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Food Quality and Preference 83 (2020) 103913

Contents lists available at ScienceDirect

Food Quality and Preference

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

Disgusting or delicious? Examining attitudinal ambivalence towards entomophagy among Danish consumers

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ARTICLE INFO

Keywords:
Entomophagy
Consumer behaviour
Attitude ambivalence
Choice experiment
Food choice

ABSTRACT

Current meat consumption habits will need to change, especially those of Western consumers. The level of meat consumption is unsustainable, and a recent study estimates a necessary reduction of 90% of the current intake. Insects are a promising alternative to existing protein sources, but previous literature has emphasised the initial level of disgust displayed towards insects as a food option. The overall aim of this paper is to understand the attitude of consumers towards eating insects, also termed entomophagy, in order to outline the barriers that prevent adoption and provide insights in order to overcome these. Data were collected through an online questionnaire with a representative sample of Danish consumers (n = 975). Several constructs from the literature were measured: food neophobia, disgust, intention to try and intention to eat regularly. In addition, a new attitude scale was used, that specifically measures the attitude towards entomophagy. A discrete choice experiment was a part of the questionnaire. Using LatentGold 5.1 a segmentation analysis based on the choice experiment was conducted. The influences of intention were analysed using hierarchical regression in SPSS 25. Results of the choice experiment indicate that different segments of consumers of entomophagy exist, and that different segments are interested in different types of insects. Younger consumers and males are more positive towards entomophagy in general and the insect options in the choice experiment. Results of the regression analysis indicate that the attitude toward eating insects is multidimensional and that there seem to be indications of attitude ambivalence in all segments. The interest in entomophagy is important, as it will be a key factor in overcoming the barrier of disgust and turning insects into an acceptable food choice in the Western world.

1. Introduction

Food choice is an ambivalent endeavour for most of us, when we as consumers struggle to find the balance between what might seem right for us now (e.g. indulging in that piece of cake for dessert) and what will be good for us in the future (e.g. eating more vegetables). Instant gratification and sensory satisfaction is tipping the scale in one direction, whereas positive health outcomes is pulling us in another direction (Sparks, Conner, James, Shepherd, & Povey, 2001). Now even more considerations have to go into food choice, as consumers are increasingly becoming aware of the detrimental effect many of their food choices have on the environment.

According to a newly released report (Buckwell & Nadeu, 2018), current meat consumption is unsustainably high and not in line with dietary guidelines. To cut the current consumption level of meat products in half would greatly benefit the environment and diminish greenhouse gas emission (Buckwell & Nadeu, 2018). This change will need to happen in the next decade in order for the EU to reach their targets agreed upon in the Paris Climate Agreement for 2050 (Buckwell & Nadeu, 2018; Springmann et al., 2018).

Insects are seen as a sustainable food source and a possible alternative to meat: they are more sustainable to produce than meat, many are high in protein and other nutrients, and they are – according to some – also quite tasty (Buckwell & Nadeu, 2018; Evans, Flore, & Frøst, 2017). For all of edible insects' seemingly good qualities, Western consumers have not yet been keen to adopt them, and often have a reaction of disgust towards the idea of eating them (Hamerman, 2016; Looy & Wood, 2006). The literature so far has focused on barriers to adoption of entomophagy among Western consumers (e.g. Cicatiello, De Rosa, Franco, & Lacetera, 2016; Hamerman, 2016; Martins & Pliner, 2005), since the reaction has been so negative.

Not all consumers find insects disgusting though and many start-ups and social entrepreneurs have seen this opportunity in the market. Quite a few companies on the Danish market believe that insects are a

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https://doi.org/10.1016/j.foodqual.2020.103913
Received 7 November 2019; Received in revised form 14 February 2020; Accepted 15 February 2020
Available online 17 February 2020

promising alternative protein source, and they have developed insect products and made them readily available for the Danish consumers in many major retail outlets (Crickster, , 2018; Enorm, , 2018; Wholi Foods, 2018).

The Danish media have also shown a great interest in entomophagy. Reports regularly surface either on the production of insects or on using insects as food (for instance Dr.dk, 2018; Videnskab, 2018). The Danish consumers are an interesting target group to study, as they have been exposed to both information on entomophagy and its benefits, and actual insect products on the shelves in the supermarkets. This growing interest from the media, the industry, and niche consumer segments, indicates the importance of including the concept of interest in entomophagy in research on consumer willingness to adopt insects as food.

This study builds on the already existing literature that examines Western consumers' attitudes and intentions towards entomophagy and applies it in a Danish context with the specific aim to examine not only the negative aspects of the reaction towards entomophagy, but also look at the more positive ones, such as interest, which have not been well represented in the literature.

The overall research question of this paper is: What are the main attitudes that influence intention of Danish consumers towards entomophagy and to what extent are they ambivalent?

The contributions of this paper are threefold: First, the concept of interest in entomophagy is explored. Previously disgust and especially food neophobia have been front and centre in research on edible insects (e.g. Baker, Shin, & Kim, 2016; Hartmann & Siegrist, 2016; Piha, Pohjanheimo, Lähteenmäki-Uutela, Kreckova, & Otterbring, 2018; Verbeke, 2015), but as products exist on the market and some consumers buy these products, the way consumers relate to entomophagy may be characterized by attitude ambivalence. Second, this study contributes with data from a representative sample of consumers in a Western country, making it possible to validate previous findings in the entomophagy literature. Third, this study has practical implications for the industry, in that insect food companies need more information on potential customers and their attitudes and intentions.

2. Previous research and theoretical frame

2.1. Entomophagy research

A growing number of researchers are examining the factors that prevent Western consumers from engaging in entomophagy. The underlying assumption of this stream of research is that Western consumers are more averse to adopting edible insects, since there has been no history of insect consumption in these areas of the world, compared to other areas such as Asia, Africa and South America (Gahukar, 2013; Tan et al., 2015; Van Huis, 2015).

Studies on entomophagy tend to either try to determine the factors that influence the attitude towards entomophagy (Cicatiello et al., 2016; Looy & Wood, 2006) or use the attitude as a predictor of willingness to eat insects (Hartmann, Shi, Giusto, & Siegrist, 2015; Menozzi, Sogari, Veneziani, Simoni, & Mora, 2017) or willingness to buy insects (Piha et al., 2018). In this study, the attitude towards entomophagy is the focal point, as are the influences on attitude and the intentionality that is assumed to follow a positive attitude (Ajzen, 1991; Bandura, 1986). Several factors have been found to have an influence on consumers' attitude towards entomophagy and some of the most researched are: Degree of processing of the insect-based food (e.g. Gmuer, Guth, Hartmann, & Siegrist, 2016; Hartmann et al., 2015; Tan, van den Berg, & Stieger, 2016), food neophobia (e.g. Baker et al., 2016; Cicatiello et al., 2016; Hartmann & Siegrist, 2016), and disgust (e.g. Hamerman, 2016; Looy & Wood, 2006).

