Would you eat an insect? The role of curiosity in willingness to engage in exploratory eating behaviour.

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Abstract

Curiosity is a powerful motivator of exploratory behaviour. Theories of curiosity suggest the awareness of a knowledge gap elicits a strong motivation to seek new knowledge and this process is said to be intrinsically rewarding. The role of curiosity in consumer behaviour has received surprisingly little attention given that experiencing curiosity about products or brands often results in favourable attitudinal change. This thesis examines the role of curiosity in the willingness to try novel foods, specifically insect foods. Entomophagy (eating insects) poses a unique challenge compared to many other consumer behaviours, it is often met with revulsion in Western societies despite possessing many benefits. Therefore, a strong motivational force is needed to overcome the negative associations and encourage willingness to try. The three reported empirical papers examine the potential of curiosity as a motivator for entomophagy. The first paper assessed the relative contribution of curiosity on willingness to try using a rating task. The results showed that curiosity predicts willingness to try insect foods above several other previously identified factors. Furthermore, a "curiosity-boosting" effect specific to insect foods was uncovered, curiosity interacted with other factors boosting the effect on willingness to try. The second paper manipulated curiosity (increasing interest with a utility-value intervention) and found that promoting interest in the benefits of entomophagy encourages willingness to try. However, similar results were also achieved using insect food recipes. The third paper manipulated curiosity (via uncertainty) using a gambling task with varying probabilities of eating insects. The results showed no significant effects of uncertainty on choices to eat insects but found other positive results potentially related to curiosity, further research is needed to clarify this. The findings from this thesis further the understanding of curiosity in encouraging the adoption of novel foods and suggests avenues for further research and practical implications.

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Declaration: I confirm that this is my own work and the use of all material from other sources has been properly and fully acknowledged.

Hannah Stone

Declaration of Authorship

Chapters 2, 3 and 4 are based on the following papers, these papers are original work I conducted in collaboration with my supervisors during my Ph.D. period.

Paper 1

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Paper 2

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Paper 3

Stone, H., FitzGibbon, L., Millan, E., & Murayama, K. (To be submitted). Does uncertainty affect people's choices to eat insects?

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Chapter 1. General Introduction

Curiosity is an innate quality we all have; we may not specifically think about curiosity as part of our everyday lives but it impacts our behaviour nonetheless. We all spend leisure time seeking new experiences and gaining new information, whether that be browsing the internet, reading new books or binging that new tv show. That feeling of wanting to know what happens in the next episode of that tv show or needing to resolve the cliff-hanger your last book left you with, can all be characterised by our desire for information and our awareness that we lack that information, in other words, curiosity. That feeling of wanting to know often leads us to make decisions that may not necessarily be wise. For example, reading late into the night to find out what happens in the next chapter of a book, even though you have an early start the next morning. The seductive lure of curiosity influences our decision-making even when we do not necessarily recognise it.

1.1. Overview of curiosity

Curiosity can be a powerful motivator, marked by an awareness of a gap in one's knowledge and a need to seek information to close that gap (Loewenstein, 1994). Lowenstein's information gap theory focuses on the 'need to know' state which motivates information-seeking behaviour in the same way that hunger motivates eating behaviour. This motivation is said to be the drive behind novel and exploratory behaviours (Gottlieb, Oudeyer, Lopes, & Baranes, 2013). Berlyne (1960) proposed that this awareness of an information gap is facilitated by 'collative variables'. Novelty, complexity, uncertainty and conflict determine whether something has the potential to be interesting. These collative variables have arousal potential, the propensity to influence the intensity of arousal, and it is suggested that the relationship between arousal and preference for stimuli takes the shape of an inverted U. Both of these theories suggest that resolving the gap in the information is rewarding and this can motivate further information-seeking behaviour (Berlyne, 1960; Loewenstein, 1994).

1.1.1. Terminology

Within the field of curiosity research, there is an ongoing debate surrounding the distinction, or lack thereof, between curiosity and interest. Some researchers suggest these terms can be distinguished in that curiosity can be a momentary feeling that once resolved, through the acquisition of knowledge, can disappear or may lead to sparking an interest in a topic. Interest can be initially triggered in a very similar way to curiosity; however, it is argued interest can be maintained and developed over a period of time leading to self-generated information-seeking as opposed to stimulus-led information-seeking (Hidi & Renninger, 2006, 2019). However, other researchers suggest the distinction may be less clear in terms of motivation and behaviour. For example, it is suggested that momentary curiosity or interest are experienced similarly and both motivate exploratory behaviour (Ainley, 2019). The two concepts are sometimes considered the same (e.g., Silvia, 2008) and are considered similar by experts and non-experts alike (Donnellan, Aslan, Fastrich, & Murayama, 2021). While curiosity may be considered more transient and interest more enduring, they share a motivation to acquire knowledge and reward associated with gaining that knowledge (Ainley, 2019; Donnellan et al., 2021). For the purpose of this thesis, I will use the terms curiosity and interest interchangeably, subscribing to the idea that motivationally and in terms of elicitation of exploratory behaviour, they are operationalised similarly.

1.1.2. Frameworks of curiosity and interest

Several frameworks have been proposed to understand the rewarding aspect of knowledge acquisition and what motivates us to seek knowledge repeatedly. It is suggested that information is intrinsically motivating and therefore people engage in exploratory behaviour in order to gain information as knowledge acts as a reward (Gottlieb & Oudeyer, 2018; Gottlieb et al., 2013). The learning progress account suggests that this exploration is directed towards minimising prediction error and optimising learning which enables a positive feedback loop between curiosity and information gain. To minimise prediction error effectively, situations that are too predictable or too difficult are avoided and situations with the fastest learning curve are attended to first (Kaplan & Oudeyer, 2007).

Hidi and Renninger (2006) propose that interest can be instigated by an environmental stimulus (triggered situational interest). This stage of interest development can be characterised as relatively short-lived and can lead to further phases of interest development. The second phase follows on from a triggered interest to a re-occurring focus of attention over a period of time (maintained situational interest). After a maintained situational interest occurs this can develop into a preference to re-engage with a topic over a sustained period of time (emerging individual interest). Finally, over time a self-generated interest for a topic can emerge. This encompasses a store of background knowledge and a positive value is placed upon knowledge associated with the topic of interest (well-developed individual interest). Importantly, all of the four phases involve an affective component. Specifically, a positive rewarding feeling associated with engagement in a topic. Empirical examinations of the four-phase model of interest development have shown a distinct difference between situational and individual interest in the field of educational research, with the level of initial situational interest predicting longer-term individual interest (Harackiewicz, Durik, Barron, Linnenbrink-Garcia, & Tauer, 2008; Linnenbrink-Garcia et al., 2010).

The reward learning framework of knowledge acquisition proposed by Murayama, FitzGibbon and Sakaki (2019) draws upon both the knowledge-gap theory proposed by Loewenstein (1994) as well as the four-phase model of interest development proposed by Hidi and Renninger (2006). They suggest that the awareness of a knowledge gap motivates information-seeking behaviour. The knowledge is acquired and assimilated into the existing knowledge base, to close the gap. The process of knowledge acquisition is rewarding which in turn promotes awareness of further knowledge gaps increasing the value of new knowledge, generating a positive loop of information-seeking and knowledge acquisition. Reward prediction errors show the difference between the expected value of the knowledge and the actual value, this determines changes in the expected reward value. In other words, how surprising the new information is. If it is more surprising than expected the reward prediction error is positive which increases the expected value of future information and vice versa. Marvin and Shohamy (2016) examined the valence of information and prediction errors using a trivia questions task. They found that information does indeed provide a reward — even relatively unimportant information such as trivia question answers — and that more positive information enhanced the reward value and memory for the information itself compared to neutral information. They also found that memory was improved when there was a positive prediction error, that is when the satisfaction from gaining the information was greater than the expected value of the information. All of these theories suggest that information is intrinsically rewarding and therefore we are motivated to seek it in pursuit of the rewarding feeling associated with knowledge acquisition.

1.1.3. The motivational influence of curiosity

The discussed frameworks of curiosity suggest a powerful motivation to seek out new information and the reward associated with gaining new knowledge can promote further information-seeking behaviour (Murayama et al., 2019). The motivation to seek information is a powerful enough drive that people are willing to make sacrifices in order to gain the information. In a card-flipping task with a reward based upon the pattern of the cards, Rodriguez Cabrero, Zhu and Ludvig (2019) found that participants were willing to pay in order to receive the result of the card-flip in advance. Similarly, FitzGibbon, Komiya and Murayama (2021) gave participants the option to seek information about what they could have won in a risky decision-making task and found that participants sought this information, even though it made them feel worse and was of no value. Within the wider context of economic and decision-making research these results may be somewhat unexpected as individuals are expected to make decisions that maximise reward. However, it is proposed that gaining information is in itself intrinsically rewarding (Murayama et al., 2019) and that incentive salience is a motivational property of curiosity (FitzGibbon, Lau, & Murayama, 2020). Incentive salience in the context of curiosity is a motivational want for information without an expected liking of that information (Litman, 2005). The strong motivational lure of curiosity provides circumstances where individuals seek out new information without assessing the costs and benefits in order to maximise reward. It has been suggested that people have a tendency to seek variety or more novel experiences. For example, individuals chose to listen to less preferred songs to experience variety even though they enjoyed them less, however, retrospectively the experience of the high-variety songs was more enjoyable than low-variety (Ratner, Kahn, & Kahneman, 1999). This evidence indicates that people tend to seek novelty over commonness because novel experiences provide a greater level of enjoyment in hindsight, even if it may be less enjoyable at the time.

1.1.3.1. Curiosity and aversive experiences

People are not only willing to risk enjoyment or incentives to gain information, they are also willing to expose themselves to potentially aversive stimuli in order to satisfy curiosity. Hsee and Ruan (2016) showed that participants were willing to expose themselves to several types of aversive stimuli to satisfy their curiosity. In one study joke pens were used that gave an electric shock when pressed, the pens were labelled as either certain to give a shock, certain not to give a shock or uncertain. They found that participants clicked more uncertain pens than either type of certain pen, this finding held for other types of aversive stimuli (negative pictures and unpleasant sounds). In a gambling task where participants were shown magic tricks, participants had to choose whether to accept a gamble to see the solution to the magic trick but the outcome of this gamble could also result in an electric shock. It was found that curiosity predicted accepting the gamble over the probability of receiving an electric shock (Lau, Ozono, Kuratomi, Komiya, & Murayama, 2020).

1.1.3.2. Curiosity for negative stimuli

Curiosity towards negative stimuli – sometimes referred to as "morbid curiosity" – can be an incredibly powerful motivator, with people choosing to view unpleasant negative images (e.g., violence and death) over neutral or positive images (Oosterwijk, 2017). It is said that morbid curiosity may be a rewarding experience, even though the content itself may be distressing, the information gain and connected emotional experience may be intrinsically rewarding (Niehoff & Oosterwijk, 2020). This is supported by neuroscientific research, which found that when choosing to view intensely negative images similar regions of the brain were activated that have previously been associated with curiosity and reward (Oosterwijk, Snoek, Tekoppele, Engelbert, & Scholte, 2020). A similar effect has been found for unpleasant and potentially harmful information. Participants were given the opportunity to seek information on a group discussion held about them which was either flattering or insulting. Participants who were told the conversation was insulting chose to view the information even though it would do "more harm than good" to learn. They found that curiosity was a reliable predictor of choosing to learn this unpleasant information (Kruger & Evans, 2009).

Overall, this research suggests that curiosity is a strong motivator. People will seek information to resolve their curiosity under many non-advantageous circumstances: when the information is unrelated to any potential outcome, when it comes at a cost (time or money) and when it makes them feel worse to receive. Further to this, people will seek information even if that information is extremely negative or is linked to an aversive consequence.

1.2. Curiosity in an applied context

The field of curiosity research provides evidence that curiosity is a powerful motivator but most of these studies are concerned with general mechanisms. Thus far, the majority of studies that have examined curiosity in an applied context focus on the field of education. These studies tend to focus on using curiosity to improve students' academic performance and motivation to learn (Hulleman, Godes, Hendricks, & Harackiewicz, 2010; Tang & Salmela-Aro, 2021) or predictors of curiosity in students such as teacher characteristics (Rotgans & Schmidt, 2017). This thesis focuses on a different applied aspect — consumer behaviour — specifically, insect foods.

1.2.1. Curiosity and consumer behaviour

Curiosity has been previously examined within a consumer behaviour context, mainly in relation to advertising, and has been identified as a powerful marketing tool. Several studies have found that higher levels of curiosity towards a product or advertisement, through creating a knowledge gap, can lead to increased information-seeking and more favourable product or brand evaluations (e.g., Daume & Hüttl-Maack, 2020; Menon & Soman, 2002; Ruan, Hsee, & Lu, 2018). For example, Menon and Soman (2002) generated 3 advertisements for a novel product (a digital camera) with either a low, moderate or high knowledge gap. The moderate knowledge gap generated the highest levels of curiosity from participants resulting in greater levels of information seeking about the novel product and better product evaluations. This is in line with the inverted U hypothesis regarding curiosity where the optimum level of uncertainty would be the moderate information condition. Hill, Fombelle, and Sirianni (2016) also found that moderate levels of product information produce the highest levels of curiosity and that curiosity can both, directly and indirectly, affect purchase motivation. After giving participants the opportunity to purchase a mystery product, including a list of potential items they may receive (moderate information), they found that participants who were curious about the mystery product were more motivated to purchase as a direct effect of curiosity. They also found that when consumers shop in a curious state they felt more positive towards the experience and therefore were more likely to purchase. In other words, curiosity indirectly increased purchase motivation through positive evaluation. Daume and Hüttl-Maack (2020) used advertising to create a knowledge gap through the use of ambiguous advertising slogans, increased curiosity resulted in more favourable attitudes towards products. Further to this, Ruan et al. (2018) used ambiguous advertising where participants were asked to guess the brand being advertised compared to a control condition where the brand was advertised from the beginning. They found participants who were shown the ambiguous ads were more curious about the ads and this generated a positive effect on attitudes towards the brand. It is important to note that within the experiment curiosity was both elicited and resolved before attitudes were measured, suggesting that the positive effects remain even after curiosity has been resolved.

In addition to greater product evaluations and increased purchase motivations, curiosity has also been shown to affect purchase decisions. For example, curiosity when left unsatisfied can lead to a desire for reward prompting more indulgent choices (Wiggin, Reimann, & Jain, 2019). Using a writing task to induce incidental curiosity (participants were asked to write about something they were curious about) and a control task (writing about something they had done yesterday), Wiggin et al. (2019) showed that consumers who were curious were more likely to opt for an indulgent reward option (luxury gym membership gift card vs. non-indulgent regular gym membership gift card) compared to the control condition. Wang and Huang (2018) found a similar effect of curiosity on indulgent choices. Using a riddle task where participants were not provided the answers to leave curiosity unsatisfied, in a follow-up menu ordering task these participants chose more indulgent food compared to participants who were given the answer to the riddles (where curiosity was satisfied) or those who completed a control writing task. Consumers have also been shown to prefer an uncertain incentive over a certain one, even if the uncertain incentive is worse. They are also more likely to engage in repeat behaviours if accompanied by an uncertain incentive in which the curiosity evoked by the uncertain incentive is resolved after each repetition (Shen, Hsee, & Talloen, 2019). It is even suggested that curiosity may be strong enough to override potential regret associated with choosing an uncertain purchase option over a certain one (van Dijk & Zeelenberg, 2007).

Other than prompting indulgent food choices, curiosity has also been shown to influence novel food choices. Even from an early age curiosity is suggested to be a crucial factor in accepting novel foods. Sick, Højer, and Olsen (2019) investigated children's reasoning for accepting or rejecting foods. They found that when foods were unfamiliar children showed a high interest in tasting the novel foods and curiosity was an incredibly important contributing factor. The importance of curiosity continues into adulthood and applies to many different types of novel food. For example, when looking at acceptance of edible flora among consumers in Taiwan, Chen and Wei (2017) found that curiosity was one of the most important influences on attitude toward the edible flora. Similar results have been found for other novel food products. Tsimitri, Michailidis and Loizou (2018) looked at consumer acceptance of novel yoghurt in Greek and Cypriot samples. Curiosity about the taste of the yoghurt was the main driving factor behind consumer acceptance in both samples. Overall, the body of evidence on curiosity and consumer behaviour suggests a multifaceted role of curiosity within the consumer decision-making process, whereby curiosity has the potential to influence many different aspects of consumer behaviour. More specifically, that curiosity may be a key driver of consumers' willingness to try foods considered unusual or novel. One particular type of novel food that is commonly avoided due to its unusualness is insect foods, which is the focus of this thesis. However, thus far the relationship between curiosity and insect foods remains an under-examined concept.

1.3. Entomophagy

Entomophagy — the practice of eating insects — offers many environmental benefits over traditional animal-derived proteins (e.g., meat, eggs and fish). For example, their environmental impact in terms of harmful emissions is much lower and they provide a more efficient use of water consumption and grain resources (Gahukar, 2011; van Huis, 2013). Not only are insects as a food source more environmentally friendly, but they also boast several health benefits in comparison to traditional animal-derived proteins. Insects provide an excellent source of protein and vitamins, they have high nutritional value and are safer to consume in terms of diseases that are able to transmit between animals and humans (e.g., SARS-CoV-2) (Lombardi, Vecchio, Borrello, Caracciolo, & Cembalo, 2019).

1.3.1. The importance of exploring entomophagy

Climate change is a topic that none of us can ignore. Every day, each of us is faced with decisions where our choices have an impact on the world around us. Whether that be to take a reusable cup to the coffee shop or what to have for lunch, these decisions, though they may seem inconsequential, carry an environmental impact. Meat consumption has been increasing exponentially since the 1960s (González, Marquès, Nadal, & Domingo, 2020). Increases in population and urbanisation have led to increased demand for traditional animal-derived proteins, this level of demand is not sustainable and is a large contributor to global warming (Boland et al., 2013; González et al., 2020). Production of traditional animal-derived proteins for consumption has several environmentally damaging consequences. For example, the raising of livestock for human consumption produces high levels of greenhouse gases, ammonia emissions, water consumption and grain consumption for feeding (van Huis, 2013). A more sustainable alternative is necessary to reduce the level of environmental degradation currently imposed upon the planet, one option is to encourage people to explore more sustainable, novel protein sources such as insects.

1.3.2. Aversion to entomophagy

Although entomophagy may seem like a viable solution to the need for more sustainable protein sources, there are many Western societies that often regard the practice of entomophagy with aversion and disgust (La Barbera, Verneau, Amato, & Grunert, 2018). While the practice is not uncommon in some cultures and insects are an acceptable source of protein in some countries (e.g., Thailand, China, Australia), Western societies consider insects a novel food, not consumed as part of the traditional diet (van Huis, 2013). There have been several potential barriers to eating insects identified in the literature, for example, perceived taste, a lack of awareness of the benefits and social influence have all been identified as contributing factors to the acceptance of entomophagy (Lombardi et al., 2019; Motoki, Ishikawa, Spence, & Velasco, 2020; Tan, Fischer, van Trijp, & Stieger, 2016; Woolf, Zhu, Emory, Zhao, & Liu, 2019). Despite the barriers to the adoption of entomophagy, research suggests that previous experience with insects as a food source favourably increases perceptions of edible insects compared with prior expectations (e.g., Hartmann & Siegrist, 2016; Sogari, Menozzi, & Mora, 2018). This suggests that after the first experience, the initial aversion decreases and individuals are more willing to try insects again. This raises the question of how to encourage that first experience?

1.4. Curiosity as a motivator for entomophagy

Considering the evidence suggesting the strong motivational pull of curiosity (e.g., FitzGibbon et al., 2021) and the body of evidence suggesting the positive effect on consumer decision-making (e.g., Daume & Hüttl-Maack, 2020; Ruan et al., 2018), curiosity has the potential to be an effective motivator in encouraging people to try insect foods. Thus far, the impact of curiosity on entomophagy has only been studied in a limited capacity. To date, research stating the influence of curiosity on entomophagy tends to rely upon either, interviews focusing on asking participants what would influence them to try insect foods or general measures of attitudes towards insect foods. For example, House (2016) interviewed consumers who had previously purchased edible insect products and found that their main purchase motivation was curiosity towards the product. This was closely followed by the knowledge that insect foods are a more sustainable and healthy food source. Verbeke (2015) found similar results when examining consumers' readiness to adopt entomophagy, an interest in the environmental benefits of entomophagy increased the likelihood of acceptance by over 70%. Similarly, (Sogari, 2015) used open-ended questions regarding factors influencing the intention to try insect foods and found curiosity to be one of the most important factors. When looking at the characteristics of potential consumers of insect-based foods, Videbæk and Grunert (2020) suggest that to engage in entomophagy and overcome the associated disgust an interest in entomophagy is paramount. Caparros Megido et al. (2016) conducted a questionnaire before a tasting session so participants responses were recorded just before trying insect food. Participants reported feeling curiosity towards insect foods above preconceptions of fear and disgust. Insects as a food source represent a unique challenge in comparison to other consumer behaviours or novel foods. The main preconception to food containing insects tends to be disgust and this is driven by the misconception that insects are a pathogen risk which leads people to engage in avoidance behaviours (Jensen & Lieberoth, 2019). Therefore, in order to overcome such an entrenched preconception of insect foods, a powerful motivator able to suppress disgust and promote exploratory behaviour is needed. The evidence suggests that curiosity has the potential to provide this powerful form of motivation to encourage entomophagy but at present it is lacking in-depth, systematic investigation.

1.5. This Thesis

The aim of this thesis is to shed light on the potential role of curiosity in the willingness to engage in exploratory eating behaviours. In order to examine this, the first paper explores whether curiosity predicts the willingness to try novel foods, specifically, insect foods. Curiosity is thus far, an under-explored but potentially well-placed motivator for encouraging entomophagy. Other studies have found that curiosity is somewhat involved in the decision to try insect foods (e.g., House, 2016; Verbeke 2015). These studies tend to rely on qualitative interviews or using general measures of interest in entomophagy, this paper differs from these in that it used a wide set of images and a comprehensive rating task including many key predictors identified in the literature (see the papers literature review), in order to systematically establish the role of curiosity as a key predictor of the willingness to try insect foods. After establishing curiosity as a predictor of willingness to try insect foods over and above many other previously identified factors, the next two studies manipulate aspects of curiosity to understand if this affects the willingness to try edible insects.

The second study focuses on the manipulation of interest to encourage the willingness to try insect foods. This study aimed to increase interest in insect-based foods using a utility-value intervention. Often used in educational research, a utility-value intervention is an interactive activity (e.g., an essay including self-generation of personal relevance) designed to foster interest and perceived value (personal relevance and connection) in a topic (e.g., Gaspard et al., 2015; Hulleman et al., 2010). Entomophagy research suggests that increasing interest and information gain about the benefits may be one way to overcome the initial reaction of disgust towards insect foods (House, 2016; Lombardi et al., 2019). Across two experiments (each with a one-month follow-up), we examined whether an intervention such as this could increase willingness to try insect foods compared to a control condition.

Last is the examination of whether uncertainty affects people's choices to eat insects. Resolving uncertainty and gaining information is said to be part of a rewarding feedback loop of curiosity (Murayama et al., 2019), even when the stimuli may be considered aversive (Hsee & Ruan, 2016). This study uses a gambling task with varying probabilities of receiving an insect snack or a familiar snack as the outcome. Uncertainty is manipulated in the varying probabilities of eating an insect snack. Participants were free to engage in any of the available gambles as little or often as they wished and their gambling choices were recorded. Further to the previous studies which examine the intention to try, this study goes one step further by providing edible insects as outcomes to the gambling task and asking participants to eat the snacks as a result of the gamble. The following three chapters report these studies in further detail.

Chapter 2. Paper 1: Curious to eat insects? Curiosity as a Key Predictor of Willingness to try novel food

Abstract

Entomophagy – the consumption of insects – is often rejected by Western society despite its benefits over traditional animal-based proteins. While several factors have been identified as potential predictors of people's willingness to try insect foods, this study introduced an under-explored factor: curiosity, which is a powerful motivator of behaviour that can overcome negative emotions and motivate us to seek new experiences. In two experiments (Ns = 240 and 248), participants (all UK residents, 99.6% British citizens) rated a number of food dishes, half of which contained insects, on a number of factors including curiosity and willingness to try the dish. Across both studies, curiosity predicted willingness to try both insect and non-insect foods above and beyond other factors. Furthermore, we unexpectedly (but consistently) observed a "curiosity-boosting effect" in which curiosity positively interacted with other predictors, increasing their effect on willingness to try insect foods, but not familiar foods. These findings suggest that curiosity promotes the willingness to try insect food in two different manners: A direct effect (above and beyond other factors) and a boosting effect.

Keywords: Curiosity; entomophagy; willingness to try; insects; novel foods; consumer behavior

2.1 Introduction

Traditional animal-derived proteins such as meat, eggs and fish make up approximately 40% of the protein consumed by the global human population and as the population continues to grow this is set to increase (Boland et al., 2013). For some time now, there have been growing concerns that this level of demand is not sustainable, and the increased consumption is contributing to degradation of the environment (Boland et al., 2013; Gahukar, 2011; Thavamani, Sferra, & Sankararaman, 2020; van Huis, 2013). The production of traditional animal-derived protein has several harmful side effects including greenhouse gas and ammonia emissions, high levels of water consumption and an increased demand for grain and livestock feed with high levels of protein (van Huis, 2013). Therefore, there is a pressing need for more sustainable alternatives.

Entomophagy (the practice of eating insects) is one promising avenue to explore as an alternative to traditional animal-derived proteins. In many cultures (e.g., Australia, Thailand, Mexico, China, Ghana) entomophagy has provided a staple source of protein for centuries (Gahukar, 2011). There are many potential benefits to adopting entomophagy, compared to traditional animal-derived protein. Insect-based foods boast a lower environmental impact in terms of greenhouse gas and ammonia emissions, water consumption, as well as a more efficient use of grain resources. They are often higher in nutritional value than traditional protein sources and are potentially safer to consume in terms of cross-species transmission of diseases (Gahukar, 2011; Lombardi et al., 2019; van Huis, 2013).

However, there are also several barriers to adopting insect-based foods, particularly in Western cultures. In fact, previous literature has shown that some factors such as perceived sensory attributes, feelings towards insect foods and lack of awareness of their benefits are associated with consumer's willingness to eat insect foods (Cicatiello, De Rosa, Franco, & Lacetera, 2016; Jensen & Lieberoth, 2019; Woolf et al., 2019). The present study extends the existing literature by exploring the role of curiosity – a critical but to date overlooked factor – in promoting consumer willingness to try insect foods.

2.1.1 Factors influencing consumption of insect foods

Despite the many benefits of adopting entomophagy, it is still considered a food taboo in Western cultures (van Huis, 2013), mainly due to the deeply entrenched views of insects as pests and the associated disgust. Recently there has been a growing body of research dedicated to understanding the factors that predict acceptance of insect-based foods. These factors are discussed below.

2.1.1.1 Consumers' expectations and attitudes towards insect foods

Consumers' expectations and attitudes associated with insect foods are key factors that influence willingness to try. These expectations tend to be negative, particularly in regard to taste. In a study of people's attitudes towards novel foods, participants tasted burgers that were labelled as containing unusual ingredients (lamb brain, frog meat and mealworms) as well as a beef-only burger (Tan et al., 2016). No novel ingredients were actually used – the patties all contained varying ratios of beef and plant-based material for sensory variation. Importantly, before trying the burgers, participants expected those with novel ingredients including insects to be less tasty than the beef-only burger (see also Tan, Tibboel, & Stieger, 2017). After tasting, participants increased their sensory liking of novel burgers to a level similar to the beef-only burger. Along with expectations of taste, appearance is also important for the sensory liking of a product. In an experimental tasting study, participants tasted burgers containing beef, insect and plant-based materials (Caparros Megido et al., 2016). Each burger was presented to participants randomly with only a number for identification. Both appearance and taste were important predictors of overall liking of the burgers. Similarly, Cicatiello et al. (2016) administered a survey with 5 accompanying pictures of insect food dishes to assess potential barriers to entomophagy in Italy. Appearance was suggested to be the most pervasive barrier, with perceived taste also being identified as another barrier. They also found that familiarity with foods from other countries was positively associated with willingness to try insect foods.

The practice of eating insect foods is often met with disgust and revulsion in Western cultures (La Barbera et al., 2018). Disgust has been shown to be a recurring and pervasive barrier across several studies investigating the potential barriers to eating insect foods (Ruby & Rozin, 2019; Sogari, Bogueva, & Marinova, 2019). La Barbera et al. (2018) investigated the effects of disgust on people's willingness to try a chocolate bar containing crickets. Disgust was found to be the highest contributor of the intention not to eat the chocolate bar. Similarly, Jensen and Lieberoth (2019) found that disgust predicted tasting behaviour of mealworms in a surprise tasting session. However, they also found that disgust was not a consistent predictor of willingness to eat and that the disgust factor may be driven by social norms and the perception of insects being an inappropriate food source. This may explain the discrepancy between participants' intentions and their actions in the tasting session – 27.5% of participants who said they would not eat insects actually tried mealworms when offered. The change in behaviour was explained by a change in perceived social norms during the tasting session.

2.1.1.2. Appropriateness, experience and familiarity

Perceptions of the appropriateness of an ingredient within a product can affect people's willingness to try novel foods. It has been suggested that novel ingredients are seen as more acceptable for consumption if they are included in a product that is perceived as appropriate to contain novel ingredients. For example, insect-based pasta was perceived as more acceptable than an insect-based chocolate bar (Lombardi et al., 2019). Even after tasting a novel product and overcoming negative sensory expectations, the level of food appropriateness may still remain below that of food made with familiar ingredients (Tan et al., 2016). Food appropriateness has also been linked to familiarity and sensory liking of a product. For example, Tan, Verbaan, and Stieger (2017) presented participants with mealworm products that were considered appropriate (meatball) or inappropriate (dairy drink) – the participants were questioned on aspects of the products before and after the tasting. The study found that meatballs were seen as the more appropriate product and this had a positive effect on sensory liking. Meatballs were also rated higher on familiarity.

Past experience or familiarity with insect foods has been shown to modify people's expectations and attitudes. A recent survey study found that people's reported willingness to consume insects was highly dependent on their familiarity with the concept of insects as a food source (Woolf et al., 2019). Perceptions of both unprocessed (whole insects cooked or used as ingredients) and processed (insects processed to form other products such as cricket flour) insect food products have been found to be more favourable after tasting compared to prior expectations (Sogari et al., 2018). Similarly, Tan et al. (2016) found that after tasting, participants rated the taste of burgers labelled as containing unusual ingredients, including insects, as highly as beef-only burgers, despite low prior expectations. This appears to be a consistent finding across entomophagy research.

Therefore, encouraging individuals to try insect foods may change their perceptions and attitudes, which raises the question: How can this first experience be encouraged? One possibility is that a single positive experience with entomophagy may encourage future consumption. Along this line, Hartmann and Siegrist (2016) found that a tasting experience using processed insects increased willingness to try unprocessed insects. Specifically, study participants were presented with tortilla chips made with either corn flour or cricket flour and were also asked to rate their willingness to eat unprocessed insects accompanied by pictures. Eating the tortilla chips made with cricket flour increased participants' willingness to eat unprocessed insects. Therefore, one potential route to adoption of entomophagy is to find a motivator to foster an initial positive tasting experience and thus increase familiarity. This is what our study aims at achieving.

2.1.1.3. Perceived benefits of insect foods

Beliefs about the benefits of insect foods have been shown to play a role in people's willingness to pay for insect-based foods. Lombardi et al. (2019) looked at the influence of environmental and health benefits on willingness to pay for different food products containing mealworms (pasta, cookies and a chocolate bar) in comparison to their traditional counterparts. In the first round of testing, participants were given general information regarding the products (such as the type of insect used in the ingredients), while in the second round they were given information either on the health benefits or the environmental benefits. When presented with the benefits of entomophagy, willingness to pay for all products containing insects rose to a similar level to that of their traditional counterparts. Communication of both health and environmental benefits increased the willingness to pay for insect food products, with health benefits showing a slightly larger impact than environmental benefits. Awareness of the health and environmental benefits of insect foods was also found to be an important predictor of willingness to consume insects in a recent survey study (Woolf et al., 2019). Therefore, consumers' beliefs about the health and environmental benefits associated with eating insects are another factor influencing insect food consumption.

2.1.1.4. Contextual influences

The context in which insect foods are consumed may contribute to people's willingness to eat them. Increased willingness to try insects has been associated with social contexts such as 'in a pub' or 'at a food festival' as well as simply 'being with friends' (Motoki et al., 2020), suggesting that there may be a role for social influence in supporting consumption of insects. Similarly, Jensen and Lieberoth (2019) found that perceived social norms predicted people's likelihood to try mealworms even when they had reported that they would not eat insects. Despite these reported positive social effects, Sogari (2015) found that the majority of participants felt their friends and family would not look upon entomophagy favourably, and this was a potential significant barrier to introducing insect foods into peoples' diets.

2.1.1.5. Individual differences

Finally, individuals differ in their willingness to eat novel foods more generally. Food neophobia is characterised as an unwillingness to try new foods (Pliner & Hobden, 1992) and is therefore an important factor to consider in the intention to eat novel foods such as insects. La Barbera et al. (2018) found that food neophobia made a significant contribution to the intention to eat along with disgust. Trait-level disgust sensitivity has been shown to be linked to food neophobia, some studies suggest that this is an important predictor of willingness to try some types of insect foods (e.g., chocolates with insects), explaining additional variance in willingness to consume insects on top of food neophobia (Ammann, Hartmann, & Siegrist, 2018). It has been found that disgust sensitivity is positively correlated with food neophobia (Bjorklund & Hursti, 2004). Many other studies have measured individual differences in food neophobia, and the majority found that higher levels of food neophobia significantly reduced an individual's willingness to try novel foods in general (Piha, Pohjanheimo, Lähteenmäki-Uutela, Křečková, & Otterbring, 2018; Sogari, Menozzi & Mora, 2019; Tan et al., 2016). Alongside food neophobia, food variety seeking tendencies should also be considered. Food variety seeking is another individual difference factor, which has been defined as a tendency to seek variety, motivated by preferences for new experiences resulting in a variation of the types of food consumed (Van Trijp & Steenkamp, 1992). While some see food neophobia and food variety seeking as two sides of the same coin (Steenkamp, 1993), others suggest that these concepts should be considered separately due to the underlying differences in risk preference and motivation (Lenglet, 2018). Lastly, individual differences in food involvement (the level of importance food holds in one's life) may also impact willingness to try new foods (Bell & Marshall, 2003). Not only is a higher level of food involvement suggested to increase willingness to try new foods, it is also suggested that these consumers may experience sensory differences more acutely (Bell & Marshall, 2003). Individuals with higher levels of food involvement have been shown to engage in local food culture when visiting destinations as tourists (Kim, Eves, & Scarles, 2013). Overall, this body of research suggests that individual differences on food preference, especially food neophobia, food variety seeking, and food involvement, may play a critical role in explaining people's willingness to try novel foods such as insects.

