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The food neophobia scale and young adults' intention to eat insect products

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Abstract

In the coming years, the new EU Regulation on Novel Food is likely to facilitate the development of a niche market for insects and insect-based ingredients in many European countries. In this research, the aim is to explore the relationship between willingness to try (WTT) and behavior of eating insects, where the independent variables are food neophobia, sensory property expectations, and previous consumption. In total, 88 Italian participants took part in the study. The food neophobia scale (FNS) was constructed using 9 of the 10 items from the original FNS, and a Structural Equation Modeling approach was used to test the research hypotheses. The results show that males are more open to trying insects than females, and food neophobia is negatively correlated with the willingness to eat insects. Findings also indicate that the first exposure to insects positively increases consumers' sensory property expectations. Intention to try is a strong predictor of the behavior of eating insects. People who scored lower on the FNS were more likely to try (intention) and consequently eat insects (behavior). These findings enhance knowledge about factors which could lead to lower levels of negative prejudice and greater willingness to taste edible insects among Western consumers. Finally, some marketing implications are discussed, like the need of information campaigns to emphasize positive sensory attributes of edible insects to increase the WTT this unfamiliar food.

KEYWORDS

behavior, consumers, disgust, entomophagy, Italy, novel foods

1 | INTRODUCTION

In many industrialized countries, the debate of breading, producing, and commercializing edible insects as human food has been discussed intensively in the last few years, among both the scientific communities, the food industry and policy makers. As a follow-up subsequent to this debate, a large media coverage about entomophagy has been presented to the general public. Today, the perspective of eating insects is considered as a new (unknown) phenomenon for Western consumers.

As a matter of fact, the practice of insect consumption, known as entomophagy, from the Greek *éntomon* (insect), and *phagein* (to eat), is an ancient food habit and widespread among many people in the world (van Huis, 2013).

In addition to this, since the early 2000s, with the increasing demand for alternative protein sources worldwide, the Food and Agriculture Organization of the United Nations has promoted insects as a potential food source for humans as animal (van Huis et al., 2013; Zielińska, Baraniak, Karaś, Rybczyńska, & Jakubczyk, 2015).

Until few years ago, in most Western countries it was only possible to find few whole insect products (e.g., deep-fried or chocolate-covered) where insects were combined more or less with familiar foods and preparation methods. This type of approach was considered more for its novelty than for need or a real demand since these products were created only for specific events or occasions in order to raise curiosity among people (Sogari & Vantomme, 2014; van Huis et al., 2013).

In recent years, there has been a much larger variety of insect products offered in Western countries. There is growing business interest around this new food ingredient, especially processed insects (e.g., cricket or mealworm powder) and as a food ingredient for other products (e.g., chips, energy-bars and bakery products). Many small and medium enterprises were born in different countries in Europe with the intention to enter and proliferate in this new emerging market (La Barbera, Verneaua, Amato, & Grunert, 2018). Today, the growing interest in insects as an alternative sustainable form of protein for humans and animals is supported by many potential sustainable benefits (e.g., lower environmental impact than more common animal protein sources) (Dobermann, Swift, & Field, 2017; Payne, Scarborough, Rayner, & Nonaka, 2016; van Huis, 2013).

The high protein level in edible insects (Rumpold & Schlüter, 2013) raised the question whether to develop food products for the Western market using insects in food formulations considered to be meat substitutes (Caparros Megido, Haubruge, & Francis, 2018; Tan, Berg, & Stieger, 2016).

The likelihood that insects as food could become more widely available on the European market has recently become possible due the full application of the new regulatory framework about novel food. In fact, although European food legislation is very conservative about the introduction of new foods or new ingredients (Belluco et al., 2013), the new Regulation on Novel Food was adopted in 2015 (Regulation (EC) No 2015/2283) becoming fully implemented from January 1, 2018. This new regulation will increase enhance the circumstances in which companies may bring innovative and new foods, and at the same time keep advanced standards of food safety and quality for all European consumers.

Many advocates in the sector of entomophagy believe that in the coming years, a new emerging market for insects or insect-based ingredients (e.g., bakery products and snacks) might be presented in many European countries, especially starting in the Northern Europe where some insect food products were already commercially available before the full application of the Novel Food Regulation.