2.1.1. Degree of processing

Degree of processing is often considered a key factor in increasing acceptance – the more hidden the insect in the food product, the better (Gmuer et al., 2016). Even just hiding a whole insect in a dish, so it is not immediately visible, improves consumer evaluations (De-Magistris, Pascucci, & Mitsopoulos, 2015). If a high degree of processing is combined with incorporating it into a familiar dish for the consumer, the willingness to taste increases (Tan, Verbaan, & Stieger, 2017B). It can be problematic, however, if only processed insects are used and only in familiar dishes, as this might signal a lack of authenticity of the food product (Kauppi, Pettersen, & Boks, 2019). Sogari, Menozzi, and Mora (2018) also found that for some consumer groups, it was necessary to have the experience of consuming a whole insect, because after tasting it, their preference for it significantly increased. This suggests that there are differences in consumer acceptance between processed and whole insects. This distinction will be included in this study.

2.1.2. Food neophobia and disgust

The concepts of food neophobia and disgust are individual consumer traits that influence acceptance of insects as food. Food neophobia is the tendency for a consumer to avoid new foods or meals that they have not tried before (Pliner & Hobden, 1992). This trait has been widely used in the literature and has been found to have a significant negative effect on Western consumers' willingness to eat insects (Baker et al., 2016; Hartmann & Siegrist, 2016; Hartmann et al., 2015; Piha et al., 2018; Tan et al., 2016; Verbeke, 2015).

Disgust is defined as a basic emotion as it "has a characteristic facial expression, an appropriate action (distancing of the self from an offensive object), a distinctive physiological manifestation (nausea), and a characteristic feeling state (revulsion)" (Rozin & Fallon, 1987: 23). The emotion of disgust is felt towards a certain object. Haidt, McCauley, and Rozin (1994) examined if a trait of disgust sensitivity could be found, that is, individual differences in how much disgust you feel in general towards different objects and domains. They developed a scale measuring disgust sensitivity and this scale was further developed by Olatunji et al. (2009). It measures three dimensions of disgust: core disgust, contamination disgust, and animal reminder disgust. Especially core disgust has been found to have an effect on respondents' willingness to eat insects (Hamerman, 2016; Hartmann & Siegrist, 2016).

Food neophobia has as of yet been researched more than disgust and has been found to have a relatively large effect on the attitude towards eating insects in many studies (Schlup & Brunner, 2018). However, recent studies have questioned the key role of neophobia in relation to entomophagy. Fischer and Steenbekkers (2018) found that disgust had a significant impact on willingness to eat insects, whereas neophobia did not, and Schlup and Brunner (2018: 44) found that "food neophobia is not the key barrier to insect consumption (anymore), but it shares its prediction power with the salience of insects, food technology neophobia, and the need for familiarity". As edible insects become more and more familiar to the consumers, when they see them on the shelves of the supermarkets or hear about them in the news, the food neophobia and disgust sensitivity could potentially be replaced by an interest in the products instead. As food neophobia seems to lose its predictive power (Schlup & Brunner, 2018), it could be interesting to measure the opposite trait, namely that of food neophilia. Food neophilia is the "general human inclination of enjoying a wide range of new and unfamiliar foods" (Baker et al., 2016: 96). This trait could potentially capture an openness and willingness to try new foods that could be key in determining the intention to eat insects. Both concepts are examined in this study.

2.1.3. Willingness to eat and to adopt

Previous studies have used various dependent variables. Some researchers have examined the level of acceptance for insects as food among consumers (Cicatiello et al., 2016; Lensvelt & Steenbekkers, 2014; Looy & Wood, 2006; Megido et al., 2014; Tan et al., 2016). Other researchers have chosen to look at willingness to eat (Gmuer et al., 2016; Hartmann & Siegrist, 2016; Hartmann et al., 2015; Martins &

Pliner, 2005; Tan, Tibboel, & Stieger, 2017A; Verneau et al., 2016) or willingness to buy (De-Magistris et al., 2015; Piha et al., 2018; Tan et al., 2017B).

Given the differing dependent variables it is no surprise that estimates of how many consumers are potential insect eaters vary as well. At the same time, the studies also differ in their sampling strategy and hence in the composition of the resulting sample. Verbeke (2015) found only three percent of consumers in a Belgian sample were ready to adopt insects, while Megido et al. (2016) found that 79 percent likewise from a Belgian sample evaluated insects positively. The respondents in the latter study were chosen, however, based on a priori interest in edible insects, which most likely explains the high share of people evaluating insects positively. Other studies settle on a middle ground with around 30 percent of consumers being willing to at least try entomophagy: Cicatiello et al. (2016) found a third of consumers being willing to try insects in a sample from Italy and Hamerman (2016) had similar results in a sample from the US.

Previous literature found that men are more likely to eat insects than women (Cicatiello et al., 2016; Hartmann et al., 2015; Menozzi et al., 2017; Verbeke, 2015; Verneau et al., 2016) and are also more likely to have eaten them before (Schlup & Brunner, 2018). Even though many studies have found that as age increases, willingness to eat insects decreases, a qualitative study found that even among the elderly (60+) there is a segment of consumers willing to try insects (Myers & Pettigrew, 2018).

2.1.4. Theoretical model

Based on previous research on entomophagy, a theoretical model (Fig. 1) is proposed and tested in this study. It is theorised that individual traits determine the attitude, which in turn determines intention. The traits include food neophobia and disgust sensitivity known from the literature, and also food neophilia, which has not been examined before in this context. The attitude is theorised to consist of two parts – one drawing the intention in a positive direction, measured by the interest, and one drawing the intention in a negative direction, measured by the disgust towards edible insects. The intention is divided into two: an intention to eat whole insects and an intention to eat products with insects as an ingredient, as these are expected to differ.

2.2. Attitudinal ambivalence

In much of attitude research, attitude is conceptualized as a single overall evaluation of an attitude object (Eagly & Chaiken, 1998). This bipolar treatment of attitude – from negative to positive – has considerably simplified the measurement of an attitude, but in doing so, has also muddied the waters when it comes to understanding and predicting behaviour (Thompson, Zanna, & Griffin, 1995). It is not that researchers incorporating a bipolar overall attitude measure in their studies necessarily believe in that unidimensional structure (Eagly & Chaiken, 1998), but it is an easy and convenient way of capturing attitudinal response in a survey format. The research done on edible insects has often followed this approach (e.g. Lensvelt & Steenbekkers, 2014; Piha et al., 2018).

An attitude towards an object can consist of multiple components (Eagly & Chaiken, 1998; Thompson et al., 1995; Zanna & Rempel, 1988). These components can be different in terms of directionality and valence, in that a person can hold both positive and negative beliefs or emotions about the same attitude object at the same time. This creates a tension within the individual, and this tension is called attitude ambivalence.

Attitude ambivalence is defined as: “When the valence of evaluative responding is so discrepant within a class or across classes that the individual’s attitude could be described as two attitudes – one positive and one negative – that individual’s overall attitude (i.e., abstract evaluation) is considered to be ambivalent” (Eagly & Chaiken, 1998: 279). Ambivalence is then a lack of consistency within the individual towards a certain attitude object.