2.1.2. Curiosity as a motivator

As mentioned earlier, one previously under-examined factor that has the potential to motivate the first tasting experience is curiosity. Curiosity is an enticing feeling, characterised by awareness of a knowledge gap which can elicit a need to seek information in order to close that gap (Loewenstein, 1994). It is an important driver of novel and exploratory behaviours (Gottlieb et al., 2013); hence, curiosity is well positioned to motivate the first – novel – experience with insect foods. Decisions to engage in novel behaviours are thought to be driven by the intrinsic reward associated with learning new information about the environment and can kickstart a positive feedback loop of trying new things (Murayama et al., 2019).

The power of curiosity is such that people are even willing to expose themselves to aversive stimuli. People choose to view negative images over neutral or positive images and will risk electric shocks or unpleasant sounds to satisfy their curiosity (Hsee & Ruan, 2016; Oosterwijk, 2017). This enticing power of curiosity is seen even for information that could be considered trivial. When shown magic tricks, individuals were willing to accept a gamble that could result in an electric shock to see the solution to the trick. Curiosity predicted the decision to accept the gamble above and over the probability of receiving a shock (Lau et al., 2020). FitzGibbon et al. (2021) allowed participants to seek information about what they could have won in a risky decision-making task. Across 6 experiments, the study found that individuals would seek this information even if it came at a cost. Importantly, this information was of no value to participants in the future and made them feel worse to receive; nevertheless, participants still chose to seek it. This body of research suggests that curiosity may be of use as a motivator even in expectation of aversive experiences (FitzGibbon et al., 2020).

There have been a few studies that examined the role of curiosity in consumer behaviour. For example, Menon and Soman (2002) used varied levels of information in an advertisement for a novel product. They found that higher levels of curiosity resulted in increased information-seeking behaviours and more favourable product evaluations. In a more recent study, Daume and Hüttl-Maack (2020) created information gaps by providing selective information in advertisements and used ambiguous slogans to study the effects of curiosity on attitudes towards products. They showed that these curiosity inductions had a positive impact on participants' attitudes towards the advertised product. What is more, Ruan et al. (2018) found that this positive influence was evident even after curiosity has been resolved, thus suggesting an enduring power of curiosity to influence attitudes and behaviours even after the initial thirst for knowledge has been quenched. These studies empirically demonstrated curiosity's potential as a motivating factor to facilitate consumer behaviour.

However, the role of curiosity has not been systematically examined in the context of entomophagy. In fact, although some studies report the importance of curiosity, they are either qualitative studies relying on content from participant interviews or tend to capture a general measure of interest towards entomophagy and use this to predict people's intention to try insect foods. For example, a survey of Danish consumers, designed to understand the consumer characteristics of potential adopters of entomophagy, suggested that increased interest in entomophagy may be important in overcoming the barrier of disgust (Videbæk & Grunert, 2020). This is particularly important in terms of the initial motivation to engage with insect foods (e.g., CaparrosMegido et al., 2016; House, 2016). House (2016) conducted interviews with consumers, who had previously purchased insect-food products. They report that the main initial motivation for purchasing is curiosity, followed by insect foods being seen as more sustainable and healthy food options. Similarly, Sogari (2015) also found that curiosity was one of the most important factors, together with social influence from friends and family members, in initiating consumption of insects. This again was self-reported intention using content from open-ended questions. These findings suggest that curiosity has the potential to be the initial trigger for willingness to try, whereas other factors (e.g., social influence) may play a role in maintaining that consumption.

2.1.3. The present study

Across two studies we examined the role of curiosity predicting willingness to try insect foods in a European sample. To examine the role of curiosity in a systematic manner, the current research has several features that aim to overcome the limitations of the existing literature. First, we assessed and included a number of potential predictive factors (e.g., perceived sensory attributes, attitude, healthiness, sustainability, exoticness, familiarity, and social influence) in the study design so that we can identify the unique effect of curiosity above and beyond these factors in predicting willingness to try insect foods. Such a statistical control would provide us with a more accurate assessment of its predictive utility. Second, we selected a large number of food pictures and descriptions of insect foods to ensure the generalizability of our findings across different types of insect foods. This stimuli-related approach is an improvement compared to previous research, which uses survey questions, taste tests, or a combination of these to examine potential predictors (e.g., Tan et al., 2016; Woolf et al., 2019). Even those that have used visual stimuli have tended to use a very small sample of images (e.g., Cicatiello et al., 2016). Using a large number of diverse images ensures that our findings are not bound to a specific type of insect food. Third, by using a larger number of stimuli, the design also allowed us to examine the "within-person" relationship between curiosity and willingness to try insect foods. Most of the previous non-experimental studies on insect foods examined the factors related to insect foods at a between-person level. However, such a between-person analysis is limited in its ability to address the within-person relationships that we are typically interested in (Murayama et al., 2017). Specifically, while between-person analysis focuses on the relative rank of individuals (i.e., are people who showed higher willingness to try different from other people in terms of factor X?), within-person analysis focuses on the relative rank of foods within a given person — does a person indicate higher willingness to try for the foods that are higher on factor X as well? The current study focused on within-person analysis because our primary research question is the latter. Finally, we compared the results on insect foods with those on familiar foods, with the aim to clarify the factors that are specific to insect foods. To make a reasonable comparison between insect and familiar foods, we attempted to control for visual appearance by using images of familiar foods visually matched to the selected insect food images in Study 1 and identical images with differing descriptions in Study 2. All of these methodological features allow us to comprehensively and rigorously examine the role of curiosity and other factors in predicting the willingness to eat insect foods.

In both studies, participants completed an online menu evaluation task, in which they had to rate a series of images on the potential predictors (e.g., curiosity, familiarity, attractiveness). The task presented the images in the style of a restaurant 'specials board' with an accompanying description. Study 1 used images collated from the internet, with half of the images containing insects and the other half visually matched familiar foods. Study 2 used the same images for both insect and familiar foods varying only the descriptions. Images were selected from a pre-existing database (Kawano & Yanai, 2015) and none of the depicted foods actually contained any insect ingredients. Each image had two accompanying descriptions (one containing familiar ingredients and the other containing insect ingredients). Participants were presented with a selection of the images, half with familiar descriptions and half with descriptions containing insects, allowing the visual input to be kept constant.

2.1.3.1. Hypotheses

Our main hypothesis was that curiosity predicts within-person variation of consumer's willingness to try insect foods, above and beyond other factors (Hypothesis 1). In our exploratory analysis of the first study (Study 1), we also found an interesting phenomenon, namely, that curiosity interacts with other factors in a way that increases the effects of these factors on willingness to try insect foods. Consequently, Study 2 tested this novel "curiosity-boosting effect", in addition to the main hypothesis (Hypothesis 1). More specifically, we hypothesised that curiosity strengthens the association between willingness to try and other predictors of insect food consumption (Hypothesis 2).

2.2 Study 1

The study aimed to examine whether and how within-person variation of curiosity for insect foods predicts people's willingness to eat them above and beyond other factors identified in the existing literature. In addition, we also examined in an exploratory fashion (1) whether and how curiosity interacts with other factors to predict people's willingness to eat insect foods, and (2) whether individual differences in these effects can be explained by some curiosity-related traits for foods such as neophobia, variety seeking and involvement.

2.2.1. Method

2.2.1.1. Participants

Two hundred and forty participants took part in the study (65% females, Mean Age = 35.24 Age *SD* = 12.80). Recruitment was conducted online using Prolific academic (https://www.prolific.co). Only participants without dietary or allergy restrictions and of

Western nationality were eligible to take part in the study. All participants were required to sign an online consent form and were financially rewarded £5 for their time. Of the 250 individuals recruited, 10 were excluded prior to data analysis on the basis of incomplete data due to technical issues. All participants resided in the UK (99.6% British citizens, 0.4% Polish citizens). The recruited sample size was mainly defined by budgetary considerations. This sample size is sufficient to detect an effect size of $d = 0.18$ at 80% power for the main analysis. This was determined by conducting a sensitivity power analysis following the method suggested by Murayama, Usami, and Sakaki (2020) for calculating sample sizes for nested data in mixed-effects modelling and using their accompanying app (https://koumurayama.shinyapps.io/summary_statistics_based_power/). Ethical approval was granted by the University of Reading School of Psychology and Clinical Language Science's School Ethical Review Committee.

2.2.1.2. Stimuli

A database of 42 dishes containing various types of edible insect were collated from the internet. To ensure variety, the images included as many different types of edible insects as possible. A set of 42 images with familiar ingredients were then selected based on visual similarity to the novel foods. The insect food images were run through Google's reverse image search function and the closest match was selected, resulting in 42 pairs of visually matched images of insect and non-insect foods. Menu names and descriptions for each image used are available via the Open Science Framework (https://doi.org/10.17605/OSF.IO/5F9SP). Example stimuli can be seen in Figure 1.

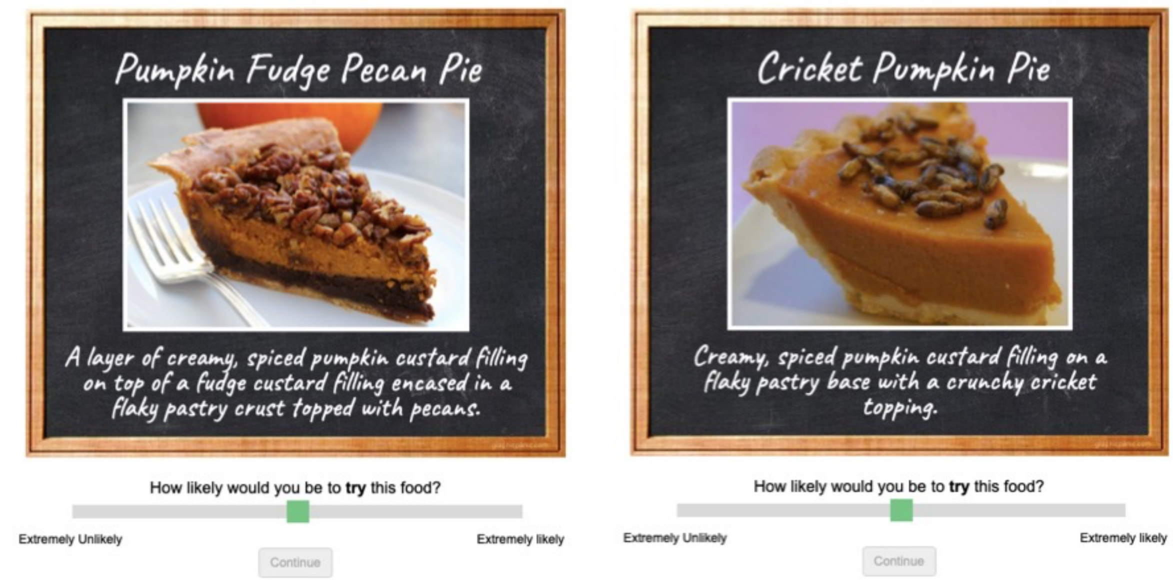

Figure 1. Example stimuli used in Study 1 (visually matched image pair, titles and descriptions).

2.2.1.3. Questionnaire measures

The Food Neophobia scale (Pliner & Hobden, 1992) was used to measure participants' reluctance to try novel foods. The scale consisted of 10 items, for example (e.g., "If I don't know what a food is, I won't try it"). Five items from the VARSEEK scale (Van Trijp & Steenkamp, 1992) were used to assess variety seeking behaviour in relation to food (e.g., "I think it is fun to try out food items one is not familiar with"); three items of the original scale (items 5, 7 and 8) were excluded due to high levels of similarity with other questionnaire items. One item from the Food Involvement scale (item 8) measured food involvement (e.g., "When I eat out, I don't think or talk much about how the food tastes") (Bell & Marshall, 2003) was also included. All questions were rated on a 5-point Likert scale ranging from "Strongly Disagree" (0) to "Strongly Agree" (4).

2.2.1.4. Procedure

Participants were asked to take part in a 'Menu Study', in which they were presented with a 'specials board' similar to what one might expect to find in a restaurant. This board contained a picture of a dish including a title and short menu description. For each participant, 22 pairs of images were randomly selected from the stimulus pool and these images were presented in a randomized order as 44 separate dishes. This random selection procedure was used to reduce the potential effect of item specific effects (Murayama, Sakaki, Yan, & Smith, 2014).

Participants rated each dish in response to the following 12 questions (including scale anchors): (1) Willingness to try ("How likely would you be to try this food?"; Extremely unlikely – Extremely likely); (2) Curiosity ("How curious are you about this food?"; Not at all curious – Extremely curious); (3) Attitude ("How do you feel about this food?"; Extremely negative – Extremely positive); (4) Tastiness ("How tasty do you think this food would be?"; Extremely disgusting – Extremely tasty); (5) Familiarity ("How familiar is this food to you?"; Extremely unfamiliar – Extremely familiar); (6) Attractiveness ("How attractive do you think this food looks?"; Extremely unattractive – Extremely attractive); (7) Healthiness ("How healthy do you think this food is?"; Extremely unhealthy – Extremely healthy); (8) Sustainability ("How sustainable do you think large scale production of this food would be?"; Extremely unsustainable – Extremely sustainable), (9) Exoticness ("How exotic do you think this food is?"; Not at all exotic – Extremely exotic); (10) Filling ("How filling do you think this food would be?"; Not at all filling – Extremely filling); (11) Social ("How do you think your friends would feel about you trying this food?"; Extremely unimpressed – Extremely impressed); and (12) Willingness to pay ("How much would you be willing to pay for this food in a restaurant?"). Ratings to the first 11 questions were given using a visual analogue scale with anchors at each end, which allowed us to assess participants' ratings on a continuous scale of 0 to 100, whereas £1–£100 was used for willingness to pay and participants were asked to type a value from £1–£100 into a text box. For each dish, Willingness to try was always presented first to avoid possible priming effects of other questions, and willingness to pay was always presented last; the order of the remaining questions was randomised across participants so that each participant answered the questions in a fixed order across trials, but the order varied between participants. Once the rating task was complete, participants were presented with the 44 images they had previously rated and were asked to indicate whether they had "tried the exact dish before", "tried something similar" or "never tried anything like this before". Lastly, participants were asked to complete the Food Neophobia scale followed by the VARSEEK scale and finally the food involvement question.

2.2.1.5. Data Analysis

Data was analysed in R (R Core Team, 2020) using the lme4 package (Bates, Maechler, Bolker, & Walker, 2015). Linear mixed-effects models were estimated to predict willingness to try from the measured predictors for insect foods and non-insect foods separately at the within-person level. The same strategy was applied to examine the effects of the individual difference measures.

2.2.1.5.1 Model specification

All predictors were included as fixed effects with random participant slopes. Random intercepts of participants were also included. To resolve convergence and singularity issues models were simplified first by setting all of the random effect covariances to zero. After this, random effect structures were further simplified by removing the minimum number of predictors for the model to converge normally. For models looking at interactions between curiosity and other predictors, only the interaction term was included as a random effect and some of the models were restarted from a previous fit increasing the number of iterations to resolve convergence issues. Although this is not a standard way of specifying such a model, recent work has suggested that this strategy can prevent the potential inflation of Type-1 error rate in testing the interaction effect even when the model is very complex (Brauer & Curtin, 2018). A similar strategy was applied to the three-way interaction models looking at the interactions between curiosity, other predictors and insect or non-insect food images. Only the interaction term was included as a random effect and models were restarted from previous fits. The exception to this was the three-way interaction including the predictor ‘filling’, this model does not include the interaction term as a random effect due to convergence issues. For individual difference measures, only curiosity was included as a random effect, and for some models the number of iterations were increased, and the models restarted from a previous fit.

For the following analyses, the predictors were all mean-centered by subject (i.e., centering within clusters) in order to appropriately examine within-person relations by controlling for individual differences in response bias. Before the analysis, all variables were rescaled from 0 – 100 to 0 – 10 to aid model fitting. Willingness to pay was removed from the analysis as we discovered that it seemed to simply reflect the price of the dishes/ingredients rather than the motivation to eat the dishes which is of main interest within these studies.

Because some correlation between the predictors would be expected, we checked each model for multicollinearity using the variance inflation factor (VIF). Following Tattar, Ramaiah, and Manjunath (2016), we used a benchmark value of 10 for the VIF as the cut-off for problematic levels of multicollinearity. Models with VIF values less than 10 were deemed unproblematic.

2.2.2 Results

2.2.2.1. Previous experience

Overall, participants reported not having tried the majority of the insect dishes or anything similar previously. For familiar foods, the proportion of having tried either the exact dish or something similar was much higher.[1] The overall mean percentages for each response

[1] Mixed-effects models were conducted using only participants who reported not having tried the insect dishes previously ($N = 204$) for insect and non-insect stimuli. The results for insect foods showed a very similar set of significant predictors to the full sample, the only difference being how filling the food was perceived to be became

are represented in Table 1. Due to technical issues, only 233 participants were able to respond to the previous experience questions.

Table 1.
Mean percentages of previous experiences with dishes presented for insect and non-insect foods.

	Insect	Not Insect
Tried the exact dish before	1%	46%
Tried something similar	10%	35%
Never tried anything like this before	89%	19%

2.2.2.2. Descriptive statistics

Overall mean ratings for the majority of measures were higher for non-insect food compared to insect foods, indicating that insect foods were generally perceived less favourably than non-insect foods. The mean for Willingness to try also followed this pattern: M = 1.63, SD = 1.83 for insect foods; M = 7.41, SD = 1.35 for non-insect foods. Intraclass correlations were conducted to indicate the proportion of between-person variance. The intraclass correlations were higher for insect foods compared to non-insect foods, suggesting there was a larger variance in mean values for insect foods across individuals (see Table 2). A within-person correlation matrix (correlation between the variables after controlling for between-person differences; see Kenny & La Voie, 1985) for both insect and non-insect ratings are included in the supplementary material (Tables S1 and S2).

a significant predictor in this reduced sample analysis. For non-insect foods the significant predictors of willingness to try were identical to the main analysis.

Table 2.
Mean ratings and Intraclass correlations (ICC) for insect and non-insect dishes in Study 1.

	Insect		Not Insect	
	Mean (*SD*)	ICC	Mean (*SD*)	ICC
Willingness to try	1.63 (1.83)	0.46	7.41 (1.35)	0.16
Curious	3.03 (2.54)	0.59	4.88 (2.01)	0.38
Attitude	1.84 (1.67)	0.48	7.04 (1.23)	0.18
Tasty	2.39 (1.91)	0.48	7.40 (1.18)	0.18
Familiar	1.20 (1.12)	0.34	7.01 (1.27)	0.17
Attractive	2.28 (1.59)	0.30	6.93 (1.15)	0.15
Healthy	4.58 (1.68)	0.31	5.15 (1.10)	0.10
Sustainable	5.17 (2.19)	0.54	6.13 (1.54)	0.36
Exotic	6.48 (2.45)	0.57	3.63 (1.66)	0.32
Filling	4.37 (1.77)	0.35	6.59 (1.07)	0.16
Social	3.91 (2.74)	0.68	5.50 (1.94)	0.51

Note. SD was computed using the entire data points.

2.2.2.3. Curiosity predicts willingness to try

We conducted mixed-effects models for insect and non-insect stimuli separately to examine which variables were significant predictors of the willingness to try for each type of food. Curiosity, the variable of our primary interest, predicted willingness to try both insect foods ($\beta = 0.10$, $p < .001$) and non-insect foods ($\beta = 0.09$, $p < .001$) above and beyond the other factors in the model, thus supporting Hypothesis 1. For insect foods, all factors apart from exoticness, sustainability and how filling the food was perceived to be, were significant predictors of willingness to try. For non-insect foods, the significant predictors were fewer (attitude, tastiness, curious, familiarity, and exoticness). Across both insect and non-insect food models, attitude and tastiness were the two strongest predictors of willingness to try: $\beta = 0.43$ & 0.21, *ps* < .001 for insect foods; $\beta = 0.55$ & 0.40, *ps* < .001 for non-insect foods, with curiosity being the 3rd strongest predictor overall[2]. Both insect (*VIF* = 1.02 – 1.10) and non-

[2] At the request of a reviewer, we have also conducted a set of analyses predicting willingness to try from all predictors at between-person level. More specifically, we focused on the ratings for the first image participants were presented (in order to control for any carry-over effect) and conducted multiple regression analyses using the rating scores. The results (Tables S3, S4 and S5) did not replicate the within-person analysis well, although there is some overlap. However, it is important to interpret these results with caution as (1) the between-person analysis does not adequately control for individual differences to infer psychological mechanisms (Murayama et al., 2017), and (2) the analyses focused only on the first-item, meaning that the analyses are based on less reliable observed scores.

insect (*VIF* = 1.05 – 1.43) models were checked for multicollinearity and this was not found to be an issue. Model results are shown in Table 3.

Table 3.
Mixed-effects modelling predicting willingness to try for insect and non-insect data for Study 1.

	Insect					**Not Insect**				
	Fixed Effects									
Predictors	*Est.*	*SE*	*CI*	*t*	*p*	*Est.*	*SE*	*CI*	*t*	*p*
Intercept	1.63	0.12	1.40 – 1.86	13.79	**<0.001**	7.41	0.09	7.24 – 7.58	85.25	**<0.001**
Curious	0.10	0.02	0.06 – 0.13	5.66	**<0.001**	0.09	0.01	0.06 – 0.11	6.23	**<0.001**
Attitude	0.43	0.03	0.38 – 0.49	16.57	**<0.001**	0.54	0.02	0.50 – 0.58	26.26	**<0.001**
Tasty	0.21	0.02	0.17 – 0.25	9.36	**<0.001**	0.40	0.02	0.36 – 0.44	19.75	**<0.001**
Familiar	0.06	0.02	0.02 – 0.09	3.35	**0.001**	0.09	0.01	0.06 – 0.11	7.18	**<0.001**
Attractive	0.05	0.01	0.03 – 0.07	4.26	**<0.001**	0.01	0.01	-0.02 – 0.03	0.50	0.615
Exotic	0.00	0.01	-0.01 – 0.02	0.55	0.581	-0.03	0.01	-0.05 – -0.01	-2.91	**0.004**
Filling	-0.01	0.01	-0.03 – 0.00	-1.87	0.062	-0.01	0.01	-0.03 – 0.01	-1.05	0.293
Healthy	-0.01	0.01	-0.03 – -0.00	-2.18	**0.029**	-0.01	0.01	-0.02 – 0.01	-1.10	0.270
Sustainable	0.01	0.01	-0.00 – 0.03	1.58	0.114	0.01	0.01	-0.01 – 0.04	1.20	0.229
Social	0.03	0.01	0.00 – 0.05	2.12	**0.034**	-0.02	0.01	-0.04 – 0.01	-1.47	0.141
	Random Effects									
			Variance		*SD*			*Variance*		*SD*
Subject (Intercept)			3.33		1.82			1.75		1.32
Curious | Subject			0.03		0.18			0.02		0.13
Attitude | Subject			0.08		0.28			0.03		0.19
Tasty | Subject			0.06		0.25			0.03		0.16
Familiar | Subject			0.02		0.14			0.01		0.10
Attractive | Subject			0.01		0.10			0.01		0.09
Exotic | Subject			–		–			0.00		0.05
Filling | Subject			0.00		0.03			0.00		0.06
Healthy | Subject			–		–			0.00		0.03
Sustainable | Subject			–		–			0.00		0.07
Social | Subject			0.01		0.09			0.00		0.05
	Model Fit									
R^2			*Marginal*		*Conditional*			*Marginal*		*Conditional*
			0.29		0.86			0.63		0.84

p-values computed using Wald-Statistics approximation.

Model equation example (Insect model):
Willingness to try ~ Attractive + Familiar + Exotic + Attitude + Filling + Healthy + Sustainable + Tasty + Social + Curious + ((1 | subject) + (0 + Attractive | subject) + (0 + Familiar | subject) + (0 + Attitude | subject) + (0 + Filling | subject) + (0 + Tasty | subject) + (0 + Social | subject) + (0 + Curious | subject))

2.2.2.4. Interactions with curiosity

To further examine the potential role of curiosity in willingness to try insect foods, we conducted exploratory analyses in which interactions between curiosity and other predictors were estimated. To reduce model complexity, insect and non-insect data were analysed in separate models and only one interaction effect was tested for each model. Specifically, each model included all predictors and the interaction of interest as fixed effects, and we ran the model for each of 9 (predictors of interest) x 2 (insect food and non-insect food) = 18 combinations.

Interaction effects from each of these models are represented in Table 4. The overall pattern suggests that when there is a significant interaction between curiosity and another predictor, curiosity moderates the relationship in opposite directions for insect and non-insect foods. For insect food it suggests a *boosting* effect: when curiosity is high, the absolute association between the predictor of interest and willingness to try is increased. This effect was observed for five predictors out of the nine variables of interest (i.e., familiarity, attitude, sustainability, tastiness and social), $\beta = 0.01 – 0.02$, $t = 2.36 – 2.81$, $ps < .02$. For non-insect foods, there were fewer significant interaction effects, and when they were observed, the overall direction tended to be opposite: when curiosity is high, the absolute association between the predictor of interest and willingness to try was decreased. These effects were found for familiarity, exoticness, attitude and sustainability ($\beta = -0.00 – 0.01$, $t = -3.29 – 3.36$, $ps < .04$). The models were checked for issues with multicollinearity and this was not found to be an issue ($VIF = 1.00 – 3.98$).

To understand whether the interaction effects found were significantly different between the two types of food (insect and non-insect), we ran further models looking at the three-way interactions between curiosity, each of the other predictors and the type of food image. Each model included all predictors and the interaction effect of interest as fixed effects.

Seven of the nine interaction effects were statistically significant ($\beta = 0.00 - 0.04$, $t = 2.06 - 16.25$, $ps < .04$), with only healthiness ($p > .50$) and exoticness ($p > .40$) showing no interaction with curiosity and food image type. This suggests that the role of curiosity when interacting with other predictors is different for insect foods compared to familiar foods. All three-way interaction models were checked for multicollinearity, for each model tastiness and attitude had moderate values ($VIF = 5.18 - 7.77$). As these are under 10 it is suggested that multicollinearity is likely not an issue (Tattar, et al., 2016, p. 442). All other parameters were in the low range ($VIF = 1.04 - 4.36$).

As the "attitude" variable was highly correlated with other predictors (e.g., perceived tastiness; see Tables S1 and S2., a comparable analysis was conducted for the models predicting willingness to try and interactions with curiosity, eliminating the "attitude" variable. The results show a very similar set of predictors across the models, suggesting the robustness of our main findings. The results are shown in the supplementary material (Tables S6, S7 and S8).

Table 4.

Interactions between curiosity and the other predictors of willingness to try for insect and non-insect data in Study 1.

	Insect					**Not Insect**				
	Fixed Effects (for interaction term in each model)									
Interactions	*Est.*	*SE*	*CI*	*t*	*p*	*Est.*	*SE*	*CI*	*t*	*p*
Curious X Attractive	0.01	0.01	-0.00 – 0.02	1.85	0.065	-0.00	0.00	-0.01 – 0.01	-0.61	0.545
Curious X Familiar	0.02	0.01	0.00 – 0.03	2.58	**0.010**	0.01	0.00	0.00 – 0.02	3.36	**0.001**
Curious X Exotic	-0.00	0.00	-0.01 – 0.01	-0.60	0.547	-0.01	0.00	-0.02 – -0.00	-3.29	**0.001**
Curious X Attitude	0.02	0.01	0.00 – 0.03	2.47	**0.014**	-0.01	0.00	-0.02 – -0.00	-2.28	**0.023**
Curious X Filling	0.00	0.00	-0.01 – 0.01	0.30	0.768	-0.00	0.00	-0.01 – 0.00	-0.69	0.493
Curious X Healthy	-0.01	0.00	-0.02 – 0.00	-1.93	0.053	0.00	0.00	-0.00 – 0.01	0.72	0.469
Curious X Sustainable	0.01	0.00	0.00 – 0.02	2.80	**0.005**	-0.01	0.00	-0.02 – -0.00	-2.10	**0.036**
Curious X Tasty	0.01	0.01	0.00 – 0.03	2.36	**0.019**	-0.01	0.00	-0.01 – 0.00	-1.36	0.173
Curious X Social	0.02	0.01	0.00 – 0.03	2.81	**0.005**	0.00	0.00	-0.00 – 0.01	1.12	0.263

	Random Effects							
	Subject (Intercept)		Interaction | Subject		Subject (Intercept)		Interaction | Subject	
Model	*Variance*	*SD*	*Variance*	*SD*	*Variance*	*SD*	*Variance*	*SD*
Curious X Attractive	3.35	1.83	0.00	0.06	1.74	1.32	0.00	0.03
Curious X Familiar	3.30	1.82	0.00	0.05	1.75	1.32	0.00	0.03
Curious X Exotic	3.31	1.82	0.00	0.02	1.73	1.31	0.00	0.01
Curious X Attitude	3.31	1.82	0.00	0.07	1.74	1.32	0.00	0.04
Curious X Filling	3.31	1.82	0.00	0.02	1.73	1.32	0.00	0.00
Curious X Healthy	3.32	1.82	0.00	0.03	1.73	1.32	0.00	0.02
Curious X Sustainable	3.30	1.82	0.00	0.03	1.74	1.32	0.00	0.02
Curious X Tasty	3.32	1.82	0.00	0.06	1.73	1.32	0.00	0.03
Curious X Social	3.31	1.82	0.00	0.04	1.73	1.32	0.00	0.02

	Model Fit (R^2)			
Model	*Marginal*	*Conditional*	*Marginal*	*Conditional*
Curious X Attractive	0.33	0.82	0.62	0.81
Curious X Familiar	0.33	0.81	0.61	0.80
Curious X Exotic	0.33	0.81	0.62	0.81
Curious X Attitude	0.33	0.82	0.62	0.81
Curious X Filling	0.33	0.81	0.61	0.80
Curious X Healthy	0.33	0.81	0.61	0.81
Curious X Sustainable	0.33	0.81	0.61	0.81
Curious X Tasty	0.34	0.82	0.62	0.81
Curious X Social	0.33	0.82	0.61	0.80

Model equation example (Curious X Attractive):
Willingness to try ~ Familiar + Exotic + Attitude + Filling + Healthy + Sustainable + Tasty + Social + Curious* Attractive + ((1 | subject) + (0 + Attractive:Curious | subject))

Curious X Sustainable (insect) and Curious X Familiar, Curious X Filling, Curious X Social (not insect) were restarted from a previous fit with an increased number of iterations to enable convergence.

2.2.2.5 Individual difference measures

Due to technical issues, only 234 participants were able to complete the questionnaire section of the study. Each questionnaire measure was grand mean-centered and analysed using a mixed-effects model. Our main interest was whether individual differences of these measures predict the between-person variation of (a) overall willingness to try and (b) the within-person association of curiosity and willingness to try. As such, all predictors were included as fixed effects as well as the interaction between curiosity and the questionnaire measure of interest. Only curiosity was included in the random effect structure.

Food neophobia negatively predicted willingness to try both insect and non-insect foods, suggesting that participants with high food neophobia tend to have lower willingness to try both insect and non-insect foods, β = -1.05 & -0.75, *ps* < .001. There was a significant negative interaction between food neophobia and curiosity for insect food, β = -0.09, $p < .001$. Suggesting that those with high food neophobia have a smaller association between curiosity and willingness to try insect foods. This interaction effect was not found for non-insect foods ($p > .30$). Food variety seeking also positively predicted willingness to try both types of foods, suggesting that those who are high in variety seeking generally exhibit higher willingness to try insect and non-insect foods, β = 0.94 & 0.73, *ps* <.001. Further, variety seeking showed a significant positive interaction with curiosity for insect food, suggesting that those who reported higher food variety seeking scores showed a stronger association between curiosity and willingness to try insect foods, β = 0.06, p = .003. Similar to food neophobia, this significant interaction effect was not found for non-insect foods, $p > .30$. Food involvement did not show a significant relationship with willingness to try insect foods ($p > .10$). However, for non-insect foods the effect of food involvement was positive and significant (β = 0.09, p = .02), indicating that food involvement is associated with higher willingness to try for non-insect foods. There were no significant interaction effects for either type of food, *ps* > .10. As the food involvement measure was based on a single-item measure, the latter results should be interpreted with caution. The effects of each individual difference factor and their interactions with curiosity are presented in Table 5.

Table 5.
Mixed-effects modelling of individual difference measures and their interactions with curiosity in predicting willingness to try for Study 1.

		Insect					**Not Insect**				
Model		Fixed Effects									
	ID measures/ Interactions	*Est.*	*SE*	*CI*	*t*	*p*	*Est.*	*SE*	*CI*	*t*	*p*
FNS											
	Intercept	1.65	0.11	1.43 – 1.86	14.97	**<0.001**	7.41	0.08	7.25 – 7.57	90.69	**<0.001**
	FNS	-1.05	0.15	-1.35 – -0.75	-6.86	**<0.001**	-0.75	0.11	-0.97 – -0.53	-6.61	**<0.001**
	Curious X FNS	-0.09	0.02	-0.14 – -0.05	-4.14	**<0.001**	0.01	0.02	-0.02 – 0.04	0.86	0.392
VAR											
	Intercept	1.65	0.11	1.43 – 1.86	14.76	**<0.001**	7.41	0.08	7.25 – 7.57	90.62	**<0.001**
	VAR	0.94	0.15	0.65 – 1.24	6.26	**<0.001**	0.73	0.11	0.51 – 0.94	6.58	**<0.001**
	Curious X VAR	0.06	0.02	0.02 – 0.11	2.96	**0.003**	-0.02	0.02	-0.05 – 0.01	-1.03	0.302
INV											
	Intercept	1.11	0.39	0.35 – 1.87	2.87	**0.004**	6.78	0.28	6.22 – 7.34	23.82	**<0.001**
	INV	0.19	0.13	-0.07 – 0.44	1.44	0.149	0.22	0.09	0.03 – 0.40	2.32	**0.020**
	Curious X INV	0.02	0.02	-0.01 – 0.06	1.44	0.150	0.02	0.01	-0.01 – 0.04	1.49	0.137

		Random Effects					
		Insect			Not Insect		
Model		*Variance*	*SD*	*Correlation*	*Variance*	*SD*	*Correlation*
FNS							
	Subject (Intercept)	2.78	1.67		1.48	1.22	
	Curious | Subject	0.04	0.19	0.64	0.01	0.12	-0.45
VAR							
	Subject (Intercept)	2.86	1.69		1.48	1.22	
	Curious | Subject	0.04	0.19	0.66	0.01	0.12	-0.44
INV							
	Subject (Intercept)	3.32	1.82		1.73	1.32	
	Curious | Subject	0.04	0.20	0.68	0.01	0.12	-0.47

Model Fit (R^2)				
Model	*Marginal*	*Conditional*	*Marginal*	*Conditional*
Food Neophobia	0.40	0.83	0.64	0.81
Variety Seeking	0.38	0.83	0.64	0.81
Involvement	0.31	0.83	0.61	0.81

FNS = Food Neophobia scale
VAR = Variety Seeking scale
INV = Food Involvement scale

Model equation example (Curious X Food Neophobia):
Willingness to try ~ Attractive + Familiar + Exotic + Attitude + Filling + Healthy + Sustainable + Tasty + Social + Curious + Curious*Food Neophobia + (1 + Curious | subject)

INVOL (insect) and VAR (not insect) were restarted from a previous fit with an increased number of iterations to enable convergence.