However, based on the authors' knowledge, so far, no verified data are available on the actual market of insect products in the world. A report in 2016 (Global Market Insights) predicted a significant growth of the market of edible insects for food and animal feed worldwide as consumer awareness and acceptance increases. European countries like the United Kingdom, the Netherlands, and France appear to have more promising market growth of this sector (Global Market Insights Inc., 2016; Han, Shin, Kim, Choi, & Kim, 2017).

In this rapidly evolving context, communicating positive aspects of entomophagy could facilitate the acceptance of this practice and reduce prejudice and negative attitudes (Sogari, 2015); but communicating environmental and nutritional benefits might still be insufficient, especially for older adults (Myers & Pettigrew, 2018). It has been clearly demonstrated that taste appeal is generally more effective than informational communication (Hamerman, 2016; Myers & Pettigrew, 2018). Moreover, the preparation method strongly influences the overall acceptability of insects and the perception of entomophagy among consumers (Caparros Megido et al., 2014; Materia & Cavallo, 2015). The likelihood of acceptance depends especially on the presence of an unprocessed or processed insect in the product (Balzan, Fasolato, Maniero, & Novelli, 2016; Schösler, Boer, & Boersema, 2012). It is reasonable to image that consumers will be more open to eating insects where the food looks and tastes familiar and where insects are not readily visible (Caparros Megido et al., 2016; Sogari, 2015; Sogari, Menozzi, & Mora, 2017).

The present study provides new insights into the acceptance of trying and consuming a novel food (edible insect) and identifies the main determinants driving this when an unfamiliar food product is introduced into a Western culture.

In our research a house cricket was incorporated into a common type of jelly sweet. These types of novelty enriched protein products might help to establish and increase consumer knowledge and acceptance of insect as a food ingredient.

This paper aims to investigate the willingness to eat insects, and related behavior, depending on different variables including participants' level of food neophobia.

2 | CONSUMER FOOD NEOPHOBIA AND RESEARCH HYPOTHESIS

Food neophobia has been defined as the tendency of the individual to avoid unfamiliar foods (Ritchey, Frank, Hursti, & Tuorila, 2003; Rozin & Fallon, 1987). In the past, the fear of unfamiliar food had the function of protecting people from eating possibly dangerous or nutritionally inadequate foods (Martins & Pliner, 2006). The fear however, is still prevalent today. For instance, when a new food is introduced within a traditional and conservative food culture, at the beginning consumers tend to reject it. This rejection is often due to socio-psychological rather than logical reasons (DeFoliart, 1999; Myers & Pettigrew, 2018).

Pliner and Hobden (1992) developed the food neophobia scale (FNS) which consists of 10-item statements (Table 1) used to quantify neophobia in individuals and predict the willingness to try (WTT) novel foods. The FNS consisted of five neophilic and five neophobic statements about food or situations related to food consumption. People usually complete the FNS by indicating their degree of agreement/disagreement on a seven-point Likert scale.

Recently, many studies have indicated that food neophobia as an individual trait is one of the most important predictors in understanding consumer WTT insects (Hartmann, Shi, Giusto, & Siegrist, 2015; Hartmann & Siegrist, 2016; Verbeke, 2015; Verneau et al., 2016).

TABLE 1 Food neophobia scale

No	Statement
1	I am constantly sampling new and different foods (R—reverse coded)
2	I don't trust new foods
3	If I don't know what a food is, I won't try it
4	I like foods from different cultures (R)
5	Ethnic food looks too weird to eat
6	At dinner parties, I will try new foods (R)
7	I am afraid to eat things I have never had before
8	I am very particular about the foods I eat
9	I will eat almost anything (R)
10	I like to try new ethnic restaurants (R)

Source. Pliner and Hobden (1992).

Although in recent years there has been an increased amount of research on food neophobia and WTT processed and unprocessed insect products in Western populations (Hartmann et al., 2015; Hartmann & Siegrist, 2016; Verbeke, 2015), to our knowledge there is no research on the relationship between neophobia, intention and the actual behavior of eating insects.

