	1.035	.666
Pub-Home	0.060	0.471	1.000	Cafe-Home	0.009	0.068	1.000	Home-Cafe	0.058	0.434	.666

Note: Bold and asterisk (*) denote significant difference (adj. $p < .05$). P value adjusted by Shaffer's modified sequentially rejective Bonferroni procedure (Shaffer, 1986).

1194