2.2.3. Discussion

The results from Study 1 confirmed Hypothesis 1, showing that curiosity was the 3rd strongest predictor (in terms of the point estimate of standardized coefficient) of willingness to try insect and non-insect foods, after attitude and perceived tastiness. Our further examination of the relationship between curiosity and the other predictors revealed that curiosity has an additional function for insect foods compared to non-insect foods. Specifically, the findings suggest a curiosity-boosting effect on the effects of the additional predictors for insect foods, namely, when curiosity is high the relationship between the predictor and willingness to try becomes stronger. It is possible that when curiosity is high this may invoke attentional resources (Gottlieb, 2012). This may increase awareness of the other predictor, in turn, strengthening the relationship between curiosity and the predictor of interest. This interesting effect, which is uncovered by our study, is investigated further in Study 2.

2.3 Study 2

Study 1 supported our main hypothesis (Hypothesis 1) that curiosity predicts willingness to try insect foods above and beyond other major factors such as attractiveness, familiarity, healthiness and social influence. Furthermore, in our exploratory analysis, we observed that curiosity had a "boosting effect" for many of the predictors: Curiosity increased the association between willingness to try and attractiveness, familiarity, attitude, sustainability, perceived tastiness and social influence. This boosting effect was observed only for insect foods, but not for ordinary foods. These results were interesting as they suggest that the effect of curiosity may work differently for novel foods compared to familiar foods. As such, Study 2 was conducted in order to confirm this newly generated hypothesis that curiosity increases the association between willingness to try and the other predictors for foods containing insects (Hypothesis 2), in addition to the main hypothesis that curiosity predicts willingness to try insect foods (Hypothesis 1). An additional purpose of Study 2 was to test these hypotheses whilst controlling for the visual input of the stimuli. In Study 1, although we tried to match the visual appearance between insect and non-insect foods, insects were still discernible in the insect food pictures. To ensure that our findings were not affected by the negative visual appearances of insect foods (rather than the fact that these foods were made of insects), we used pairs of identical images with alternate descriptions (insect or non-insect). This procedure allowed us to explore the predictors of the willingness to try insect foods and familiar foods with a consistent visual input.

2.3.1 Method

2.3.1.1. Participants

Two hundred and forty-eight participants (66% females, Mean Age = 32.86 Age *SD* = 11.40) were included in the main analysis. The recruitment process and exclusion criteria were identical to that of Study 1. Of the 250 participants recruited, two were excluded prior to analysis due to incomplete data. All participants were people residing in the UK. Similar to Study 1, the recruited sample size was determined by budget considerations. The same procedure used in Study 1 was implemented to determine the minimal detectable effect size. This sample size is sufficient to detect an effect size of $d = 0.18$ at 80% power for the main analysis.

2.3.1.2. Stimuli

A total of 84 food images were selected from an available 256 images in the UECFOOD256 database (Kawano & Yanai, 2015). Of the 256 available images, 84 with the most familiarity to Western food culture were selected. For each image, we created two descriptions: one containing edible insect ingredients and the other containing familiar ingredients. Image descriptions created for the rating task are available via the Open Science

Framework (https://doi.org/10.17605/OSF.IO/5F9SP). Example stimuli are shown in Figure 2. None of the images contained any of the insects the descriptions alluded to.

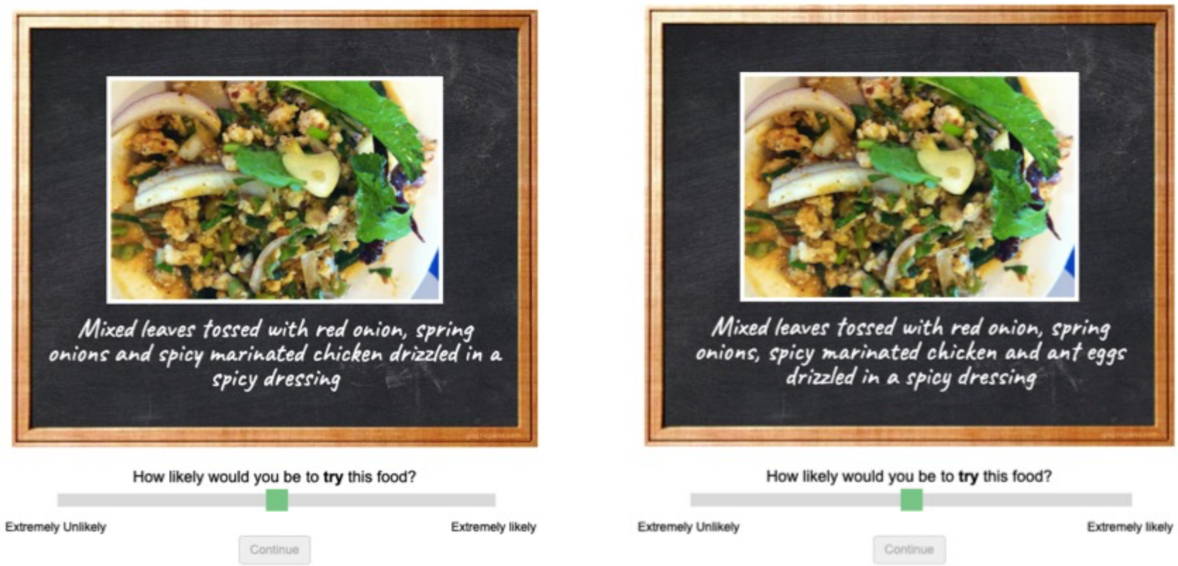

Figure 2. Example stimuli used in Study 2 (identical images and alternate descriptions).

2.3.1.3. Questionnaire measures

As in Study 1, participants completed the Food Neophobia Scale, the VARSEEK scale, and the Food involvement Scale. In Study 2, however, we used the full VARSEEK scale (8 items) and the Food Involvement scale (12 items), to allow for a more thorough analysis of the relationships of these traits and individuals' willingness to try novel insect foods.

2.3.1.4. Procedure

The procedure was similar to that of Study 1. Participants were given similar instructions regarding the 'specials board' except that dishes were presented without a title; only an image and description were present. They were also instructed that "some dishes may contain unusual ingredients such as insects". Participants were presented with 44 dishes (22 with an insect description, and 22 with a non-insect description), which were randomly selected from the pool of 84 images. Each dish was rated using the same rating scales as in Study 1.

Participants rated an image only once, with either an insect or non-insect description. The order of stimulus presentation was randomized across participants. Like Study 1, participants first rated 'willingness to try' and then rated the other scales which had a fixed order within participants but were randomized between participants. Willingness to pay was removed from the measures in this study but all other measures were used. Once the 44 images were completed, participants were asked to complete the questionnaire measures. Following this, participants were asked whether they had ever tried food containing insects before (yes/no). To ensure the descriptions suggesting the dishes contained insects were plausible, participants were also asked how often they could see the 'insects' in the dish ("none of the time", "some of the time", "most of the time", or "all of the time").

2.3.1.5. Data analysis

The data from Study 2 were analysed using the same procedure as in Study 1, including model specification parameters, centering and scaling.

2.3.1.5.1 Data availability

The data related to both Study 1 and Study 2 are openly available via the Open Science Framework (https://doi.org/10.17605/OSF.IO/5F9SP).

2.3.2. Results

2.3.2.1. Previous experience

When asked if they have previously tried insect foods, the majority of participants reported they had not. Only 14.6% of them reported having eaten insects in the past[3]. One participant did not respond to the previous experience question.

[3] Mixed-effects models were conducted predicting willingness to try using only participants who reported not having previously tried insect foods ($N = 211$). As with the main analysis the models examined insect foods and non-insect foods separately. For both insect and non-insect foods the significant predictors were identical to the main analysis.

2.3.2.2. Plausibility check

The majority of participants reported they could see insects in the stimuli presented at least "some of the time" (63.01%), 11.38% reported seeing the insects "most of the time" and 2.44% "all of the time". Only 23.17% reported that they were never able to see the insects. This result suggests that the manipulation pairing dishes without insects with descriptions containing insects was effective.

2.3.2.3. Descriptive Statistics

Similar to Study 1, the overall ratings for the majority of measures were higher for non-insect foods compared to insect foods. The majority of intraclass correlations were higher for insect foods compared to non-insect foods. As in Study 1, this suggests larger variance in mean values across individuals (see Table 6).

Table 6.
Mean ratings and Intraclass correlations (ICC) for insect and non-insect dishes in Study 2.

	Insect		Not Insect	
	Mean (*SD)*	ICC	Mean (*SD*)	ICC
Willingness to try	3.27 (2.37)	0.47	7.53 (1.43)	0.20
Curious	4.30 (2.29)	0.47	4.76 (2.06)	0.42
Attitude	3.47 (1.97)	0.44	6.99 (1.19)	0.17
Tasty	4.24 (2.08)	0.44	7.40 (1.20)	0.18
Familiar	2.62 (1.61)	0.37	6.93 (1.37)	0.22
Attractive	4.89 (1.62)	0.23	6.64 (1.25)	0.17
Healthy	4.41 (1.35)	0.20	4.63 (1.07)	0.09
Sustainable	5.25 (1.66)	0.38	5.91 (1.36)	0.29
Exotic	5.98 (1.94)	0.43	3.55 (1.55)	0.28
Filling	5.87 (1.51)	0.29	6.96 (1.04)	0.17
Social	4.83 (2.20)	0.53	4.94 (2.16)	0.55

Note. SD was computed using the entire data points.

2.3.2.4. Curiosity predicts willingness to try

We again conducted mixed-effects models examining the significant predictors of the willingness to try insect foods and non-insect foods separately. Model results are shown in Table 7. Curiosity was again a significant predictor of willingness to try both insect and non-insect foods above many other predictors, $\beta = 0.15$ & 0.12, $ps < .001$. The three strongest predictors showed the same pattern as in Study 1, with attitude (β = 0.47 & 0.47, *ps* < .001) and perceived tastiness (β = 0.24 & 0.41, *ps* < .001) being the first and second and curiosity again 3rd overall[4]. The pattern of significant predictors of willingness to try insect and non-insect foods was similar across the two studies. For non-insect foods the significant predictors were identical across Studies 1 and 2 (familiarity, exoticness, attitude, tastiness and curiosity). For insect food there are some differences in the pattern; exoticness was a significant predictor in Study 2 but not in Study 1, and conversely healthiness, attractiveness and social perceptions were not significant predictors in Study 2 whereas they were in Study 1. Sustainability and how filling the food was perceived to be were not significant in either study. Despite the differences in statistical significance, the effect sizes were comparable between Study 1 and Study 2. Multicollinearity was checked for insect (*VIF* = 1.02 – 1.17) and non-insect (*VIF* = 1.04 – 1.52) models and was not found to be a concern. A within-person correlation matrix for both insect and non-insect ratings are included in the supplementary material (Table S9 and S10).

[4] We conducted the same between-person analysis as in Study 1 for Study 2. Once again, the results did not replicate the within-person analyses well but there was some overlap. However, the caution on interpretation noted earlier should be taken into account here as well. Model results are presented in the supplementary material (Tables. S11, S12 and S13).

Table 7.
Mixed-effects modelling predicting willingness to try for insect and non-insect data for Study 2.

	Insect					**Not Insect**				
Fixed Effects										
Predictors	*Est.*	*SE*	*CI*	*t*	*p*	*Est.*	*SE*	*CI*	*t*	*p*
Intercept	3.27	0.15	2.97 – 3.56	21.69	**<0.001**	7.53	0.09	7.35 – 7.71	82.88	**<0.001**
Curious	0.15	0.02	0.12 – 0.19	9.06	**<0.001**	0.12	0.02	0.09 – 0.15	8.17	**<0.001**
Attitude	0.47	0.02	0.43 – 0.52	21.63	**<0.001**	0.47	0.02	0.44 – 0.50	29.95	**<0.001**
Tasty	0.24	0.02	0.20 – 0.28	11.8	**<0.001**	0.41	0.02	0.37 – 0.45	19.64	**<0.001**
Familiar	0.08	0.01	0.05 – 0.11	5.35	**<0.001**	0.08	0.01	0.05 – 0.10	6.12	**<0.001**
Attractive	0.02	0.01	-0.00 – 0.03	1.50	0.133	0.00	0.01	-0.02 – 0.03	0.30	0.764
Exotic	-0.04	0.01	-0.06 – -0.02	-3.65	**<0.001**	-0.04	0.01	-0.06 – -0.02	-4.20	**<0.001**
Filling	-0.02	0.01	-0.04 – 0.00	-1.54	0.123	-0.01	0.01	-0.03 – 0.01	-0.86	0.391
Healthy	-0.01	0.01	-0.03 – 0.01	-0.84	0.402	-0.01	0.01	-0.02 – 0.01	-0.95	0.342
Sustainable	-0.00	0.01	-0.02 – 0.02	-0.26	0.792	0.02	0.01	-0.01 – 0.04	1.44	0.150
Social	0.03	0.01	-0.00 – 0.06	1.91	0.057	-0.00	0.01	-0.03 – 0.03	-0.04	0.968

Random Effects				
	Variance	*SD*	*Variance*	*SD*
Subject (Intercept)	5.55	2.36	1.98	1.41
Curious | Subject	0.03	0.17	0.02	0.16
Attitude | Subject	0.05	0.23	–	–
Tasty | Subject	0.05	0.22	0.04	0.20
Familiar | Subject	0.02	0.13	0.01	0.10
Attractive | Subject	0.00	0.06	0.02	0.13
Exotic | Subject	0.01	0.07	0.00	0.03
Filling | Subject	0.01	0.07	0.01	0.09
Healthy | Subject	0.00	0.07	0.00	0.02
Sustainable | Subject	0.00	0.04	0.01	0.09

Model Fit				
R^2	*Marginal*	*Conditional*	*Marginal*	*Conditional*
	0.32	0.86	0.58	0.82

2.3.2.5. Interactions with curiosity

The mixed-effects models used to test the interactions between curiosity and the other predictors followed the same structure as in Study 1. Interaction effects from each of the models are represented in Table 8. The same overall pattern as in Study 1 emerged here too: when curiosity interacted with the other predictors, the effect on willingness to try was different for insect and non-insect foods. Attitude and perceived tastiness showed consistent interactions with curiosity across both studies. For these significant interactions, the same "*boosting*" effect of curiosity is observed for insect foods ($\beta = 0.01 – 0.02$, $t = 2.33 – 3.17$, $ps < .03$). The pattern for non-insect foods was also generally consistent with Study 1 ($\beta = -0.02 – 0.01$, $t = -4.57 – 2.80$, $ps < .04$). Therefore, Hypothesis 2 is supported. Multicollinearity was checked for each model and was found not to be an issue ($VIF = 1.00 – 3.57$).

The three-way interaction models also follow the same structure as in Study 1, with all models including all predictors and the interaction term of interest as fixed effects. Seven of the nine interactions were statistically significant ($\beta = 0.01 – 0.03$, $t = 2.25 – 11.39$, $ps < .03$). Of the interactions that were not significant, the predictors of interest were healthiness ($p > .50$) and exoticness ($p > .30$). These significant interactions follow the same pattern as in Study 1, supporting further the finding that curiosity interacts with other predictors in a different way for insect foods and non-insect foods (see Table 8). Again, each model was checked for multicollinearity and no issues were found ($VIF = 1.01 – 4.77$).

Similar to Study 1, the "attitude" variable was highly correlated with other predictors (e.g., perceived tastiness), see Tables S9. and S10. Therefore, analyses were conducted for the models predicting willingness to try and interactions with curiosity, eliminating the "attitude" variable. The results show a similar overall trend to the previous analyses, supporting the "*boosting*" effect of curiosity and also showing a consistent pattern for non-insect foods, even after removing the highest correlated predictor. Model results are shown in the supplementary material (Tables S14, S15 and S16).

Table 8.

Interactions between curiosity and the other predictors of willingness to try for insect and non-insect data in Study 2.

Fixed Effects (for interaction term in each model)

	Insect					Not Insect				
Interactions	*Est.*	*SE*	*CI*	*t*	*p*	*Est.*	*SE*	*CI*	*t*	*p*
Curious X Attractive	0.01	0.00	0.00 – 0.02	2.33	**0.020**	-0.01	0.00	-0.02 – -0.00	-2.15	**0.032**
Curious X Familiar	0.01	0.01	-0.00 – 0.02	1.49	0.136	-0.02	0.00	-0.03 – -0.01	-3.81	**<0.001**
Curious X Exotic	-0.01	0.00	-0.01 – 0.00	-1.27	0.206	0.01	0.00	0.00 – 0.02	2.80	**0.005**
Curious X Attitude	0.01	0.01	0.00 – 0.02	2.51	**0.012**	-0.02	0.01	-0.03 – -0.01	-4.57	**<0.001**
Curious X Filling	0.01	0.00	-0.00 – 0.02	1.67	0.095	-0.00	0.01	-0.01 – 0.01	-0.66	0.509
Curious X Healthy	-0.01	0.00	-0.02 – 0.00	-1.95	0.051	0.00	0.00	-0.00 – 0.01	0.56	0.574
Curious X Sustainable	0.01	0.00	-0.00 – 0.02	1.46	0.144	-0.01	0.01	-0.02 – 0.00	-1.53	0.125
Curious X Tasty	0.02	0.01	0.01 – 0.03	3.17	**0.002**	-0.02	0.00	-0.03 – -0.01	-3.53	**<0.001**
Curious X Social	0.01	0.00	-0.00 – 0.01	1.25	0.212	0.00	0.01	-0.01 – 0.01	0.55	0.583

Random Effects

	Insect: Subject (Intercept)		Insect: Interaction | Subject		Not Insect: Subject (Intercept)		Not Insect: interaction | Subject	
Model	*Variance*	*SD*	*Variance*	*SD*	*Variance*	*SD*	*Variance*	*SD*
Curious X Attractive	5.59	2.36	0.00	0.04	1.98	1.41	0.00	0.03
Curious X Familiar	5.56	2.36	0.00	0.04	1.98	1.41	0.00	0.04
Curious X Exotic	5.53	2.35	0.00	0.02	1.97	1.40	0.00	0.03
Curious X Attitude	5.71	2.39	0.00	0.05	1.97	1.40	0.00	0.05
Curious X Filling	5.53	2.35	0.00	0.03	1.98	1.41	0.00	0.05
Curious X Healthy	5.52	2.35	0.00	0.03	1.96	1.40	0.00	0.01
Curious X Sustainable	5.52	2.35	0.00	0.03	1.97	1.40	0.00	0.04
Curious X Tasty	5.67	2.38	0.00	0.05	1.97	1.40	0.00	0.05
Curious X Social	5.53	2.35	0.00	0.03	1.97	1.40	0.00	0.04

Model Fit (R^2)

	Insect		Not Insect	
Model	*Marginal*	*Conditional*	*Marginal*	*Conditional*
Curious X Attractive	0.33	0.82	0.56	0.79
Curious X Familiar	0.33	0.82	0.57	0.79
Curious X Exotic	0.33	0.82	0.56	0.79
Curious X Attitude	0.32	0.83	0.57	0.80
Curious X Filling	0.33	0.82	0.57	0.79
Curious X Healthy	0.33	0.82	0.56	0.78
Curious X Sustainable	0.33	0.82	0.56	0.79
Curious X Tasty	0.32	0.83	0.57	0.80
Curious X Social	0.33	0.82	0.56	0.79

Curious X Filling (insect) and Curious X Attractive, Curious X Attitude and Curious X Healthy (not insect) were restarted from a previous with an increased number of iterations to enable convergence.

2.3.2.6. Individual difference measures

Technical issues meant not all participants were able to complete all of the questionnaire items. Thus, the Food Neophobia Models were estimated using data from 237 participants, whereas the VARSEEK and Food Involvement models used data from 247 participants. As in Study 1, higher scores on the Food Neophobia scale suggested a lower willingness to try both types of food, β = -1.39 & -0.83, *ps* < .001. The interaction between food neophobia and curiosity predicting willingness to try insect foods seen in Study 1 was also present in Study 2, β = -0.06, *p* = .001, suggesting that the association between curiosity and willingness to try insect foods is weaker for those with high food neophobia. Again, the interaction was not significant for non-insect foods (*p* > .10). For the VARSEEK scale, the pattern of results across Studies 1 and 2 is very similar, with variety seeking positively predicting willingness to try both types of foods (β = 1.64 & 0.73, *ps* < .001) and interacting with curiosity in predicting willingness to try insect foods only (β = 0.07, *p* = .001). The interaction effect suggests that the association between curiosity and willingness to try insect food becomes stronger for those with higher variety seeking. As in Study 1, this effect was not statistically significant for non-insect foods, *p* > .06. Finally, the results for the longer Food Involvement scale show the same pattern across both studies. Food involvement was not predictive of willingness to try insect foods (*p* > .06), however, it significantly predicted willingness to try non-insect foods (β = 0.73, *p* < .001). Non-significant interaction effects were found (*ps* > .10), suggesting higher levels of food involvement are only predictive of willingness to try familiar foods. The individual difference measures and interactions with curiosity from each model are shown in Table 9.

Table 9.
Mixed-effects modelling of individual difference measures and their interactions with curiosity in predicting willingness to try for Study 2.

		Insect					Not Insect				
Model	Fixed Effects										
	ID measures/ Interactions	*Est.*	*SE*	*CI*	*t*	*p*	*Est.*	*SE*	*CI*	*t*	*p*
FNS											
	Intercept	3.23	0.14	2.96 – 3.50	23.29	**<0.001**	7.53	0.08	7.36 – 7.69	90.00	**<0.001**
	FNS	-1.39	0.18	-1.74 – -1.05	-7.94	**<0.001**	-0.83	0.11	-1.04 – -0.62	-7.83	**<0.001**
	Curious X FNS	-0.06	0.02	-0.09 – -0.02	-3.26	**0.001**	0.02	0.02	-0.01 – 0.06	1.46	0.144
VAR											
	Intercept	3.27	0.13	3.01 – 3.53	24.72	**<0.001**	7.53	0.09	7.36 – 7.69	88.23	**<0.001**
	VAR	1.64	0.19	1.28 – 2.01	8.73	**<0.001**	0.73	0.12	0.49 – 0.97	5.99	**<0.001**
	Curious X VAR	0.07	0.02	0.03 – 0.10	3.38	**0.001**	-0.03	0.02	-0.07 – 0.00	-1.82	0.069
INV											
	Intercept	3.27	0.15	2.97 – 3.56	21.74	**<0.001**	7.53	0.09	7.36 – 7.70	86.17	**<0.001**
	INV	0.48	0.26	-0.04 – 1.00	1.83	0.068	0.73	0.15	0.43 – 1.03	4.79	**<0.001**
	Curious X INV	0.01	0.02	-0.04 – 0.06	0.37	0.713	-0.03	0.02	-0.08 – 0.01	-1.49	0.135

Random Effects

		Insect			Not Insect		
Model		*Variance*	*SD*	*Correlation*	*Variance*	*SD*	*Correlation*
FNS							
	Subject (Intercept)	4.47	2.11		1.57	1.26	
	Curious | Subject	0.02	0.15	0.43	0.02	0.15	-0.53
VAR							
	Subject (Intercept)	4.23	2.06		1.72	1.31	
	Curious | Subject	0.02	0.15	0.45	0.02	0.14	-0.53
INV							
	Subject (Intercept)	5.50	2.34		1.80	1.34	
	Curious | Subject	0.02	0.15	0.52	0.02	0.15	-0.53

Model Fit (R^2)

Model	*Marginal*	*Conditional*	*Marginal*	*Conditional*
Food Neophobia	0.43	0.83	0.61	0.80
Variety Seeking	0.44	0.83	0.59	0.79
Involvement	0.33	0.83	0.57	0.79

FNS (not insect) was restarted from a previous fit with an increased number of iterations to enable convergence

2.3.3. Discussion

The results from Study 2 also confirmed Hypothesis 1, curiosity was the 3rd strongest predictor of willingness to try insect and non-insect foods after attitude to the food and perceived tastiness. Consistent with Study 1, the three strongest predictors remained the same. When examining the curiosity-boosting effect, we found a similar pattern to that of Study 1. In that, curiosity interacts with other predictors in a way that is unique to insect foods with attitude and perceived tastiness showing consistent interactions with curiosity across both studies (Hypothesis 2).

2.4. General Discussion

Consistent with our prior hypotheses, across two studies we have shown that curiosity is one of the strongest predictors of willingness to try both insect and non-insect foods. In addition, we also discovered a curiosity-boosting effect, in which curiosity interacted with other predictors in a way that increased the effects of these factors on willingness to try. This boosting effect was specific to insect foods and not seen for familiar foods. For familiar foods, when curiosity was high, the association between other relevant factors and willingness to try tended to become weaker. These effects were consistent across the two studies even when different stimuli were used, actual insect foods (Study 1) or simply the allusion of insect ingredients (Study 2). The consistency of our findings demonstrates the robustness of the effects found and the validity of our hypotheses. Thus, we contribute to the existing literature on curiosity in consumer behaviour by unravelling whether and how it influences consumers' willingness to try novel foods. Our findings open new avenues for applying curiosity research to consumer behaviour. Our methodological approach allowed us to examine curiosity alongside other previously suggested predictive factors, across a wide range of stimuli, using a within-person approach. These methodological choices not only enabled us to examine the predictive power of curiosity in a more accurate way but also the psychological processes operating within individuals.

2.4.1. Curiosity as a predictor

Our findings from both studies supported the hypothesis that curiosity is an important predictor of the willingness to try both insect and non-insect foods. This finding is in line with previous qualitative and survey research positing a role for curiosity in determining consumption of insects (e.g., Caparros Megido et al., 2016; Sogari, 2015; Videbæk & Grunert, 2020). Our findings demonstrate the powerful effect of curiosity to overcome negative expectations (FitzGibbon et al., 2020). Previously, curiosity has been shown to increase positive affect towards products, increase risky decision-making and encourage people to seek information that is of no value and makes them feel worse (Daume & Hüttl-Maack, 2020; FitzGibbon et al., 2021; Ruan et al., 2018). We add to this literature by showing that curiosity also predicts willingness to try novel foods that are frequently perceived negatively.

Not only was curiosity found to be an important predictor, but this was true even after controlling for other previously identified factors (e. g., perceived tastiness). This may suggest that curiosity has a direct effect on exploratory eating behaviour, as it is not mediated by other factors. This could result from an interesting property of curiosity – that it has incentive salience (FitzGibbon et al., 2020). Incentive salience is a motivational urge, in this case for information, in the absence of expected liking of that information (Litman, 2005). Our results suggest that curiosity may tap into this feeling of incentive salience so that even for foods that may not seem appealing, such as those containing insects. If curiosity is high, people may still be motivated to seek information and so be willing to try the food.

Furthermore, we uncovered a distinctive effect of curiosity when interacting with other relevant predictors, which differed notably across insect and familiar foods. Specifically for insect foods, we found the ‘curiosity-boosting effect’ – high curiosity strengthens the relationship between willingness to try and other predictive factors. One possible explanation for this effect is that curiosity recruits attentional processes (Gottlieb, 2012). Gottlieb (2012) suggests this selective attention process to novel/interesting stimuli is activated when engaging in exploratory behaviour and in determining the value of information. It is possible that high curiosity increased awareness of the other predictive factors measured, selective attention would increase focus on these factors and thus strengthen the relationship between curiosity and other factors in predicting willingness to try. Given the far-reaching effects of curiosity, the idea that it would also impact the other predictive factors is consistent with the existing literature. House (2016) found that the initial motivation for consumers to purchase insect foods was curiosity, followed by health and sustainability benefits and it is suggested that none of these factors are mutually exclusive, rather they work in combination with one another to influence consumption. This could be an example of the curiosity-boosting effect, where initial curiosity towards the product is high and this strengthens the relationship between willingness to try and other predictive factors (e.g., healthiness and sustainability).

However, it is also worth noting that as the 'curiosity-boosting effect' is correlational it is also possible that the other predictors of interest may result in higher curiosity. For example, concerns about sustainability may result in higher curiosity to environmentally friendly products such as insect foods. This may also fit with previous findings (e.g., House, 2016), even though those results suggested that curiosity was the initial motivation it may be considerations of other factors that drive curiosity towards the product. If, as suggested, these factors work in combination with one another there may be further routes to encouraging adoption of entomophagy using higher levels of curiosity to motivate willingness to try, regardless of which direction the 'curiosity-boosting effect' may operate in.

2.4.2. Other factors influencing willingness to try

The effects of the additional factors considered in our models show some consistency with other previously identified key factors in encouraging entomophagy. Across both studies familiarity, perceived taste and attitude consistently predicted willingness to try insect foods, and these have all been previously identified as key factors in encouraging entomophagy (Cicatiello et al., 2016; van Huis, 2013; Woolf et al., 2019). Other factors had less predictive value. For example, social influence had a consistently small effect on willingness to try, and was only a significant predictor in Study 1, as might have been expected from previous research (Jensen & Lieberoth, 2019; Sogari, 2015). Sogari (2015) argues that while social influence is important for integration of insect-based diets into our lifestyle, it is possible that some predictors are more conducive to encouraging the 'first try' and others are important for maintaining that consumption as part of our everyday dietary decision-making. Our findings suggest that if social factors are playing a role, this is more likely to be with long-term change rather than initiation of insect-eating behaviour.

Interestingly, across both studies sustainability and how filling the food was perceived to be were not significant predictors of willingness to try insect foods. This is somewhat inconsistent with previous research, particularly for sustainability. The positive environmental benefits of entomophagy have been shown to be of large importance in the decision to eat insect foods (Lombardi et al., 2019; Woolf et al., 2019). However, what both of these previous studies suggest is that one must be aware of the benefits for the issues of sustainability to increase willingness to try or pay for insect foods. As we did not provide participants any information of the benefits of entomophagy, it may be that participants were unable to base their decision to try on these critical factors.

Healthiness had a small but consistent negative effect on willingness to try insect foods and was a significant predictor in Study 1 only. The negative effect of healthiness suggests that people were more willing to eat less healthy insect foods. One explanation is that through the menu style rating task many of the dishes presented to participants contained other ingredients or cooking practices that are not necessarily considered healthy (e.g., fried foods). This may have affected the healthiness ratings in two ways, firstly, certain dishes may have been awarded lower ratings even when containing insect foods as other ingredients or cooking practices in the dish were perceived as unhealthy. Secondly, a pre-conceived notion that unhealthy foods may taste better or be more enjoyable may explain the negative relationship found in Study 1. It is also worth noting that the constraints of being aware of the benefits discussed in relation to the sustainability ratings also apply to healthiness. One must be aware that insects contain higher levels of vitamins and minerals compared to traditional animal-derived proteins in order for this to affect the healthiness rating.

It is important to note that we included various factors (including curiosity) as simultaneous predictors in the regression model, treating them as exogeneous variables. However, it is very likely that these predictors have causal relationships with each other. For example, novelty is often described as the determinant of the feeling of curiosity (Berlyne, 1960). Perceived tastiness is likely to be a consequence of other predictors such as exoticness. As we do not have a precise causal model among these predictors, we rather decided to include all the predictors together in the model. However, this means that our parameter estimates are likely not accurate causal estimates. It is also possible that there are other omitted variables that we are not aware of. As such, it is best to see our parameter estimates in terms of predictions rather than causation.

One final consideration is that the effect of some predictors may be seen more clearly at the between-person level. Particularly for predictors such as sustainability and healthiness where the impact of these relies on each individuals' knowledge of the benefits. In fact, intraclass correlations of the insect food ratings generally showed much larger levels of variance between participants (as opposed to within participants) compared to familiar foods.

It is also worth noting that repeated measurements of predictors could create a carry-over effect, however as we were interested in the within-person process this was necessary to address the aim of this study.

2.4.3. Individual differences

As well as identifying the properties of food dishes that predict willingness to try the dish, we were also able to identify factors at the level of the individual participants that predict their willingness to try insect foods. Studies 1 and 2 show that food neophobia and food variety seeking tendencies were both predictive of willingness to try insect and non-insect foods, showing consistency with previous findings (Pliner & Hobden, 1992; Van Trijp & Steenkamp, 1992). Interestingly, our findings show, for both concepts, a significant interaction with curiosity that occurs only for insect foods. This finding was replicated across both studies using a wide variety of stimuli. This suggests that when individuals have higher variety seeking tendencies and low food neophobia, the more curious they are the more willing they are to try insect foods.

In contrast to Bell and Marshall (2003), who advance the notion that individuals with higher levels of food involvement may be more inclined to try new food flavours and may be more receptive to novel food experiences, our studies did not find a significant effect of food involvement for insect foods. We did, however, find a significant effect of food involvement on the willingness to try familiar foods. This is consistent with the proposal that food involvement is related to food choice behaviours. Given the significant effects for non-insect foods, as well as the consistent results for insect foods across both studies, which also used two different measures of food involvement, it is likely that involvement does not play a significant role in predicting willingness to try insect foods. This would suggest that those who report that food plays an important role in their lives are no more willing to try insect foods than individuals who feel that food is not of importance. Our findings suggest that curiosity is more important than food involvement when engaging in exploratory food behaviours, a notion in line with the argument that curiosity is an important driver of novel behaviours in general (Gottlieb et al., 2013) and that the motivational power of curiosity can be stronger than other decision-making factors (FitzGibbon et al., 2021).

2.4.4. Practical implications

Our findings that curiosity is an important predictor of people's willingness to try insect foods have some practical implications. Given its motivational power, curiosity can be used as a powerful marketing tool to positively influence beliefs, attitudes, and behaviours towards novel products. For example, using curiosity in advertising messages can lead to the formation of positive attitudes towards the promoted brands and increase willingness to try them (see Ruan et al., 2018) The boosting effect of curiosity also suggests that the effectiveness of such campaigns may be increased significantly by targeted consumers who are more receptive to unfamiliar foods (i.e., low on food neophobia) and who exhibit variety seeking tendencies. Attitudinal and behavioural changes, in turn, could have a positive impact on the environment through decreased consumption of traditional animal-derived proteins (Boland et al., 2013; van Huis, 2013).

2.4.5. Limitations and future research

There are some limitations to the present studies. Firstly, we only assessed the intention to try insect foods and not the actual behaviour. While our study suggests potential ways to increase that intention, whether this affects the actual behaviour of trying insect foods and whether it impacts incorporating entomophagy into one's diet in the long term should be examined in future research. For example, future studies could examine ways to increase intention to try followed by a tasting session to assess actual behaviour. Relating to this, we would like to note that our wording choice to assess intention (willingness to try) was the word 'likely' instead of 'willing'. It could be argued that 'likely' and 'willing' assess slightly different intentions. However, given that willingness is the preparedness to perform an action and likelihood is the probability of an event occurring, we argue that our question "how likely would you be to try this food?" asks participants to estimate the probability of the situation occurring alongside whether they would try the food if presented with it, rather than whether they would be prepared to try if the situation presented itself.