As noted by Hartmann and Siegrist (2016), instead of only self-reporting the WTT insects, future studies should include the actual eating behavior as an outcome measure. Compared to other studies that used labeled product images without including actual tasting of insects (Balzan et al., 2016; Cicatiello, Rosa, Franco, & Lacetera, 2016; Tan et al., 2016), in our experiment we provided two insect products (processed and unprocessed) to verify the correspondence between the intention (WTT) and actual behavior. Moreover, to our knowledge, only one Italian study (Laureati, Proserpio, Jucker, & Savoldelli, 2016) has focused on food neophobia and consumer willingness to eat edible insects, but it had the limitations of not providing actual products to taste.

In sum, the aim of this study is twofold: (a) to examine possible relationships between the WTT insects and the actual eating behavior of a group of Italian young adults consumers; (b) to investigate the main factors (socio-demographic variables, food neophobia, past exposure and sensory properties expectations) that affect the intention to eat insects.

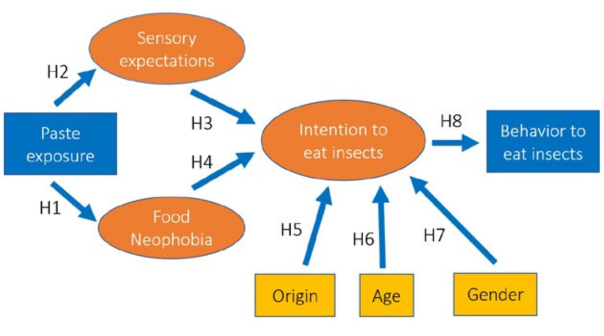

FIGURE 1 Hypothesized model

Our study tested the hypotheses that (Figure 1):

H1 *Past Exposure to novel food reduces food neophobia in young adults*. (Pliner, Pelchat, & Grabski, 1993)

H2 *Past exposure (familiarity) to edible insect would significantly increase positive sensory expectations for future tastings*. (Hartmann et al., 2015)

H3 *Positive sensory property expectations (aspect and taste pleasantness) would significantly increase the intention of trying insects*. (Martins, Pelchat, & Pliner, 1997; Tuorila, Meiselman, Bell, Cardello, & Johnson, 1994)

H4 *Food neophobia would be a significant predictor of people's willingness to try insects*. (Caparros Megido et al., 2014; Verbeke, 2015)

H5 *Region of origin would have a role in influencing the intention*. (Menozzi, Sogari, & Mora, 2015)

H6 *Younger people would be more willing to try insects*. (Schösler et al., 2012; Siegrist, Hartmann, & Keller, 2013)

H7 *Males are more willing to try insects than females*. (Caparros Megido et al., 2014; Hartmann et al., 2015; Menozzi, Sogari, Veneziani, Simoni, & Mora, 2017a; Sogari et al., 2017)

H8 *Intention to try insects would significantly predict eating behavior*. (Menozzi et al., 2017a; Sogari et al., 2017)

3 | MATERIAL AND METHODS

3.1 | Participants

The experiment was conducted at the Department of Food and Drug of the University of Parma (Italy) where the research team has produced the insect products using its food technologies facilities and organized the tasting sessions in the University laboratories. During the study period (spring 2016), the research team collected data from 88 students and faculty members (45 females) who agreed to participate in the study. Participants were aged 18–40 years (mean age = 25.7 ± 4.9). Participants were recruited using a database of people who might have participated in earlier, similar studies and who had stated their interest in the topic. In addition, recruitment also consisted of announcements on the university notice boards, based on the availability of individuals studying and working at the University. This study is part of a wider research project on consumer sensory-liking expectations and perceptions of processed and unprocessed insect products (Sogari, Menozzi & Mora, in press).

The place of origin was North Eastern Italy (20%), North Western Italy (36%), Central Italy (14%), and Southern Italy (30%). The majority were students (80%) and the rest Faculty members (Table 2). All participants confirmed that they did not suffer from any food allergy and were not allergic/intolerant to any of the ingredients used in food preparations. For obvious reasons, other exclusion criteria comprised of people who consider themselves vegans and/or vegetarians. All individuals signed an informed consent form in which they agreed to voluntarily participate in the experiment.

