Food Quality and Preference 117 (2024) 105165

Contents lists available at ScienceDirect

Food Quality and Preference

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

Short Communication

Exploring intergenerational differences in consumer acceptance of insects-fed farmed fish

M.T. Trentinaglia [a], M. Adler [b], M. Peri [a], L. Panzone [c,*], L. Baldi [a]

[a] Department of Environmental Science and Policy, University of Milan, Via G. Celoria 2, 20133 Milan, Italy
[b] Institute of Psychology, Otto Von Guericke University, Magdeburg, Germany
[c] School of Natural and Environmental Sciences, Newcastle University, Newcastle upon Tyne, Tyne and Wear NE1 7RU United Kingdom, UK

ARTICLE INFO

Keywords:
Consumer acceptance
Campbell paradigm
Insects-fed farmed fish
Intergenerational perspectives
Circular economy
Rasch model

ABSTRACT

This study delves into the multi-faceted process of consumer acceptance of innovative food products, such as insect-fed farmed fish. This is a food product that introduces new, though potentially conflicting, intangible attributes aligning with circularity and sustainability but also evoking negative emotions, such as disgust or neophobia. Drawing from two distinct studies on young and older Italian consumers, we employ an intergenerational lens to explore individual psychometric characteristics, socio-demographic variables, and nudging effects in shaping the acceptance process. We apply the Campbell Paradigm, integrating three acceptance items into well-established scales measuring attitudes towards the environment and nature.

Our results reveal that environmental protection inclination, rather than a connectedness to nature, primarily drives acceptance. Notably, young consumers exhibit a more facile acceptance process, indicating lower behavioral costs at each stage. Sociodemographic variables, particularly gender, exert varied influences on acceptance stages, with older women displaying greater hesitancy in adopting new dietary practices. Additionally, exploring the impact of nudges, we find that information significantly influences acceptance, while visual priming does not. Interestingly, the effectiveness of information varies between generations, indicating different reactions and responses.

The findings propose strategies for policymakers and marketers to highlight the positive attributes of insects-fed farmed fish, emphasizing sustainability and addressing consumer disgust concerns. Introducing insects as feed in various farming practices may enhance familiarity with this alternative protein source, potentially reducing disgust and fostering widespread acceptance.

1. Introduction

Novel foods can support the achievement of sustainable food systems. For instance, previous research has shown that insects, unusual seafood such as algae, or in vitro meat can be used to reduce the environmental impact of diets (Onwezen et al., 2021; Siegrist & Hartmann, 2020). However, consumers often offer resistance to the adoption of novel foods (Barrena & Sánchez, 2013). Consumers often experience neophobia and disgust when considering the consumption of insects, particularly in Western economies (Bisconsin-Júnior et al., 2022; Verneau et al., 2016). As a result, the success of novel products requires a thorough understanding of the acceptance process and the psychological drivers that can affect it (Fischer & Reinders, 2022). In the case of insects, an alternative and likely more feasible first step compared to direct consumption is represented by the introduction of insects as feed in farming practices, both for land animals and aquaculture (Ribeiro et al., 2022).

Aquaculture farms could be an interesting testing ground for the use of insect feeds: the recent increase in the global demand for fish and seafood is threatening the economic and environmental sustainability of aquaculture systems, which depend heavily on unsustainable fish- or plant-based feed (Naylor et al., 2021). On the other hand, insect-based feed has been cleared for production by the European Commission (Regulation 2017/893) and can be used in fish farms. Insects can be raised using waste from the food industry or agriculture, supporting the concept of circular economy and zero waste approach, based on the

* Corresponding author.
E-mail addresses: maria.trentinaglia@unimi.it (M.T. Trentinaglia), maximilian.adler@ovgu.de (M. Adler), Massimo.peri@unimi.it (M. Peri), luca.panzone@newcastle.ac.uk (L. Panzone), Lucia.baldi@unimi.it (L. Baldi).

https://doi.org/10.1016/j.foodqual.2024.105165
Received 22 December 2023; Received in revised form 12 March 2024; Accepted 12 March 2024
Available online 14 March 2024

"reduce, reuse, repair, and recycle" theory, and reducing energy consumption and associated emissions (Pinotti et al., 2019; Veldkamp et al., 2023). Moreover insect feed commonly has a better nutritional composition (Gasco et al., 2021), and overall a lower environmental impact (Mulazzani et al., 2021). In the case of insects-fed farmed fish, consumers are faced with a relevant trade-off: swapping fish feed can improve the environmental sustainability of diets, but it may also trigger the disgust or neophobia associated with insects (Verneau et al., 2016). As a result, the acceptance process requires developing an understanding of this trade-off.