It may be prudent for further research to examine willingness to try without the potential influence of the other predictors. It is possible that these predictors have an additive effect on willingness to try and this research suggests they certainly interact with one another in predicting willingness to try. Therefore, by separating the willingness to try measure from the other predictors in the rating task one might expect to see lower willingness to try ratings for insect foods. However, for the purpose of this research we were primarily interested in understanding the relative contribution of curiosity on the willingness to try insect foods, therefore, it was not necessary to separate out this measure. Furthermore, these predictors likely work in combination to promote the willingness to try, meaning any additive effects while useful to separate out in terms of research, in terms of the overall practical implication of encouraging entomophagy it may not be necessary to fully understand the singular effects of each predictor but rather focus on using the potential additive effects to encourage entomophagy further.

Secondly, this research provides a contribution to a set of factors that influence willingness to try insect foods. However, this is not exhaustive in terms of both potentially relevant factors and different types of insect foods. In this study, we collected demographic information on age, sex nationality and country of residence. It is possible that other demographic factors such as SES could also influence willingness to try insect foods. This should be examined further in order to contribute to the intricacies of a consumer decision such as this. Many other factors and individual differences may contribute to an individual's willingness to try insect foods, for example, participants in this study were UK residents and attitudes towards willingness to try insect foods may not be comparable in other Western societies. Also, there may be differences in willingness to try depending on the type of edible insect (e.g., mealworm vs. cricket). Future research should investigate this further using a larger set of insect food stimuli.

This research also chose not to explicitly measure disgust within the rating task paradigm. General reactions of disgust are prevalent in Western preconceptions regarding insect foods (e.g., La Barbera et al., 2018). However, disgust has been shown to be an inconsistent predictor of the willingness to try insect foods and may be driven by other previously identified factors such as social norms (e.g., Jensen & Lieberoth, 2019). The rating task itself also examines disgust towards insect foods indirectly through measurement of various attributes of the food (e.g., attitude, attractiveness and perceived taste) on a scale ranging from negative to positive to capture any disgust related negative attitudes towards the insect dishes presented. Furthermore, including disgust explicitly in the rating task may have resulted in negative priming effects on the other ratings.

Finally, while these studies consider a set of relevant factors that influence consumption, the question regarding how to use curiosity to initiate consumption still needs research attention. Our results indicate that curiosity is well placed to encourage a positive first tasting experience. Future studies should focus on manipulating aspects of curiosity to see if this increases willingness to try insect foods. For example, future studies could focus on manipulating curiosity through increasing uncertainty (Loewenstein, 1994), in order to reduce uncertainty and satisfy their curiosity participants may be more willing to try insect foods.

2.5. Conclusion

The current two studies have confirmed the role of curiosity as an important predictor of willingness to try insect foods. What is more, our findings demonstrate the unique contribution of curiosity above and beyond other relevant predictors. Finally, we demonstrate how curiosity can interact with other predictors, thus revealing a mechanism for increasing willingness to try novel foods, such as insect foods.

Chapter 3. Paper 2: Encouraging willingness to try insect foods with a utility-value intervention

Abstract

Despite the benefits of eating insects (entomophagy), Western society is often inclined to reject the practice based on initial reactions of disgust. It has been suggested that there is potential to overcome this attitude through increasing interest and gaining knowledge of the benefits. One way to accomplish these goals is an adapted utility-value intervention, traditionally used in education research to increase interest and perceived value in a topic. Across two studies (each with a one-month follow-up) participants researched and wrote an essay designed to increase the interest and value of entomophagy or a control essay. Participants then completed a rating task assessing their willingness to try insect and familiar foods, along with other key attributes (e.g., sustainability). The utility-value intervention increased willingness to try insect foods as well as other key attributes compared to a non-insect control essay (Study 1). Unexpectedly, we also found a comparable effect of researching an insect-based recipe (Study 2) on willingness to try. The effects found in both studies were present at follow-up. These findings indicate the usefulness of utility-value interventions in encouraging entomophagy but also suggested the possibility that mere exposure to information about insect food may be sufficient to encourage willingness to try.

Keywords: Interest; entomophagy; willingness to try; utility value; insects

3.1. Introduction

Entomophagy – eating insects – has been practiced for centuries and in some cultures, it is already a key sustainable protein source (Gahukar, 2011). The need for more sustainable protein sources is becoming more pressing over time. As the population continues to grow and consumption of animal-derived proteins increases, sourcing sufficient high-quality protein is likely to become a global challenge by 2050 (Boland et al., 2013). Traditional animal-derived protein sources have much larger negative environmental impacts in comparison to insect-based protein sources (van Huis, 2013). Problems stemming from the production of traditional animal-derived proteins such as greenhouse gas emissions, water consumption, and scarcity of resources to feed livestock, are all growing concerns for which entomophagy is a viable alternative (Gahukar, 2011; van Huis, 2013). Not only is the consumption of insects a sustainable alternative to traditional animal-derived proteins, insect-based foods also boast higher nutritional value and safer consumption in terms of animal transmitted diseases than traditional protein sources (Lombardi et al., 2019).

3.1.1. The critical role of interest in the adoption of entomophagy

One of the main issues with adopting entomophagy is that the practice is typically met with disgust in Western cultures (La Barbera et al., 2018). Many factors are said to contribute to the negative attitudes towards insect foods such as perceived taste and being unaware of the benefits (e.g., Tan et al., 2016; Woolf et al., 2019). To overcome this, it is crucial to identify methods for encouraging the practice of entomophagy in everyday life. One potential factor that has been identified in the literature is interest. Interest or curiosity can be conceptualised as people's intrinsic motivation to gain and develop knowledge (Murayama et al., 2019) and for the purpose of this research, we use these terms interchangeably to describe this concept. Several studies have suggested that having an interest in entomophagy, or in the benefits of entomophagy, are important factors in the acceptance of insect-based foods (e.g., House, 2016;

Verbeke, 2015; Videbæk & Grunert, 2020). Videbæk and Grunert (2020) surveyed Danish consumers and the results suggested a general interest in eating insects as an important factor in Western acceptance of insect foods. From data collected through open-ended questions, Sogari (2015) also proposed that interest may be one of the most important factors in initiating the practice of entomophagy. Similarly, House (2016) conducted semi-structured interviews with consumers who had previously purchased insect food products. The findings suggested that a general interest in entomophagy was the initial motivating factor in the purchase, followed by an awareness of the environmental and health benefits. In line with this, Verbeke (2015) found that an interest in sustainable food choices predicted a 71% increase in the likelihood of engaging with entomophagy. Finally, Stone, FitzGibbon, Millan and Murayama (2022) used a menu-style image rating task of insect and non-insect dishes to address the relative contributions of a number of key predictors of willingness to try insect foods. They showed that curiosity was a significant predictor of the willingness to try insect foods even after controlling for many other previously identified factors (e.g., taste, healthiness and sustainability). Overall, this research suggests that a general interest or curiosity towards entomophagy or the associated benefits are potentially useful tools in encouraging individuals to try insect foods.

Why can interest promote willingness to try insect-based foods? Theories on curiosity and interest suggest that people are motivated when they become aware of a lack of knowledge (i.e., knowledge gap; Loewenstein, 1994) and when the new information has a positive emotional value (Kobayashi, Ravaioli, Baranès, Woodford, & Gottlieb, 2019; Sharot & Sunstein, 2020).

We believe interest (i.e., desire to gain information) provides a powerful route to the acceptance of insect-based foods in this regard because people often do not know much about them; therefore, it is relatively easy to stimulate their curiosity (it is easy to make people aware of the knowledge gap). In addition, it is typically the positive aspects of entomophagy that are unknown, such as its healthiness and importance for sustainability, meaning that new information about insect-based foods is likely to elicit positive emotional feelings.

In fact, information about the benefits of entomophagy has been shown to increase both willingness to pay and willingness to try insect-based foods (Lombardi et al., 2019; Woolf et al., 2019). Lombardi et al. (2019), for example, compared people's willingness to pay for food products containing insects (pasta, cookies, and a chocolate bar, all containing processed mealworms) against their counterparts containing familiar ingredients. They measured the willingness to pay for each product after presenting participants with different types of information. In round 1, participants were only provided with general information regarding the ingredients, in round 2 participants were given one of two different types of information on the benefits of eating insects (health vs sustainability). After receiving general information willingness to pay for insect-based products was equal or lower than their conventional counterparts. However, after receiving information on the benefits, participants' willingness to pay for insect-based products increased, and they valued them equally or even higher than their conventional counterparts. Woolf et al. (2019) also found that being aware of the health and environmental benefits of insect foods is an important factor in influencing willingness to eat insects.

It is also important to note that people's behaviour motivated by curiosity is not always short-lived or transient. Several theories also suggest that once someone is interested enough to initiate information-seeking behaviour, they can develop motivation to re-engage with information on a repeated topic over a long period of time. For example, Hidi and Renninger (2006) propose that interest can be initially sparked from an environmental cue ("situational interest"), and the repeated occurrence of such situational interest can lead to a stable preference to re-engage with a topic over a longer period of time ("individual interest"). The reward-learning model of knowledge acquisition also argues that initial acquisition of knowledge makes people more aware of further knowledge gaps and increases the value of new knowledge, creating a positive-feedback loop and maintaining the reward-learning process of knowledge acquisition. As a result, people can increasingly strengthen the rewarding feeling as they acquire further information, sustaining the engagement in knowledge acquisition behaviour over a long period of time (Murayama et al., 2019). These theoretical perspectives further indicate the critical role of curiosity in prompting people to eat insect-based foods in a sustainable manner.

Interest and curiosity have been identified as important concepts in the field of consumer behaviour. They have been used to promote information-seeking behaviour and positive attitudes towards products (e.g., Menon & Soman, 2002; Ruan et al., 2018). For example, using different levels of information in advertising a new product Menon and Soman (2002) found that when participants were more curious this resulted in greater levels of information seeking and more positive product evaluations. Several studies have also suggested that when advertising products by creating an information gap and giving the consumer the opportunity to resolve the uncertainty related to the advertisement, consumers show increased positive attitudes towards the product or brand (Daume & Hüttl-Maack, 2020; Ruan et al., 2018). As previously mentioned, interest has been examined in the context of entomophagy, but previous work has not explicitly sought to manipulate interest or curiosity to increase willingness to try. Considering the suggested importance of interest as an initial motivator as well as sustainment of entomophagy, the rewarding nature of information seeking, and the resulting positive attitudes towards products, increasing interest in entomophagy may be the ideal means of achieving wider acceptance and more positive perceptions of edible insects.

3.1.2. Utility-value interventions

Having identified interest as a well-placed target for intervention, the next challenge is to increase interest in entomophagy. One potential route to increasing interest in a topic is through a utility-value intervention. Utility-value interventions involve an interactive activity designed to increase personal relevance and connection to a topic (value) (Hulleman et al., 2010). Utility-value interventions within educational settings have been shown to enhance student motivation, interest and performance across a range of disciplines (Gaspard et al., 2015; Hulleman et al., 2010; Rosenzweig, Wigfield, & Hulleman, 2020). They share a broad aim of increasing the perceived relevance of the content to be learned and this, in turn, increases interest in the topic and is said to lead to better performance (Hulleman, Kosovich, Barron, & Daniel, 2017; Shin et al., 2019).

Gaspard et al. (2015) used a psychoeducational presentation along with two relevance-inducing tasks (evaluating quotations about the usefulness of mathematics for personal relevance or an essay self-generating the personal relevance of mathematics to their lives) to increase students' value beliefs for mathematics. Both intervention conditions showed increased utility value at up to 5 months post-intervention compared to the wait-control condition, with the effect being slightly larger for the quotations condition. Brisson et al. (2017) also found promising results for relevance interventions, again in the field of mathematics. Using a similar procedure to Gaspard et al. (2015), two relevance interventions showed positive effects (e.g., increased belief in ability to complete homework) up to 5 months post-intervention in comparison to the wait-control condition. This style of intervention has been further adapted across other disciplines. For example, Rosenzweig et al. (2020) compared a utility-value intervention (evaluating and writing quotations) with a cost reduction intervention (same style of task but focusing on overcoming challenges) for students on a university physics course. Both intervention conditions showed improved exam performance compared to the control conditions.

Utility-value interventions have also been adapted to become lab-based experiments, still within the field of education but outside of a classroom setting (Hulleman et al., 2010). For example, Hulleman et al. (2010) showed that a utility-value intervention increased perceptions of the value of a mathematical technique and this, in turn, predicted increased interest and performance, particularly for those with low performance expectations. Participants in the intervention condition were asked to write a short essay on the relevance of the mathematical technique to their own lives or the lives of others. Those in the control condition wrote an essay describing pictures hanging on the wall in the testing room. The intervention condition not only showed increased interest in the task but also increased willingness to engage with the task again in the future in comparison to the control condition. Value interventions have been adapted in several different ways to suit a variety of different subjects and student groups with positive practical implications (e.g., Hulleman et al., 2010; Shin et al., 2019). For example, Shin et al. (2019) adapted a utility-value intervention for use with younger students (10-12 years old) studying sciences, whereas Hulleman et al. (2010) used a utility-value intervention for students on a psychology course (Study 2). Both interventions successfully increased perceived value and interest in their respective topics, suggesting that this style of intervention could be adapted for use in many different areas to encourage interest and increase value.

Despite their great promise for increasing interest across a broad range of topics (e.g., Gaspard et al., 2015; Rosenzweig et al., 2020), utility-value interventions have received little attention outside of the field of education. To the best of our knowledge, we are not aware of any studies that have adapted a utility-value intervention task for use outside of the field of education. Given that curiosity and interest likely play a crucial role in the motivation to eat insect foods (e.g., Sogari, 2015; Stone et al., 2022; Videbæk & Grunert, 2020), we believe that it is possible to increase interest in entomophagy and the willingness to try insect foods by adapting a utility-value intervention based on the potential relevance of insect foods. We suggest that, by engaging in a value intervention task in which participants learn the benefits of insect foods, participants would gain both an awareness of the benefits and potentially an interest in entomophagy which, in turn, could result in increased willingness to try and ultimately help overcome the barriers Western culture typically has towards insect-based foods.

3.1.3. The present studies

In two pre-registered studies and follow-ups, we aimed to examine whether a utility-value intervention based on the benefits of eating insect-based foods can increase people's willingness to try those foods and, if so, whether this change is maintained over a prolonged period. In the first study, participants were randomly allocated to a utility-value intervention (hereafter referred to as the value intervention condition for brevity) or a control condition. In both conditions, participants were asked to research and write a short essay. Participants in the value intervention condition were asked to write about the potential relevance of eating insects to their lives or the lives of others and participants in the control condition were asked to write about what constitutes a healthy and sustainable diet. The key differences between the two conditions were the topic and the emphasis on self-generating value through the wording of the essay question. Participants then completed an image rating task, in which images of insect food dishes and visually matched familiar foods were presented in the style of a restaurant-style specials board (Stone et al., 2022). Participants rated a series of images on willingness to try, and five further attributes variables (including curiosity, sustainability, healthiness). Before and after the intervention task participants also completed a set of self-report questions looking at perceived interest and value in the information they had researched in the essay. Our main research question was whether we would see increased willingness to try insect foods (as assessed by an image rating task) in the value intervention condition compared to the control condition. Participants were then invited back one month later to complete another menu evaluation task using the different images from the same database, as well as a series of questions regarding self-reported interest, value and general attitudes towards insects. The research question here was whether the effects of the intervention on the willingness to try insect foods would still be observed one month later.

Study 2 followed a very similar strategy to that of Study 1. However, instead of the control condition used in Study 1, an alternative recipe condition was introduced. The recipe condition asked participants to research and write an essay on how to cook a meal using edible insects. The purpose of introducing a different control condition that used insects as a topic was to uncover whether any effects of a value intervention task were unique to the generation of value in the topic or whether exposure to insects as a food source would be an alternative explanation. The main research question was the same as in Study 1 – whether the willingness to try insect foods would be higher after the value intervention condition than after the recipe control condition. Participants were once again invited back one month later to complete a second menu evaluation task. The research question was again to see if the effects of the value intervention condition would be present one month later.

3.2. Study 1

The preregistered research question (hypothesis) was whether participating in a value intervention task designed to self-generate value and increase interest in insect foods would increase willingness to try. The main dependent variable was willingness to try as assessed by an experimental image rating task (Stone et al., 2022). We also assessed various aspects of insect foods using the same experimental task (curiosity, attitude, tastiness, healthiness and sustainability) and pre-post self-reported questions (value, interest, mood and task engagement). We examined whether a value intervention also has an impact on these measures. At the follow-up, we tested another preregistered hypothesis: whether the effects of the value intervention on willingness to try insect foods would still be present one month later. In addition to the main hypothesis, again, we also examined whether the intervention would have an impact on other aspects of insect foods (curiosity, attitude, tastiness, healthiness and sustainability) as well as pre-post self-reported questions (value, interest, entomophagy re-engagement and general attitudes towards entomophagy).

3.2.1. Method

3.2.1.1. Participants

Two hundred and eighty participants took part in the study (67.5% females, Mean Age = 34.01 *SD* = 12.27). Twenty out of 300 participants recruited were excluded prior to data analysis due to technical issues or incomplete data. The sample size was determined using data from a pilot study, following a new method for calculating sample sizes for nested data in mixed-effects modelling by Murayama et al., (2020) and using their accompanying app (https://koumurayama.shinyapps.io/summary_statistics_based_power/). We were able to determine a sample size of 249 participants was required to achieve 80% power, using the *t* value (0.95) and sample size (n = 30) from the pilot data. Recruitment was conducted using Prolific (https://www.prolific.co) and participants were financially rewarded £5 for 60 minutes of their time. All participants were British citizens as reported on Prolific, however, four participants reported different nationalities in the demographic questionnaire in the study (Bulgarian, Italian, Bangladeshi and Nigerian). All participants resided in the UK. The majority of participants were native English speakers (97.5%), of those who were not native speakers their Mean learning age was 9.71 years (*SD* = 9.20).

All 280 participants were invited to take part in a follow-up study, invitations were sent through the Prolific system one month after their original participation. The follow-up study was not part of the initial study pre-registration, but the design and hypotheses were registered prior to follow-up data being collected (with the exception of three participants who had already completed the task due to the one-month deadline) and prior to any analysis being conducted. The study link was active for 5 days, 223 participants (retention rate = 80%) completed the follow-up study (65% females, Mean Age = 35.17 *SD* = 12.70). Of these 223 participants, 108 of those were originally assigned to the value intervention condition and 115 to the control condition. As in the main study, the majority were native English speakers (97.8%), for those who were not, their mean learning age was 10.40 years (*SD* = 10.97). Participants were rewarded £3 for 30 minutes of their time for the follow-up study.

3.2.1.2. Intervention

Participants were randomly assigned to either the value intervention condition (*n* = 141) or the control condition (*n* = 139). Both conditions were given a short background to their assigned topic and informed that they would be required to conduct a web search and write a short essay on the given topic. The essay task was adapted from Hulleman et al. (2010). Participants in the value intervention condition were instructed as follows:

> "Edible insects have gained a large amount of media attention recently. The reason for this is due to the need to find an alternative protein source that is more environmentally sustainable than current meat production practices. It is widely agreed that insects have the potential to fulfil this need, however many people are still unaware of this. During this experiment you will be asked to search for information on edible insects that is readily available on the internet. Specifically, we ask that you conduct a web search to find information on the benefits of eating insects."

> "Please conduct a web search and type a short essay (1-3 paragraphs) describing the potential relevance of eating insects, to your own life and the lives of others, please focus on how this information could be useful to you or others and give examples."

Participants in the control condition were instructed as follows:

> "Within the UK media attention has long focused on the need for a healthy and environmentally sustainable diet. However, with many confusing and unhealthy options readily available the need for information on healthier and more sustainable choices continues. During this experiment you will be asked to search for information on a healthy and sustainable diet that is readily available on the internet. Specifically, we ask that you conduct a to find information on the factors of a healthy and sustainable diet."
>
> "Please conduct a web search and type a short essay (1-3 paragraphs) on the factors that are important for a healthy and environmentally sustainable diet."

3.2.1.3. Measures

3.2.1.3.1. Image rating task (including "willingness to try")

Participants were asked to rate a series of images on a range of attributes. The images were presented as though on a specials board in a restaurant with the image, title and a short description. Fourteen pairs of images were randomly selected for each participant, the order of these was then randomised when presented to participants to reduce any potential item-specific effects (Murayama et al., 2014). Participants were required to rate the images on the following 6 scales: (1) Willingness to try (the hypothesised main dependent variable), "How likely would you be to try this food?"; (2) Curiosity, "How curious are you about this food?"; (3) Attitude, "How do you feel about this food?"; (4) Tastiness, "How tasty do you think this food would be?"; (5) Healthiness, "How healthy do you think this food is?"; (6) Sustainability, "How sustainable do you think large scale production of this food would be?". Ratings were given on a visual analogue scale (0 – 100) with anchors at either end. Willingness to try was always presented first to avoid priming effects of other questions, the order for the other ratings was randomised across participants. This meant that each participant had a fixed order of questions but this order changed for each participant.

The same image rating task was used in the follow-up study; however, participants were shown images they had not previously rated in Study 1.

To select images for the rating task, a database of dishes containing several different types of edible insects was collated from the internet. Forty-two images were selected to ensure a variety of edible insects within the dishes. To find suitable matched non-insect food images, these images were then run through Google's reverse image search and the closest resemblance containing familiar ingredients was selected. This resulted in 42 pairs of images (insect foods vs. non-insect foods) matched for visual similarity. The inclusion of the matched insect and non-insect food pictures allows us to examine whether the intervention has specific effects on insect foods (as opposed to non-insect foods). An example of a visually-matched pair of images can be seen in Figure 1.

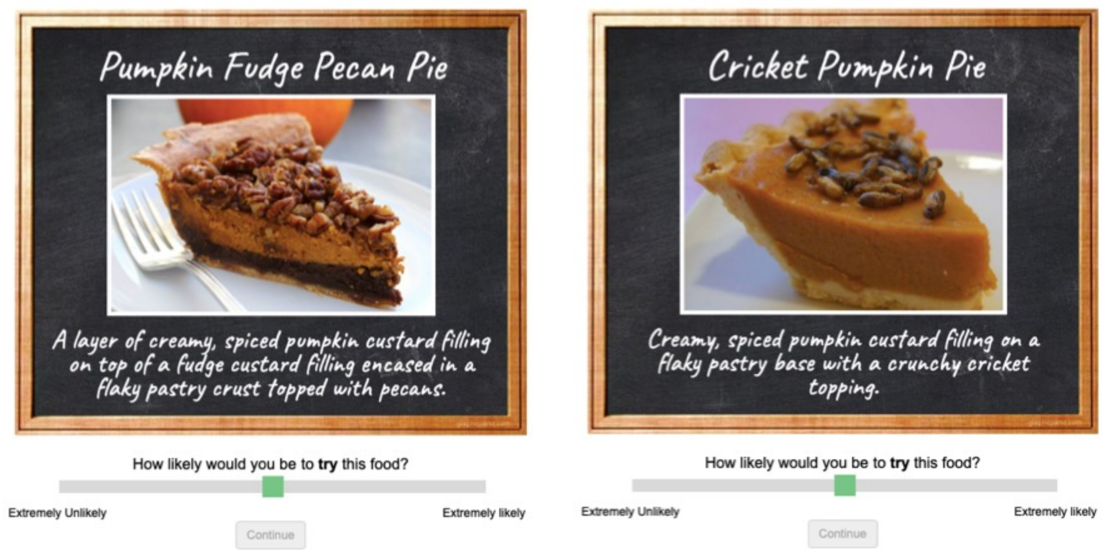

Figure 1. Example stimuli used in all studies (visually matched image pair, titles and descriptions)

3.2.1.3.2. Pre-Post measures

To assess participants' feelings and motivation outside of the context of the image rating task, participants were asked to complete a series of questions prior to and following the intervention task. Participants were asked questions before the intervention to assess the perceived value of the information they were going to research, based on reading the short background to the given topic (e.g., "I think I could use the information I learn in the future") and after with the questions marginally re-worded to make sense after the intervention had taken place (e.g., "I think I will use the information I have learned today in the future"). The same style of pre-post questions was used for interest in the information (e.g., pre: "I think this information will be interesting"; post: "I found the information to be interesting"). Participants also rated mood ("How are you feeling right now?") and task engagement ("How engaged do you feel right now?") before and after the task. All questions were rated on a 5-point Likert scale (0 – 4). See appendix A for a full list of the pre-post items.

The same post interest and perceived value questions were used for the follow-up, however, these were slightly re-worded to make sense one month later (see Appendix A). For example, "I enjoyed learning this information" was re-worded to "I enjoyed learning the information from the essay task". To ensure that participants understood the questions related to the essay task from Study 1, the following prompt was shown at the top of the page: "The questions on this page are related to the information you learned while completing the essay task in the first study".

3.2.1.3.3. Other measures

The interest and disgust sub-scales of the Entomophagy Attitudes Questionnaire (EAQ) were included in the follow-up to measure participants' general attitude towards insect-based foods (La Barbera, Verneau, Videbæk, Amato, & Grunert, 2020). The scale consists of 3 sub-scales, the third was excluded as it relates to eating animal protein that has been fed using insects. The disgust sub-scale consists of 5 items (Cronbach's $\alpha = 0.91$) aimed to measure an individual's level of disgust towards eating insects (e.g., "I would be disgusted to eat any dish with insects"). The interest sub-scale consists of 3 items (Cronbach's α = 0.84) aimed at capturing the level of interest in eating insects (e.g., "I'd be curious to taste a dish with insects, if cooked well").

The 'entomophagy re-engagement' questions were created for the follow-up to examine how often the participants in each condition had thought about eating insects and the potential value of eating insects since completing Study 1 (e.g., "In the past month I have thought about the idea of eating insects."). The questions were rated on a scale of 0 (Never) to 4 (A great deal). The full list of entomophagy re-engagement questions are presented in Appendix B.

3.2.1.4. Procedure

Participants were invited to take part in the 'Food Information Study'. In each condition, they were shown task-specific instructions as described earlier. Participants were then asked to complete the pre-task questions (value, interest, mood and task engagement) and then proceeded on to the essay task. They were told that they would be given a maximum of 20 minutes to complete the task and a countdown timer appeared on the screen so they would be aware of the remaining time. The task required participants to use the search bar within the experiment page which would then bring up search results that when clicked would open the web page in a new browser tab. A minimum word and time limit was imposed to ensure participants had to engage with the task for at least 5 minutes and write a minimum of 150 words. Following this, participants were required to complete the post-task questions (value, interest, mood and task engagement) and were then given instructions for the image rating task. Participants rated their willingness to try insect foods (the main dependent variable) as well as curiosity, attitude, tastiness, healthiness and sustainability with this task. After the main task, participants completed questionnaire items to assess individual differences in eating behaviour: the Food Neophobia scale, (Pliner & Hobden, 1992); the VARSEEK scale, (Van Trijp &

Steenkamp, 1992); the food involvement scale, (Bell & Marshall, 2003); and the openness to experience sub-scale of the HEXACO 60, (Ashton & Lee, 2009). Finally, participants were asked if they had any previous experience with insect foods "Have you previously tried foods containing insects?" (Yes/No).

For the follow-up study, participants were asked to take part in further tasks related to the 'Food Information Study'. This involved completing a second image rating task using the same procedure as used in Study 1. Following this, participants took part in a recall task, during which, they were asked to type as much information as they could recall about the content of the essay which they were asked to write one month previously (the recall question was not included in the pre-registration of the follow-up study in error). Participants were then asked to complete the post measures on perceived value and interest again. After this, participants were asked to complete the entomophagy re-engagement questions, followed by the interest and disgust subscales of the EAQ.

3.2.1.5. Data analysis

Data analysis was performed in R 4.0.4 (R Core Team, 2021) using the *lme4* package (Bates et al., 2015) for linear mixed-effects modelling and the *caret* (Kuhn, 2020) and *glmnet* (Friedman, Hastie, & Tibshirani, 2010) packages for the statistical learning models. Linear mixed-effects models were estimated to predict each of the six attributes from condition and food type at the within-person level. Before analysis, all of the six attributes were re-scaled from 0 – 100 to 0 – 10 to aid model fitting. Pre-post measures were analysed using ANCOVA to examine between-group differences after controlling for participants' baseline scores. For the follow-up data, the entomophagy re-engagement questions and EAQ sub-scales were analysed using t-tests to examine differences between conditions.

3.2.1.5.1. Model specification of linear mixed-effects modelling

Condition (value intervention vs. control, effect coded as 1 and -1 respectively), food type (insect vs. non-insect, effect coded as 1 and -1 respectively) and their interaction were included as fixed effects in each model. We included random participant slopes as well as intercepts. The same strategy was used for all 6 attributes measured. For all mixed-effects models, we focused on the interaction effects as this enabled us to investigate the effect of the intervention specific to insect food images.

3.2.1.5.2. Statistical learning analysis of essay content

Additional exploratory analysis of essay content was conducted to explore whether features of participants' essays predicted their willingness to try insect food. Each participant's essay was spellchecked and tokenised using the *hunspell* (Ooms, 2020) and *quanteda* (Benoit et al., 2018) packages, this also removed stop words and counted the frequency each word stem was used for each participant. These data along with condition were added as predictors to a lasso regression model with willingness to try ratings for insect foods as the dependent variable. The data was split into training (70%) and testing (30%) datasets. The optimal tuning parameter (λ) was selected using 10-fold cross-validation using the training data set. Once the optimal λ was selected, this value was used to run the lasso model across the entire training data set. The lasso model applied feature selection to the training data and coefficients were extracted using the optimal tuning parameter. The final model and optimal λ were used to make predictions on the test data. To examine the predictive power of the model, RMSE and R^2 were calculated for both the training and test data.

3.2.1.5.3. Memory data

Exploratory analysis of the memory data was also conducted for the follow-up data. Memory data was coded by the researchers; memory responses were coded as 'remembered' if participants were able to remember any of the content or topic of their essay and 'not remembered' if they were unable to remember, remembered the topic incorrectly or only described the image rating task. This data was then analysed using a chi-squared test to look for a possible association between condition and memory performance.

3.2.1.5.4. Transparency and openness

We describe our sampling plan, all data exclusions, all manipulations, and all measures in the study, and we adhered to the *Journal of Applied Psychology* methodological checklist. The study design, hypotheses and analysis plan were pre-registered (https://osf.io/djrz6/?view_only=cb346a531a754a4380232bdb24531142 and https://osf.io/5z7rq/?view_only=8a4da138e5b746b2845189b3181e0cb6). All materials, data and analysis code have been made publicly available on OSF and can be accessed at (https://osf.io/4reys/?view_only=16d0605344d84f879128935566387f96).

3.2.2. Results

3.2.2.1. Previous experience

Due to technical issues 20 participants were unable to record responses to the previous experience question, the question was asked at the end of the study and some participants did not reach this page but as they had completed the main task and questionnaire measures their data was not excluded. Of the 260 participants who did respond, 27% reported having previously eaten insects (value intervention = 26%, control = 27%).

3.2.2.2. Intervention effects on rating task

A mixed-effects model was conducted predicting willingness to try from condition, food type and their interaction. Condition was a significant predictor of willingness to try, suggesting those in the value intervention condition gave higher willingness to try ratings compared to the control condition across both food types, $\beta = 0.26$, $p = 0.006$. Importantly, the main effect was qualified by a significant interaction between condition and food type, $\beta = 0.27$, $p < 0.001$. This suggests that those in the value intervention condition rated willingness to try significantly higher for insect food images compared to the control condition. The same model structure was used for each of the other five attributes. For the remaining five attributes condition was also a significant predictor, suggesting that those in the value intervention condition gave higher ratings for all attributes compared to the control condition across both food types, $\beta = 0.23 - 0.28$, $ps < 0.007$ (See Table 1 for descriptive statistics). As with willingness to try, the main effects were qualified by significant interactions between condition and food type, $\beta = 0.21 - 0.33$, $ps < 0.002$. Again, suggesting that participants in the value intervention condition rated insect food images significantly higher on all attributes compared to the control condition, this would indicate that the effects of the intervention were specific to insect foods. The mixed-effects models are presented in Table 2.

Table 1.
Study 1 mean ratings for insect and non-insect images for value intervention and control conditions post-intervention (S1) and at one month follow-up (S1 follow-up).

	Value Intervention				Control			
	Insect		Not Insect		Insect		Not Insect	
	S1	S1 follow-up	S1	S1 follow-up	S1	S1 follow-up	S1	S1 follow-up
	Mean (*SD*)							
Willingness to try	3.00 (2.49)	2.58 (2.33)	7.03 (1.73)	7.24 (1.57)	1.93 (1.90)	1.61 (1.80)	7.05 (1.65)	7.18 (1.55)
Curious	4.53 (2.74)	3.81 (2.66)	5.11 (1.98)	5.15 (2.05)	3.31 (2.40)	2.96 (2.43)	5.23 (1.98)	5.34 (1.89)
Attitude	3.21 (2.21)	2.69 (2.14)	6.79 (1.45)	6.92 (1.41)	2.16 (1.69)	1.93 (1.74)	6.71 (1.47)	6.94 (1.38)
Tasty	3.67 (2.23)	3.14 (2.22)	7.33 (1.37)	7.41 (1.36)	2.67 (1.80)	2.34 (1.88)	7.39 (1.37)	7.39 (1.24)
Healthy	5.85 (1.51)	5.32 (1.54)	5.02 (1.20)	5.23 (1.30)	4.95 (1.88)	4.84 (1.85)	4.96 (1.07)	4.93 (1.06)
Sustainable	6.44 (1.67)	6.01 (1.90)	5.28 (1.52)	5.65 (1.50)	5.33 (2.18)	5.40 (2.30)	5.31 (1.36)	5.81 (1.44)

Table 2.
Mixed-effects modelling for each predictor for Study 1.