This lack of attitude consistency has a number of consequences. As ambivalent attitudes are less consistent, they are also inherently viewed as weak and unstable attitudes (Armitage & Conner, 2000), and they are not as easily accessible in memory as more consistent, stronger attitudes (Jonas, Broemer, & Diehl, 2000). Because of the inconsistency, ambivalent attitudes are “more susceptible to persuasion” (Armitage & Conner, 2000: 1429). A consistent attitude towards a certain attitude object is harder to change, as this attitude will often guide information processing, so only information in line with the attitude will be observed and processed (Jonas et al., 2000). A consistent attitude has also been found to be a better predictor of behaviour (Armitage & Conner,

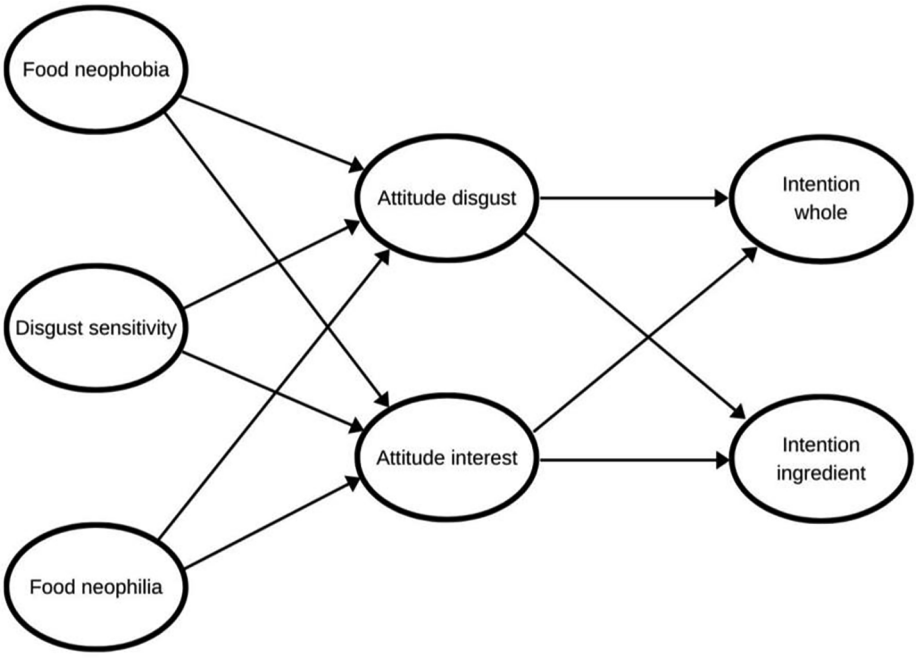


Fig. 1. Theoretical framework of the influences on intention to eat insects.

2000; Conner et al., 2002).

In order to examine the level of ambivalence, both a positive attitude and a negative attitude will be measured. The positive attitude is conceptualised as interest in entomophagy, and the negative attitude as disgust towards it (see Fig. 1). As can be seen from above, the very definition of an ambivalent attitude, is that it contains both a negative and positive component, creating tension within the individual (Eagly & Chaiken, 1998). We expect the degree of ambivalence to differ between individuals, and we therefore expect to find segments that differ with regards to ambivalence. It follows that for respondents with more ambivalent attitudes, both these components will have an impact on intention:

H_1: Both the positive and the negative component of the attitude will have an impact on the intention for more ambivalent consumers.

Not only will both components have an impact for ambivalent individuals, it is also assumed that for those with an ambivalent attitude, each component will influence the intention with an approximately equal weight. This follows from Jonas et al. (2000: 45) who state that an ambivalent attitude consists of "two opposing but balanced evaluations". For less ambivalent individuals, the attitude measures will be more unidirectional. The second hypothesis underlines this:

H_2: The segment of consumers that are more negative towards edible insects will be more influenced by the negative attitude component than the positive.

As previous research on attitude ambivalence suggests that more consistent (i.e., less ambivalent) attitudes are more likely to lead to behaviour (Armitage & Conner, 2000; Conner et al., 2002), the final hypothesis assumes that the more likely it is that you intend to try insects, the less ambivalent your attitude will be. This follows the logic of Jonas et al. (2000), who hypothesise that more ambivalence will lead to a less strong attitude-intention link. That is, the more univalent the attitude in a positive direction, the more likely it is that it will lead to a higher intention. The third hypothesis is as follows:

H_3: Segments which are more likely to try insects, will have a less ambivalent attitude, than those segments which are less likely to try insects.

3. Methods

3.1. Participants and data collection

An online questionnaire was developed and distributed through the market research agency Userneeds, (2020), who collected 1000 responses. The market research agency sampled based on gender, age and education level. Table 1 compares the descriptive statistics of the sample to population values. The sample corresponds well with the composition of gender and age in the Danish population, but a slight difference can be detected in the education levels. An issue with online panels can be that you only reach resourceful consumers that have access to their own computer and the Internet. Given the high Internet penetration rate among Danish consumers (95 percent; Danmarks Statistik, 2019), it is assumed that the sample is close to being representative of the average Danish consumer. As responses with a duration below five minutes were deleted as well as respondents with straight-line answers, the sample size came to 975 respondents (496 women, 50.9%). The data were collected in the fall of 2017[1].

3.2. Measures

3.2.1. Food neophobia

Food neophobia was measured using the validated scale developed by Pliner and Hobden (1992), which consists of ten items. The logic of the scale is the higher the score, the more neophobic. Five of the items on the scale are positively worded, and have been reverse coded (see appendix, Table A1). The items were measured on a seven-point scale ranging from 1: Completely disagree to 7: Completely agree. All ten items have factor loadings above 0.5 (appendix, Table A1) and the internal reliability for the scale is good (Cronbach's alpha 0.837, 10 items). The variance explained for the scale is relatively low at 41%, but since this is a validated scale, and the factor loadings and internal reliability is satisfactory, all ten items are transformed into one factor called food neophobia.

Table 1
Sample descriptive statistics.

Descriptives	Sample (n = 975) (%)	Danish population (%)
Gender		
Male	49.1	50.1
Female	50.9	49.9
Age		
18–35	25.5	32.0
36–55	37.4	36.0
56–75	37.0	32.0
Education		
Secondary school	25.3	19.2
High school	15.3	10.7
Vocational education	37.0	37.8
Bachelor-level	13.6	18.7
Master-level	5.9	10.9
PhD	0.6	1.0
Other	2.2	1.8

Note: Danish population data from DST (2019).

3.2.2. Disgust sensitivity

Disgust sensitivity is measured by the validated scale by Olatunji et al. (2009), which is a further development of a scale measuring disgust across eight domains developed by Haidt et al. (1994). The scale by Olatunji et al. (2009) is expected to display three distinct but interrelated dimensions of disgust: core disgust, animal-reminder disgust, and contamination disgust. In this study, only core disgust and contamination disgust were measured. All items on the contamination disgust scale have satisfactory factor loadings (appendix, Table 1) and a good internal reliability (Cronbach's alpha 0.726, five items), and are transformed into one scale termed contamination disgust. The confirmatory factor analysis showed that forcing all twelve items of the core disgust scale into one factor only explained 33% of the variance. Several factor loadings were also low (appendix, Table 1). An exploratory factor analysis was run, and showed that the scale split into three factors. The factor with the best-performing items was selected as the measure of core disgust (item 7, 8, 9, 10, 11, and 12, see appendix, Table 1), and this factor also had the highest internal consistency (Cronbach's alpha 0.778, six items). These items were transformed into one factor, and this measure was used as the disgust sensitivity score.