Specifically, the aim of this work is to investigate whether socio-demographic, psychological and nudge factors explain the process of acceptance of fish farmed with insect meal, using an intergenerational lens. In this sense, this work presents some novelties as, to the knowledge of the authors, there are no studies that have addressed this issue by comparing different generations and simultaneously considering factors of different nature. To this end, we start from the data of two studies conducted on young and older Italian fish consumers (Baldi et al., 2022, 2023) that separately addressed these issues with different aims. Compared to the original articles, we study the attitude-intention relationship using a Rasch model and a subset of variables representing waypoints in the acceptance process. Consequently, this paper provides a more comprehensive analysis and enables an intergenerational comparison, with the findings not limited to an understanding of the acceptance of insects-fed farmed fish, but also other novel products.

Identifying the factors that influence consumer acceptance can provide valuable insights into such processes; these, in turn, can be used to promote more sustainable food system strategies, such as targeted communication, building trust and confidence, and informed policymaking.

1.1. Hypotheses

Consumer psychology has identified a multitude of psychological factors influencing consumer behaviour (e.g., Pham, 2013). The acceptance of insects as feed can be explained by attitudes such as the individual attitude towards environmental protection or connectedness to nature (Baldi et al., 2022). On one side, insect feed, with its reduced environmental impact, can respond to the desire to protect the environment. On the other side, fish eating insects might recall a true image of "naturalness" that would be captured by one's ability to form a bond with nature (Bazoche & Poret, 2021).

Accepting the fact that it is more reasonable to feed aquaculture fish with insects might come with little negative consequences for the individual, but implementing such a product in the everyday diet comes with the costs of overcoming one's neophobia or disgust regarding insects as feed.

Previous research has shown, for example, that being of a certain age or belonging to a specific generation, as it alters life experience, results in differences in values, attitudes, purchasing preferences, and buying behaviour (Williams & Page, 2011).

This leads to our first hypothesis:

H1: *The acceptance of insects-fed farmed fish is explained by one's desire to protect the environment or by one's connectedness to nature.*

H1a: *The connection between acceptance of insects-fed farmed fish and one's desire to protect the environment or the predisposition to connect with nature is different between young and older consumers.*

Within the two generations, it is possible that other sociodemographic variables (gender, income, and education) may exert diverse influences in the acceptance process (Mancuso et al., 2016; Naranjo-Guevara et al., 2021) and could impact young and older individuals differently. Understanding the role of demographics allows for consumer segmentation and facilitates the design of appropriate marketing actions. We can then investigate the following hypothesis:

H2: *Socio-demographic characteristics can influence young and older individuals differently in their acceptance process of insects-fed farmed fish.*

Another factor influencing consumers' opinions regarding innovative products like insect-fed farmed fish is the effect of information and priming. Informing consumers about the nutritional and environmental advantages or gently encouraging them by highlighting/evoking the positive aspects of environmental protection and the naturalness of insect-fed farmed fish can facilitate acceptance (Verneau et al., 2016). However, existing research does not provide much insight into how different generations respond to nudges promoting sustainable behaviour. Every generation is shaped by varying social influences, which may result in different interests and starting points for nudging. From these considerations, we can formulate the last hypothesis:

H3a: *Young and older consumers respond differently to priming cues when evaluating fish fed with insects.*

H3b: *Young and older consumers respond differently to information when evaluating fish fed with insects.*

2. Materials and methods

In this work we use datasets from two previously published studies: one targeted young consumers (Baldi et al., 2022), while the other focused on older consumers (Baldi et al., 2023). We advance the research in these previous studies by providing a comparison on a small set of variables that previous research has highlighted as key to new product acceptance. The comparison also adopts a methodological approach commonly adopted in environmental psychology to understand and analyse attitudes.