		Fixed Effects				
Model		*Est.*	*SE*	*95% CI*	*t*	*p*
Willingness to try						
	Intercept	4.75	0.10	4.57 – 4.94	49.76	**<0.001**
	Condition	0.26	0.10	0.07 – 0.45	2.74	**0.006**
	Insect	-2.29	0.07	-2.43 – -2.15	-33.06	**<0.001**
	Condition X Insect	0.27	0.07	0.13 – 0.41	3.90	**<0.001**
Curious						
	Intercept	4.55	0.10	4.36 – 4.74	47.63	**<0.001**
	Condition	0.28	0.10	0.09 – 0.46	2.89	**0.004**
	Insect	-0.62	0.10	-0.82 – -0.43	-6.32	**<0.001**
	Condition X Insect	0.33	0.10	0.14 – 0.53	3.39	**0.001**
Attitude						
	Intercept	4.72	0.08	4.56 – 4.87	59.60	**<0.001**
	Condition	0.28	0.08	0.13 – 0.44	3.58	**<0.001**
	Insect	-2.03	0.07	-2.17 – -1.90	-30.50	**<0.001**
	Condition X Insect	0.24	0.07	0.11 – 0.37	3.63	**<0.001**
Tasty						
	Intercept	5.27	0.08	5.10 – 5.43	63.22	**<0.001**
	Condition	0.23	0.08	0.07 – 0.40	2.79	**0.005**
	Insect	-2.10	0.06	-2.22 – -1.98	-34.05	**<0.001**
	Condition X Insect	0.26	0.06	0.14 – 0.38	4.27	**<0.001**
Healthy						
	Intercept	5.20	0.07	5.06 – 5.33	73.92	**<0.001**
	Condition	0.24	0.07	0.10 – 0.38	3.43	**0.001**
	Insect	0.20	0.05	0.10 – 0.30	4.00	**<0.001**
	Condition X Insect	0.21	0.05	0.11 – 0.31	4.17	**<0.001**
Sustainable						
	Intercept	5.59	0.08	5.44 – 5.74	74.26	**<0.001**
	Condition	0.27	0.08	0.12 – 0.42	3.57	**<0.001**
	Insect	0.29	0.07	0.16 – 0.43	4.23	**<0.001**
	Condition X Insect	0.29	0.07	0.15 – 0.42	4.15	**<0.001**

		Random Effects		
Model		*Variance*	*SD*	*Correlation*
Willingness to try				
	Subject (Intercept)	2.31	1.52	
	Condition:Insect | Subject	1.10	1.05	0.19
Curious				
	Subject (Intercept)	2.34	1.53	
	Condition:Insect | Subject	2.51	1.58	0.09
Attitude				
	Subject (Intercept)	1.57	1.25	
	Condition:Insect | Subject	1.06	1.03	0.21
Tasty				
	Subject (Intercept)	1.75	1.32	
	Condition:Insect | Subject	0.86	0.93	0.18
Healthy				
	Subject (Intercept)	1.13	1.06	
	Condition:Insect | Subject	0.46	0.68	-0.27
Sustainable				
	Subject (Intercept)	1.41	1.19	
	Condition:Insect | Subject	1.16	1.08	-0.23

	Model Fit (R^2)	
Model	*Marginal*	*Conditional*
Willingness to try	0.34	0.56
Curious	0.05	0.48
Attitude	0.35	0.57
Tasty	0.36	0.57
Healthy	0.02	0.19
Sustainable	0.03	0.37

The mixed-effects model for the follow-up showed that the effect of condition on willingness to try was still present one month later, $\beta = 0.26$, $p = 0.007$. The interaction effect was also sustained at follow-up, $\beta = 0.23$, $p = 0.003$. This suggests that one month after the intervention had taken place those in the value intervention condition still rated insect foods significantly higher than those in the control condition. Many of the effects seen during the original intervention were also sustained one month later for the other five attributes. A significant effect of condition was seen for attitude, tastiness and healthiness ($\beta = 0.18 – 0.21$, *ps* < 0.030). Suggesting that for these attributes, those in the value intervention condition provided higher ratings than those in the control condition across insect and non-insect food. The effects of condition on ratings of curiosity and sustainability were not maintained at the one-month follow-up (*ps* > 0.100). The only attribute not to show a significant interaction at follow-up was healthiness ($p = 0.476$), all other attributes showed sustained interactions between condition and food type, $\beta = 0.19 – 0.26$, *ps* < 0.030. At one-month post-intervention, the pattern of interactions is consistent with Study 1, where those in the value intervention condition rated insect food images higher compared to those in the control condition. Model results are presented in Table 3 and descriptive statistics in Table 1.

Table 3.
Mixed-effects modelling for each predictor for Study 1 follow-up.

		Fixed Effects				
Model		*Est.*	*SE*	*95% CI*	*t*	*p*
Willingness to try						
	Intercept	4.65	0.10	4.46 – 4.84	48.15	**<0.001**
	Condition	0.26	0.10	0.07 – 0.45	2.67	**0.007**
	Insect	-2.55	0.08	-2.70 – -2.41	-33.59	**<0.001**
	Condition X Insect	0.23	0.08	0.08 – 0.38	3.00	**0.003**
Curious						
	Intercept	4.31	0.10	4.11 – 4.51	42.57	**<0.001**
	Condition	0.16	0.10	-0.03 – 0.36	1.62	0.105
	Insect	-0.93	0.11	-1.15 – -0.71	-8.14	**<0.001**
	Condition X Insect	0.26	0.11	0.04 – 0.48	2.29	**0.022**
Attitude						
	Intercept	4.62	0.08	4.45 – 4.78	55.19	**<0.001**
	Condition	0.18	0.08	0.02 – 0.35	2.19	**0.028**
	Insect	-2.31	0.08	-2.46 – -2.16	-30.17	**<0.001**
	Condition X Insect	0.19	0.08	0.04 – 0.34	2.54	**0.011**
Tasty						
	Intercept	5.07	0.09	4.90 – 5.24	57.60	**<0.001**
	Condition	0.21	0.09	0.03 – 0.38	2.36	**0.018**
	Insect	-2.33	0.07	-2.48 – -2.18	-31.43	**<0.001**
	Condition X Insect	0.20	0.07	0.05 – 0.34	2.63	**0.008**
Healthy						
	Intercept	5.08	0.07	4.93 – 5.23	67.93	**<0.001**
	Condition	0.20	0.07	0.05 – 0.34	2.61	**0.009**
	Insect	-0.00	0.06	-0.13 – 0.13	-0.00	0.997
	Condition X Insect	0.05	0.06	-0.08 – 0.17	0.71	0.476
Sustainable						
	Intercept	5.72	0.09	5.54 – 5.89	63.62	**<0.001**
	Condition	0.11	0.09	-0.06 – 0.29	1.27	0.204
	Insect	-0.01	0.08	-0.17 – 0.15	-0.13	0.898
	Condition X Insect	0.19	0.08	0.03 – 0.35	2.32	**0.020**

		Random Effects		
Model		*Variance*	*SD*	*Correlation*
Willingness to try				
	Subject (Intercept)	1.87	1.37	
	Condition:Insect | Subject	1.08	1.04	0.17
Curious				
	Subject (Intercept)	2.11	1.45	
	Condition:Insect | Subject	2.72	1.65	0.02
Attitude				
	Subject (Intercept)	1.41	1.19	
	Condition:Insect | Subject	1.15	1.07	0.13
Tasty				
	Subject (Intercept)	1.56	1.25	
	Condition:Insect | Subject	1.06	1.03	0.09
Healthy				
	Subject (Intercept)	1.01	1.01	
	Condition:Insect | Subject	0.68	0.82	-0.25
Sustainable				
	Subject (Intercept)	1.65	1.28	
	Condition:Insect | Subject	1.37	1.17	-0.17

	Model Fit (R^2)	
Model	*Marginal*	*Conditional*
Willingness to try	0.43	0.63
Curious	0.09	0.53
Attitude	0.44	0.65
Tasty	0.43	0.64
Healthy	0.01	0.21
Sustainable	0.01	0.42

3.2.2.3. Pre-Post measures

ANCOVA's were conducted on each of the pre-post measures to assess whether there were differences between conditions post intervention, after controlling for participants pre-scores. There was a significant difference between conditions in participants' post interest scores, $F(1, 277) = 5.82$, $p = 0.017$, $\eta_p = 0.02$. The value intervention condition showed higher interest scores post-intervention ($M = 3.15$, $SD = 0.78$) compared to the control condition ($M = 3.08$, $SD = 0.71$). Post-intervention value scores did not show a significant difference between the conditions after controlling for pre-intervention scores, $F(1, 277) = 0.01$, $p = 0.919$, $\eta_p = 0.00$. There was no statistically significant difference between conditions in mood, $F(1, 277) = 0.19$, $p = 0.661$, $\eta_p = 0.00$. There was also no statistically significant difference between conditions in post-intervention task engagement, $F(1, 277) = 0.57$, $p = 0.449$, $\eta_p = 0.00$. See Table 4 for pre-post descriptive statistics.

The post measures taken at follow-up were also analysed using ANCOVA's to assess whether there were any differences between conditions one month after the intervention whilst still controlling for the pre-scores taken during Study 1. Consistent with Study 1, there was a significant difference between conditions in post interest scores, $F(1, 220) = 7.20$, $p = 0.008$, $\eta_p = 0.03$. There was no statistically significant difference in post value between the value intervention and control conditions, $F(1, 220) = 3.72$, $p = 0.055$, $\eta_p = 0.02$.

3.2.2.4. Other measures

The entomophagy re-engagement questions (5 items, $\alpha = .88$) showed that participants in the value intervention condition ($M = 1.01$, $SD = 0.88$) thought about insects as a food source and the related benefits over the previous month more than those in the control condition ($M = 0.51$, $SD = 0.69$), $t(221) = 4.69$, $p < 0.001$, $d = 0.63$.

The interest and disgust sub-scales of the EAQ measured at the one-month follow-up, also showed differences between the two conditions. In accordance with the pre-post measures, those in the value intervention condition (*M* = 2.03, *SD* = 1.24) showed higher levels of interest in insect foods compared to the control condition (*M* = 1.54, *SD* = 1.30), $t(221) = 2.85$, $p = 0.005$, $d = 0.38$. The value intervention condition (*M* = 2.02, *SD* = 1.10) also showed significantly lower levels of disgust toward insect foods compared to the control condition (*M* = 2.47, *SD* = 1.14), $t(221) = -2.99$, $p = 0.003$, $d = -0.40$. See Table 4 for descriptive statistics on all follow-up post measures and questionnaires.

Table 4.
Mean pre-post and questionnaire measures for the value intervention and control conditions for Study 1 (S1) and one month follow-up (S1 follow-up).

		Value Intervention		Control	
		S1	S1 follow-up	S1	S1 follow-up
Measure		Mean (*SD)*			
Value					
	pre	2.55 (0.77)	–	2.93 (0.60)	–
	post	2.61 (0.89)	2.35 (0.93)	2.81 (0.89)	2.27 (0.85)
Interest					
	pre	2.85 (0.79)	–	3.04 (0.61)	–
	post	3.15 (0.78)	2.91 (0.81)	3.08 (0.71)	2.70 (0.76)
Mood					
	pre	2.75 (0.66)	–	2.77 (0.63)	–
	post	2.85 (0.72)	–	2.83 (0.69)	–
Task engagement					
	pre	3.04 (0.63)	–	3.06 (0.65)	–
	post	3.21 (0.65)	–	3.17 (0.70)	–
EAQ-interest		–	2.03 (1.24)	–	1.54 (1.30)
EAQ-disgust		–	2.02 (1.10)	–	2.47 (1.14)
Entomophagy re-engagement		–	1.01 (0.88)	–	0.51 (0.69)

3.2.2.5. Essay content

Statistical learning was applied to the essay data with the tokenised word stems and condition added to a lasso model as predictors for willingness to try ratings for insect foods. Willingness to try (How likely would you be to try this food?) was rescaled to a scale of 0 (Extremely Unlikely) to 10 (Extremely Likely). The feature selection applied by the lasso regression suggested that 14 words stems and condition were predictors of the willingness to try ratings (see Table 5). However, the combination of the rather idiosyncratic selected features and the measures of predictive power (R^2 and RMSE) suggest that essay content was not particularly informative in terms of predicting willingness to try insect foods for test ($R^2 = 0.02$; RMSE = 2.33) as well as training ($R^2 = 0.05$; RMSE = 2.23) datasets.

Table 5.
Selected features and coefficients from statistical learning model including RMSE and R^2 for Study 1 essay data.

Predictors	Coefficients	
Intercept	2.19	
thailand	0.48	
protein	0.02	
shortag	0.23	
given	0.08	
soon	0.22	
beef	0.16	
just	0.07	
yield	0.97	
go	0.03	
give	0.05	
scientist	0.85	
100g	0.12	
avocado	0.59	
minut	0.51	
condition	0.08	
	RMSE	R^2
Train	2.23	0.05
Test	2.33	0.02

3.2.2.6. Memory

Memory responses of essay content at the one-month follow-up were coded based on whether participants were able to remember any of the content or topic of their essay one month after completing the task. If they reported being unable to remember, remembered incorrectly or described the rating task instead of the essay task it was coded as not remembered. Our results suggested that those in the value intervention condition remembered the topic or content of their essays (72%) more than those in the control condition (58%), χ^2 (1, N = 223) = 4.18, p = 0. 041.

3.2.3 Discussion

The results from Study 1 addressed the main research question: participants in the value intervention condition rated insect foods more favourably on willingness to try compared to the control condition and the effect was specifically stronger for insect foods. The effect was persistent in a one-month follow-up. In addition, this same effect was found for the other 5 attributes (curiosity, attitude, perceived tastiness, healthiness and sustainability) in the main data, and most of these effects were persistent in the follow-up (except for healthiness). We also found the effects of the intervention on self-reported interest, entomophagy re-engagement and both sub-scales of the EAQ. Contrary to our expectation, there was no significant difference between conditions in self-reported value after the intervention. However, this result is difficult to accurately interpret, as we only asked participants about their interest and value of the information participants learned in the task. In other words, participants in the control condition did not rate the value of the information related to insect foods. This issue will be addressed in Study 2.

3.3. Study 2

Overall, Study 1 suggests that the value intervention was successful at increasing interest in entomophagy and willingness to try, along with other measures which point toward a positive role of the intervention. However, as the control condition topic was not related to insect foods, it is not yet known whether any positive exposure to insect foods may be sufficient for an effective intervention, or whether participants' considering the value of insect foods plays a crucial role. To address the issue, the control condition was changed to a recipe task, which exposed participants to the use of insects as food in recipes but did not ask them to self-generate value in the topic. We also assessed other exploratory variables, including some new measures for the current study (explained in the method section), to further examine potential psychological and behavioural variables that a value intervention has an impact on.

Like Study 1, the preregistered research question (hypothesis) was whether participating in a value intervention task would increase interest in insect foods in comparison to the recipe control condition and whether the effect would be sustained in a one-month follow-up. The main dependent variable was again willingness to try as assessed by the same task used in Study 1.

3.3.1. Method

3.3.1.1. Participants

A sample of 422 participants were recruited, the sample size was pre-determined based on data from Study 1. We determined an approximate sample size of 422 to achieve 90% power with a 50% reduction in effect size of the smallest interaction effect from Study 1 (i.e., the curiosity interaction effect). Here the effect size is based on a correlation metric (we used a squared correlation to compute the 50% reduction), which is defined and explained by Murayama et al. (2020). Of those 422 participants, 37 were excluded prior to analysis due to technical issues or incomplete data on the main task or questionnaire measures. The remaining 385 participants completed the study (68.3% females, Mean Age = 33.39 *SD* = 13.45). Participant recruitment was conducted through Prolific and participants were rewarded £4.17 for 50 minutes of their time. All participants were UK residents and reported British nationality on Prolific (used to screen potential participants), however, 12 participants reported other nationalities in the demographic questionnaire provided in the study (French, Bangladeshi, Irish, Italian, Polish, Norwegian, Pakistani, Chinese, Bulgarian, German, Nigerian). As in

Study 1, the majority of participants were native English speakers (95.1%). The mean learning age for non-native speakers was 8.35 years (*SD* = 7.54), two participants reported that English was not their first language but did not report their learning age.

The 385 participants who completed Study 2 were invited to take part in the follow-up study one month after their original participation. The link was sent through the Prolific system and lasted 5 days, a financial reward of £3 for 30 minutes participation was offered. Two hundred and eighty-one participants completed the follow-up study (retention rate = 73%, 68.7% females, Mean Age = 34.96 *SD* = 14.21). Of these, 146 were originally assigned to the value intervention condition and 135 to the recipe condition. The majority were, again, native English speakers (94.7%), for non-native speakers their mean learning age reported was 9.46 years (*SD* = 8.30). Two participants reported English was not their first language but did not report their learning age.

3.3.1.2. Intervention

The structure of the intervention was the same as that of Study 1, both conditions were given a short background to their topic and were required to complete an information search and short essay task. Participants were randomly assigned to the value intervention condition (n = 197) or the recipe condition (n = 188). The instructions for participants in the value intervention condition were identical to Study 1, participants in the recipe condition were instructed as follows:

> "Edible insects have gained a large amount of media attention recently. The reason for this is due to the need to find an alternative protein source that is more environmentally sustainable than current meat production practices. It is widely agreed that insects have the potential to fulfil this need, however many people are still unaware of this. During this experiment you will be asked to search for information on edible insects that is readily available on the internet. Specifically, we ask that you conduct a web search to look for a recipe made using edible insects."

"Please conduct a web search and type a short essay (1-3 paragraphs) on how to cook a meal using edible insects, including ingredients and instructions."

3.3.1.3. Measures

3.3.1.3.1. Image rating task (including "willingness to try")

The image rating task was identical to that of Study 1 in terms of the image database, ratings and scales used. Participants were asked to rate fourteen pairs of randomly selected images on the same 6 attributes, with willingness to try presented first followed by the other 5 attributes which were randomised across participants.

The same image rating task was used in the follow-up with participants being shown images they had not previously rated in Study 2.

3.3.1.3.2. Pre-Post measures

The pre and post measures were expanded from Study 1 to include 4 questions for perceived value and 4 questions for interest. The perceived value and interest questions were changed to capture value (e.g., "I think edible insects could be beneficial to me in daily life.") and interest (e.g., "For me edible insects are an interesting topic.") in edible insects rather than just in the information as in Study 1. Rated on a 5-point Likert scale (0 – 4), the 4 interest and 4 value questions were asked before and after the intervention. The full list of pre and post measures for Study 2 can be seen in Appendix C. Mood ("How are you feeling right now?") and task engagement ("How engaged do you feel right now?") remained the same and the questions were asked before and after the intervention as in Study 1.

The post questions were asked again in the one-month follow-up for both perceived value and interest.

3.3.1.3.3 Other measures

The interest and disgust sub-scales from the EAQ were used to measure general attitudes towards entomophagy. The interest sub-scale (e.g., "I'd be curious to taste a dish with insects, if cooked well"), comprised of 3 items, aims to measure general levels of interest in entomophagy. The disgust sub-scale consists of 5 items (e.g., "I would be disgusted to eat any dish with insects") and aims to measure the level of disgust towards edible insects.

Both the interest and disgust sub-scales of the EAQ were asked again in the one-month follow-up.

The 'entomophagy re-engagement' questions used in the Study 1 follow-up were used again in this follow-up to examine whether participants had thought about edible insects and their potential value since completing Study 2 (e.g., In the past month I have thought about the idea of eating insects). The questions were rated on the same 0 (Never) to 4 (A Great Deal) scale, see appendix B for the full list of questions.

3.3.1.3.4 Discount code and purchase intentions

To assess behavioural intention to eat insect foods, participants were also given the opportunity to click a link to receive a 15% discount code for the edible insect website Crunchy Critters (https://www.crunchycritters.com). If they did not click the link, they simply moved on with the experiment.

For the follow-up study participants were asked if they had purchased any insect foods since completing Study 2. If they responded 'yes', they were asked if they had used the voucher offered in the previous study. If they responded 'no', they were asked if they would consider purchasing insect foods in the future ("Would you consider purchasing insect food products in the future?").

3.3.1.4 Procedure

Participants were invited to take part in the "Food Information Study". Identical to the procedure of Study 1, participants completed the pre-task questions then proceeded to complete the information search and essay task on their assigned topic. The essay task followed the same rules as Study 1 in terms of minimum and maximum time limits as well as the minimum word count. The information search part of the task also worked in the same way as that of Study 1. Immediately after the essay task, participants completed the post-task questions. Participants were then asked to complete the image rating task. Participants rated willingness to try along with the other 5 attributes (curiosity, attitude, tastiness, healthiness and sustainability) for each image. Participants then went on to complete the interest and disgust sub-scale of the EAQ. After this, participants were presented with the opportunity to claim the 15% discount code, followed by a question asking if they had any previous experience with insect foods.

The follow-up was also similar to that in Study 1. Participants were invited back to take part in further tasks related to the 'Food Information Study'. A second image rating task was completed, following the same procedure as the first but each participant rated a different set of 14 image pairs in the follow-up. Participants then completed a recall task, in which they were asked to write down everything they were able to remember regarding the content of their essay from Study 2. Participants then completed the post questions, followed by the entomophagy re-engagement questions and then the interest and disgust sub-scales of the EAQ. Participants were also asked if they had purchased insect foods in the past month. Finally, participants were given a second chance to redeem the discount code they were offered in Study 2.

3.3.1.5 Data analysis

Data analysis followed the same structure as in Study 1 including model specification (value intervention vs. recipe, effect coded as 1 and -1 respectively), statistical learning, scaling and pre-post analysis. The option to claim the discount code for the edible insects website and questions on purchasing insect foods were analysed using chi-squared tests to examine any differences between the conditions.

3.3.1.5.1 Transparency and openness

As in Study 1, the study design, hypotheses and analysis plan were pre-registered (https://osf.io/dcfrm/?view_only=509f0af273d64216acb1d200128bab93) and https://osf.io/59pwv/?view_only=d191a3242caa467db703e2b328c7e413).

3.3.2. Results

3.3.2.1 Previous experience

Twenty-one participants did not provide responses to the previous experience question due to technical issues. Of the 364 responses collected, 15% of participants reported having previously eaten insects (value intervention = 16%, recipe = 14%).

3.3.2.2. Intervention effects on rating task

A mixed-effects model was again conducted on willingness to try. Condition was not a significant predictor of willingness to try, suggesting ratings did not significantly differ across conditions for both food types, $\beta = 0.03$, $p = 0.778$. There was also no significant interaction, $\beta = 0.04$, $p = 0.539$. This would suggest that for willingness to try, ratings given by those in the value intervention condition were not significantly different from those in the recipe condition for either food type.

Mixed-effects models were conducted on the remaining attributes, as in Study 1. Condition was not a significant predictor for any of the attributes, $\beta = 0.02 – 0.10$, *ps* > 0.080. There were also no significant interactions between condition and food type, $\beta = 0.03 – 0.13$, *ps* > 0.060, suggesting there was no statistically significant difference in ratings of any attribute between the value intervention and recipe condition for either type of food. See Table 6 for descriptive statistics and Table 7 for model results.

Table 6.
Study 2 mean ratings for insect and non-insect images for value intervention and recipe conditions post-intervention (S2) and at one month follow-up (S2 follow-up).

	Value Intervention				Recipe			
	Insect		Not Insect		Insect		Not Insect	
	S2	S2 follow-up	S2	S2 follow-up	S2	S2 follow-up	S2	S2 follow-up
Willingness to try	2.92 (2.54)	2.51 (2.33)	6.99 (1.60)	7.06 (1.60)	2.79 (2.46)	2.42 (2.34)	7.01 (1.78)	7.08 (1.65)
Curious	4.06 (2.57)	3.38 (2.44)	5.04 (1.95)	5.22 (1.88)	3.76 (2.62)	3.28 (2.65)	5.24 (2.10)	5.31 (2.11)
Attitude	3.12 (2.16)	2.77 (2.05)	6.69 (1.35)	6.73 (1.34)	2.99 (2.16)	2.58 (2.09)	6.70 (1.51)	6.76 (1.38)
Tasty	3.61 (2.19)	3.29 (2.12)	7.18 (1.34)	7.25 (1.33)	3.36 (2.19)	3.14 (2.25)	7.18 (1.48)	7.22 (1.31)
Healthy	5.44 (1.68)	5.08 (1.65)	5.07 (1.24)	5.14 (1.13)	5.09 (1.67)	4.95 (1.70)	5.00 (1.18)	5.14 (1.16)
Sustainable	6.05 (1.64)	5.60 (1.81)	5.20 (1.43)	5.47 (1.37)	5.81 (1.81)	5.61 (1.87)	5.36 (1.40)	5.70 (1.45)

Table 7.
Mixed-effects modelling for each predictor for Study 2.

		Fixed Effects				
Model		*Est.*	*SE*	*95% CI*	*t*	*p*
Willingness to try						
	Intercept	4.93	0.09	4.75 – 5.10	55.27	**<0.001**
	Condition	0.03	0.09	-0.15 – 0.20	0.28	0.778
	Insect	-2.07	0.06	-2.20 – -1.95	-33.13	**<0.001**
	Condition X Insect	0.04	0.06	-0.08 – 0.16	0.61	0.539
Curious						
	Intercept	4.53	0.09	4.36 – 4.70	51.70	**<0.001**
	Condition	0.03	0.09	-0.14 – 0.20	0.31	0.756
	Insect	-0.62	0.08	-0.77 – -0.46	-7.71	**<0.001**
	Condition X Insect	0.13	0.08	-0.03 – 0.28	1.59	0.112
Attitude						
	Intercept	4.87	0.07	4.74 – 5.01	68.76	**<0.001**
	Condition	0.03	0.07	-0.11 – 0.17	0.40	0.689
	Insect	-1.82	0.06	-1.94 – -1.70	-29.83	**<0.001**
	Condition X Insect	0.03	0.06	-0.08 – 0.15	0.57	0.569
Tasty						
	Intercept	5.33	0.08	5.19 – 5.48	70.89	**<0.001**
	Condition	0.06	0.08	-0.09 – 0.21	0.80	0.424
	Insect	-1.85	0.06	-1.96 – -1.74	-32.90	**<0.001**
	Condition X Insect	0.06	0.06	-0.05 – 0.17	1.09	0.276
Healthy						
	Intercept	5.15	0.06	5.04 – 5.27	88.04	**<0.001**
	Condition	0.10	0.06	-0.01 – 0.22	1.75	0.080
	Insect	0.11	0.05	0.02 – 0.20	2.48	**0.013**
	Condition X Insect	0.07	0.05	-0.02 – 0.16	1.52	0.128
Sustainable						
	Intercept	5.61	0.06	5.49 – 5.72	93.46	**<0.001**
	Condition	0.02	0.06	-0.10 – 0.14	0.36	0.716
	Insect	0.32	0.05	0.22 – 0.43	6.07	**<0.001**
	Condition X Insect	0.10	0.05	-0.01 – 0.20	1.86	0.064

		Random Effects		
Model		*Variance*	*SD*	*Correlation*
Willingness to try				
	Subject (Intercept)	2.83	1.68	
	Condition:Insect | Subject	1.28	1.31	0.08
Curious				
	Subject (Intercept)	2.75	1.66	
	Condition:Insect | Subject	2.26	1.50	0.02
Attitude				
	Subject (Intercept)	1.76	1.33	
	Condition:Insect | Subject	1.25	1.12	0.05
Tasty				
	Subject (Intercept)	1.99	1.41	
	Condition:Insect | Subject	1.03	1.02	0.05
Healthy				
	Subject (Intercept)	1.09	1.04	
	Condition:Insect | Subject	0.59	0.77	-0.01
Sustainable				
	Subject (Intercept)	1.22	1.11	
	Condition:Insect | Subject	0.94	0.97	-0.07

	Model Fit (R^2)	
Model	*Marginal*	*Conditional*
Willingness to try	0.29	0.57
Curious	0.04	0.49
Attitude	0.29	0.56
Tasty	0.29	0.55
Healthy	0.00	0.21
Sustainable	0.02	0.34

The same pattern was seen in the one-month follow-up, condition was not a significant predictor of willingness to try, β = 0.02, *p* = 0.875. There was also no significant interaction, β = 0.03, *p* = 0.675.

Condition was not a significant predictor for any of the other 5 attributes, β = -0.06 – 0.04, *ps* > 0.400. Nor were there any significant interactions between condition and food type, β = 0.03 – 0.05, *ps* > 0.400. Similar to the main study, our results suggest there were no differences between conditions on the ratings given for any of the attributes for either food type. Mixed-effects models are presented in Table 8 and descriptive statistics in Table 6.

Table 8.
Mixed-effects modelling for each predictor for Study 2 follow-up.

		Fixed Effects				
Model		*Est.*	*SE*	*95% CI*	*t*	*p*
Willingness to try						
	Intercept	4.77	0.10	4.58 – 4.96	48.66	**<0.001**
	Condition	0.02	0.10	-0.18 – 0.21	0.16	0.875
	Insect	-2.30	0.07	-2.44 – -2.17	-33.20	**<0.001**
	Condition X Insect	0.03	0.07	-0.11 – 0.16	0.42	0.675
Curious						
	Intercept	4.30	0.10	4.10 – 4.49	43.12	**<0.001**
	Condition	0.00	0.10	-0.19 – 0.20	0.01	0.992
	Insect	-0.97	0.09	-1.15 – -0.78	-10.38	**<0.001**
	Condition X Insect	0.04	0.09	-0.14 – 0.23	0.48	0.630
Attitude						
	Intercept	4.71	0.08	4.55 – 4.87	58.17	**<0.001**
	Condition	0.04	0.08	-0.12 – 0.20	0.52	0.604
	Insect	-2.04	0.07	-2.17 – -1.91	-30.75	**<0.001**
	Condition X Insect	0.05	0.07	-0.08 – 0.18	0.80	0.425
Tasty						
	Intercept	5.23	0.09	5.05 – 5.40	59.98	**<0.001**
	Condition	0.04	0.09	-0.13 – 0.22	0.51	0.611
	Insect	-2.01	0.06	-2.13 – -1.88	-31.71	**<0.001**
	Condition X Insect	0.03	0.06	-0.09 – 0.15	0.49	0.627
Healthy						
	Intercept	5.08	0.07	4.94 – 5.21	75.15	**<0.001**
	Condition	0.03	0.07	-0.10 – 0.16	0.46	0.643
	Insect	-0.06	0.05	-0.16 – 0.04	-1.17	0.243
	Condition X Insect	0.03	0.05	-0.07 – 0.13	0.58	0.565
Sustainable						
	Intercept	5.60	0.07	5.45 – 5.74	74.86	**<0.001**
	Condition	-0.06	0.07	-0.21 – 0.09	-0.8	0.424
	Insect	0.01	0.06	-0.11 – 0.13	0.16	0.870
	Condition X Insect	0.05	0.06	-0.07 – 0.17	0.8	0.422

		Random Effects		
Model		*Variance*	*SD*	*Correlation*
Willingness to try				
	Subject (Intercept)	2.48	1.58	
	Condition:Insect | Subject	1.13	1.06	0.02
Curious				
	Subject (Intercept)	2.61	1.62	
	Condition:Insect | Subject	2.25	1.50	0.00
Attitude				
	Subject (Intercept)	1.67	1.29	
	Condition:Insect | Subject	1.06	1.03	0.01
Tasty				
	Subject (Intercept)	1.96	1.40	
	Condition:Insect | Subject	0.95	0.98	-0.04
Healthy				
	Subject (Intercept)	1.06	1.03	
	Condition:Insect | Subject	0.55	0.74	0.00
Sustainable				
	Subject (Intercept)	1.42	1.19	
	Condition:Insect | Subject	0.97	0.98	0.01

	Model Fit (R^2)	
Model	*Marginal*	*Conditional*
Willingness to try	0.35	0.60
Curious	0.09	0.54
Attitude	0.36	0.59
Tasty	0.34	0.59
Healthy	0.00	0.21
Sustainable	0.00	0.36

3.3.2.3. Pre-Post measures

As in Study 1, ANCOVAs were conducted on each of the pre-post measures to assess post-intervention differences between conditions after controlling for baseline scores. Unlike the image rating task, value intervention condition showed higher post interest and value scores compared to the recipe condition. Participants in the value intervention condition (M = 2.67, SD = 0.89) showed higher post-interest scores compared to the recipe condition (M = 2.39, SD = 0.97). This was significantly different between conditions, $F(1, 381) = 36.60$, $p < 0.001$, η_p = 0.09. One participant was removed from the pre-post interest analysis due to a technical issue resulting in a missing score. A similar pattern was seen for post value; the value intervention condition (M = 2.77, SD = 0.83) also showed higher post-value scores compared to the recipe condition (M = 2.34, SD = 0.95). This was once again significantly different between conditions, $F(1, 382) = 56.01$, $p < 0.001$, η_p = 0.13. Participants in the value intervention condition also appeared to find the task more engaging (M = 3.29, SD = 0.63) in comparison to the recipe condition (M = 3.17, SD = 0.64), $F(1, 382) = 9.42$, $p = 0.002$, η_p = 0.02. This same pattern was also reflected in the mood measure, with the value intervention condition having higher mood scores post-intervention (M = 2.75, SD = 0.72) compared to the recipe condition (M = 2.60, SD = 0.81), $F(1, 382) = 6.83$, $p = 0.009$, η_p = 0.02.

To assess differences between conditions on post measures at one-month follow-up ANCOVAs were again implemented controlling for the pre-scores taken in the main data collection. The significant differences in self-reported interest measures were sustained at follow-up, $F(1, 277) = 16.42$, p = <0.001, η_p = 0.06. As were the significant differences in the value measure, $F(1, 277) = 17.11$, p = <0.001, η_p = 0.06. Participants in the value intervention condition reported higher post-interest (M = 2.43, SD = 0.95) and value (M = 2.52, SD = 0.84) at follow-up compared to the recipe condition (M = 2.09, SD = 1.09 for interest; M = 2.23, SD = 0.96 for value).

3.3.2.4. Other measures

Participants also completed the interest and disgust subscales of the EAQ; in the main study, independent samples t-tests showed that there were no significant differences between conditions the interest sub-scale, $t(383) = 0.75$, $p = 0.454$, $d = 0.08$. The same was found for the disgust sub-scale, $t(383) = -0.45$, $p = 0.652$, $d = -0.05$. Similarly, in the one-month follow-up, participants showed no significant differences between conditions on the interest sub-scale, $t(279) = 0.16$, $p = 0.874$, $d = 0.02$. The disgust sub-scale of the EAQ also showed no significant differences, $t(279) = -0.64$, $p = 0.526$, $d = -0.08$.

The entomophagy re-engagement questions showed no significant differences between conditions at the one-month follow-up, $t(279) = 1.83$, $p = 0.07$, $d = 0.22$, suggesting that participants in both the value intervention condition ($M = 0.91$, $SD = 0.92$) and the recipe condition ($M = 0.71$, $SD = 0.85$) thought about insects as a food source and the related benefits similar amounts within that previous month. Descriptive statistics for pre-post measures and questionnaire measures are presented in Table 9.

Table 9.
Mean pre-post and questionnaire measures for the value intervention and recipe conditions for Study 2 (S2) and one month follow-up (S2 follow-up).

		Value Intervention		Recipe	
		S2	S2 follow-up	S2	S2 follow-up
Measure		Mean (*SD*)			
Value					
	pre	2.12 (0.93)	–	2.12 (0.95)	–
	post	2.77 (0.83)	2.52 (0.84)	2.34 (0.95)	2.23 (0.96)
Interest					
	pre	2.09 (0.97)	–	2.16 (1.03)	–
	post	2.67 (0.89)	2.43 (0.95)	2.39 (0.97)	2.09 (1.09)
Mood					
	pre	2.54 (0.73)	–	2.52 (0.73)	–
	post	2.75 (0.72)	–	2.60 (0.81)	–
Task engagement					
	pre	3.03 (0.68)	–	3.09 (0.55)	–
	post	3.29 (0.63)	–	3.17 (0.64)	–
EAQ-interest		2.25 (1.25)	2.07 (1.27)	2.16 (1.27)	2.04 (1.27)
EAQ-disgust		1.99 (1.08)	2.10 (1.12)	2.04 (1.13)	2.19 (1.14)
Entomophagy re-engagement		–	0.91 (0.92)	–	0.71 (0.85)

3.3.2.5. Essay content

Statistical learning was applied to the essay data in the same way as Study 1. The feature selection applied by the lasso suggested 10 word stems as predictors of willingness to try insect foods (see Table 10). As in Study 1, the combination of the idiosyncratic features selected and measures of predictive power suggested the essay content was not particularly predictive of willingness to try insect foods for both test (R^2 = -0.01; RMSE = 2.62) and training (R^2 = 0.06; RMSE = 2.41) data sets.