Participants were invited to respond to the first part of the questionnaire. This part of the survey solicited sociodemographic information (gender, age, and region of origin) and previous consumption (Have you already eaten insects? If yes, where?). Participants who answered "yes" were coded 1 as having been exposed to insects in the past regardless of the venue or the reasons for the exposure. Since a high percentage of respondents (42%) indicated that they had already tried insects at least once, past exposure was included in the model.

3.2 | Food neophobia scale

In the second part of the survey, participants were asked to indicate the level to which they agreed or disagreed on a seven-point scale ranging from −3 ("do not agree at all") to +3 ("totally agree") to the 10 statements of the FNS. The FNS consists of five positive (neophilic) and five negative (neophobic) items regarding situations to food consumption (Pliner & Hobden, 1992). The extreme categories were verbally anchored, while the other categories were only numerically anchored. The 10-items from the FNS were translated into Italian. The wording of some items had to be slightly changed to obtain the same meaning as the original items. The five responses for the neophilic statements were reversed coding. More specifically, the neophilic items are represented by "I am constantly sampling new and different foods," "I like foods from different cultures," "At dinner parties, I will try new foods," "I will eat almost anything," and "I like to try new ethnic restaurants."

Considering that the inclusion of invalid items creates the risk of invalid conclusion (Hartmann et al., 2015), a Principal Components Analysis (Varimax rotation, eigenvalues greater than one) was carried out to explain the variability of the FNS. Item 8 was excluded in order to have acceptable item-total correlations (Table 3).

A confirmatory factor analysis was carried out to confirm the validity of the instrument (Byrne, 2010). The final nine statements were merged into one food neophobia score. The internal consistency of multi-item scales was tested using Cronbach's alpha and indicated a very good degree of internal reliability (α = 0.87).

3.3 | Expectations, intention, and behavior of eating insect products

The third part of the questionnaire started by rating two sensory property expectations of eating insects (appearance and taste) ranging from "extremely negative" (−3) to "extremely positive" (+3). These two items were loaded into the insect sensory property expectation construct.

TABLE 2 Sample sociodemographic characteristics

Sociodemographic classes and level	Total (n = 88)
Gender	%
Male	49
Female	51
Age (18–40 years)	Mean (*SD*)
Age of respondents	25.7 (4.9)
Place of origin	%
North Eastern Italy	20
North Western Italy	36
Central Italy	14
Southern Italy and Islands	30
Past exposure (previous insect consumption)	%
Yes	42

TABLE 3 Principal Components Analysis (coefficients after Varimax rotation) and consistency for the construct food neophobia scale

No	Statement	Components	Value
1	I am constantly sampling new and different foods (R)	0.76	
2	I don't trust new foods	0.61	
3	If I don't know what a food is, I won't try it	0.59	
4	I like foods from different cultures (R)	0.88	
5	Ethnic food looks too weird to eat	0.77	
6	At dinner parties, I will try new foods (R)	0.57	
7	I am afraid to eat things I have never had before	0.70	
8	I am very particular about the foods I eat	Excluded	
9	I will eat almost anything (R)	0.68	
10	I like to try new ethnic restaurants (R)	0.81	
	Explained variance		51.03
	KMO		0.859
	Cronbach's alpha		0.87

Next, respondents indicated their intention to eat an insect product and an insect-based product on a seven-point scale ranging from −3 ("do not agree at all") to +3 ("totally agree"). The extreme categories were verbally anchored, while the other categories were only numerically anchored. The two items were loaded into the willingness to eat insects construct.

After the questionnaire, the visible insect product (whole cricket in a jelly sweet) and the insect-based product (a cricket flour in a jelly sweet) were provided for tasting. The behavior of eating was coded as four where participants ate both insect products (unprocessed and processed cricket), three only the unprocessed, two only the processed and one if they ate neither product.