2.1. Participants and data collection

The study merges the insights from two samples:

- Older consumers: the sample refers to consumers with age in the range 54–89. Data was collected using an external data provider (Qualtrics) between January and February 2022. This sample consists of 437 respondents (222 women; 50.8 %).
- Young Sample: the sample refers to consumers with age in the range 18–40. Data collection was conducted via social networks (Facebook and Instagram) between April and May 2021. This sample consists of 410 respondents (211 women; 51.5 %).

It is worth nothing that the samples are not strictly comparable, as they were conducted at different times and with different collection platforms. As a result, this study aims to compare the acceptance of novel food and its interrelation with attitudes in different age groups without making causal statements of age defining the likely different processes.

2.2. Design and procedure

The original studies had a near-identical survey that collected attitudes towards environmental protection and appreciation for nature (not used in Baldi et al., 2023), as well as the socio-demographic characteristics of the respondents. Subsequently, participants were randomly allocated to six different groups, with different experimental stimuli (as explained below). Lastly, participants responded to questions on the acceptance of insect-fed farmed fish. In this section, we briefly summarize the key elements of the original datasets that we use in this study. For the full set of variables in the original surveys, see Baldi et al. (2022) and Baldi et al. (2023).

2.2.1. Attitudes

Environmental attitude was assessed using the well-established General Ecological Behavior (GEB) scale (Kaiser & Lange, 2021), while attitude towards nature was assessed using the Nature Appreciation scale (NA) (Brügger et al., 2011). These approaches start from the premise that attitudes are not directly observable, and need to be

derived from verbal (i.e., self-reports of opinions, appraisals or past behavior) or non-verbal (observed in labs or real-life situations) behaviors. They are grounded in the well-established Campbell Paradigm (CP) (Kaiser, 2021, p. 20; Kaiser et al., 2010), where personal commitment to attain a goal – e.g., protecting the environment, or connecting with nature – becomes apparent in the goal-relevant behaviors and the level of behavioral costs a person is willing to overcome to reach that goal. Both scales were recoded and calibrated in accordance with the common procedure using CP based scales (cf. Kaiser & Lange, 2021; for all fit indices, see Tables S2 and S3 in the supplementary material).

2.2.2. Nudges and treatments

Both studies employed a 3 (environmental priming, nature priming, no priming) x 2 (information, no information) orthogonal design. The *Information* treatment provided participants with accurate information on the environmental benefits of insects-fed farmed fish. The priming treatments, using nudges, exposed participants to a set of pictures associated with either the environment or nature. The first set of images specifically evoked situations and solutions related to environmental protection, while the second set depicted images of natural beauty and enjoyment. All images were intended to potentially act as a "gentle nudge" by evoking positive emotions towards the attributes of product in question. More details, and the precise stimuli, can be found in Baldi et al (2023).

2.2.3. Acceptance

From the original list of items in the surveys, we identified three verbal opinions to represent the acceptance process as described by Albertsen et al., (2020). *Acknowledgment* captures the product's justification; in our case, this refers to the idea of eating the product: "*For me, eating insects-fed farmed fish is reasonable in the scheme of things*" (Bazoche & Poret, 2021). The *Implementation* phase captures consumers' willingness to buy the product and to implement it; this was captured through the question: "*How likely is it that you will integrate the product into your everyday life?*" (Albertsen et al., 2020). Lastly, *Embracement* refers to the acceptance of the possible negative consequences of the production process; this is captured through the statement "*I would see no problem having an insect farm near my home*" (Bazoche & Poret, 2021).