Table 10.
Selected features and coefficients from statistical learning model including RMSE and R^2 for Study 2 essay data.

Predictors	Coefficients	
Intercept	2.74	
insid	0.28	
actual	0.47	
lose	0.05	
level	0.08	
vitamin	0.00	
obtain	0.00	
franc	-0.19	
save	1.05	
broccoli	0.36	
sculpt	0.00	
	RMSE	R^2
Train	2.41	0.06
Test	2.62	-0.01

3.3.2.6. Memory

Memory responses of essay content at the one-month follow-up were coded identically to the Study 1 follow-up. The results suggested that there was no significant difference between the value intervention condition (80% remembered) and the recipe condition (73% remembered) in memory of the content or topic of the essays, χ^2 (1, N = 281) = 1.46, p = 0.226.

3.3.2.7. Discount code and purchase intentions

In the value intervention condition, 77 participants revealed the discount when given the option compared to 60 in the recipe condition, this difference was not significant χ^2 (1, N = 385) = 1.86, p = 0.173. When given the opportunity to reveal the discount code at the follow-up, 42 participants from the value intervention condition and 33 from the control condition revealed the code. Of these participants, 29 from the value intervention condition and 21 in the recipe condition revealed the code in both Study 2 and the follow-up. There were no significant differences in the number of times the code was revealed between conditions χ^2 (1, N = 281) = 0.47, p = 0.494.

Three participants (value intervention n = 1, recipe n = 2) reported having purchased insect food products between the main study and the follow-up. Those who had not made a purchase (n = 278) were asked if they would consider purchasing insect foods in the future, 68 participants from the value intervention condition and 50 from the recipe condition replied they would consider purchasing in the future. There were no significant differences on future purchase intentions between conditions, χ^2 (1, N = 278) = 2.09, p = 0.148.

3.3.3. Discussion

Our results from Study 2 showed that willingness to try (the main pre-registered dependent variable) did not indicate a significant interaction between condition and food type, suggesting that participants in the value intervention condition were not significantly more willing to eat insect foods than those in the recipe condition. The same pattern was found for the five other attributes. Considering the significant effect of the value intervention condition found in Study 1, this could suggest that it is not the value intervention itself that increases willingness to try but rather the exposure to insects as a food source. The results of the EAQ sub-scales suggest the same pattern as there were no significant differences between conditions in the levels of interest and disgust reported. Critically, the pre-post measures did show significant differences between the value intervention and recipe conditions suggesting participants found the recipe task more interesting and perceived more value in the task in the value intervention condition (for both the main study and one-month follow-up). These results support the idea that the value intervention was effective at increasing interest and perceived value, but in terms of increasing willingness to try exposure may be sufficient.

3.4. General Discussion

We have shown that a value intervention in which participants researched and wrote a short essay about the value of insect-based foods for a healthy and sustainable diet has the potential to increase the willingness to try insect foods, as well as increasing curiosity, attitude, perceived tastiness, healthiness, and sustainability ratings of insect foods. Our results also suggest that the intervention has an extended effect, surviving at a one-month follow-up. These results are consistent with the value intervention studies within the field of education which have shown it is possible to increase interest and performance through increasing the perceived value of a topic (e.g., Brisson et al., 2017; Gaspard et al., 2015; Rosenzweig et al., 2020).

However, we also found that there were no significant differences between the value intervention condition and recipe condition in terms of willingness to try and general attitudes towards entomophagy, despite that value intervention indeed increased self-reported interest and value for insect foods. Given, the effectiveness of the value intervention seen in Study 1 (and willingness to try in value intervention condition showed similar values between Study 1 and Study 2), these results could suggest that it may not be the increase in perceived value driving this attitudinal change but rather exposure to insects as a food. This is consistent with the idea that placing novel foods in a practical context, such as in recipes, enables consumers to acquire knowledge on how to use novel ingredients. Asp (1999) suggests that consumers may be inclined not to choose certain foods when they have limited knowledge of how to prepare them. The majority of Western consumers would likely have limited knowledge of how to use insects as an ingredient. Therefore, while utility-value interventions may provide an effective route to increase willingness to try insect foods there may be other routes that include simple exposure to insects as a food source that may be equally effective.

3.4.1. Other benefits and predictors

Our results showed that the value intervention influenced perceptions about insect foods in various ways, in addition to a willingness to try them. The results are consistent with the existing entomophagy literature in that factors relevant to the adoption of entomophagy were bolstered by the intervention. For example, healthiness and sustainability ratings increased for insect foods in comparison to the control condition; this is in line with Lombardi et al. (2019) who found that when given information on these benefits participants were willing to pay more for insect-based products. This suggests that using a value intervention task to enable individuals to learn about those benefits also has a positive effect on the perceptions of insect-based foods. The same effects were found for tastiness and attitude; perceived tastiness has been shown to be a consistent predictor of willingness to try insect foods (Tan et al., 2016). Improving attitudes towards insect foods and overcoming disgust is again, a main component in adoption of entomophagy (La Barbera et al., 2018). The improved attitude and reduction of disgust is supported by the EAQ results, particularly the disgust sub-scale — Study 1 follow-up showed lower disgust in the value intervention condition compared to the control condition.

A similar effect can be seen for curiosity, participants in the value intervention (Studies 1 and 2) and recipe (Study 2) conditions appeared to rate insect food images higher on curiosity than those in the control condition (Study 1). Entomophagy research once again supports this finding, with curiosity being a key factor in encouraging entomophagy (House, 2016; Stone et al., 2022; Verbeke, 2015,). Consumer behaviour research suggests that increased curiosity about a product can lead to increased information seeking and more favourable product evaluations (Daume & Hüttl-Maack, 2020; Menon & Soman, 2002; Ruan et al., 2018). Our results support these notions not only with the higher curiosity ratings but also with the higher interest ratings shown across several different measures (including the pre-post items, interest-subscale of the EAQ and the entomophagy re-engagement questions). The increased interest in entomophagy is consistent with both the value intervention's ability to increase interest in a topic (e.g., Gaspard et al., 2015; Hulleman et al., 2017) but also with interest research more broadly, in the sense that it is important for knowledge acquisition, information seeking and is a rewarding process (Litman, 2008; Murayama et al., 2019; Rotgans & Schmidt, 2018).

One possible explanation for these results is that of demand characteristics, by including the benefits of entomophagy in the essay task for the value intervention condition this may have made participants aware of the aims of the study and thus boosted insect food ratings. However, this is unlikely when taking into account the results of Study 2. The recipe condition used in Study 2 did not mention the benefits or positive consequences associated with entomophagy and the results suggested there were no significant differences found between the recipe and value intervention conditions on any of the attributes measured. This would suggest that participants did not give higher ratings to insect foods based on demand characteristics but rather due to the positive influences of the intervention or practical applications provided by the recipe condition.

It is important to note that, like willingness to try, most of the effects found in Study 1 were not observed in Study 2 when the value intervention was compared to the recipe condition. Again, these findings indicate that a utility-value intervention may not be the only way to develop these perceptions about insect foods. Future studies should examine the exact mechanisms underlying the beneficial effects of a utility-value intervention.

3.4.2. Memory and essay content

The analysis of the essay data suggested several word stems were predictors of willingness to try insect foods. However, many of these words appear to have little relevance to the essay topics. This may suggest that the content of the essays themselves are not as important as the act of participating in the task. It may be that the task allows individuals to familiarise themselves with the concept of entomophagy and this is what drives the effectiveness of the task. Similar conclusions about the lack of importance of the contents of self-generated materials have been found with expressive writing interventions for improving health outcomes. Smyth and Pennebaker (2010) suggested that the content may not be as important as previously thought when exploring the effectiveness of expressive writing, which aims to improve health outcomes by having participants write about negative experiences. Several studies found that similar health benefits may be obtained whether people write about negative experiences or positive ones; and indeed, some research even suggests it is not necessary to write about traumas at all (Burton & King, 2004; Pennebaker & Chung, 2007). This reinforces our explanation of the essay content not being as important as the engagement with the task itself.

When asking participants to recall the content/topic of the essay task our results suggested that people were better able to remember the content or essay topic when they were assigned to the value intervention or recipe condition. Participants in the control condition were unable to remember the topic or content as often. Gruber, Gelman and Ranganath (2014) argue that individuals find it easier to learn about and remember information they are interested in. Research on memory repeatedly showed that people are better at memorizing valuable information (e.g., Middlebrooks, Murayama, & Castel, 2017). Our findings are consistent with such literature. The role of memory has not been examined in the context of value intervention studies but it is an important topic inquiry for future studies, as consolidated memory may serve as a mechanism for the potential long-term effects of the intervention (Gruber & Ranganath, 2019; Murayama et al., 2019).

3.4.3. Limitations and future research

The present studies have some limitations. Firstly, these studies mainly assessed the intention to try insect foods and not actual behaviour. While we do show the potential of the interventions to affect behaviour by examining the request for the discount code, this is not a direct measure of purchase behaviour. Future studies could look at purchase behaviour and tasting behaviour in more depth to understand the effect the value intervention or similar tasks may have on these behaviours.

Secondly, our pre-post measures of interest and value in Study 1 may not be entirely comparable between conditions as they focused on the information learned in the task itself. As the value intervention and control conditions were assigned different essay topics, comparing the interest and value of the information learned may not be as informative as the comparison made in Study 2 where both conditions focused on the same topic (insect foods).

3.4.4. Implications

Our findings suggest some potential practical uses of value intervention tasks for encouraging the adoption of entomophagy. Communicating the benefits of insect foods through advertising could help foster interest in insect foods. The literature suggests that once this interest is sparked it has the potential to grow and promote re-engagement (Hidi & Renninger, 2006). This may be key not only for encouraging the first try but also for longer-term adoption of entomophagy (House, 2016; Sogari, 2015). This could have many positive long-term effects on environmental degradation, as the consumption of traditional animal-derived proteins would be lessened causing reductions in water consumption and greenhouse gasses (Gahukar, 2011; van Huis, 2013). Additionally, these studies have also successfully adapted a value intervention task for use outside of the field of education. Given that utility-value interventions can promote interest and value in a topic which can lead to improved performance (Gaspard et al., 2015), our results suggest that this task could be applied to many different areas with relative ease and success.

Chapter 4. Paper 3: Does uncertainty affect people's choices to eat insects?

Abstract

Curiosity is part of a positive and rewarding knowledge acquisition process. It can motivate us to explore novel experiences and gain information that resolves uncertainty. In service of resolving uncertainty, curiosity can motivate individuals to learn about stimuli they may perceive as aversive. The practice of eating insects (entomophagy) may be classed as one of the aforementioned aversive experiences, particularly for Western society, who often regard the practice with disgust despite having many benefits over traditional animal-based proteins. Using a gambling task to manipulate uncertainty by varying the probabilities of receiving an insect snack or a familiar non-insect snack, we examined whether the opportunity to resolve uncertainty affected peoples' willingness to try insect foods. Participants' (N = 54) choice of probabilities showed no significant effect of uncertainty and significant effects showing a preference for more certain gambles with a higher probability of a non-insect outcome. However, the significant effects showing a preference for the more certain non-insect gambles were no longer present after the first tasting of insect snacks. Due to the lack of systematic research on this topic, as well as certain limitations of this study (i.e., the relatively small sample size), the role of uncertainty in willingness to try insect foods is still unclear. Potential explanations and future research directions to clarify the role of uncertainty are discussed.

Keywords: Curiosity; uncertainty; entomophagy; insects; eating behavior

4.1. Introduction

Curiosity is often described as a 'need to know' feeling, one that drives us to seek information and novel experiences (Gottlieb et al., 2013). The enticing feeling associated with curiosity comes from an awareness of a knowledge gap which can evoke information-seeking behaviour in order to close the gap (Loewenstein, 1994). Curiosity is suggested to be an aversive state due to a feeling of uncertainty, which is uncomfortable, and therefore individuals are motivated to seek information to resolve the curiosity and reduce the uncomfortable feeling associated with uncertainty (Berlyne, 1954). The process of uncertainty reduction through knowledge acquisition is said to be rewarding, reinforcing the value of new knowledge and, in turn, motivating further information-seeking behaviour (Murayama et al., 2019).

4.1.1. Curiosity and aversive experiences

Reducing uncertainty is such a powerful drive that people are willing to expose themselves to unpleasant stimuli or physical harm in order to satisfy curiosity. For example, people choose to view negative images of death, violence or harm (morbid curiosity) as opposed to neutral or positive images (Oosterwijk, 2017). Lau et al. (2020) showed participants magic trick videos, and to gain the solution to the trick participants had to take part in a gamble that could result in an electric shock. Curiosity regarding the solution of the trick predicted the decision to accept the gamble above the probability of receiving an electric shock. Similarly, Hsee and Ruan (2016) showed that participants were willing to expose themselves to electric shocks, unpleasant sounds, and negative pictures in order to reduce uncertainty, even when the choices made them feel worse. They found that participants were more curious about aversive stimuli when the outcome was uncertain compared to aversive or neutral stimuli with a certain outcome.

The power of curiosity is such that participants will seek information even when it involves a financial loss. Rodriguez Cabrero et al. (2019) examined whether people would pay to gain information early about a card-flipping task. Participants were rewarded based on a pattern of 3 cards, which were revealed in turn after a delay; however, they could pay to reveal the outcome of the next card(s) without the delay. They found that when given the option to gain the information in advance, participants were willing to sacrifice nearly 8% of their earnings, even though the information did not affect the outcome of the card flip. Extending on this, FitzGibbon et al. (2021) let participants seek information about what they could have won in a decision-making task involving risky decisions. Their results showed that not only would people seek information when it comes at a cost but would also seek information when it was of no use to them and resulted in negative emotions. Therefore, curiosity is a powerful motivator of information-seeking behaviour in the context of novel experiences, even when those experiences have aversive effects.

4.1.2. Curiosity and consumer behaviour

Given its strong motivating power, curiosity can be used as an effective marketing tool to influence the consumer decision-making process (Hill et al., 2016). Evidence suggests that when given the optimal level of information about a product to create a sufficient information gap, consumers' curiosity can be piqued resulting in greater levels of information seeking, more positive product evaluations, and increased purchase motivation (Hill et al., 2016; Menon & Soman, 2002). Similar effects have been found when withholding information in advertisements. For example, Daume & Hüttl-Maack (2020) found that using ambiguous advertising slogans that created an information gap and induced curiosity resulted in more positive attitudes towards the advertised products; and, in a separate study, this positive effect has been shown to endure even after curiosity has been resolved (Ruan et al., 2018). Further to this, research has suggested that incidental curiosity, unrelated to the consumer product, can influence consumer decision-making, prompting more indulgent choices in several different domains (Wang & Huang, 2018; Wiggin et al., 2019). It has been suggested that increasing curiosity in purchase decisions could override reluctance to choose uncertain purchase options that may lead to regret over the wrong decision (van Dijk & Zeelenberg, 2007). Consumers are also more likely to repeat purchase behaviours if accompanied by an uncertain incentive, even when a certain incentive is financially better as the uncertain incentive piques curiosity (Shen et al., 2019). This body of research indicates that curiosity can play an important role in consumer decision-making.

4.1.2.1. Curiosity and entomophagy

Given the motivational impact on novel experiences and the influence on consumer decision-making, curiosity may be well placed to stimulate the purchase of an extreme type of novel product: insect foods. Entomophagy (i.e., eating insects as a food source) features in many cultures' food choices as a source of protein, vitamins and minerals (Gahukar, 2011; Lombardi et al., 2019). Though often regarded with disgust in western cultures due to associations with pests and poverty, edible insects boast many benefits in comparison to traditional animal-derived proteins (e.g., meat and fish). Along with providing higher nutritional value compared to traditional animal-derived proteins, they are more environmentally friendly; involving lower levels of greenhouse gases and ammonia emissions during production, requiring less water consumption and pose a lower risk of cross-species disease transmission (Gahukar, 2011; Lombardi et al., 2019; van Huis, 2013). It has been argued that the level of demand for traditional animal-derived proteins is becoming unsustainable; increasing global population and consumption are contributing to harmful degradation of the environment (Boland et al., 2013; Thavamani et al., 2020). It is therefore paramount to find ways to encourage consumers to consider alternative sources of protein, such as insects.

The role that curiosity may play in encouraging entomophagy is thus far, somewhat underexamined in the literature. Curiosity can be a crucial factor in encouraging entomophagy

(House, 2016; Sogari, 2015; Stone et al., 2022). A survey of Danish consumers found that curiosity towards entomophagy is an important characteristic of future adopters (Videbæk & Grunert, 2020). Caparros Megido et al. (2016) found that curiosity was the main preconception concerning entomophagy, with 69% of respondents selecting this as their first response, even over fear (14%) and disgust (13%). In an interviews-based study with consumers who previously purchased insect foods, House (2016) found that curiosity was the main initial motivating factor. Being the first in its experimental approach, Stone et al. (2022) used a rating task of menu-style dishes containing images of both insect and non-insect foods, where participants assessed the dishes on several factors that predicted willingness to try insect foods (e.g., curiosity, familiarity, attitude, healthiness, and sustainability). They found that curiosity was a significant predictor of willingness to try insect foods even when controlling for other factors like expected taste and general attitudes towards the dish. To summarise, as curiosity is part of a rewarding process of knowledge acquisition and uncertainty reduction (Murayama et al., 2019), it is potentially well placed to motivate and encourage entomophagy.

4.1.3. Individual differences

Individuals differ in their characteristics and food preferences, which are likely to affect their willingness to try novel foods. To start with, food neophobia, an individual difference factor characterised by an aversion to trying novel foods (Pliner & Hobden, 1992), affects an individual's willingness to try insect foods. Research suggests that food neophobia is closely associated with disgust in relation to eating insects (e.g., Ammann et al., 2018; La Barbera et al., 2018). However, the exact contribution of food neophobia is somewhat unclear. Evidence suggests that for some insect foods disgust sensitivity may explain variance in willingness to try insects beyond that of food neophobia alone (Ammann et al., 2018). Therefore, while there may be a more complex relationship between food neophobia and disgust towards insect foods, it is still important to account for individual differences in food neophobia. Next, individual differences in food variety seeking are also important to consider given that it is widely acknowledged to be a key influence on consumer choice (Tang & Chin, 2007). Food variety-seeking is characterised by an increased motivation to seek out new experiences in relation to eating behaviours (Van Trijp & Steenkamp, 1992). For consumers who seek variety in their product choices, both the food novelty and a preference for risk play a role (Lenglet, 2018).

Additionally, individuals' general attitudes towards eating insects are also important to consider. The interest and disgust sub-scales of the entomophagy attitudes questionnaire (EAQ) (La Barbera et al., 2020) measure both a general interest and general disgust specific to insect foods. The food neophobia research clearly shows that disgust is an important factor impacting individual intention to eat insects (Ammann et al., 2018). Previous research on curiosity/interest also suggests that interest is an important predictor of willingness to try insect foods (e.g., House, 2016; Stone et al., 2022; Videbæk & Grunert, 2020). It is, therefore, logical to also consider the effects of these individual-level concepts on willingness to try insect foods, in addition to any uncertainty/curiosity manipulation.

Finally, intolerance of uncertainty tends to vary on an individual difference level, with intolerance of uncertainty regarding re-exposure to an unpleasant stimulus being related to increased worry and anxiety (Carleton, Norton, & Asmundson, 2007). Hence, this individual difference may be also an important factor to be considered, as curiosity research suggests that people are willing to repeatedly expose themselves to potentially aversive stimuli to resolve uncertainty (Hsee & Ruan, 2016). This motivation to resolve uncertainty may differ depending on an individual's intolerance of uncertainty.

4.1.4. The present study

The literature suggests that curiosity could encourage people to try insect foods. It is also suggested that once consumers' have tried insect foods, overcoming the initial aversion, they are more willing to try insect foods again in the future (Hartmann & Siegrist, 2016).

However, thus far there has been little research directly examining the role of curiosity in encouraging entomophagy. As uncertainty has been shown to trigger curiosity (e.g., Hsee & Ruan, 2016), the main aim of this study was to examine the role of uncertainty in people's choices to eat insects. In order to satisfy curiosity and thus reduce the uncomfortable feeling associated with uncertainty, individuals may opt for more uncertain gambles to reduce that discomfort. Participants were sent pre-packaged insect and familiar non-insect snacks and asked to take part in a computerised gambling task. The task presented participants with an array of "spinners", each representing a gamble with different probabilities of being asked to eat an insect or a familiar, non-insect, snack ranging from a 0% probability of eating an insect to 100%. Participants were given five minutes to select as many gambles as they liked. Once they selected a gamble this was played out on the screen and an outcome was displayed. In response to the outcome, participants were asked if they tried the snack and how they felt about it. Before and after the task participants completed pre-post measures of curiosity, attitude and future willingness to try insect foods, as well as being asked to complete some individual difference measures.

In this pre-registered study (https://osf.io/qn8yr/?view_only=cf8e7258412c49308f08d0d5cb6f0529), we aimed to examine different types of uncertainty effects that might have been present in participants' gambling choices. Having multiple "spinners", with varying probabilities of receiving an insect snack allowed us to explore several different predictions about people's gambling choices and how these choices may be influenced by uncertainty and preference for eating familiar snacks over insect snacks.

4.2. Method

4.2.1. Pre-screening

One hundred and forty-one participants first completed an online pre-screening through Positly (https://www.positly.com) to ensure they met the inclusion criteria for the study. Participants had to confirm that they were free of any allergy or dietary requirements and had a working webcam to be able to participate in the main study. Due to the food tasting element of this study, allergy and dietary restrictions were used to ensure participants' safety. The webcam requirement was for data quality purposes to discourage participants from fabricating eating behaviours in the main study, therefore this was not included in the analysis. The pre-screening also collected demographic data including whether participants had previously tried insect foods. All participants were required to sign an online consent form covering information about both the pre-screening and the main study. This pre-screening also established who of the participants were comfortable providing their address information to enable the experiment supplies to be posted to them for the completion of the main task. All participants that provided information in the pre-screening regardless of their suitability were rewarded approximately $2.04 for 5 minutes of their time. Eighty-four out of the 141 participants initially contacted were eligible and agreed to take part in the main study. Ethical approval was granted by the School Ethical Review Committee of the School of Psychology and Clinical Language Sciences at the University of Reading. Identifiable information provided in the pre-screening section of the study was uploaded to a private portion of the server via a secure SSL connection and was disposed of once participants completed the main study or when the data collection period finished for those that did not complete the main task. The webcam data was also stored on a private portion of the server and uploaded via a secure SSL connection.

4.2.2. Main Study

4.2.2.1. Participants

Of the 84 participants that agreed to take part in the main study, 57 completed the task. Three participants were excluded from the analysis (2 due to missing data, 1 for not following the task instructions correctly). The final sample consisted of 54 participants (41% females, Mean Age = 53.50, *SD* Age = 14.07). All participants resided in the UK. The majority of them reported being of UK nationality (93%). Four participants reported being of European nationalities (Polish, French and Irish), where eating insects is also not common practice. Participants who completed the task were rewarded with a £5 e-gift card for 25 minutes of their time. The sample size was mainly determined by practical limitations, this sample size is sufficient to detect an effect size of d = 0.39 at 80% power for the main analysis. This was calculated using the Murayama et al., (2020) method for calculating sample sizes for nested data in mixed-effects modelling and using their accompanying app (https://koumurayama.shinyapps.io/summary_statistics_based_power/).

4.2.2.2. Materials

Each participant was posted a packet of dried crickets (insect snacks) and roasted chickpeas (familiar non-insect snacks) to use as the outcome snacks in the gambling task. See Figure 1 for images of the insect and familiar snacks sent to participants.

Figure 1. Insect and familiar snacks sent to participants for the gambling task outcomes.

4.2.2.3. Gambling Task

The online gambling task consisted of a series of spinners presented on the screen. These spinners were made up of varying probabilities of eating insect or non-insect snacks. Specifically, 20 spinners were used ranging from 0% probability of eating an insect to 100% probability, increasing in 5% increments (with the 50% spinner removed to create an even number of spinners). Once a gamble was selected, the spinner was enlarged and the gamble played out on the screen. The outcome of the gamble was then displayed (i.e., "Eat a snack from the insect bowl" or "Eat a snack from the not insect bowl"). Participants were then asked "Did you try the snack?" (Yes/No) and "How do you feel about the snack?" (Extremely negative – Extremely positive). After answering these questions, the screen returned to the series of spinners and participants were able to choose another gamble. Participants could choose any of the 20 gambles as many times as they wished.

4.2.2.4. Pre-post questions

Participants were asked three questions immediately before and after the gambling task. These were designed to get a general measure of their curiosity and attitudes towards eating insects to see if participating in the gambling task changed these general attitudes. The questions were as follows: "How curious do you feel about eating insects?" (Not at all curious – Extremely curious); "How do you feel about snacks made with insects?" (Extremely negative – Extremely positive); "How likely are you to eat insects in the future?" (Extremely unlikely – Extremely Likely). All questions were measured using a slider scale (0 – 100) with the anchors at either end.

4.2.2.5. Questionnaire Measures

To measure individual differences in the reluctance to try novel or new foods we used the 10 item Food Neophobia scale (Pliner & Hobden, 1992) (e.g., "If I don't know what a food is, I won't try it"). We also assessed food variety-seeking behaviour using the VARSEEK scale

(Van Trijp & Steenkamp, 1992). The scale consisted of 8 items (e.g., "I think it is fun to try out food items one is not familiar with"). The interest and disgust sub-scales of the EAQ (La Barbera et al., 2020) measured participants' levels of interest and disgust in entomophagy. The third sub-scale in the EAQ was excluded as it measures attitudes towards insects as livestock feed and was therefore not directly related to insect consumption. The interest sub-scale consisted of 3 items (e.g., "I'd be curious to taste a dish with insects, if cooked well"), and the disgust sub-scale of 5 items (e.g., "I would be disgusted to eat any dish with insects"). These questionnaires were rated on a 5-point Likert scale ranging from "Strongly Disagree" (0) to "Strongly Agree" (4). Finally, as the main task manipulated uncertainty, we also measured participants' general intolerance to uncertainty using the Intolerance of Uncertainty scale – short version (IUS-12) (Carleton et al., 2007). This was rated on a 5-point Likert scale from "Not at all characteristic of me" (0) to "Entirely characteristic of me" (4).

4.2.2.6. Procedure

Once participants had received the experiment supplies in the post, they were asked to follow the invitation link sent with the materials to complete the main study. They were asked to set up the snacks and their computer space as demonstrated in Figure 2, this was to ensure they could easily reach the snacks and be in the range of their webcam. Next, participants were asked to allow the study website access to their webcam to record responses throughout the task. Following this, participants were asked to complete the pre-post questions. Participants then proceeded to the main gambling task (see Figure 3 for the gambling task procedure). They were given 5 minutes to participate in as many or as few gambles as they wished. Participants were video recorded through their webcam during these 5 minutes. Once the 5-minute timer ran out, participants were asked to complete the pre-post questions once again. Following this, participants were asked to complete the Food Neophobia scale, the VARSEEK scale, the EAQ and finally the IUS-12.

Figure 2. Task set-up diagram shown to participants at the beginning of the study.

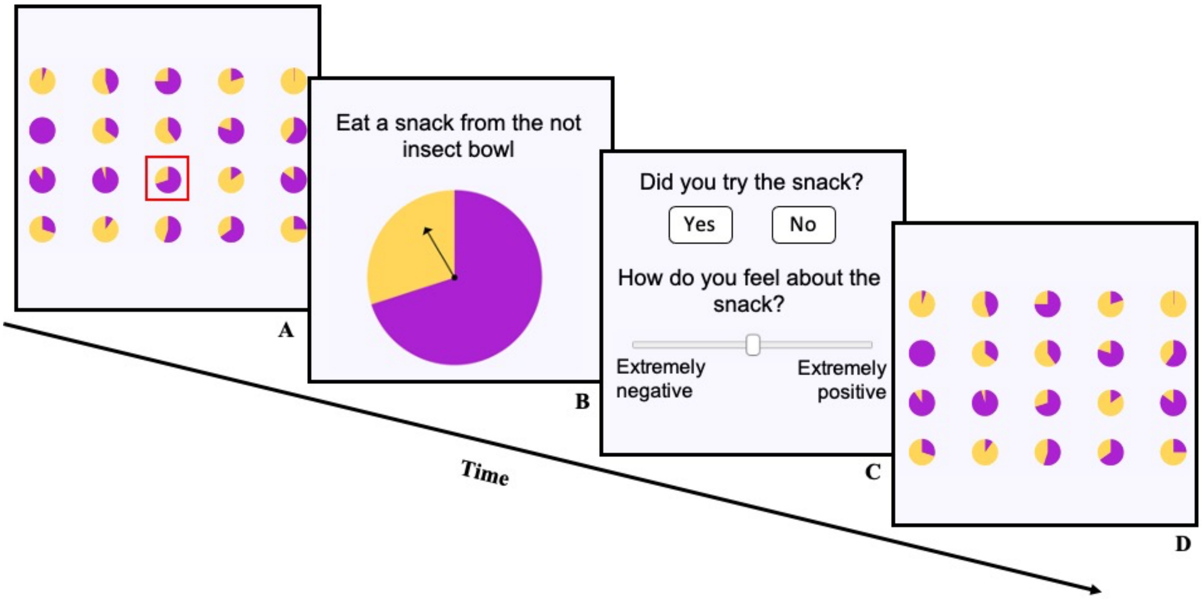

Figure 3. Gambling task trial sequence. A) Participants can select a gamble if they wish to do so. B) If a gamble is selected, the gamble is played out showing participants the outcome. C) Post-gamble questions. D) Return to the main screen, where participants were able to select another gamble if they wished to do so.

4.2.2.7. Data analysis

Data were analysed in R (R Core Team, 2021) using the *brms* package (Bürkner, 2017). The dependent variable was whether a gamble was chosen by a participant (gambling choice). We recoded this to become a binary variable (1 = gamble chosen at least once, 0 = gamble not chosen). The reason for recoding the variable was to reflect that choosing a gamble more than once does not necessarily indicate higher levels of curiosity towards that probability in particular. To analyse the potential effects of uncertainty, we generated four predictor variables. First, a probability variable that included all the possible probabilities in the gambling task. Second, the binary effect of 0% insect probability, where the 0% probability is coded as 1 and all other probabilities are coded as 0. Third, the binary effect of the 100% insect probability, where the 100% probability is coded as 1 and all other probabilities are coded as 0. Last, a quadratic term of the probability variable. These four predictors were generated to analyse four possible uncertainty effects. A no uncertainty effect, a linear decreasing trend in choice of the probability variable as the probability of eating insects increases. A binary effect of 0% insect, this is where there is a strong preference for the 0% insect gamble which then drops for other probabilities, thus indicating a lack of an uncertainty effect. A binary effect of the 100% insect option, where preference is high for all other probabilities but drops considerably at the 100% level. This would indicate a preference for probabilities with more uncertainty. Finally, a quadratic effect, taking the shape of an inverted U, showing a preference for mid-level probabilities with the highest levels of uncertainty. For the individual difference measures, scores were mean-centered by participant before analysis. The warmup period and number of iterations varied by model to enable convergence. For interpretation of the Bayesian models, we considered an effect to be present when 0 was outside of the 95% credible intervals around the parameter estimate.

4.3. Results

4.3.1. Previous experience

Participants were asked if they had previously tried insect foods before the task. The majority of participants (91%) reported they had never tried insects before[5].

4.3.2. Descriptive statistics

Participants made between 4 and 14 (M = 11.07, SD = 1.86) gambles within the five-minute time period. The average probability chosen was 0.42 (SD = 0.34). See Figure 4 for frequencies of the probabilities chosen and the number of gambles selected. When the result of a gamble was to eat an insect snack, participants tried the snack 87% of the time. When the result was to eat a non-insect snack, participants tried 93% of the time. A paired samples t-test was conducted to examine whether there was a difference in tasting behaviour across the two types of snacks. The results showed no significant difference in tasting behaviour between insect snacks and familiar snacks, $t(50) = -1.70$, $p = 0.095$, $d = -0.24$. As both percentages are relatively high this suggests that choice in the gambling task represents participants' actual behaviour in terms of willingness to try. For the following analyses gambling choice is analysed rather than eating behaviour.

[5] A Bayesian mixed-effects model (with identical fixed and random effect structure to the gambling choice model) was conducted using only participants who reported not having tried insect foods before ($N = 49$). The results showed a pattern of results very similar to the full sample, there were no differences in significant predictors of gambling choice.

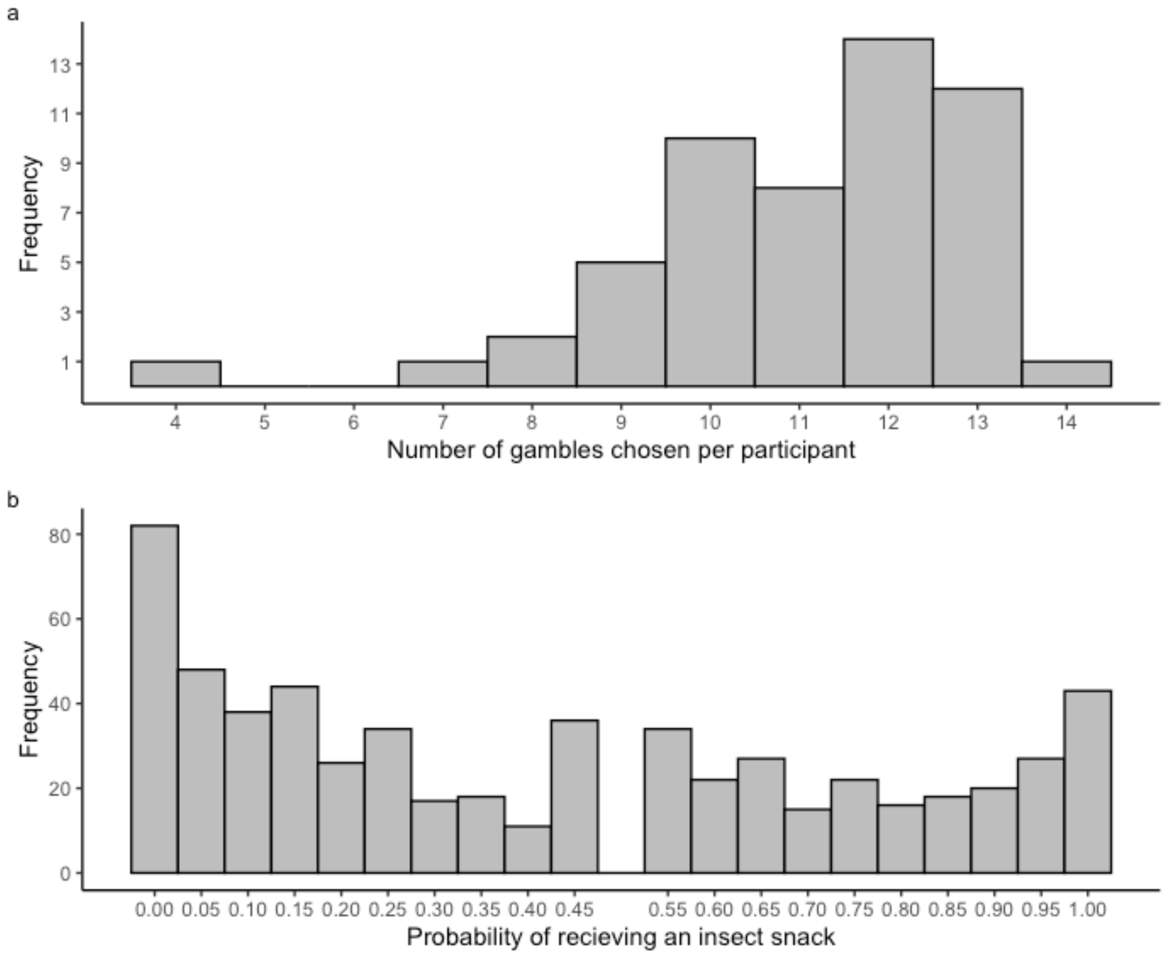

Figure 4. (a) Frequency of the number of gambles selected by each participant in the gambling task. (b) Frequency each probability was chosen in the gambling task.