3.2.3. Food neophilia

In order to measure food neophilia one dimension from a newly developed scale called the Modular Food Related Lifestyle (MFRL) by K. Brunsø and colleagues (not yet published) was used. The MFRL is a further development of the Food Related Lifestyle (FRL) developed and tested by Brunsø and Grunert (1995). The core instrument of the MFRL is expected to fall in three factors: Innovation, Involvement, and Responsibility. Innovation corresponds well with the trait food neophilia (see appendix, Table 1, for items). A confirmatory factor analysis showed decent factor loadings and a satisfactory internal consistency (Cronbach's alpha 0.908, five items). The items were transformed into one factor termed food neophilia.

[1] Part of the data were also used in LaBarbera et al., 2020, for the development of the attitude scale.

3.2.4. Attitude

The entomophagy attitude among respondents was measured using a scale consisting of ten items (La Barbera, Verneau, Videbaek, Amato, & Grunert, 2020). The items measure the attitude towards edible insects and are expected to display three factors: disgust towards edible insects (attitude disgust), interest in edible insects (attitude interest), and the attitude towards using insects as feed (attitude feed). Through confirmatory factor analysis (appendix, Table 1), these three factors are confirmed, all with an acceptable level of internal reliability (Cronbach's alpha 0.911, five items, 0.843, three items, and 0.785, two items, respectively).

3.2.5. Intention

The intention to consume insects was measured in two ways in this study: using a discrete choice experiment and by likelihood of adoption ratings of insect products.

3.2.5.1. Discrete choice experiment. In a discrete choice experiment respondents were asked to imagine themselves in a restaurant, being offered a choice between two meals. Before the choice experiment, the respondents read the following text: "On the following eight pages you will be presented for two dishes that you are asked to choose between. You should pick the dish that it is most likely that you would eat. Even if you do not immediately like one of them, please still choose the one you like the most. The dishes might look the same, but they consist of different ingredients, so it is important that you read the descriptions thoroughly before you make your choice".

The two options differed on the attributes and levels shown in Table 2. For all attributes there is a level with insects and one without. For the attribute whole insect there are three levels, as two different types of insects were tested.

Respondents were asked to make a choice between two meals a total of eight times, where the levels of the attributes differed each time. These eight choice sets were constructed using the software Ngene (2017), based on expected effect sizes and maximizing D-efficiency. All respondents saw all eight choice sets.

The respondents saw the following text above each choice set: "Please read the descriptions of dishes below and indicate which dish it is most likely that you would choose if these were offered in a restaurant". The two dishes were presented in text containing a combination of the attributes and their levels. An example: "Whole oven-baked crickets with olive oil and lemon juice. Fried salmon filet of salmon bred in Norway and fed with insects. Baguette baked with cricket flour. Purée of mushy peas and cricket flour, seasoned with garlic and lemon". Please see the appendix (appendix Fig. 1) for an illustrative example of the screen that the respondents saw in the choice experiment.

3.2.5.2. Likelihood ratings. The second approach to measuring intention was to list current insect products on the Danish market, and then ask the respondents to estimate the likelihood of adopting the product into their regular diet (defined as eating it at least once a month) on a seven-point scale. Using factor analysis the products fell into three overall categories: Insects used as feed, insects as ingredients, and whole insects (see appendix, Table 1). Insects as feed was only one item, and this will not be examined further. Insects as ingredients consisted of four items with a Cronbach's alpha of 0.936 and whole insects consisted of three items with a Cronbach's alpha of 0.885. The items were transformed into the two factors termed Intention ingredient and Intention whole.

Table 2
Attributes and levels for the choice experiment.

Attributes	Levels
Whole insect	Cricket
	Mealworms
	Sautéed carrots (none)
Fish	Grilled salmon filet bred in Norway
	Grilled salmon filet bred in Norway fed with insects
Bread	Baguette baked with spelt flour
	Baguette baked with cricket flour
Purée	Purée of peas, spiced with garlic and lemon
	Purée of peas and cricket flour, spiced with garlic and lemon

3.3. Procedure

In the online questionnaire the respondents were first presented with a short introduction to the survey, its purpose and the subsequent data handling. In order to start the questionnaire with easier questions for the respondent, the first questions were regarding their eating habits, such as the amount of times they eat out at restaurants, whether they are meat eaters or vegetarians, and how many days a week they cook meat for a main meal. The items for food neophilia were then displayed, followed by food neophobia, and disgust items. The choice experiment was then presented, followed by the likelihood rating intention measure. The attitude items were then administered, before the questionnaire ended with asking respondents on their prior experience with eating insects ("Have you eaten whole insects before?" and "Have you eaten products where insects were an ingredient before?") and general demographics, such as gender, age, region, education level, employment status, and income level.

3.4. Analysis

In order to derive consumer segments, an analysis of the choice experiment data was done with the statistical software LatentGold 5.1 (Magidson & Vermunt, 2019). It was assumed that the population consisted of different segments, and these different segments would have different tastes and preferences when it came to insect products. The choices made by the respondents in the choice experiment were therefore assumed to be guided by the latent segment that they were a part of, which makes the choice model a latent class choice model.

In order to profile the segments further, ANOVAs were run. To understand the relationships between the attitude measures and the intention measures, a hierarchical regression analysis was performed.

4. Results

4.1. Segmentation with latent gold

The segmentation was done based on the choice experiment. To estimate the optimal solution, models with between one and eight latent classes (segments) are run. The dependent variable is choice of dish and covariates are gender, age, eaten insects before, food neophobia, disgust sensitivity, contamination disgust, attitude disgust, attitude interest, and attitude feed. Table 3 outlines the model summaries of the eight models.

Following the BIC-criteria, where the lowest BIC signals the best model (Louviere, Hensher, & Swait, 2004), Table 3 would indicate a

Table 3
Summaries of latent class models.

Models	BIC(LL)	Npar	df	p-value	Class.err.	R^2
1-Class	13402.9058	5	970	< 0.001	0.0000	0.2279
2-Class	12453.8759	20	955	< 0.001	0.0496	0.3811
3-Class	11600.7256	35	940	< 0.001	0.0785	0.4919
4-Class	11560.7705	50	925	< 0.001	0.1249	0.5170
5-Class	11519.3578	65	910	< 0.001	0.1560	0.5449
6-Class	11502.4738	80	895	< 0.001	0.1648	0.5647
7-Class	11523.2624	95	880	< 0.001	0.1504	0.5757
8-Class	11572.2946	110	865	< 0.001	0.1695	0.5949

Table 4
Parameters, Wald statistics and p-values for the dependent (choice) variables.