2.3. Methods

To test **H1**, we ran the Rasch model[1] by integrating the additional three items (*Acknowledgment, Implementation, Embracement*) concerning the acceptance process in the GEB and NA scale for both samples separately. This procedure is valid due to the so-called indicator independency of the Rasch model (Kaiser et al., 2018). Before integrating the acceptance indicators, we dichotomized them as it is common procedure working with CP-based scales (Kaiser & Lange, 2021). This way we can determine, (1) whether accepting insect-fed fish is an expression of the environmental attitude and/or connectedness to nature, and (2) which of these latent attributes better account for the acceptance process – depending on the fit of these indicators to the one-parametric model. As both scales used to estimate participants' attitudes are grounded in the Campbell Paradigm, we examine the suspected reasons for accepting insect-fed fish using the same theory of how such a response a questionnaire occurs. The Rasch model estimates all responses – including the response patterns of items – using the level of a person's attitude and the behavioral costs associated with the behavior: either the costs of behavior shown in the past or the anticipated costs of accepting insect-fed fish. This way we can see from the fit of the acceptance items in both models which latent attribute is superior in explaining the data. Then, for **H1a**, we compared the item difficulties for young and older consumers after standardization. Here, we transformed the Rasch model values of the young consumers into the metric of the older consumers to be able to compare the values from two distinct calibrations (Kolen & Brennan, 2004).

Second, to test **H2**, we performed for the two samples a Differential Item functioning (DIF) on the GEB scale (the scale that performed best in the previous step) considering the impact of different socio-economic variables (gender, education, income, responsibility of household food purchase, and geographical area). DIF was tested using the Mantel-Haenszel Chi-square test with Benjamini-Hochberg adjustments of p-values for multiple comparisons. This test checks whether the difficulties of the behavioural indicators vary between participants with the same level of attitude based on an external grouping criterion.

Third, to test **H3a** and **H3b** we performed two analyses of covariance (ANCOVA) to explore how the different nudges (information and priming), controlling for the environmental attitude, affect the stages of the acceptance process in the two generations.

3. Results and discussion

Table 1 reports the psychometric characteristics obtained from the calibration performed on both scales (GEB, NA) on the two samples (older, young). The three acceptance items were successfully integrated into both scales even if fit indices indicate a better integration into the GEB scale (Infit MS closer to 1). Hence, in both samples the acceptance of fish fed with insects is indeed motivated by individual commitment to protect the environment.

These first results indicate that the acceptance process of insects-fed farmed fish can be explained better by environmental attitude than by nature attitude (**H1**). Since the former is more closely linked to the "altruistic" sphere of consumers, while the latter is associated with the more "individualistic" aspect (Kaiser & Byrka, 2011), this initial finding leads us to conclude that the product in question might be perceived more as a "green" product rather than a product giving personal pleasure.

As one would expect from the acceptance process, the three stages require increasing behavioral costs: the negative coefficient for the *acknowledgment* item indicates that this part of the acceptance process does not entail a significant behavioral cost relatively to the mean of behavioral costs set to 0 (range older/young: −3.413/-3,979 – 4.469/4.680; see Table S1 in the supplementary material), whereas the following stages of the acceptance process involve substantial behavioral costs.

As for hypotheses **H1a**, in accordance with the literature on neophobia and the life course (Hazley et al., 2022; Rabadán & Bernabéu, 2021) results signal that the entire acceptance process is easier among young consumers, for whom the behavioral costs, or difficulties, of each stage are slightly lower than the corresponding values resulting from the scale calibration in the sample of older consumers.

As for hypothesis **H2** tested by DIF, among the different socio-demographic variables considered, we only observed significant gender differences in the *implementation* and *embracement* stages. In particular, the *implementation* is more difficult for older women than for older men, $p = .009$, $\chi^2(1) = 14.06$, $d = 0.36$; this difference was not significant in the young sample, $p = .093$, $\chi^2(1) = 7.75$, $d = 0.28$. The *embracement* phase is harder for young women than for young men, $p < .001$, $\chi^2(1) = 19.49$, $d = 0.45$; no statistically significant difference is observed between older men and women.

These findings indicate that it is more difficult for older women to consider insects-fed fish for consumption (i.e., implementation) compared to old men. This difference could not be observed between younger men and women. Older women do not exhibit greater difficulty in accepting a farm near their homes (i.e., embracement) compared to older men, whereas for the younger generation, this aspect poses more

[1] Rasch model (Rasch, 1960) is a one-parameter logistic item response theory model that was used to calibrate both attitude scales (GEB and NA). The methodological details on the implementation of the two scales can be found in Kaiser et al., (2010) and in Brügger et al., (2011).