4.3.3. Gambling choice

A Bayesian mixed-effects model examining the effects of uncertainty was fitted to gambling choice. All four predictors were included as fixed effects. A maximal random effect structure was used to allow each predictor of interest to vary by participants. The default priors from the *brms* package were used, specifically flat priors for the regression coefficients and a Student's *t*-distribution ($\nu = 3$, $\mu = 0$, $\sigma = 2.5$) for the intercept. Default priors were also used for standard deviations of random effects, a Student's *t*-distribution ($\nu = 3$, $\mu = 0$, $\sigma = 2.5$), and for correlation coefficients (LKJ $\eta = 1$). Two sampling chains ran for 3000 iterations with a warm-up period of 500 iterations, totalling 5000 post warm-up draws. Model results are presented in Table 1.

Table 1.
Bayesian mixed-effects modelling showing the effects of uncertainty on gambling choice.

	Mean	SD	Lower 95% CI	Upper 95% CI	Rhat
			Fixed Effects		
Intercept	0.12	0.28	-0.41	0.66	1.00
Probability	-2.52	1.15	**-4.78**	**-0.28**	1.00
Zero	2.84	2.69	**0.47**	**11.00**	1.00
One hundred	1.08	0.74	-0.41	2.50	1.00
Quadratic	1.21	1.11	-1.01	3.35	1.00
			Random Effects		
σ Intercept	1.04	0.25	0.57	1.55	1.00
σ Probability	2.42	0.66	1.13	3.82	1.00
σ Zero	4.23	4.67	0.16	17.13	1.00
σ One hundred	2.32	3.03	0.06	10.31	1.00
σ Quadratic	0.90	0.66	0.04	2.42	1.00
			Model Fit		
	Estimate			*Est. Error*	
R^2	0.21			0.02	

The results show that there was an effect of probability, β = -2.52, *CI* = [-4.78, -0.28]. The decreasing trend suggests that as the probability of eating insects increases participants were less likely to choose the gamble. A binary effect of the 0% insect probability was also seen, where participants showed a preference for the 0% insect choice, β = 2.84, *CI* = [0.47, 11.00]. There was no binary effect of the 100% insect choice, β = 1.08, *CI* = [-0.41, 2.50], suggesting that participants did not show a preference for the more uncertain probabilities over the certain 100% insect option. We did not find a quadratic effect, β = 1.21, *CI* = [-1.01, 3.35], suggesting that participants did not show a preference for the mid-level probabilities with higher levels of uncertainty.

4.3.4. Gambling choices after tasting insects

In an additional exploratory analysis, another Bayesian mixed-effects model was fitted to the gambling choices made after participants tried their first insect snack. This analysis was conducted to understand whether participants' gambling choices changed once they had experienced the insect snacks for the first time. When participants received an insect snack as a result of a gamble and reported they had tried the snack for the first time, their subsequent choices in the gambling task were used for the analysis. This resulted in 417 gambling choices from 47 participants. Identical to the gambling choices model, the same fixed and random effect structures were used. Default priors from the *brms* package were once again used, resulting in identical priors to the gambling choices model. Two sampling chains ran for 2,100 iterations with a warm-up period of 600 iterations, totalling 3,000 post warm-up draws. See Table 2 for model results.

Table 2.
Bayesian mixed-effects model showing effects of uncertainty on gambling choice after trying insects.

	Estimate	Est. Error	Lower 95% CI	Upper 95% CI	Rhat
			Fixed Effects		
Intercept	-0.40	0.27	-0.92	0.11	1.00
Probability	-1.34	1.25	-3.81	1.07	1.00
Zero	0.28	1.11	-2.09	2.27	1.00
One hundred	0.78	1.04	-1.64	2.77	1.00
Quadratic	0.61	1.24	-1.81	3.00	1.00
			Random Effects		
σ Intercept	0.59	0.29	0.07	1.16	1.00
σ Probability	1.50	0.72	0.14	2.94	1.00
σ Zero	3.43	5.06	0.07	16.71	1.01
σ One hundred	3.82	4.58	0.17	16.27	1.01
σ Quadratic	0.92	0.64	0.03	2.35	1.01
			Model Fit		
	Estimate			*Est. Error*	
R^2	0.14			0.03	

Interestingly, after trying their first insect participants' gambling choices changed. While the probability effect still showed a decreasing trend, this was no longer significant, β = -1.34, *CI* = [-3.81, 1.07]. Therefore, after tasting, participants were no longer less likely to choose a gamble as the probability of an insect result increased. There was also no longer a binary effect of 0%, β = 0.28, *CI* = [-2.09, 2.27]. Once participants had tasted an insect, they no longer showed a preference for the 0% insect option. Similar to the main analysis, we found no evidence of the quadratic effect (β = 0.61, *CI* = [-1.81, 3.00]) or the 100% choice effect (β = 0.78, *CI* = [-1.64, 2.77]).

4.3.5. Individual difference measures

To examine whether the individual difference measures affected choice in the gambling task, Bayesian mixed-effects models were fitted to gambling choice with all four predictors included as fixed effects and random effects using the same structure as in the previous models. Each individual difference variable and interactions between each predictor and the individual difference variable of interest were included as fixed effects in separate models resulting in four models per measure. Default *brms* priors were used, as with previous models, flat priors were used for the individual difference term and the related interaction term. All other priors were identical to previous models. Each model ran with two sampling chains. To ensure convergence and adequate mixing of chains the number of iterations and warm-up period varied depending on the model. The models ran for 2000 to 4600 iterations with a warm-up period between 430 and 750 iterations. Total post warm-up draws ranged between 3100 and 8900 depending on the model. Individual difference measures and their interactions with each predictor are presented in Table 3.

Table 3.
Individual difference measures and their interactions with the uncertainty effects

Model	Fixed Effects					
	Measure/Interaction	*Estimate*	*Est. Error*	*Lower 95% CI*	*Upper 95% CI*	*Rhat*
FNS Probability*						
	FNS	0.03	0.27	-0.48	0.56	1.00
	FNS x Probability	-0.05	0.56	-1.18	1.04	1.00
*FNS*Zero*						
	FNS	0.04	0.15	-0.25	0.34	1.00
	FNS x Zero	-1.68	4.17	-12.95	3.94	1.00
*FNS*One hundred*						
	FNS	0.02	0.15	-0.26	0.31	1.00
	FNS x One hundred	0.19	1.48	-2.61	3.36	1.00
*FNS*Quadratic*						
	FNS	-0.02	0.20	-0.43	0.36	1.00
	FNS x Quadratic	0.12	0.52	-0.91	1.15	1.00
VAR Probability*						
	VAR	0.14	0.28	-0.41	0.70	1.00
	VAR x Probability	-0.16	0.61	-1.34	1.05	1.00
*VAR*Zero*						
	VAR	0.02	0.16	-0.28	0.35	1.00
	VAR x Zero	3.11	4.14	-0.97	15.27	1.00
*VAR*One hundred*						
	VAR	0.07	0.16	-0.24	0.38	1.00
	VAR x One hundred	-1.37	2.19	-7.12	1.26	1.00
*VAR*Quadratic*						
	VAR	0.12	0.20	-0.28	0.53	1.00
	VAR x Quadratic	-0.17	0.55	-1.26	0.93	1.00
IUS Probability*						
	IUS	-0.49	0.30	-1.08	0.10	1.00
	IUS x Probability	0.24	0.63	-1.05	1.49	1.00
*IUS*Zero*						
	IUS	-0.45	0.15	**-0.76**	**-0.15**	1.00
	IUS x Zero	5.24	5.52	**0.72**	**21.46**	1.00
*IUS*One hundred*						
	IUS	-0.39	0.16	**-0.70**	**-0.09**	1.00
	IUS x One hundred	-0.25	2.59	-6.75	3.30	1.00
*IUS*Quadratic*						
	IUS	-0.53	0.21	**-0.95**	**-0.12**	1.00
	IUS x Quadratic	0.60	0.56	-0.48	1.70	1.00
*EAQ-i*Probability*						
	EAQ-i	-0.19	0.17	-0.53	0.15	1.00
	EAQ-i x Probability	1.02	0.37	**0.32**	**1.77**	1.00
*EAQ-i*Zero*						
	EAQ-i	0.25	0.11	**0.05**	**0.47**	1.00
	EAQ-i x Zero	-0.40	1.87	-4.89	3.37	1.00
*EAQ-i*One hundred*						
	EAQ-i	0.24	0.10	**0.04**	**0.44**	1.00
	EAQ-i x One hundred	1.02	1.83	-0.73	6.62	1.00
*EAQ-i*Quadratic*						
	EAQ-i	0.06	0.13	-0.20	0.33	1.00
	EAQ-i x Quadratic	0.70	0.37	-0.02	1.40	1.00
EAQ-d Probability*						
	EAQ-d	0.10	0.21	-0.31	0.51	1.00
	EAQ-d x Probability	-0.77	0.44	-1.64	0.09	1.00
*EAQ-d*Zero*						
	EAQ-d	-0.23	0.12	**-0.47**	**-0.01**	1.00
	EAQ-d x Zero	1.17	2.50	-2.46	7.93	1.00
*EAQ-d*One hundred*						
	EAQ-d	-0.21	0.11	-0.44	0.00	1.00
	EAQ-d x One hundred	0.08	1.30	-2.63	2.70	1.01
*EAQ-d*Quadratic*						
	EAQ-d	-0.12	0.15	-0.45	0.16	1.00
	EAQ-d x Quadratic	-0.34	0.43	-1.16	0.52	1.00

The results suggested that neither the Food neophobia scale nor the VARSEEK showed any significant interactions with any of the potential effects of uncertainty. For the Intolerance of uncertainty scale, there was no interaction with probability, the 100% effect or the quadratic effect. There was a significant interaction with the 0% effect, $\beta = 5.24$, $CI = [0.72, 21.46]$, suggesting that those with higher scores on the IUS showed a greater preference for the 0% insect probability. In some of the models, there were main effects of the IUS scale, suggesting that those high in intolerance of uncertainty were more avoidant of the gambling task in general but this is not consistent across all of the IUS models. For the interest sub-scale of the EAQ, there was a significant interaction with probability $\beta = 1.02$, $CI = [0.32, 1.77]$. Hence, those with greater levels of interest towards entomophagy were more likely to choose gambles with higher probabilities. There was also a main effect of the interest sub-scale of the EAQ in some models which would suggest that those who showed a higher level of interest towards entomophagy were more willing to engage with the gambling task overall. However, this was not consistent across all EAQ-i models. The disgust subscale of the EAQ showed no significant interactions with any of the uncertainty effects.

4.3.6. Pre-post items

The difference scores from the pre-post items (-100 to 100) were correlated with the number of insects tried in the gambling task. A total of 51 participants tried at least one insect snack. Overall, the curiosity difference score suggested that curiosity towards insect foods decreased after the gambling task ($M = -4.76$, $SD = 22.17$). However, this difference was not statistically different from zero, $t(50) = -1.53$, $p = 0.131$, $d = -0.21$. There was also no correlation with the number of insect snacks tried, $r(49) = 0.02$, $p = 0.900$. For the pre-post difference in attitude, the difference score suggested that attitudes towards insect food were more positive after the task ($M = 6.35$, $SD = 20.84$), $t(50) = 2.18$, $p = 0.034$, $d = 0.30$. There was a weak to moderate positive correlation between the attitude difference score and the number of insect snacks tried *r*(49) = 0.35, *p* = 0.012, suggesting that the more insect snacks were consumed in the task the more positive the attitude towards insect foods. In terms of willingness to try, the difference score also increased after the gambling task (*M* = 9.31, *SD* = 17.98), *t*(50) = 3.70, *p* < 0.001, *d* = 0.52. There was a weak to moderate positive correlation between the willingness to try difference score and the number of insects eaten in the task *r*(49) = 0.30, *p* = 0.035. This would suggest that the more insect snacks they tried in the task the more willing they were to try insect food. See Table 4 for pre-post descriptive statistics. See Figure 5 for scatterplots.

Table 4.
Means and standard deviations for pre-post measures.

	Pre	Post
Measure	*Mean (SD)*	*Mean (SD)*
Curiosity	64.90 (29.51)	60.14 (32.10)
Attitude	45.59 (28.61)	51.94 (33.46)
Willingness to try	44.63 (29.50)	53.94 (32.88)

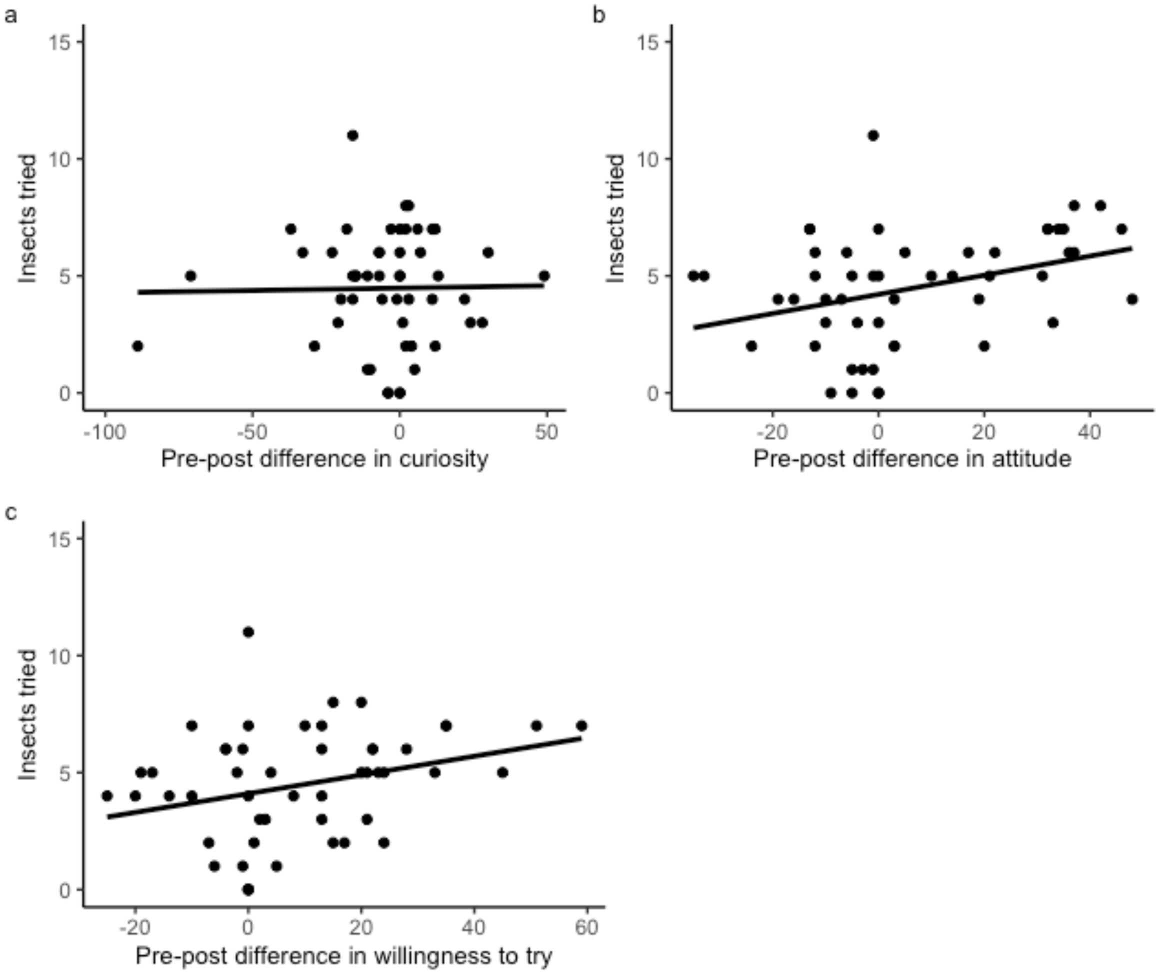

Figure 5. Relationships between the number of insects tried during the task and the pre-post difference scores. (a) curiosity (b) attitude (c) willingness to try.

4.4. General Discussion

Overall, our study results suggest that the uncertainty introduced by the gambling task did not influence willingness to try insect foods within the task. Both the effect of probability showing a decreasing trend and the preference for the 0% insect option suggests that participants did not prefer more uncertain gambles over certain ones. Also, the lack of a significant quadratic effect suggests participants showed no preference for the more uncertain probabilities. They also did not prefer more uncertain probabilities over the 100% insect option. This again, suggests that uncertainty did not have a significant impact on willingness to try insect foods as part of the gambling task.

4.4.1 Uncertainty and willingness to try insect foods

Our results suggest that uncertainty may not play a role in people's willingness to try insect foods. Previous curiosity literature suggests that in order to satisfy curiosity individuals are willing to expose themselves to aversive stimuli to reduce uncertainty (Hsee & Ruan, 2016; Lau et al., 2020). Given the level of disgust associated with insects as a food source (La Barbera et al., 2018), they would consequently be considered aversive stimuli. Therefore, previous research suggests that the more uncertain gambles would be chosen over the certain ones even though that may lead to a higher probability of eating an insect snack as the outcome. However, we did not find a significant quadratic effect, which suggests that participants did not show a preference for the more uncertain gambles.

A recent study on curiosity and entomophagy found that curiosity is one of the major motivating factors in the willingness to try insect foods (Stone et al., 2022). Given that uncertainty in a stimulus can result in curiosity (Berlyne, 1960), the gambling task paradigm used in our study should in theory increase the willingness to try insect foods. Our results suggest that uncertainty did not affect the choice to try insect foods. In particular, we did not find a quadratic effect which would show a preference for uncertainty in an inverted U shape. Other studies have found this inverted U effect consistent with the information gap hypothesis proposed by Loewenstein (1994), which states that a small amount of information increases curiosity whereas too little information does not evoke curiosity and too much resolves curiosity. Therefore, curiosity should be highest when there is mid-level information. For example, Menon and Soman (2002) found that curiosity in advertising novel products was at its highest when information was at a mid-level. Similarly using trivia questions, Kang et al. (2008) found an inverted U-shaped relation between curiosity and confidence. They suggest that people were most curious about the answers when they had an idea of what the answer might be but were not confident they knew the answer. One could argue that our study may have provided too little information, resulting in too much uncertainty for participants. The uncertainty provided by the gambling task and the uncertainty of tasting an insect snack may have been counterproductive in evoking curiosity. It is also possible that after the first insect tasting the task does not provide enough uncertainty. Even if participating in the most uncertain gambles the outcome has already been experienced and the information already gained. One final possibility to consider is that the small sample size was not sufficient to show the quadratic effect. It may be that there is a preference for the mid-level probabilities that cannot be seen due to a lack of power. Overall, it is possible that curiosity is still a major influence in the willingness to try insect foods but the role of uncertainty is unclear.

As many studies do suggest that curiosity does play a key role in willingness to try insect foods (e.g., Caparros Megido et al., 2016; Videbæk & Grunert, 2020), it is also important to consider other aspects of curiosity in influencing willingness to try insect foods. There are other components (i.e., novelty, complexity, and conflict) alongside uncertainty that determine whether curiosity is evoked by a stimulus (Berlyne, 1960). As insect foods are a novel concept it may be that as a stimulus they evoke enough curiosity through being unusual that the uncertainty induced through the gambling task was less important in participant's decisions to try. Therefore, while the focus of this study was on uncertainty, it is possible that another component, such as novelty is predominantly important in determining curiosity for insect foods.

Another factor to consider is that uncertainty may be a more useful tool in other aspects of the consumer decision-making process. For example, much of the curiosity and consumer behaviour research focuses on the use of uncertainty in advertisements (e.g., ambiguous slogans or withholding certain information) and the positive impact on attitudes towards the advertised products (e.g., Hill et al., 2016; Menon & Soman, 2002; Ruan et al., 2018). Hence, uncertainty may be a more useful tool when advertising insect foods rather than at the tasting stage where other ways of increasing curiosity may be more effective. It is important to note that the pre-post measures suggest that the gambling task may have had some effect on attitudes towards insect foods, this should be examined further to understand if this is due to uncertainty in the gambling task or another mechanism.

4.4.1.1. Gambling choice after tasting

When examining gambling choices made after participants had tasted their first insect snack, we found that the preference for the 0% insect option and the decreasing trend of probability were no longer significant. This may suggest that after the first try participants were more willing to try the insect foods again and therefore selected gambles with a higher probability of an insect outcome. This is consistent with previous research regarding insect foods which suggests that after the first try if this is a positive experience, consumers are able to overcome the initial disgust and are more willing to try insect foods again (Hartmann & Siegrist, 2016). It is possible that the gambling task created a positive first experience for participants and thus they were willing to try again.

It is also possible that after the first tasting experience, curiosity towards the insect foods had been satisfied. Research suggests that positive attitudes towards products remain even after curiosity has been resolved (Ruan et al., 2018). If an aspect such as novelty drives curiosity towards insect foods, once tasted, the curiosity may be satisfied but positive attitudes remain resulting in further tasting experiences. This may also be related to the idea that knowledge acquisition is rewarding and in turn, can promote future exploratory experiences (Murayama et al., 2019). For participants who tried the insect foods, gaining information about a novel experience may have been rewarding and therefore promoted further exploratory behaviour within the gambling task.

4.4.1.2 Individual differences

With regard to the individual difference factors, for the majority of these measures we found no significant interactions with the uncertainty effects. Contrary to previous research findings (Ammann et al., 2018; La Barbera et al., 2020), in our study differences in disgust and food neophobia did not affect willingness to try insect foods in the gambling task. We found a similar result for variety seeking. This is also at odds with previous research, which suggests that those who score higher on the VARSEEK scale would not only be more willing to try insect foods but may also be attracted to the risk element of the gambling task (Lenglet, 2018). A possible explanation for this finding is the lack of adequate sample size or that the novelty of insect foods alone provided significant risk and variety. Another possibility is that the novelty of insect foods is related to the general interest in entomophagy as novelty is a component of curiosity/interest as suggested by Berlyne (1960). This may explain the significant positive interaction effect between the interest subscale of the EAQ and probability, suggesting as interest increases so does the choice of probability. Also, the main effect of the interest sub-scale in some models could suggest that those who were more interested in insect foods were more engaged with the gambling task overall. This would suggest a leaning towards insect foods which is consistent with curiosity and insect food literature (e.g., Caparros Megido et al., 2016; House, 2016; Sogari, 2015; Videbæk & Grunert, 2020).

Regarding intolerance of uncertainty, there was a significant interaction between IUS and the 0% effect and a main effect of IUS in some of the models. Suggesting that those who were higher in intolerance of uncertainty showed a stronger preference for the 0% effect and that those with higher IUS were more reluctant to engage in the gambling task in general. This is consistent with IUS research as it shows a lack of willingness to re-expose oneself to aversive stimuli (Carleton et al., 2007). However, as these effects of the individual difference measures are not necessarily reliable, it is also possible that the lack of consistent effects suggest participants may have had a positive experience with the insect foods and were, therefore, more willing to try after the first taste regardless of individual differences in areas such as intolerance of uncertainty, food neophobia or general disgust. Once again, this would be consistent with Hartmann and Siegrist (2016) who suggested that a single positive experience with insect foods encourages individuals to try again in the future. This would also be consistent with our results showing the significant effects of the 0% option and the decreasing trend of probability no longer evident after the first try. Overall, it is unclear whether individual differences play a role in relation to uncertainty and the willingness to try insect foods, however, these results suggest there are possible links to the current literature which should be investigated further.

4.4.2. Relationship between pre-post measures and insect tasting

We found a significant positive relationship between pre-post attitude ratings and the number of insects tried during the task. A similar positive relationship was found for pre-post willingness to try ratings. Suggesting that participants who tried more insects gave more positive ratings of attitude and willingness to try, this is again consistent with the idea that after trying insect foods individuals are more willing to try again in the future (Hartmann & Siegrist, 2016). This coincides with the positive relationship between willingness to try and the number of insects eaten. It has also been suggested that after tasting attitudes towards insect foods improve (Tan et al., 2016), this again, coincides with our findings that there is a positive relationship between attitude towards insect foods and the number of insects tried in the task. There was no significant relationship between the pre-post curiosity measure and the number of insects tried. This is in contrast with previous research which suggests that curiosity predicts willingness to try insect foods (e.g., House, 2016; Stone et al., 2022; Videbæk & Grunert, 2020). However, as the difference between pre-post curiosity suggested that curiosity decreased after the task it could be that for some participants the curiosity was resolved after they tried their first insect snack, therefore, there would be no relationship between the number of insects tried and the curiosity rating.

The differences in willingness to try and attitude ratings suggest that post-task participants were more willing to try insect foods and showed improved attitudes towards insect foods. Many curiosity and consumer behaviour studies have found that resolution of curiosity, through uncertainty reduction, improves attitudes towards products and can influence purchase motivations (e.g., Daume & Hüttl-Maack, 2020; Hill et al., 2016; Menon & Soman, 2002) and that these positive influences can endure after curiosity has been resolved (Ruan et al., 2018). This may be an explanation as to why the attitude and willingness to try measures were significantly different post-task while the curiosity measure showed a non-significant decrease. However, it should be noted that as we did not have a control condition, the pre-post differences cannot necessarily be attributed to the task itself and may be the result of other factors.

4.4.3. Limitations and future research

The main limitation of this study is the small sample size. Due to the nature of the study, with participants being able to complete the task in their own homes, even though experimental supplies were posted to 84 participants only 54 useable responses were received. Due to time and budgetary constraints as well as Covid-related restrictions, we were unable to collect further data. Therefore, it is possible that uncertainty may play a role in the willingness to try insect foods but given the constraints of the data, we are unable to confirm this. Further research could conduct a similar online task with a larger sample size to further understand the role of uncertainty in the willingness to try novel foods.

It should also be noted that participants did select many gambles with uncertain outcomes and tried insect foods much of the time when the outcome was an insect snack (87%). This could suggest that there was an aspect of the gambling task that may have encouraged willingness to try. One possible explanation is the idea of gamification (positively influencing consumers/users through the application of gaming features). Gamification is said to evoke curiosity about a product through increased consumer playfulness and this can lead to an increased likelihood of consumer adoption (Müller-Stewens, Schlager, Häubl, & Herrmann, 2017). For example, in a study examining how gamification affects consumers' dietary choices, they found that gamification of menus led to healthier eating choices compared to non-gamified menus (Ögel Aydın & Argan, 2021). It could be that the gambling task employed some sort of gamification to the trying of insect foods which encouraged participants and would account for the high level of eating engagement found in the task. Future research should investigate this further and the potential application of gamification in encouraging pro-environmental dietary choices.

Secondly, a concern with participants completing the task at home is the reliability of the data. The responses given by participants in the task may not be accurate due to a lack of understanding of the task or untruthful responses. Participants were recorded through their webcam during the gambling task to avoid this, although this data was not analysed as the video recording was used as a dissuasion against fabricating eating behaviours. However, due to the Coronavirus pandemic, this study had to be conducted online, therefore, placing trust in the participants to complete the task correctly and honestly. Future research could examine this type of task in a more controlled lab setting to avoid this potential issue. It may also be prudent to add a trial by trial curiosity rating into the task as it is currently unclear whether curiosity (as measured by the pre-post scores) is resolved after the first tasting of insect foods and how this relationship may change across the task as further insects are tried.

Lastly, it is important to note the lack of control condition present in this study. Due to the time and resources needed to collect the data online, we decided to conduct the study using a within-subjects design and a single gambling task to manipulate uncertainty. However, the role of uncertainty in the willingness to try insect foods may be better examined using a between-subjects design. Future research should consider using insect food and familiar non-insect food products in a tasting task with 2 conditions, one condition where all the outcomes are certain and another that includes uncertainty towards the type of outcome snack.

If this study had been conducted outside of the constraints of the pandemic it may have been possible to employ a more direct uncertainty manipulation. For example, the lab version of the present study originally planned before the pandemic included a control condition. This was based upon a task from Hsee & Ruan (2016) in which they presented participants with a series of buttons that played either a pleasant or an aversive sound. Participants in the certain condition (control) were present with the majority of buttons labelled describing the sound, the uncertain condition provided participants with the majority of buttons labelled with a "?". Our original design adapted this paradigm using insect snacks and familiar snacks. The certain condition contained an array of 36 boxes labelled as to whether they contained an insect or non-insect snack, the uncertain condition had 50% labelled as containing insect or non-insect snacks the other 50% was labelled with a "?". Participants in both conditions had 5 minutes to open as many boxes as they wished and could try the snacks inside. The comparison between the certain and uncertain conditions may have allowed us to examine the manipulation of uncertainty in a more robust manner.

Another consideration would have been to employ a more direct manipulation of uncertainty related to the insect foods themselves. For example, a lab-based tasting study manipulating uncertainty regarding the taste of insect foods while assessing curiosity and other relevant attributes before and after tasting may have provided a more direct manipulation and therefore expanded upon the potential of uncertainty in encouraging the willingness to try insect foods. However, studies relating to curiosity and consumer behaviour suggest that incidental curiosity can affect consumer choice (e.g., Wang & Huang, 2018; Wiggin et al, 2019) which could suggest that it may not be necessary to manipulate uncertainty specifically in relation to the insect foods themselves to increase curiosity towards the product. This may mean that a more robust manipulation of uncertainty would increase willingness to try insect foods whether related directly to insect foods or not.

Chapter 5. General Discussion and Conclusion

The studies presented in this thesis examined whether curiosity is a well-placed motivator to facilitate the willingness to try insect foods. Using a variety of methods, longitudinal designs and a large number of stimuli this research was able to assess the relative contribution of curiosity to the willingness to try insect foods in a number of different ways. Chapter 2 provided evidence that curiosity predicts the willingness to try insect foods above and beyond many other key predictors (e.g., familiarity, social influence and attractiveness). We also found that curiosity interacted with other predictors of willingness to try, these interactions boosted the willingness to try insect foods. Specifically, we found a unique effect for insect foods that when curiosity was high, the relationship between other predictors (including attitude and perceived taste) and willingness to try was strengthened. Chapters 3 and 4 aimed to further examine the effects of curiosity on willingness to try insect foods by manipulating curiosity in order to increase willingness to try. Specifically, Chapter 3 focused on interest. Increasing interest in insect foods using an adapted utility-value intervention, we found this increased willingness to try insect foods as well as increasing knowledge of other key attributes specific to insect foods (e.g., sustainability and healthiness). This study also found a comparable effect when researching an insect-based recipe, which may be an effect of exposure to the topic or potentially another route to attitudinal change. Chapter 4 explores manipulating uncertainty to increase curiosity in order to understand if this affects people's choices to eat insect foods. At odds with prior expectation, this study found no significant effect of uncertainty on choices to eat insect foods. However, the task did produce some interesting additional effects: people showed more positive attitudes towards insect foods after completing the task and showed high levels of engagement with the task and the insect snacks tried. While these findings do not give conclusive evidence about the role of uncertainty in willingness to try insect foods, mainly due to the limitations of the study (e.g., the relatively small sample size), this research opens up other avenues for future investigation. Both the role of uncertainty and the role of other curiosity-related mechanisms that may increase willingness to try insect foods require further research.

In a broader sense, this research adds to existing theories on curiosity which suggest a motivational pull of curiosity, where gaining information is intrinsically rewarding and this outweighs potential aversive consequences associated with that information (FitzGibbon et al., 2020; Murayama et al, 2019). Edible insects, as a stimuli provide both information gain as they are novel to most people in Western societies and an aversive consequence through their associated disgust. Curiosity is said to recruit attentional resources and when attending to novel stimuli (such as edible insects) selective attention is directed towards the source of novelty when engaging in exploratory behaviour in order to gain information which is intrinsically rewarding (e.g., Gottlieb, 2012; Gruber & Ranganath, 2019). In the case of edible insects, they may provide a similar reward to that seen in morbid curiosity (e.g., Oosterwijk, 2017), where prior expectation of the information is unpleasant, but the information gain is rewarding.

As each individual paper includes an in-depth discussion of the results, this discussion will focus on the overall contributions and practical implications of this research.

5.1. The effectiveness of curiosity as a motivator

This thesis examined the effectiveness of curiosity as a motivator for entomophagy, with each of the three empirical chapters examining a different facet of curiosity as potential motivation to increase the willingness to try insect foods. First, the feeling of curiosity, this examined the potential of curiosity as a predictor of the willingness to try insect foods. Second, sparking an interest in entomophagy, this examined the effects of increasing interest in the topic of entomophagy on the willingness to try insect foods. Lastly, reducing uncertainty, this examined the need to reduce uncertainty in order to resolve curiosity on peoples' choices to eat insects.

5.1.1. The feeling of curiosity

This research found strong evidence about the ability of curiosity to predict willingness to try insect foods, beyond the effects of familiarity, attractiveness, exoticness, healthiness, sustainability, how filling the food was perceived to be and social influence. This finding aligns with previous research that also found curiosity to be one of the most important factors in encouraging willingness to try insect foods (e.g., House, 2016; Sogari, 2015). The research in Chapter 2 was correlational in nature, therefore, it is possible that curiosity may be a by-product of another factor that affects both curiosity and willingness to try. For example, it may be that attitudes towards insect foods drive both curiosity and willingness to try. Attitude was the strongest predictor across both studies conducted in Chapter 2 and we know that curiosity and positive emotions are interlinked through the value of knowledge (Murayama et al., 2019). We also found an interaction between curiosity and attitude which suggested that if attitude is more positive and curiosity is high then willingness to try is higher.