Attributes	Class 1	Class 2	Class 3	Wald	P-value	Wald(=)	P-value
Class size	372 (38.2%)	371 (38.0%)	232 (23.8%)				
Whole insect							
Cricket	-1.67_{ab}	0.08_{ac}	0.06_{bc}	2106.25	< 0.001	1945.68	< 0.001
Mealworms	0.15_{ab}	-1.83_{ac}	-0.009_{bc}				
Sautéed carrots	1.52_{ab}	1.75_{ac}	-0.07_{bc}				
Fish							
Bred in Norway	-0.05_{a}	0.10_{ab}	-0.004_{b}	15.45	0.002	14.94	0.0006
Bred in Norway and fed with insects	0.05_{a}	-0.10_{ab}	0.004_{b}				
Bread							
Spelt flour	0.11	0.14_{a}	0.04_{a}	53.19	< 0.001	8.34	0.015
Cricket flour	−0.11	-0.14_{a}	-0.04_{a}				
Puree							
Peas	0.06_{a}	0.15_{ab}	0.05_{b}	42.97	< 0.001	6.85	0.033
Peas and cricket flour	-0.06_{a}	-0.15_{ab}	-0.05_{b}				

Note: The first Wald statistic tests whether an attribute had an influence on the choice. The second Wald statistic (Wald(=)) tests whether these effects are different between the three classes. N = 975. Subscripts indicate significant differences between segments for the attribute.

model with six latent classes. For this model, the classification error is fairly low and the R-squared is acceptable. However, upon further inspection the six classes of consumers are not very distinct and several classes have similar choice patterns. This is also the case for the 5- and 4-class solutions. Furthermore, the increase in R^2 becomes small when moving beyond the 3-class solution. The 3-class model is chosen, as the classes here have distinct, interpretable choice patterns. This model has a lower, but still acceptable R-squared, and in turn a better classification error rate. Table 4 outlines the choice model for the three classes.

4.2. Profiling segments

The first Wald statistic in Table 4 tests the constraint that the parameters in the sets are equal to zero. As these are all significant, we can conclude that the parameters are different from zero. The second Wald statistic in Table 4 (Wald(=)) tests the constraint that all effects across the three classes are the same. As these are also significant for all attributes tested, we conclude that there are at least some differences between the parameters of the different segments. That is, the segments significantly differ in their choices of dishes in the choice experiment.

Segment 1 is the Insect Opponents. They dislike whole insects, and they especially dislike crickets. If a cricket is in the meal offered, this segment will steer clear. The Insect Opponents highly favour sautéed carrots over whole insects. They are significantly more disgusted in general than the other segments and they show no interest in entomophagy (Table 6). The segment also has the highest level of food neophobia of the three (Table 6). This segment is the oldest segment of consumers with an equal gender split and the majority have not tried to eat insects before (Table 5).

We named segment 2 as Insect Feeders. This segment also dislikes whole insects, but they dislike mealworms the most and will tend to avoid any dish containing them. This segment also highly favours the sautéed carrots over whole insects. They show no interest towards entomophagy, but they are the segment which is the most positive towards using insects as feed, and display a significantly lower level of contamination disgust than the other segments (Table 6). The respondents in this segment tend to be female and the majority have not tried to eat insects before (Table 5).

Finally, there is segment 3, named the Potential Entomophagists. This segment is much more indifferent towards whether or not there are whole insects on the plate, and seem to actually slightly prefer that crickets are present as opposed to carrots, although the parameter values are very small. They feel the highest level of contamination disgust among the three segments, but also the lowest level of attitude disgust – that is, they do not find eating insects disgusting (Table 6). It is also the segment with the highest level of interest towards entomophagy and they also display significantly more food neophilia than the other segments (Table 6). They are the most negative towards using insects as feed. They tend to be younger males, and many in the segment have tried to eat insects before (Table 5). This corresponds with findings in previous studies of who would be most likely to become an insect consumer (Cicatiello et al., 2016; Hamerman, 2016; Schlup & Brunner, 2018).

Table 5
Frequency table of demographics of the three segments (N = 975).

Demographics	Segment 1 Insect Opponents (n = 370)	Segment 2 Insect Feeders (n = 377)	Segment 3 Potential Entomophagists (n = 228)
Gender			
Female	185 (50.0%)	236 (62.6%)	75 (32.9%)
Male	185 (50.0%)	141 (37.4%)	153 (67.1%)
Age			
18–25	57 (15.4%)	93 (24.7%)	99 (43.4%)
36–55	153 (41.4%)	140 (37.1%)	72 (31.6%)
56+	160 (43.2%)	144 (38.2%)	57 (25.0%)
Eaten whole insects			
No	321 (86.8%)	319 (84.6%)	140 (61.4%)
Yes	49 (13.2%)	58 (15.4%)	88 (38.6%)
Eaten insect ingredients			
No	337 (91.1%)	340 (90.2%)	156 (68.4%)
Yes	33 (8.9%)	37 (9.8%)	72 (31.6%)

Note: Results of χ^2 tests: Gender: χ^2 (2, n = 975) = 50.342, p = .000. Age: χ^2 (4, n = 975) = 60.059, p = .000. Whole insects: χ^2 (2, n = 975) = 64.857, p = .000. Insects as ingredients: χ^2 (2, n = 975) = 69.359, p = .000.

Across all three segments, and especially for segment 1 and 2, the choice is dominated by whether a whole insect is present, and the other components of the meal are of much less importance to the respondents (appendix, Table 3).

4.3. Hierarchical regression

In order to test the first two hypotheses of this study, a number of regressions were run. The analysis was split into the three segments above, and for each segment, two hierarchical regressions were run: one with the intention to eat whole insects as the dependent variable (Intention whole), and one with the intention to eat products with insects as an ingredient as the dependent variable (Intention ingredient). The intention measure used as the dependent variable is based on the likelihood ratings. The regressions are shown in Table 7, where a full mediation analysis is also outlined for the model shown in Fig. 1. Mediation analysis is done according to the procedure by Baron and Kenny (1986).

Table 6
Mean scores and results of ANOVA analysis of the listed factors between segments.

Factors	Segment 1 Insect Opponents (n = 370)		Segment 2 Insect Feeders (n = 377)		Segment 3 Potential Entomophagists (n = 228)	
	Mean	Std.dev.	Mean	Std.dev.	Mean	Std.dev.
Food neophobia ^	3.38_{ab}	1.11	3.15_{a}	1.01	3.01_{b}	1.09
Disgust sensitivity ^	4.96_{a}	1.22	4.87_{b}	1.13	4.50_{ab}	1.25
Food neophilia ^	3.75_{ab}	1.55	4.07_{ac}	1.45	4.47_{bc}	1.45
Contamination disgust ¤	3.17_{a}	1.32	2.94_{a}	1.17	3.02	1.33
Attitude disgust ^	4.39_{ab}	1.79	4.01_{ac}	1.77	3.05_{bc}	1.70
Attitude interest ¤	3.20_{a}	1.82	3.44_{b}	1.68	4.63_{ab}	1.67
Attitude feed ¤	5.43_{a}	1.60	5.70_{ab}	1.36	5.18_{b}	1.64
Intention ingredient ¤	2.40_{a}	1.55	2.48_{b}	1.50	3.44_{ab}	1.73
Intention whole¤	1.69_{a}	1.11	1.63_{b}	0.98	3.35_{ab}	1.76

Note: All factors measured on a 7-point Likert scale. ANOVA: Food neophobia: F(2,972) = 9.213, p = .000. Disgust sensitivity: F(2,972) = 11.118, p = .000. Food neophilia: F(2,972) = 16.789, p = .000. Contamination disgust: F(2,972) = 3.170, p = .042. Attitude disgust: F(2,972) = 41.834, p = .000. Attitude interest: F (2,972) = 51.849, p = .000. Attitude feed: F(2,972) = 8.768, p = .000. Intention ingredient: F(2,972) = 35.199, p = .000. Intention whole: F(2,972) = 159.595, p = .000. ^: Scheffe used for multiple comparisons. ¤: Dunnett T3 used for multiple comparisons, as the variance was unequal between groups for these factors. Subscripts indicate significant differences.