Table 1
Acceptance items statistics.

Sample	Scale	Acceptance Item	Difficulty*	Standard error	Infit MS	Outfit MS
Older consumers	GEB	Acknowledgment	−0.763	0.115	1.159	1.298
		Implementation	1.069	0.106	1.082	1.143
		Embracement	1.371	0.110	1.131	1.220
	NA	Acknowledgment	0.457	0.107	1.353	1.644
		Implementation	0.890	0.110	1.237	1.387
		Embracement	1.217	0.114	1.288	1.774
Young consumers	GEB	Acknowledgment	−1.033	0.117	1.187	1.507
		Implementation	0.650	0.109	1.176	1.237
		Embracement	1.126	0.116	1.127	1.240
	NA	Acknowledgment	0.612	0.112	1.326	1.512
		Implementation	0.663	0.112	1.262	1.395
		Embracement	1.193	0.119	1.208	1.271

Note: The mean of difficulties is set to 0, therefore all values above 0 indicate more costly behavior compared to the average of all other behaviors. MS refers to the Meansquares of the variation of an item. The optimal value of 1 represents the variability of responses expected by the Rasch model. * Difficulty in young consumers were standardized to be comparable with older consumer difficulty using Kolen M.J. & Brennan R.L. (2004) procedure.

of a challenge for women compared to men. This could imply that neophobia regarding the consumption of new foods is less stereotypical in the younger population, while general disgust regarding insects might be more stereotypical. Regardless of the acceptance stage, our results are consistent with previous findings on women more sensitive to disgust with regards to suggest that women, especially the elderly, are generally more reluctant to accept novel foods (Hamerman, 2016; Mustapa & Kallas, 2023).

The ANCOVA results reported in Table 2 respond to **H3a** and **H3b**. It emerges that we cannot accept **H3a** since visual priming is not statistically significant in neither sample. Yet, young and older consumers seem to respond differently to information (**H3b**) along the acceptance process (with the exception of *acknowledgement*, which was excluded from the analysis for its weak performance in the previous estimation steps). The extent to which information can affect acceptance might depend on respondents' age. In particular, older consumers, when informed, are encouraged to use the product, with information increasingly affecting the different intensity of product implementation (from least likely to most likely). Yet, information is not enough to make older consumers willing to sustain the behavioural cost of having an insect farm near their homes (*embracement*). Information is instead important in mitigating the "not in my backyard" (NIMBY) effect among young consumers: when informed about how insect farms improve the circularity of aquaculture systems, young respondents are likely more prone to tolerate the negative consequences of an insect farm nearby. Differently from older consumers, implementation among young respondents is not affected by the provision of information.

This finding indicates that for this type of product (contrasting attribute) stimuli that engage individuals' cognitive rather than emotional sphere may be more effective. To accept such a potentially controversial product, consumers need to be informed and educated rather than merely influenced and this is particularly true for older consumers. Yet, environmental attitude continues to emerge as the most significant predictor, as further substantiation of H1 results.

4. Conclusions

Understanding consumer acceptance of products with contrasting attributes, such as sustainability and disgust, is crucial for promoting sustainable food systems. Combining datasets from two previous studies, this work adopts an intergenerational lens, which was lacking in the literature, to examine consumer acceptance of insect-fed farmed fish, a product that embodies both sustainability benefits and potential disgust reactions.

The results revealed that environmental attitude, age, gender differences, and the presence of information influence consumer acceptance. These findings suggest that policymakers, stakeholders, and marketers can develop strategies to highlight the positive attributes of insects-fed farmed fish, emphasizing their sustainability credentials while addressing consumer concerns about disgust. Specifically, these results can be used to support the development of targeted information campaigns, also considering the gender differences that emerged in the analysis. The data suggests to tailor campaigns to specific consumer segments, particularly older female shoppers in Italy who may hold stronger traditional food preferences. Information emphasizing both environmental benefits and product quality can reassure these consumers. Furthermore, in an economic context in which entrepreneurial management is increasingly induced to enhance the sustainable management of its business, for example, through sustainability reports, stakeholders could benefit from the "circularity" of this product by obtaining a competitive advantage over more traditional chains.