3.4 | Statistical method

A Structural Equation Modeling (SEM) approach was used to test the research hypothesis for the model identified in Figure 1. SEM, which may be considered as an extension of multiple regression, is particularly useful to carry out regression using both latent and observed variables and shows correlation among variables using path diagrams. In particular, endogenous latent variables (i.e., dependent variables) are influenced by the exogenous variables (i.e., independent variables) in the model either directly or indirectly, i.e., mediated by other (endogenous) variables. Therefore, exogenous latent variables "cause" fluctuations in the values of other endogenous latent variables in the model (Byrne, 2010). Thus, the whole model can be tested in relation to the dataset in one analysis (Menozzi et al., 2015). The use of different goodness-of-fit indices is generally recommended to test how well the observed data fit the model. The model fit was assessed with comparative fix index (CFI), Tucker–Lewis index (TLI) and root mean square error of approximation (RMSEA). The coefficient of determination (R^2) was used to measure the explained variance of the endogenous variables (intention and behavior). The significance level $p < 0.05$ is used as the threshold for statistical significance.

All analyses were conducted using SPSS statistics software package version 24 and AMOS v.24 (SPSS Inc., Chicago, IL).

TABLE 4 Descriptive statistics of the constructs: Mean scores, and standard deviations (n = 88)

Construct items	
Sensory property expectations	Mean (*SD*)
Sensory property expectation of eating insects	
Appearance	0.45 (1.52)
Taste	0.44 (1.32)
Intention to eat insects	Mean (*SD*)
I am willing to try insect products (unprocessed)	0.81 (2.17)
I am willing to try insect based-products (processed)	2.27 (1.28)
FNS items	Means (*SD*)
I am constantly sampling new and different foods (R—reverse coded)	−1.50 (1.49)
I don't trust new foods	−1.56 (1.46)
If I don't know what a food is, I won't try it	−0.31 (1.87)
I like foods from different cultures (R)	−1.96 (1.26)
Ethnic food looks too weird to eat	−1.93 (1.45)
At dinner parties, I will try new foods (R)	−2.45 (0.92)
I am afraid to eat things I have never had before	−1.15 (1.78)
I am very particular about the foods I eat	Excluded
I will eat almost anything (R)	−1.79 (1.50)
I like to try new ethnic restaurants (R)	−1.93 (1.27)
Behavior	Percentage
I ate both the unprocessed and processed insect product	75
I ate only the unprocessed insect product	–
I ate only the processed insect product	19
I ate neither of the two products	6

4 | RESULTS AND DISCUSSION

Items for expectations, intention and behavior of eating insect products, as shown in Table 4, were scored on a seven-point Likert scale (−3 = "totally disagree", +3 = "totally agree"). The results showed moderately positive sensory expectations of eating insect products, both in terms of appearance (0.45 ± 1.52) and taste (0.44 ± 1.32).

The respondents reported moderately positive intentions to try unprocessed insect products (0.81 ± 2.17), while the intention to try processed insect based-products was significantly higher (2.27 ± 1.28). In the case of the FNS, after reverse coding the five neophilic statements, a neophobia score mean value for each of the nine items was calculated. The value was potentially ranging from −3 to +3 in which a greater level of food neophobia is represented by a higher score. The responses which have been evaluated with the the lowest score (less neophobic) are "At dinner parties, I will try a new food" (−2.45 ± 0.92), "I like foods from different countries" (−1.96 ± 1.26), "Ethnic food looks too weird to eat" (−1.93 ± 1.45), "I like to try new ethnic restaurants" (−1.93 ± 1.27). Instead, the items revealed as the most neophobic were "If I don't know what a food is, I won't try it" (−0.31 ± 1.87) and "I am afraid to eat things I have never had before" (−1.15 ± 1.78). These latter results suggest how important it can be to know about a food (the role of information) and the fear of eating food never tried (the role of the first tasting). On the other hand, not surprising, people who show openness to try new foods (i.e., ethnic products from different countries) will be considered as less neophobic and will tend to try unfamiliar products (i.e., edible insects) more easily.

Finally, three fourth of the respondents ate both the unprocessed and processed insect product, while 19% ate only the processed insect product; only 6% of the participants did not taste either.

The SEM was utilized to understand the main determinants of WTT (intention) and the behavior of eating processed and unprocessed insect products, as shown in Figure 1. Results are reported in Figure 2. Goodness-of-fit statistics related to the SEM reveal that the hypothesized model fits the data very well (CFI = 0.959, TLI = 0.951, RMSEA = 0.046). All the tested hypotheses were confirmed. Overall, the model was significant and explained 65% of the variance in behavior and 62% of the variance in intention (R^2 values).