Table 7
Mediation analysis and regression models for the three segments for both intention whole and intention ingredient.

	Segment 1 Insect Opponents (n = 370)		Segment 2 Insect Feeders (n = 377)		Segment 3 Potential Entomophagists (n = 228)	
STEP 1						
Dependent variable	Intention whole[a]	Intention ingredient[b]	Intention whole[c]	Intention ingredient[d]	Intention whole[e]	Intention ingredient[f]
R^2 (adj)	0.144	0.226	0.112	0.124	0.246	0.267
Constant	3.105	5.358	2.721	4.708	3.379	3.489
Food neophobia	-0.125*	-0.306***	-0.131*	-0.242***	-0.133	-0.184*
Disgust sensitivity	-0.270***	-0.277***	-0.239***	-0.199***	-0.201**	-0.163*
Food neophilia	0.085	0.062	0.114	0.043	0.349***	0.346***
STEP 2						
Dependent variable	Attitude disgust[g]	Attitude interest[h]	Attitude disgust[i]	Attitude interest[j]	Attitude disgust[k]	Attitude interest[l]
R^2 (adj)	0.304	0.213	0.331	0.286	0.425	0.303
Constant	-0.269	6.364	−1.091	7.398	−1.512	6.319
Food neophobia	0.350***	-0.349***	0.369***	-0.368***	0.580***	-0.385***
Disgust sensitivity	0.366***	-0.202***	0.391***	-0.307***	0.249***	-0.140*
Food neophilia	0.022	0.060	0.014	0.039	0.060	0.181*
STEP 3						
Dependent variable	Intention whole[m]	Intention ingredient[n]	Intention whole[o]	Intention ingredient[p]	Intention whole[q]	Intention ingredient[r]
R^2 (adj)	0.364	0.492	0.335	0.351	0.359	0.376
Constant	1.387	2.673	0.904	1.634	1.320	1.654
Food neophobia	0.098	-0.082	0.100	-0.013	0.117	0.069
Disgust sensitivity	-0.108*	-0.123**	-0.026	0.007	-0.100	-0.059
Food neophilia	0.063	0.036	0.103	0.029	0.320***	0.326***
Attitude disgust	-0.203**	-0.150*	-0.239***	-0.182*	-0.268**	-0.298***
Attitude interest	0.434***	0.491***	0.387***	0.440***	0.246**	0.210**

Note: Standardised beta-coefficients are shown. *=significant at the 0.05 level, **=significant at the 0.005 level, ***significant at the 0.000 level. a: F (3,366) = 16.817, p = .000. b: F(3,366) = 36.917, p = .000. c: F(3,373) = 16.816, p = .000. d: F(3,373) = 18.771, p = .000. e: F(3,224) = 25.674, p = .000. f: F (3,224) = 28.500, p = .000. g: F(3,366) = 54.647, p = .000. h: F(3,366) = 34.360, p = .000. i: F(3,373) = 62.908, p = .000. j: F(3,373) = 51.133, p = .000. k: F (3,224) = 57.030, p = .000. L: F(3,224) = 33.932, p = .000. m: F(5,364) = 43.175, p = .000. n: F(5,364) = 72.537, p = .000. o: F(5,371) = 38.817, p = .000. p: F(5,371) = 41.666, p = .000. q: F(5,222) = 26.427, p = .000). r: F(5,222) = 28.363, p = .000.

Table 8
Mean ambivalence index scores for the three segments.

Ambivalence index	Segment 1 Insect Opponents (n = 370)	Segment 2 Insect Feeders (n = 377)	Segment 3 Potential Entomophagists (n = 228)
Index 1: S^2/L [a]	1.4375	1.4737	1.6392
Index 2: 2S + 1/S + L + 2[b]	0.5878	0.6099	0.6103
Index 3: (L + S)/2-|L-S| [c]	0.8841	1.0436	1.1249

Note: Mean scores for each ambivalence index shown. S: smaller of the sum of either positive or negative ratings. L: the larger of the sums of positive or negative ratings. Index 1 varies from 0 to 7, index 2 varies between 0 and 1 (Scott, 1966), and index 3 varies between −2 and 7 (Thompson et al., 1995). ANOVA test statistics: a: F(2,972) = 1.820, p = .163. b: F(2,972) = 1.420, p = .242. c: F(2,972) = 1.150, p = .317. N = 975.

This procedure works in three steps: first, the effect of the independent variables on the dependent variable is tested. There needs to be a significant linkage between these variables. The second step is testing the independent variables on the proposed mediator variables. This linkage will also need to be significant. Finally, the full model is tested in step three with both the independent variables and the mediator variables. In order for full mediation to be proven, only the mediator variables should now be significant (Baron & Kenny, 1986).

Table 7 outlines this procedure step by step.

Segment 1, the Insect Opponents, show full mediation of food neophobia, but only partial mediation of disgust sensitivity. There is no effect of food neophilia for this segment. Segment 2, the Insect Feeders, show full mediation for food neophobia and disgust sensitivity, and there is also no effect of food neophilia for this segment. Segment 3, the Potential Entomophagists, shows full mediation of food neophobia and disgust sensitivity. There is no mediation of food neophilia, but this independent variable is instead directly influencing the intention to eat both whole insects and insects as ingredients for this segment.

Hypothesis 1 stated that both the positive and the negative component of the attitude will have an impact on the intention for more ambivalent consumers. The third step in Table 7 shows that for all segments of consumers both components of the attitude have a significant impact on the intention to eat insects. Hypothesis 1 is partly confirmed, with the caveat that it is not only for the ambivalent consumers, but for all consumers in the sample that intentions are influenced by both attitude components.

Hypothesis 2 stated that the segment of consumers that was more negative towards edible insects would be more influenced by the negative attitude component than the positive. Again, turning to Table 7, we see that this hypothesis cannot be confirmed, as the opposite would seem to be the case. The Insect Opponents and the Insect Feeders, who are both significantly more disgusted towards the idea of eating insects than the Potential Entomophagists (Table 6), seem to be influenced more by the interest than by the disgust component of the attitude (Table 7). This is the case for these two segments for both the intention to eat whole insects and the intention to eat products with insects as an ingredient.