Yet, the separate analysis of two distinct consumer surveys could

Table 2
ANCOVA analysis – product acceptance and interventions.

	Implementation			Embracement		
	Sum Sq	DOF	F value	Sum Sq	DOF	F value
Older consumers						
Environmental Attitude	8.80	1	5.455**	2.65	1	1.433
Information	4.52	1	2.800*	0.00	1	0.000
Priming (environmental or nature)	5.21	2	1.613	1.86	2	0.503
Information * priming	2.85	2	0.884	0.28	2	0.074
Young consumers						
Environmental Attitude	5.55	1	3.840**	15.48	1	7.969***
Information	0.45	1	0.313	5.39	1	2.774*
Priming (environmental or nature)	1.23	2	0.425	0.19	2	0.048
Information * priming	0.97	2	0.334	0.98	2	0.253

Note: The results regarding the acknowledgment phase have been omitted from the Table above since the polytomous acceptance item indicated substantial measurement error. ANCOVA analyses were conducted controlling for individual's environmental attitude, as obtained from the GEB data matrix without the integration of the acceptance items. DOF stands for degrees of Freedom. Statistical significance: *** 1%; ** 5%, * 10%.

represent a limitation; even though the attitudes measured by the GEB and NAT scales are rather stable over time (Kaiser et al., 2014), the use of two different platforms could influence the way questions are interpreted by respondents (Jaeger & Cardello, 2022). Nonetheless, older people have less access to social media platforms than young respondents; under these instances, different platform strategies may be more effective in reaching diverse respondent targets.

Future research could include studies comparing EU countries that will be increasingly interested in developing this sector in the future. Further insights could also come from the use of different types of nudges or information applied to consumers divided by age and gender, in order to identify ad hoc treatments for each segment.

Ethical statement

The experiments conducted apply to the ethical principles stated by the American Psychological Association (American Psychological Association, 2017) for psychological research with human participants. Prior to the experiments, all individuals were informed about the basic intent of the study and gave their consent to participate. All individuals received a complete debriefing after the experiments containing the specific purpose of the study.

CRediT authorship contribution statement

M.T. Trentinaglia: Methodology, Conceptualization. **M. Adler:** Methodology, Conceptualization. **M. Peri:** Writing – original draft, Data curation. **L. Panzone:** Writing – review & editing, Validation. **L. Baldi:** Writing – original draft, Supervision, Data curation.

Funding

This work was supported by Global Food Security programme (BBSCR/NERC/ESRC/ Scottish government) [BB/S014195/1].

Declaration of competing interest

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

Data availability

Data will be made available on request.

Acknowledgement

The authors are grateful to the Editor Cees de Graaf, to two anonymous referes for their constructive comments, and to Prof. Florian Kaiser for the valuable support received.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.foodqual.2024.105165.

References

Albertsen, L., Wiedmann, K.-P., & Schmidt, S. (2020). The impact of innovation-related perception on consumer acceptance of food innovations – Development of an integrated framework of the consumer acceptance process. *Food Quality and Preference, 84*, Article 103958. https://doi.org/10.1016/j.foodqual.2020.103958

Baldi, L., Mancuso, T., Peri, M., Gasco, L., & Trentinaglia, M. T. (2022). Consumer attitude and acceptance toward fish fed with insects: A focus on the new generations. *Journal of Insects as Food and Feed, 8*(11), 1249–1263. https://doi.org/10.3920/JIFF2021.0109

Baldi, L., Trentinaglia, M. T., Peri, M., & Panzone, L. (2023). Nudging the acceptance of insects-fed farmed fish among mature consumers. *Aquaculture Economics & Management, 1–32*. https://doi.org/10.1080/13657305.2023.2265875

Barrena, R., & Sánchez, M. (2013). Neophobia, personal consumer values and novel food acceptance. *Food Quality and Preference, 27*(1), 72–84. https://doi.org/10.1016/j.foodqual.2012.06.007