Previous studies have discussed the influence of food neophobia and familiarity as main influential factors on consumers' acceptance of insects as food. For stakeholders and promoters involved in the new sector of edible insects, one of the main challenges for their success is a better comprehension of how to overcome consumer's neophobia trait and the intention to try insects for the first time.

Our results (Figure 2) show that behavior is significantly affected by intentions ($\beta = 0.81$; $p < 0.001$). Sensory expectations ($\beta = 0.48$; $p < 0.001$) and food neophobia ($\beta = -0.27$; $p < 0.01$) are predictors of the WTT edible insects (intention). Previous consumption of insect (past exposure) positively affects the level of expected liking of edible insects ($\gamma = 0.41$; $p < 0.001$); in other words, having tried edible insects in the past significantly increases positive sensory expectations for future tastings. This result confirms the crucial role of the first taste experience to favorably influence consumers' attitudes toward entomophagy and develop their evaluations on past sensory experiences (Caparros Megido et al., 2018). Considering that in many food cultures the introduction of a new food ingredient creates a general situation of reject (Caparros Megido et al., 2018), the integration of powder or more processed insects in familiar food preparation might help to reduce this fear (Menozzi et al., 2017a).

Moreover, past experience with eating insects reduces the level of neophobia ($\gamma = -0.37$; $p < 0.01$) which confirms how the exposure to unfamiliar foods is essential to decrease fear among individuals.

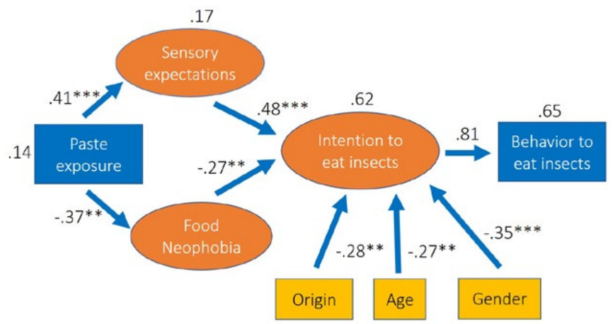

FIGURE 2 Tested model
Note. Goodness-of-fit statistics (CFI = 0.959, TLI = 0.951, RMSEA = 0.046), variance intention (0.62) and behavior (0.65), $^{**}p < 0.01$; $^{***}p < 0.001$

Finally, the impact of gender, age and region of origin on the willingness to eat insects was also considered. Although the impact of all these three socio-demographics characteristics is significant, the gender effect ($\gamma = -0.35$, $p < 0.001$) had the greatest effect, followed by origin and age. The effect of gender on the likelihood to try eating insects indicates that male participants were consistently more willing to eat insects than female participants.

Region of origin is also a significant predictor of intention but with a weaker effect ($\gamma = -0.28$, $p < 0.01$), indicating that respondents from Southern Italian regions have lower WTT edible insects that those from Northern Italian regions. Age negatively affects the WTT edible insects products ($\gamma = -0.27$, $p < 0.01$). The effect of gender is well-demonstrated by previous studies on edible insects (Caparros Megido et al., 2014; Hartmann et al., 2015; Sogari et al., 2017; Tan et al., 2016), and the reason why the intention changes according to region of origin can be explained looking at other studies. For instance, Menozzi, Sogari, Veneziani, Simoni, and Mora (2017b), found out that the intention to eat insects is significantly different between a traditional food culture (Italy) and more simple and straightforward gastronomic culture (The Netherlands). Within the same country, the food preferences of young people from Southern Italian regions are closer to the traditional Mediterranean-type diet (Menozzi et al., 2015) than those of Northern Italians. The food culture in the Southern regions, in fact, tends to be more strongly rooted. Respondents from Southern Italian regions showed a lower perception of insects as food and are less willing to eat them.