The segment of Potential Entomophagists is significantly less disgusted than each of the other two segments when it comes to edible insects (Table 6), but these consumers would seem to be almost equally influenced by the negative and the positive component of the attitude (Table 7). It would actually seem as if the negative disgust component influences intention more for this segment, than the positive interest component. Hypothesis 2 is therefore disconfirmed.

4.4. Ambivalence index

In order to test hypothesis 3, which stated that the more likely you are to want to try insects, the less ambivalent your attitude will be, it is necessary to calculate an index of ambivalence. As an ambivalent attitude contains both positive and negative components, it is necessary to find an index formulation that captures both these, and that also takes into account the valence and intensity of them in relation to each other (Jonas et al., 2000). There is currently no agreement on a specific measure, however, Jonas et al. (2000) have compared a wide variety of measures in the literature, and have determined that the indexes that best captures ambivalence are two formulas by Scott (1966) and one by Thompson et al. (1995).

Scott (1966: 394) suggests using one of two formulas: S^2/L or $2S + 1/S + L + 2$, "where S is the smaller sum of positives or negative ratings, and L is the larger of these sums". Both are used to calculate mean ambivalence ratings for the segments. The formula that Thompson et al. (1995) suggest is $(L + S)/2-|L-S|$, and the mean scores for this formula are also displayed in Table 8. All three formulas are used in order to validate the findings, and to see if all indexes display a similar pattern for the segments. ANOVA showed no significant differences between the segments for either of the indexes.

No evidence is found for hypothesis 3, as there is no significant difference between the segments in the amount of ambivalence they are feeling. There is instead a slight tendency for the Potential Entomophagists to be more ambivalent across all the measures, than the other segments.

5. Discussion

The prevalence of attitude ambivalence when it comes to entomophagy seems to be confirmed in this study, as both a positive and negative component of the attitude were found to have a significant influence on the intention (hypothesis 1) to eat both whole insects and products with insects as ingredients for all three segments. This highlights that the consumers' attitude toward eating insects is more complex than can be captured by a unidimensional measure. For consumers that are more negative towards edible insects it was hypothesised that they would be influenced more by the negative component of the attitude (hypothesis 2), however, these consumers were more influenced by the positive component, and the segment that was most positive towards edible insects was actually more ambivalent (hypothesis 3).

So, consumers are ambivalent toward edible insects. Their intention is being pulled in opposite directions with the feeling of disgust on the one hand, and the sense of interest on the other. The Potential Entomophagists also seemed to be the most ambivalent. But are the Potential Entomophagists really that – potential insect eaters? It has been the aim of this study to measure willingness to incorporate insects into a regular diet, but there is a distinction between willingness to try once and willingness to adopt (Tan et al., 2016). The choice experiment measure of intention used in this study to segment the consumers could perhaps be argued to be a measure of trying insects once, as the setting was framed as a choice in a restaurant and as such is more of a trial. The Potential Entomophagists can at least be said to be more willing to try insects. They also tended to be younger males, which is consistent with previous findings in the literature.

The second intention measure of this study was closer to an intention to adopt insects, as this was measuring the willingness to incorporate specific insect products into a regular diet. The Potential Entomophagists were significantly more willing to incorporate both whole insects and insects used as ingredients into their regular diets, than the other two segments (Table 6). However, their willingness was still not overwhelming, as the mean scores for these intention measures did not go above the midpoint of the seven-point Likert scale they were measured on. This would seem to indicate a gap between the willingness to try insects once, and the willingness to incorporate them into an everyday diet.

That the Potential Entomophagists are the segment that is most positive towards at least trying edible insects, while still being the most ambivalent consumers contradict hypothesis 3. The findings do however suggest that there is a level of felt ambivalence. Felt ambivalence is the consumer's subjective experience of ambivalence, when they feel the tension of the opposing attitudes and are consciously aware of the conflict (Conner & Armitage, 2008; Jonas et al., 2000). The hypothesised effects of felt ambivalence will have the opposite influence than that expected in hypothesis 3, which is a structural ambivalence: "A high degree of experienced ambivalence should lead to more elaboration and pertinent research has shown that elaboration increases the correlation between attitudes and behaviour" (Jonas et al., 2000: 58). Since the Potential Entomophagists are both the most ambivalent and at the same time also the segment that are most positive towards edible insects and have tried to eat them before, it could indicate that they feel the ambivalence, they process it more deeply, and they then act on it, thereby creating a stronger attitude-behaviour link. Felt ambivalence was unfortunately not measured in this study, but it could be an interesting avenue to explore for future research.

This attitude ambivalence found in all the segments is nonetheless promising, as ambivalent attitudes have been found to be easier to change (Eagly & Chaiken, 1998). Future research need to look into strategies on how to grow the interest in edible insects even more, downplay the disgusting attitude component, and stabilising the preferred attitude components toward the attitude object – in this case edible insects.

Some methodological issues that might have skewed the results are

the forced choice of the respondents in the choice experiment. They had no option to say "don't know/neither". Another issue is the validated scale of core disgust (disgust sensitivity in this study) that did not operate as expected in this sample. A factor analysis failed to find one underlying factor of core disgust, but instead the scale fell into three distinct factors.

Looking at the profiling of the segments, it becomes clear that the Potential Entomophagists are the segment where many of the consumers have tried to eat both whole insects and products with insects as ingredients before. Given that they have tried it, and are still positive toward at least trying it again in the future is promising as behavioural experiences have been found to be highly influential for the overall attitude (Zanna & Rempel, 1988). Future research needs to look closer into the behaviour-attitude link, and how this is formed.

When analysing the two more sceptical segments, the Insect Opponents and the Insect Feeders, a distinction between insects as food or feed seems to emerge. Both the Insect Feeders and the Insect Opponents display a positive attitude towards using insects as feed, and are highly disgusted by the thought of using them as food. The Potential Entomophagists, on the other hand, are significantly less positive towards using insects as feed (Table 5). This could indicate that if you see insects as appropriate for feed, then you are not convinced that it should be used for human consumption and vice versa. The current use of insects as feed might then impact how appropriate consumers find them as human nutrition, which could potentially become a barrier for greater adoption of edible insects on the market. This relationship should be examined further in future studies.

Also, not all insects are viewed equally by the different segments – the Insect Opponents dislike crickets more than mealworms, whereas the Insect Feeders dislikes mealworms more than crickets. This emphasises the need to explore different types of insects more specifically, instead of lumping all insects into one category. Clearly there are differing perceptions of different species. Fischer and Steenbekkers (2018) have pointed out that attitudes towards a range of different species vary, but future research will have to explore these attitudes further, in order to understand what it is that makes certain species more or less suitable for consumption from a consumer point of view.

What is evident from the hierarchical regression models is that the intention to eat insects, both whole and as an ingredient, is mostly driven by an interest to do so. Disgust towards entomophagy still has a significant impact, but the main driver is interest. This is true for the two segments most on the offense about insects, the Insect Opponents and the Insect Feeders, which was surprising. The intention to eat insects of the Potential Entomophagists were also influenced by food neophilia, showing that this segment of consumers are in general more open and interested in new food experiences. As much previous literature has only examined the darker sides of entomophagy, that is disgust and neophobia, it now becomes important to also examine this interest, which is shown to have an effect on intention. Future studies should include a measure of interest as well when studying entomophagy in a consumer context.