Bazoche, P., & Poret, S. (2021). Acceptability of insects in animal feed: A survey of French consumers. *Journal of Consumer Behaviour, 20*(2), 251–270. https://doi.org/10.1002/cb.1845

Bisconsin-Júnior, A., Rodrigues, H., Behrens, J. H., da Silva, M. A. A. P., & Mariutti, L. R. B. (2022). "Food made with edible insects": Exploring the social representation of entomophagy where it is unfamiliar. *Appetite, 173*, Article 106001. https://doi.org/10.1016/j.appet.2022.106001

Brügger, A., Kaiser, F. G., & Roczen, N. (2011). One for all? Connectedness to nature, inclusion of nature, environmental identity, and implicit association with nature. *European Psychologist, 16*(4), 324–333. https://doi.org/10.1027/1016-9040/a000032

Fischer, A. R. H., & Reinders, M. J. (2022). Consumer acceptance of novel foods. In *Innovation Strategies in the Food Industry* (pp. 307–333). Elsevier. https://doi.org/10.1016/B978-0-323-85203-6.00013-X.

Gasco, L., Józefiak, A., & Henry, M. (2021). Beyond the protein concept: Health aspects of using edible insects on animals. *Journal of Insects as Food and Feed, 7*(5), 715–741. https://doi.org/10.3920/JIFF2020.0077

Hamerman, E. J. (2016). Cooking and disgust sensitivity influence preference for attending insect-based food events. *Appetite, 96*, 319–326. https://doi.org/10.1016/j.appet.2015.09.029

Hazley, D., Stack, M., Walton, J., McNulty, B. A., & Kearney, J. M. (2022). Food neophobia across the life course: Pooling data from five national cross-sectional surveys in Ireland. *Appetite, 171*, Article 105941. https://doi.org/10.1016/j.appet.2022.105941

Jaeger, S. R., & Cardello, A. V. (2022). Factors affecting data quality of online questionnaires: Issues and metrics for sensory and consumer research. *Food Quality and Preference, 102*, Article 104676. https://doi.org/10.1016/j.foodqual.2022.104676

Kaiser, F. G. (2021). Climate change mitigation within the Campbell paradigm: Doing the right thing for a reason and against all odds. *Current Opinion in Behavioral Sciences, 42*, 70–75. https://doi.org/10.1016/j.cobeha.2021.03.024

Kaiser, F. G., Brügger, A., Hartig, T., Bogner, F. X., & Gutscher, H. (2014). Appreciation of nature and appreciation of environmental protection: How stable are these attitudes and which comes first? *European Review of Applied Psychology, 64*(6), 269–277. https://doi.org/10.1016/j.erap.2014.09.001

Kaiser, F. G., & Byrka, K. (2011). Environmentalism as a trait: Gauging people's prosocial personality in terms of environmental engagement. *International Journal of Psychology, 46*(1), 71–79. https://doi.org/10.1080/00207594.2010.516830

Kaiser, F. G., Byrka, K., & Hartig, T. (2010). Reviving Campbell's paradigm for attitude research. *Personality and Social Psychology Review, 14*(4), 351–367. https://doi.org/10.1177/1088868310366452

Kaiser, F. G., & Lange, F. (2021). Offsetting behavioral costs with personal attitude: Identifying the psychological essence of an environmental attitude measure. *Journal of Environmental Psychology, 75*, Article 101619. https://doi.org/10.1016/j.jenvp.2021.101619

Kaiser, F. G., Merten, M., & Wetzel, E. (2018). How do we know we are measuring environmental attitude? Specific objectivity as the formal validation criterion for measures of latent attributes. *Journal of Environmental Psychology, 55*, 139–146. https://doi.org/10.1016/j.jenvp.2018.01.003

Kolen, M. J., & Brennan, R. L. (2004). Item response theory methods. In I. M. J. Kolen, & R. L. Brennan (Eds.), *Test Equating, Scaling, and Linking* (pp. 155–230). New York: Springer. https://doi.org/10.1007/978-1-4757-4310-4_6.