5 | DISCUSSION AND CONCLUSIONS

The ecological, nutritional and economic benefits connected with the introduction of the edible insects into the food system are well documented both in the scientific literature and reports from worldwide agencies (e.g., Food and Agriculture Organization). However, there are two completely different mental reactions when associating insects with human food. In countries where entomophagy is traditionally or commonly practiced, insects are seen as a valuable and traditional food source with knowledge passed between generations. On the other hand, in Western cultures, insects can invoke strong negative psychological reaction like disgust (Dobermann et al., 2017; Sogari & Vantomme, 2014). Today, it is not obvious to what extent this latter group might accept insects as food and what will be the proper strategy to promote such an unfamiliar ingredient. One of the reasons behind this potential interest of Western consumers is due to this positive perception as an alternative and sustainable source of protein, largely covered by the media. The interest of insect as food might be also due to this new and sustainable food trend targeted toward young consumers as a healthier and more sustainable diet. Therefore, even if cultural rules in Western countries created the idea that insects are a non-edible food, previous exploratory studies highlighted how curiosity is one of the top factors driving intention and motivates consumers to "take the first step" to try an insect product (Caparros Megido et al., 2018; Sogari et al., 2017).

Our results confirm that intention is the most important predictor of the behavior to eat a novel insect product (Menozzi et al., 2017a). The study reveals that food neophobia plays a significant role in people's WTT insects. People who scored lower on the FNS were more likely to try (intention) and consequently eat insects (behavior). Moreover, people with a higher past exposure tend to have low neophobia scores, indicating that previous experiences with novel foods may reduce food neophobia, thus increasing the consumers' intention and eating behavior.

In this study, the results show that consumers' past exposure to insects also positively affects sensory property expectations (appearance and taste), and this increases the intention to try and the behavior of eating insects. From this point of view, it is not surprising that the higher acceptance will also rely on whether insects were incorporated into familiar food products. People who have previously consumed insects at least once show more positive sensory expectations than those who have not. It is likely that repeated exposure to edible insects will increase the acceptance of insects as a food source in the Western culture (Caparros Megido et al., 2014; House, 2016; Looy, Dunkel, & Wood, 2014). Furthermore, given that taste communication increases WTT unfamiliar foods, information campaigns should emphasize the sensory attributes of insects and positive connotations, ideally with the involvement of food experts from the gastronomy sector (Sogari et al., 2017). Taste satisfaction, known flavors, texture and appearance are key attributes that should be highly taken into consideration in the research and product development of insect products (Tan et al., 2015), considering their role in shaping the acceptance of unfamiliar food. Futhermore, the situation or context of consumption of such new products is an another key element that market research should focus on, especially for naïve consumers (e.g., Italian consumers).

Significant effects were observed for region of origin and gender, which both play key roles in predicting willingness to eat insects. Individuals from Northern Italy, young, male, less neophobic, with previous experience of eating insects and positive sensory expectation tend to be significantly more willing to try (intention) and actually eat (behavior) insects than other groups of people. One of the reasons can be explained by the fact that in general men are less sensitive to disgust than women and have a lower animal reminder disgust sensitivity (Hamerman, 2016). Other recent studies on insect consumption confirms that males seem to be more adventurous taste orientations (Wilkinson et al., 2018). This finding can carry on other strong food marketing implications considering that in many cultures, females are primary food shoppers. However, the reader must consider that the average age of the sample is low, and more representative data could improve the estimates accuracy.

Finally, there are some limitations to this study. The first is the use of a convenience sample like university students and Faculty members. Considering the forthcoming introduction of insect food products in the Italian market, future studies should survey a large sample of the population, with representative socio-demographics characteristics (e.g., age, educational level, income, etc.). Second, the specific type of insect product strongly influences the likelihood of eating. Therefore, the results should be considered specific to this product category. Despite these limitations, the study yields important insights and is one of the first attempts to investigate the correspondence between intention to eat and the actual behavior of eating insect products.

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CONFLICTS OF INTEREST

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AUTHOR CONTRIBUTIONS

This work is the result of a common effort and all the authors have participated in the research and article preparation. In specific, Giovanni Sogari contributed with the design of the experiment, collection of the data and wrote Sections 1–5, Davide Menozzi contributed with the design of the experiment and wrote Sections 3 and 4 and Cristina Mora supervised the study and contributed with the revision of the final version of the article.

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