As in previous research, it was found that men seem to be more positive towards eating insects than women, but other studies have also suggested that men are more reluctant to change their current meat consumption patterns (Hartmann & Siegrist, 2017). Insects might prove to be a way to change the behaviour of these meat loving men and help them shift their diet.

6. Conclusion

Despite the often cited disgust reaction among Western consumers to entomophagy, this study finds that there is a segment of consumers that are willing to eat insects, and that the intention to do so is more influenced by the interest in edible insects than by the feeling of disgust towards it. Future research should look into the interest aspect of entomophagy, so that we can move past the disgust barrier, and hopefully find insects on our plates as a delicacy in the future.

CRediT authorship contribution statement

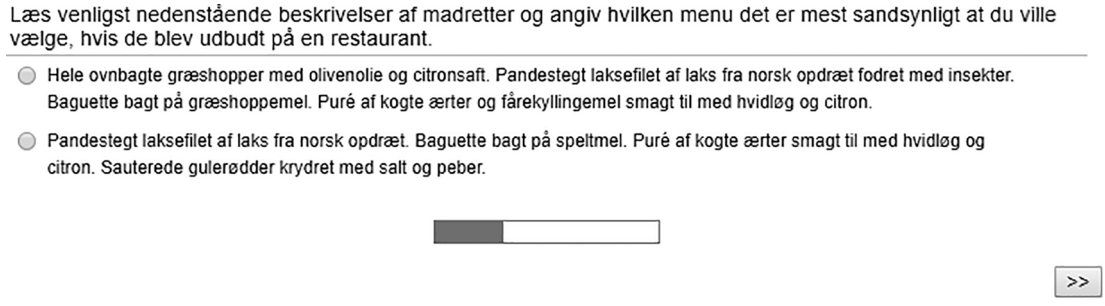
Pernille N. Videbæk: Conceptualization, Methodology, Formal analysis, Writing - original draft, Writing - review & editing. **Klaus G. Grunert:** Conceptualization, Methodology, Validation, Writing - review & editing, Supervision, Project administration, Funding acquisition.

Acknowledgements

The data was collected as part of a project commissioned by the Danish Ministry of Environment and Food as a part of the "Contract between Aarhus University and Ministry of Environment and Food for the provision of research-based policy advice at Aarhus University, Danish Centre for Food and Agriculture (DCA), 2017-2020".

Appendix A

Table A2



appendix Fig. 1. Choice experiment, example.

Table A1
Confirmatory factor analysis.

Items	Food neophobia	Core disgust	Contamination disgust	Attitude disgust	Attitude interest	Attitude feed	MFRL innovation
I am constantly sampling new and different foods (R). (1)	0.502						
I don't trust new foods. (2)	0.516						
If I don't know what is in a food, I won't try it. (3)	0.572						
I like foods from different countries (R). (4)	0.666						
Ethnic foods look to weird to eat. (5)	0.681						
At dinner parties, I will try a new food (R). (6)	0.707						
I am afraid to eat things I have never had before. (7)	0.725						
I am very particular about the foods I will eat. (8)	0.635						
I will eat almost anything (R). (9)	0.627						
I like to try new ethnic restaurants (R). (10)	0.729						
Seeing a cockroach in someone else's house doesn't bother me (R). (1)		0.376					
It bothers me to hear someone clear a through full of mucous. (2)		0.411					
Even if I was hungry, I would not drink a bowl of soup if it had been stirred by a used but thoroughly washed flyswatter. (3)		0.566					
I might be willing to try eating monkey meat, under some circumstances (R). (4)		0.479					
It would bother me to see a rat run across my path in a park. (5)		0.484					
If I see someone vomit, it makes me sick to my stomach. (6)		0.548					
You see someone put ketchup on vanilla ice cream, and it eat. (7)		0.559					
You see maggots on a piece of meat in an outdoor garbage pail. (8)		0.712					
While you are walking through a tunnel under a railroad track, you smell urine. (9)		0.747					
You are about to drink a glad of milk when you smell that it is spoiled. (10)		0.670					
You are walking barefoot on concrete, and you step on an earthworm. (11)		0.604					
You discover that a friend of yours changes underwear only once a week. (12)		0.617					
I never let any part of my body touch the toilet seat in public restrooms. (1)			0.659				
I probably would not go to my favourite restaurant if I found out that the cook had a cold. (2)			0.624				
You take a sip of soda, and then realise that you drank from the glass that an acquaintance of yours had been drinking from. (3)			0.794				
A friend offers you a piece of chocolate shaped like dog-poo. (4)			0.723				
As part of a sex education class, you are required to inflate a new unlubricated condom, using your mouth. (5)			0.666				
I would be disgusted to eat any dish with insects. (1)				0.928			
Thinking about the flavour that a bug might have sickens me. (2)				0.894			
If I ate a dish and then came to know that there were insects among the ingredients, I would be disgusted. (3)				0.879			
I would avoid eating a dish with insects among the ingredients, even if it was cooked by a famous chef. (4)				0.814			
I would be bothered by finding dishes cooked with insects on a restaurant menu. (5)				0.782			
I'd be curious to taste a dish with insects, if cooked well. (1)					0.910		
In special circumstances, I might try to eat a dish of insects. (2)					0.887		
At a dinner with friends I would try new foods prepared with insect flour. (3)					0.819		
I think it is fine to give insect-based feed to fish that are farmed for human consumption. (1)						0.907	
Using insects as feed is a good way of producing meat. (3)						0.907	
I look for ways to prepare unusual meals. (1)							0.800
Recipes and articles on food from other culinary traditions encourage me to experiment in the kitchen. (2)							0.897
I love to try recipes from different countries. (3)							0.860
I like to try new foods that I have never tasted before. (4)							0.816
I like to try out new recipes. (5)							0.898

Note: Factor loadings for the confirmatory factor analysis. Method: principal components. R = reverse coded. All items were translated into Danish in the questionnaire.

Table A2
Comparing latent class models.

Model	3-class	4-class	5-class	6-class
AIC	11468.5649	11356.3982	11253.9599	11155.2508
CAIC	11662.6854	11632.8728	11612.7885	11596.4336
Prediction error	0.1857	0.1726	0.1658	0.1610
Class sizes	1:378	1:394	1:271	1:245
	2:367	2:203	2:245	2:205
	3:230	3:196	3:225	3:186
		4:183	4:127	4:121
			5:107	5:111
				6:107

Table A3
Importance scores for three-class latent class model.

	Class 1	Class 2	Class 3
Maximum			
Whole insect	3.1332	3.6154	0.1764
Fish	0.0913	0.2088	0.0058
Bread	0.2238	0.2830	0.0834
Puree	0.1334	0.2901	0.1041
Relative			
Whole insect	0.8748	0.8222	0.4770
Fish	0.0255	0.0475	0.0158
Bread	0.0625	0.0644	0.2257
Puree	0.0372	0.0660	0.2816

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