Mancuso, T., Baldi, L., & Gasco, L. (2016). An empirical study on consumer acceptance of farmed fish fed on insect meals: The Italian case. *Aquaculture International, 24*(5), 1489–1507. https://doi.org/10.1007/s10499-016-0007-z

Mulazzani, L., Madau, F. A., Pulina, P., & Malorgio, G. (2021). Acceptance of insect meal in aquaculture feeding: A stakeholder analysis for the Italian supply chains of trout and seabass. *Journal of the World Aquaculture Society, 52*(2), 378–394. https://doi.org/10.1111/jwas.12766

Mustapa, M. A. C., & Kallas, Z. (2023). Towards more sustainable animal-feed alternatives: A survey on Spanish consumers' willingness to consume animal products fed with insects. *Sustainable Production and Consumption, 41*, 9–20. https://doi.org/10.1016/j.spc.2023.07.027

Naranjo-Guevara, N., Fanter, M., Conconi, A. M., & Floto-Stammen, S. (2021). Consumer acceptance among Dutch and German students of insects in feed and food. *Food Science & Nutrition, 9*(1), 414–428. https://doi.org/10.1002/fsn3.2006

Naylor, R. L., Hardy, R. W., Buschmann, A. H., Bush, S. R., Cao, L., Klinger, D. H., Little, D. C., Lubchenco, J., Shumway, S. E., & Troell, M. (2021). A 20-year retrospective review of global aquaculture. *Nature, 591*(7851), 551–563. https://doi.org/10.1038/s41586-021-03308-6

Onwezen, M. C., Bouwman, E. P., Reinders, M. J., & Dagevos, H. (2021). A systematic review on consumer acceptance of alternative proteins: Pulses, algae, insects, plant-based meat alternatives, and cultured meat. *Appetite, 159*, Article 105058. https://doi.org/10.1016/j.appet.2020.105058

Pham, M. T. (2013). The seven sins of consumer psychology. *Journal of Consumer Psychology, 23*(4), 411–423. https://doi.org/10.1016/j.jcps.2013.07.004

Pinotti, L., Giromini, C., Ottoboni, M., Tretola, M., & Marchis, D. (2019). Review: Insects and former foodstuffs for upgrading food waste biomasses/streams to feed ingredients for farm animals. *Animal, 13*(7), 1365–1375. https://doi.org/10.1017/S1751731118003622

Rabadán, A., & Bernabéu, R. (2021). A systematic review of studies using the food neophobia scale: Conclusions from thirty years of studies. *Food Quality and Preference, 93*, Article 104241. https://doi.org/10.1016/j.foodqual.2021.104241

Rasch, G. (1960). *Probabilistic models for some intelligence and attainment tests*. University of Chicago Press.

Ribeiro, J. C., Gonçalves, A. T. S., Moura, A. P., Varela, P., & Cunha, L. M. (2022). Insects as food and feed in Portugal and Norway – Cross-cultural comparison of determinants of acceptance. *Food Quality and Preference, 102*, Article 104650. https://doi.org/10.1016/j.foodqual.2022.104650

Siegrist, M., & Hartmann, C. (2020). Consumer acceptance of novel food technologies. *Nature Food, 1*(6), 343–350. https://doi.org/10.1038/s43016-020-0094-x

Veldkamp, T., Belghit, I., Chatzfiotis, S., Mastoraki, M., Jansman, A. J. M., Radhakrishnan, G., Schiavone, A., Smetana, S., & Gasco, L. (2023). The role of Insects in novel sustainable animal production systems. In G. Arsenos, & I. Giannenas (Eds.), *Sustainable Use of Feed Additives in Livestock* (pp. 137–172). Springer International Publishing. https://doi.org/10.1007/978-3-031-42855-5_7.

Verneau, F., La Barbera, F., Kolle, S., Amato, M., Del Giudice, T., & Grunert, K. (2016). The effect of communication and implicit associations on consuming insects: An experiment in Denmark and Italy. *Appetite, 106*, 30–36. https://doi.org/10.1016/j.appet.2016.02.006

Williams, K. C., & Page, R. A. (2011). Marketing to the generations. *Journal of Behavioral Studies in Business, 3*(1), 37–53.