However, this alternative explanation is unlikely for several reasons. Firstly, curiosity research suggests that the positive emotions result from curiosity resolution and exploratory behaviour due to their intrinsically rewarding nature (Litman, 2005). This implies that curiosity must first be present in order to facilitate positive attitudes. Second, prior expectations of insect foods are mainly negative and associated with feelings of disgust (La Barbera et al., 2018). A strong motivation is needed to suppress this feeling of disgust and encourage information-seeking in order to generate a positive attitude towards insect foods. Therefore, the alternative explanation does not take into account where the positive emotion would originate from or the motivational aspect required to overcome the disgust associated with insect foods. Thus, curiosity may provide a better explanation.

The positive feedback loop of information seeking suggests that the expected value of knowledge, if surprising, can result in a positive prediction error which increases the value of further knowledge on that topic (Murayama et al., 2019). It is possible that insect foods provide a positive prediction error, their preconceptions are mainly negative therefore information gained about their positive attributes and benefits may be surprising. This positive feedback-loop of information gain may also create positive feeling towards insect foods. It has been suggested that insect foods can create an attitudinal ambivalence, defined by the feeling of disgust on one side and feeling of interest on the other, with consumers often feeling both at the same time. When consumers are aware of these conflicting emotions it can lead to greater information seeking which can create stronger links between attitudes and behaviours (Videbæk & Grunert, 2020). It may be that this motivation to seek information results in reconciling the conflict leaving behind the positive feeling which creates a stronger link between attitude and willingness to try. Therefore, the more plausible interpretation of the results from Chapter 2 is that curiosity is a well-placed motivator of the willingness to try insect foods. Further research is needed on the positive experience of gaining knowledge as this affective component may be a potential mediator between curiosity and attitudinal change towards novel foods with negative preconceptions.

5.1.2. Interest in entomophagy

The idea that insect foods may provide a positive prediction error and the positive value of new knowledge changing attitudes towards insect foods may also be supported by the results in Chapter 3. The adapted utility-value intervention provided information on the benefits of insect foods and boosted interest in entomophagy. Participants in the value intervention condition reported higher interest in the information learned post-task compared to the control condition. This may have been due to a difference between the expected and actual value of the information gained in the task, therefore, resulting in a positive prediction error. Given that information gain has intrinsic value and there is a positive affective component related to engaging with a topic (Hidi & Renninger, 2006), this could explain the positive effects of the utility-value intervention on the willingness to try insect foods. Previous research also shows that when information is gained on the benefits of entomophagy (e.g., healthiness and sustainability) attitudes towards insect foods can improve (Lombardi et al., 2019). This may be part of the positive feedback-loop potentially generated by the utility-value intervention as an awareness of the positive benefits associated with entomophagy may create awareness of further knowledge gaps prompting further information seeking. The positive effects of the utility-value intervention were present one month later and participants reported re-engaging with the topic of entomophagy during that time. The engagement with the topic over the previous month could suggest a transition to a more maintained type of interest (Hidi & Renninger, 2006; Murayama et al., 2019). This suggests that utility-value interventions can initiate a longer-term interest in entomophagy as well as increases in willingness to try insect foods.

However, Chapter 3 also suggests that a recipe-based task can achieve the same boost in willingness to try ratings. This could provide several alternative explanations to the effect of the utility-value intervention not necessarily related to information-seeking, such as mere exposure. Previous research has suggested that mere exposure is enough to increase food liking, for example, a strong exposure effect was found for multiple tastings of an unfamiliar tropical juice. The more participants tried the juice the more they reported liking it (Pliner, 1982). Chapter 3 did not directly assess eating behaviour, exposure to insect food images cannot be directly compared to classical exposure studies as participants did not actually try the food. However, this may suggest that it is possible that this type of exposure effect can occur even when the food is not actually tasted.

Alternatively, it is possible that the recipe condition increases the willingness to try insect foods in a comparable way to a utility-value intervention. Both the recipe task and the value intervention may operate on the same underlying mechanism, the intrinsic reward associated with knowledge. The utility-value intervention provided information gain on the benefits of entomophagy increasing interest in insect food and in turn, willingness to try. The recipe task provides information gain on using edible insects in a recipe, a potentially highly novel encounter for many participants. This could also have sparked an interest in the topic and provided a positive experience gaining knowledge in relation to insect foods. Future research should examine the underlying mechanisms of both the utility-value intervention and the recipe task to understand if they are based on the same or different mechanisms.

5.1.3. Reducing uncertainty

Chapters 2 and 3 provide reasonable evidence for the motivational power of curiosity to influence willingness to try insect foods. However, the findings presented in Chapter 4 are not necessarily consistent with this view. Curiosity research suggests that uncertainty reduction is a major contributing factor to exploratory behaviour (Gottlieb et al., 2013). In order to reduce uncertainty created by awareness of a knowledge gap, people are motivated to seek information to close the gap (Loewenstein, 1994). Chapter 4 manipulated uncertainty through a gambling task with varying levels of uncertainty about receiving an insect snack as the outcome. The results showed no effect of uncertainty on choice to eat insects, participants did not show a preference for gambles with higher outcome uncertainty. These results are surprising because previous studies have shown that people are more likely to expose themselves to novel (and potentially negative) images, sounds, and tactile experiences when uncertainty is high than when it is low (Hsee and Ruan, 2016). We expected to see similar effects for novel gustatory experiences. The inconsistent results in comparison to previous research can be explained, at least in part, by some methodological limitations of this study. First, the Covid-related restrictions resulted in limitations to face-to-face data collection resulting in a relatively small sample size. Second, the experimental design may not be the most effective way to examine uncertainty. Before the Covid-19 pandemic began, the experimental design of Chapter 4 was a lab-based between-subjects design. Due to the pandemic, data collection for this study was terminated and the online experiment reported here was designed. The advantages of the original design included a control condition of all certain options compared to an uncertain condition with 50% uncertain options. Comparing an uncertain condition to a certain one allows for a more robust examination of uncertainty and a more direct manipulation. Both running the experiment in a more tightly controlled lab setting and the use of a control condition may be better suited to examining the role of uncertainty. Many of the studies that report uncertainty effects use such experimental designs (e.g., Hsee & Ruan, 2016; Ruan et al., 2018) and this should be examined further.

In addition to the results being inconsistent with previous research, there is also a discrepancy between the lack of uncertainty effects and the high level of engagement with the task. The level of tasting within the task was high, suggesting that some part of the task provided a motivation for willingness to try. Therefore, it is possible that a limitation of the task is an unknown contributing or mediating factor, such as gamification (as discussed in Chapter 4). One possibility is that of product category incongruence, where a product is dissimilar in comparison to other products of the same category (e.g., donut infused beer compared to a pilsner lager). If a product is seen as a violation of the product category norms this can evoke a specific curiosity about the product (Gerrath & Biraglia, 2021). Insects as a food source are highly likely to be seen as a violation of food norms, this may drive task engagement to resolve the curiosity about the insect foods separate to any uncertainty manipulation. This should be examined further by removing uncertainty from the paradigm and using a simple measure of curiosity towards entomophagy to understand if the curiosity regarding insect foods is enough to prompt tasting alone. However, it is likely this is only the case for those who have high levels of curiosity towards insect foods to begin with, suppressing the feeling of disgust and eliciting a motivation to try.

Alternatively, variety-seeking research suggests that consumers have a desire to maintain the optimal level of stimulation (Menon & Kahn, 1995). The level of stimulation provided by products depends upon their features (e.g., novelty, complexity, uncertainty) (Berlyne, 1960). When the stimulation is too high consumers try to reduce the complexity of the situation by choosing what is familiar to them (Menon & Kahn, 1995). The results in Chapter 4 found participants showed a preference for the more certain non-insect gambles. It is therefore possible, that the uncertainty within the gambling task and the novelty of the insect foods provided too much stimulation resulting in a preference for the familiar foods. This explanation would also be consistent with the inverted U relationship between arousal and preference for stimuli as suggested by Berlyne (1960), the combination of uncertainty and novelty (collative variables) may have provided excessive levels of arousal. The reduction in variety-seeking behaviour alone would not necessarily explain the high level of engagement seen in the task. However, this could be explained through boredom. Even in short periods of time, research has found that individuals would rather participate in negative experiences compared to doing nothing (Wilson et al., 2014). It has also been found that people anticipate that they will not enjoy doing nothing and therefore keeping busy with a task is preferred (Hatano, Ogulmus, Shigemasu, & Murayama, 2020). This could provide an explanation for the high level of engagement in the task as participants were free to select as many or as few gambles as they wished within the 5-minute time period, thus participating in gambles may have been preferable to waiting the 5 minutes. Future research should examine the role of uncertainty in encouraging entomophagy whilst controlling for the level of stimulation provided within the task. It may also be prudent to include a control condition that can account for the potential effects of boredom. As mentioned earlier using a paradigm with two conditions (e.g., certain vs uncertain) has several benefits, in this case, similar to Hsee and Ruan (2016) it would allow some of the alternative explanations discussed above to be ruled out. For example, if participants engage in the task through boredom there would be no difference in the participation in either condition. Therefore, without further research, it is not currently possible to explain the role of uncertainty in people's choices to eat insect foods.

5.2. Practical implications

One of the advantages of examining curiosity in the context of consumer behaviour are the practical implications of this body of research. Encouraging people to adopt entomophagy is not only beneficial to an individual's health but has several environmentally positive consequences (Lombardi et al., 2019). Reducing meat consumption is a global concern and edible insects provide a more sustainable and environmentally friendly alternative (Boland et al., 2013; Gahukar, 2011). Based on some of the results found in this thesis there are several practical ways in which curiosity could be used to stimulate willingness to try insect foods. For example, Chapter 3 showed that communication of the value (benefits) or practical uses (e.g., how to prepare/consume novel foods) of insect foods could increase willingness to try. These could be communicated through diverse channels, such as advertising campaigns or social media sites to potentially increase interest in entomophagy.

Chapter 2 showed how curiosity interacts with other factors predictive of willingness to try. The curiosity-boosting effect found in this chapter suggests that when curiosity is high the association between willingness to try and the other predictor is strengthened. When curiosity is high this may recruit attentional resources (Gottlieb, 2012) increasing awareness of the other predictive factor. This again could be used within advertisements to increase acceptance of insect foods. For example, inducing curiosity through an advertisement or branding whilst also providing information regarding another key factor (e.g., healthiness or sustainability) may draw attention to the benefits of insects foods and strengthen the relationship between the other factor and willingness to try.

In relation to uncertainty, even though our results suggest the role is still unclear there are practical implications to encourage entomophagy potentially including uncertainty. There are many food-related games that rely upon uncertainty to prompt people to try unusual foods. However, as these products are game-based it is also possible that gamification is responsible. Gamification can evoke curiosity through playfulness (Müller-Stewens et al., 2017) and could be used to elevate curiosity about insect foods by branding and packaging them as part of a tasting game. More research needs to be conducted regarding the use of gamification to increase curiosity specifically for insect foods.

These implications of curiosity in this context could also be applied to other novel food products and other food products where disgust plays a demotivating role. For example, 3D printed food products are another novel food product often met with disgust by consumers but offer a sustainable solution to meat consumption (Manstan, Chandler, & McSweeney, 2021). Given the similarities in consumer preconceptions towards 3D printed foods it may be possible to use curiosity to encourage acceptance of this novel food, this provides a promising avenue for further exploration. However, further research would be needed to understand if the findings of this thesis are generalisable to other types of novel foods.

Furthermore, research could examine curiosity as a motivator for entomophagy across different cultures. This research focused on samples mainly from the UK; however, previous research suggests cross-cultural similarities in the potential importance of curiosity as a motivator for entomophagy across other European countries and the US (e.g., Caparros Megido et al., 2016; House, 2016; Woolf et al., 2019). It is also important to note that curiosity can be seen as an important driver of exploration in human behaviour, thus may be a universal intrinsic motivator (e.g., Gottlieb et al., 2013; Kobayashi et al., 2019). Therefore, curiosity may be a powerful motivator to encourage entomophagy in many societies where eating insects is not common practice.

5.3. Conclusion

This thesis aimed to provide evidence as to whether curiosity is a well-placed motivator to encourage exploratory eating behaviours in relation to insect foods. This research found that curiosity is a strong motivator of the willingness to try insect foods, and it interacts and strengthens the association between other key predictors and the willingness to try insect foods. Sparking an interest in entomophagy through communication of the benefits or practical uses of insect foods is another route to successfully encourage willingness to try. The role of uncertainty in encouraging entomophagy remains unclear and the future research suggested may help to clarify this. In addition to this and the suggestions within the individual papers, it may be useful to understand the positive value of gaining new knowledge and how this mechanism may mediate the relationship between curiosity and attitudinal change. This may be an important component in overcoming the negative connotations of edible insects using curiosity.

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Appendices for Paper 1.

Appendix A. Supplementary Material

Table S1.
Within-person correlation matrix of insect food ratings for Study 1.

	Insect									
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
1. Attractive										
2. Curious	0.46									
3. Exotic	0.06	0.12								
4. Familiar	0.28	0.18	-0.16							
5. Attitude	0.60	0.58	0.02	0.38						
6. Filling	0.20	0.15	-0.02	0.22	0.22					
7. Healthy	0.13	0.14	0.25	0.01	0.15	0.07				
8. Sustainable	0.14	0.12	0.11	0.13	0.21	0.18	0.26			
9. Tasty	0.60	0.53	0.04	0.36	0.69	0.25	0.11	0.18		
10. Willingness to try	0.54	0.55	0.03	0.35	0.78	0.19	0.10	0.18	0.66	
11. Social	0.28	0.32	0.15	0.17	0.35	0.13	0.13	0.17	0.32	0.31

Table S2.
Within-person correlation matrix of non-insect food ratings for Study 1.

Not Insect

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
1. Attractive										
2. Curious	0.42									
3. Exotic	0.00	0.28								
4. Familiar	0.40	0.01	-0.35							
5. Attitude	0.72	0.47	-0.06	0.48						
6. Filling	0.33	0.16	-0.04	0.36	0.36					
7. Healthy	-0.03	0.09	0.38	-0.09	-0.02	0.07				
8. Sustainable	0.17	0.09	-0.03	0.22	0.22	0.12	0.17			
9. Tasty	0.70	0.46	-0.06	0.46	0.83	0.35	-0.09	0.16		
10. Willingness to try	0.65	0.44	-0.09	0.48	0.85	0.32	-0.06	0.20	0.82	
11. Social	0.26	0.39	0.23	0.07	0.25	0.16	0.15	0.10	0.24	0.21

Table S3.
Regression models predicting willingness to try using the first image rating for insect (*n* = 122) and non-insect (*n* = 118) data for Study 1.

	Insect					Not Insect				
Predictors	*Est.*	*SE*	*CI*	*t*	*p*	*Est.*	*SE*	*CI*	*t*	*p*
Intercept	0.12	0.39	-0.65 – 0.89	0.31	0.761	-0.45	0.65	-1.73 – 0.83	-0.70	0.489
Curious	0.17	0.05	0.08 – 0.27	3.64	**<0.001**	0.09	0.07	-0.05 – 0.22	1.29	0.201
Attitude	0.81	0.09	0.63 – 1.00	8.79	**<0.001**	0.52	0.11	0.31 – 0.73	4.87	**<0.001**
Tasty	0.12	0.08	-0.04 – 0.27	1.49	0.138	0.56	0.11	0.33 – 0.78	4.93	**<0.001**
Familiar	-0.02	0.08	-0.17 – 0.13	-0.21	0.833	0.21	0.07	0.07 – 0.34	3.03	**0.003**
Attractive	0.01	0.07	-0.12 – 0.15	0.19	0.850	-0.06	0.08	-0.22 – 0.10	-0.74	0.458
Exotic	-0.03	0.04	-0.12 – 0.05	-0.75	0.453	-0.08	0.07	-0.23 – 0.07	-1.07	0.286
Filling	-0.10	0.05	-0.21 – -0.00	-2.02	**0.046**	-0.05	0.07	-0.19 – 0.09	-0.73	0.468
Healthy	-0.06	0.05	-0.16 – 0.03	-1.26	0.210	-0.07	0.06	-0.18 – 0.05	-1.18	0.239
Sustainable	0.03	0.05	-0.07 – 0.12	0.59	0.554	-0.07	0.07	-0.20 – 0.06	-1.13	0.262
Social	-0.00	0.04	-0.09 – 0.09	-0.03	0.975	-0.03	0.07	-0.16 – 0.11	-0.38	0.707
	R^2		R^2 adjusted			R^2		R^2 adjusted		
	0.79		0.77			0.80		0.78		

Table S4.

Regression models showing two-way interactions between curiosity and other predictors of willingness to try using the first image rating for insect (*n* = 122) and non-insect (*n* = 118) data for Study 1.

	Insect					Not Insect				
Interactions	*Est.*	*SE*	*CI*	*t*	*p*	*Est.*	*SE*	*CI*	*t*	*p*
Curious X Attractive	0.03	0.02	-0.00 – 0.07	1.80	0.074	-0.05	0.02	-0.08 – -0.01	-2.42	**0.017**
Curious X Familiar	0.01	0.02	-0.04 – 0.05	0.29	0.771	-0.03	0.02	-0.06 – 0.00	-1.75	0.084
Curious X Exotic	0.01	0.01	-0.02 – 0.03	0.76	0.450	-0.02	0.02	-0.05 – 0.02	-0.97	0.336
Curious X Attitude	0.10	0.02	0.07 – 0.14	5.97	**<0.001**	-0.07	0.02	-0.11 – -0.03	-3.27	**0.001**
Curious X Filling	-0.03	0.02	-0.06 – 0.00	-1.71	0.091	-0.02	0.02	-0.06 – 0.02	-1.04	0.300
Curious X Healthy	0.01	0.01	-0.01 – 0.04	0.96	0.340	-0.00	0.02	-0.04 – 0.03	-0.30	0.767
Curious X Sustainable	0.03	0.01	0.01 – 0.05	2.57	**0.012**	-0.01	0.02	-0.05 – 0.02	-0.73	0.465
Curious X Tasty	0.06	0.02	0.02 – 0.09	3.43	**0.001**	-0.05	0.02	-0.10 – -0.00	-2.09	**0.039**
Curious X Social	0.02	0.01	-0.01 – 0.04	1.54	0.127	-0.00	0.02	-0.04 – 0.03	-0.14	0.886

Model	R^2	R^2 adjusted	R^2	R^2 adjusted
Curious X Attractive	0.80	0.78	0.80	0.78
Curious X Familiar	0.79	0.77	0.80	0.78
Curious X Exotic	0.79	0.77	0.80	0.77
Curious X Attitude	0.84	0.83	0.80	0.78
Curious X Filling	0.80	0.77	0.80	0.78
Curious X Healthy	0.79	0.77	0.80	0.78
Curious X Sustainable	0.80	0.78	0.80	0.78
Curious X Tasty	0.81	0.79	0.80	0.78
Curious X Social	0.79	0.77	0.80	0.78

Table S5.
Regression models showing three-way interactions between curiosity, image type and other predictors of willingness to try using the first image rating for Study 1.

	Willingness to try				
Interactions	*Est.*	*SE*	*CI*	*t*	*p*
Curious X Attractive X Insect	0.02	0.01	-0.01 – 0.04	1.29	0.198
Curious X Familiar X Insect	0.01	0.01	-0.02 – 0.03	0.45	0.654
Curious X Exotic X Insect	0.01	0.01	-0.01 – 0.03	0.74	0.460
Curious X Attitude X Insect	0.06	0.01	0.03 – 0.09	4.48	**<0.001**
Curious X Filling X Insect	-0.01	0.01	-0.03 – 0.02	-0.51	0.613
Curious X Healthy X Insect	0.00	0.01	-0.02 – 0.02	0.09	0.925
Curious X Sustainable X Insect	0.01	0.01	-0.01 – 0.03	0.73	0.466
Curious X Tasty X Insect	0.03	0.01	0.00 – 0.06	2.27	**0.024**
Curious X Social X Insect	0.00	0.01	-0.02 – 0.02	0.25	0.806

Model	R^2	R^2 adjusted
Curious X Attractive X Insect	0.86	0.86
Curious X Familiar X Insect	0.86	0.85
Curious X Exotic X Insect	0.87	0.86
Curious X Attitude X Insect	0.87	0.87
Curious X Filling X Insect	0.86	0.85
Curious X Healthy X Insect	0.86	0.85
Curious X Sustainable X Insect	0.86	0.86
Curious X Tasty X Insect	0.87	0.86
Curious X Social X Insect	0.86	0.85

Table S6.
Mixed-effects modelling predicting willingness to try for insect and non-insect data for Study 1 – Attitude predictor eliminated.

	Insect					Not Insect				
	Fixed Effects									
Predictors	*Est.*	*SE*	*CI*	*t*	*p*	*Est.*	*SE*	*CI*	*t*	*p*
Intercept	1.63	0.12	1.40 – 1.86	13.78	**<0.001**	7.41	0.09	7.24 – 7.58	85.25	**<0.001**
Curious	0.19	0.02	0.15 – 0.23	8.65	**<0.001**	0.15	0.02	0.12 – 0.18	9.23	**<0.001**
Tasty	0.33	0.03	0.29 – 0.38	13.37	**<0.001**	0.72	0.02	0.68 – 0.76	36.37	**<0.001**
Familiar	0.09	0.02	0.05 – 0.13	4.65	**<0.001**	0.14	0.01	0.11 – 0.16	10.77	**<0.001**
Attractive	0.13	0.01	0.10 – 0.15	8.61	**<0.001**	0.12	0.02	0.09 – 0.15	7.17	**<0.001**
Exotic	-0.00	0.01	-0.02 – 0.01	-0.54	0.591	-0.05	0.01	-0.08 – -0.03	-4.15	**<0.001**
Filling	-0.01	0.01	-0.03 – 0.00	-1.75	0.081	-0.00	0.01	-0.03 – 0.02	-0.11	0.911
Healthy	-0.00	0.01	-0.02 – 0.01	-0.50	0.618	0.00	0.01	-0.02 – 0.02	0.43	0.665
Sustainable	0.02	0.01	0.00 – 0.04	2.27	**0.023**	0.05	0.01	0.02 – 0.07	3.76	**<0.001**
Social	0.07	0.02	0.04 – 0.11	4.29	**<0.001**	-0.01	0.02	-0.04 – 0.02	-0.86	0.392

Random Effects

	Variance	*SD*	*Variance*	*SD*
Subject (Intercept)	3.32	1.82	1.73	1.32
Curious | Subject	0.06	0.25	0.02	0.16
Tasty | Subject	0.09	0.30	0.03	0.18
Familiar | Subject	0.04	0.19	0.01	0.09
Attractive | Subject	0.02	0.15	0.02	0.14
Exotic | Subject	-	-	0.01	0.07
Filling | Subject	0.00	0.03	0.01	0.08
Healthy | Subject	-	-	0.01	0.09
Sustainable | Subject	0.01	0.08	0.01	0.09
Social | Subject	0.03	0.17	0.01	0.08

Model Fit

R^2	*Marginal*	*Conditional*	*Marginal*	*Conditional*
	0.25	0.83	0.58	0.79

Table S7.
Interactions between curiosity and the other predictors of willingness to try for insect and non-insect data in Study 1 – Attitude predictor eliminated.

	Insect					**Not Insect**				
	Fixed Effects									
Interactions	*Est.*	*SE*	*CI*	*t*	*p*	*Est.*	*SE*	*CI*	*t*	*p*
Curious X Attractive	0.02	0.01	0.01 – 0.04	3.72	**<0.001**	-0.01	0.00	-0.02 – 0.00	-1.32	0.185
Curious X Familiar	0.03	0.01	0.01 – 0.05	3.36	**0.001**	-0.02	0.00	-0.03 – -0.01	-4.58	**<0.001**
Curious X Exotic	-0.00	0.01	-0.01 – 0.01	-0.10	0.923	0.01	0.00	0.01 – 0.02	3.17	**0.002**
Curious X Filling	0.01	0.00	-0.00 – 0.02	1.83	0.067	-0.01	0.00	-0.01 – 0.00	-1.30	0.194
Curious X Healthy	-0.01	0.01	-0.02 – 0.00	-1.17	0.243	0.00	0.00	-0.00 – 0.01	1.30	0.194
Curious X Sustainable	0.02	0.01	0.01 – 0.03	3.62	**<0.001**	-0.01	0.00	-0.02 – -0.00	-2.27	**0.023**
Curious X Tasty	0.03	0.01	0.02 – 0.05	4.87	**<0.001**	-0.01	0.00	-0.02 – -0.00	-2.67	**0.008**
Curious X Social	0.03	0.01	0.01 – 0.04	4.05	**<0.001**	0.00	0.00	-0.01 – 0.01	0.71	0.479

	Random Effects							
	Subject (Intercept)		Interaction | Subject		Subject (Intercept)		Interaction | Subject	
Model	*Variance*	*SD*	*Variance*	*SD*	*Variance*	*SD*	*Variance*	*SD*
Curious X Attractive	3.37	1.83	0.00	0.06	1.72	1.31	0.00	0.04
Curious X Familiar	3.29	1.81	0.00	0.04	1.71	1.31	0.00	0.04
Curious X Exotic	3.28	1.81	0.00	0.04	1.70	1.30	0.00	0.03
Curious X Filling	3.29	1.81	0.00	0.03	1.71	1.31	0.00	0.02
Curious X Healthy	3.33	1.82	0.00	0.05	1.71	1.31	0.00	0.03
Curious X Sustainable	3.28	1.81	0.00	0.04	1.71	1.31	0.00	0.02
Curious X Tasty	3.30	1.82	0.00	0.07	1.72	1.31	0.00	0.03
Curious X Social	3.30	1.82	0.00	0.06	1.72	1.31	0.00	0.03

	Model Fit (R^2)			
Model	*Marginal*	*Conditional*	*Marginal*	*Conditional*
Curious X Attractive	0.26	0.76	0.57	0.76
Curious X Familiar	0.26	0.75	0.57	0.76
Curious X Exotic	0.27	0.75	0.57	0.75
Curious X Filling	0.27	0.75	0.56	0.75
Curious X Healthy	0.26	0.75	0.56	0.75
Curious X Sustainable	0.27	0.75	0.56	0.75
Curious X Tasty	0.27	0.76	0.57	0.76
Curious X Social	0.27	0.75	0.56	0.75

Curious X Healthy, Curious X Tasty (insect) and Curious X Familiar, Curious X Tasty (not insect) were restarted from a previous fit with an increased number of iterations to enable convergence.

Table S8.
Interactions between curiosity, image type and the other predictors of willingness to try for Study 1 – Attitude predictor eliminated.

Fixed Effects

Interactions	*Est.*	*SE*	*CI*	*t*	*p*
Curious X Attractive X Insect	0.04	0.00	0.03 – 0.04	14.26	**<0.001**
Curious X Familiar X Insect	0.03	0.00	0.03 – 0.04	8.96	**<0.001**
Curious X Exotic X Insect	-0.00	0.00	-0.01 – 0.00	-0.84	0.401
Curious X Filling X Insect	0.01	0.00	0.01 – 0.02	4.98	**<0.001**
Curious X Healthy X Insect	0.00	0.00	-0.00 – 0.01	1.33	0.185
Curious X Sustainable X Insect	0.02	0.00	0.02 – 0.03	8.05	**<0.001**
Curious X Tasty X Insect	0.01	0.00	0.01 – 0.02	3.95	**<0.001**
Curious X Social X Insect	0.06	0.00	0.05 – 0.06	22.18	**<0.001**

Random Effects

	Subject (Intercept)		Interaction | Subject	
Model	*Variance*	*SD*	*Variance*	*SD*
Curious X Attractive X Insect	1.33	1.15	0.00	0.02
Curious X Familiar X Insect	1.36	1.17	0.00	0.03
Curious X Exotic X Insect	1.39	1.18	0.00	0.03
Curious X Filling X Insect	1.37	1.17	0.00	0.02
Curious X Healthy X Insect	1.38	1.17	0.00	0.02
Curious X Sustainable X Insect	1.38	1.18	0.00	0.02
Curious X Tasty X Insect	1.33	1.16	0.00	0.01
Curious X Social X Insect	1.37	1.17	0.00	0.03

Model Fit (R^2)

Model	*Marginal*	*Conditional*
Curious X Attractive X Insect	0.78	0.86
Curious X Familiar X Insect	0.78	0.86
Curious X Exotic X Insect	0.78	0.86
Curious X Filling X Insect	0.77	0.85
Curious X Healthy X Insect	0.77	0.85
Curious X Sustainable X Insect	0.77	0.85
Curious X Tasty X Insect	0.78	0.86
Curious X Social X Insect	0.79	0.87

Curious X Attractive X Insect, Curious X Familiar X Insect, Curious X Filling X Insect, Curious X Healthy X Insect, Curious X Tasty X Insect were restarted from a previous fit with an increased number of iterations to enable convergence.

Table S9.
Within-person correlation matrix of insect food ratings for Study 2.

	Insect									
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
1. Attractive										
2. Curious	0.46									
3. Exotic	-0.01	0.12								
4. Familiar	0.34	0.23	-0.20							
5. Attitude	0.55	0.63	-0.02	0.44						
6. Filling	0.28	0.21	0.01	0.25	0.27					
7. Healthy	-0.04	0.07	0.20	-0.03	0.06	0.02				
8. Sustainable	0.15	0.20	0.13	0.08	0.21	0.12	0.26			
9. Tasty	0.59	0.57	-0.02	0.41	0.72	0.32	0.02	0.16		
10. Willingness to try	0.49	0.59	-0.06	0.41	0.78	0.23	0.02	0.16	0.69	
11. Social	0.22	0.29	0.21	0.11	0.30	0.16	0.12	0.24	0.27	0.25

Table S10.
Within-person correlation matrix of non-insect food ratings for Study 2.

Not Insect

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
1. Attractive										
2. Curious	0.40									
3. Exotic	0.03	0.25								
4. Familiar	0.42	0.12	-0.24							
5. Attitude	0.66	0.51	-0.01	0.50						
6. Filling	0.30	0.19	-0.05	0.34	0.35					
7. Healthy	-0.08	0.04	0.27	-0.12	-0.07	-0.06				
8. Sustainable	0.11	0.11	0.04	0.11	0.16	0.04	0.23			
9. Tasty	0.67	0.49	-0.00	0.50	0.82	0.36	-0.12	0.10		
10. Willingness to try	0.59	0.50	-0.04	0.48	0.82	0.32	-0.09	0.14	0.80	
11. Social	0.20	0.31	0.24	0.08	0.23	0.09	0.10	0.10	0.21	0.20

Table S11.
Regression models predicting willingness to try using the first image rating for insect (n = 128) and non-insect (n = 120) data for Study 2.

	Insect					Not Insect				
Predictors	*Est.*	*SE*	*CI*	*t*	*p*	*Est.*	*SE*	*CI*	*t*	*p*
Intercept	0.09	0.57	-1.04 – 1.22	0.16	0.872	-0.21	0.68	-1.57 – 1.15	-0.31	0.761
Curious	0.10	0.08	-0.05 – 0.25	1.34	0.183	0.09	0.06	-0.03 – 0.22	1.55	0.124
Attitude	0.79	0.11	0.56 – 1.01	6.96	**<0.001**	0.46	0.11	0.25 – 0.67	4.33	**<0.001**
Tasty	0.14	0.11	-0.07 – 0.36	1.34	0.184	0.44	0.12	0.20 – 0.67	3.67	**<0.001**
Familiar	0.08	0.08	-0.08 – 0.24	1.00	0.318	0.15	0.08	-0.00 – 0.31	1.93	0.056
Attractive	-0.06	0.07	-0.20 – 0.08	-0.81	0.420	0.01	0.07	-0.13 – 0.14	0.09	0.930
Exotic	0.05	0.07	-0.09 – 0.18	0.70	0.484	-0.03	0.07	-0.16 – 0.10	-0.45	0.652
Filling	0.00	0.06	-0.11 – 0.12	0.04	0.967	0.05	0.07	-0.08 – 0.19	0.76	0.450
Healthy	-0.08	0.06	-0.20 – 0.05	-1.16	0.246	0.03	0.05	-0.08 – 0.14	0.60	0.550
Sustainable	-0.05	0.07	-0.19 – 0.08	-0.83	0.408	-0.01	0.06	-0.14 – 0.12	-0.13	0.896
Social	-0.03	0.06	-0.15 – 0.09	-0.54	0.587	-0.08	0.06	-0.20 – 0.05	-1.23	0.222
	R^2		R^2 adjusted			R^2		R^2 adjusted		
	0.74		0.71			0.75		0.73		

Table S12.
Regression models showing two-way interactions between curiosity and other predictors of willingness to try using the first image rating for insect (n = 128) and non-insect (n = 120) data for Study 2.

	Insect					**Not Insect**				
Interactions	*Est.*	*SE*	*CI*	*t*	*p*	*Est.*	*SE*	*CI*	*t*	*p*
Curious X Attractive	0.01	0.02	-0.02 – 0.04	0.41	0.681	-0.05	0.02	-0.08 – -0.01	-2.42	**0.017**
Curious X Familiar	0.01	0.02	-0.02 – 0.05	0.64	0.523	-0.03	0.02	-0.06 – 0.00	-1.75	0.084
Curious X Exotic	0.01	0.02	-0.02 – 0.04	0.57	0.567	-0.02	0.02	-0.05 – 0.02	-0.97	0.336
Curious X Attitude	0.03	0.02	-0.01 – 0.07	1.53	0.128	-0.07	0.02	-0.11 – -0.03	-3.27	**0.001**
Curious X Filling	0.01	0.02	-0.02 – 0.04	0.54	0.590	-0.02	0.02	-0.06 – 0.02	-1.04	0.300
Curious X Healthy	-0.01	0.02	-0.04 – 0.02	-0.53	0.600	-0.00	0.02	-0.04 – 0.03	-0.30	0.767
Curious X Sustainable	-0.00	0.02	-0.04 – 0.03	-0.25	0.804	-0.01	0.02	-0.05 – 0.02	-0.73	0.465
Curious X Tasty	0.03	0.02	-0.01 – 0.06	1.64	0.103	-0.05	0.02	-0.10 – -0.00	-2.09	**0.039**
Curious X Social	-0.01	0.02	-0.04 – 0.02	-0.83	0.406	-0.00	0.02	-0.04 – 0.03	-0.14	0.886

Model	R^2	R^2 adjusted	R^2	R^2 adjusted
Curious X Attractive	0.74	0.71	0.76	0.74
Curious X Familiar	0.74	0.71	0.76	0.73
Curious X Exotic	0.74	0.71	0.75	0.73
Curious X Attitude	0.74	0.72	0.77	0.75
Curious X Filling	0.74	0.71	0.75	0.73
Curious X Healthy	0.74	0.71	0.75	0.73
Curious X Sustainable	0.74	0.71	0.75	0.73
Curious X Tasty	0.74	0.72	0.76	0.74
Curious X Social	0.74	0.71	0.75	0.73

Table S13.
Regression models showing three-way interactions between curiosity, image type and other predictors of willingness to try using the first image rating for Study 2.

	Willingness to try				
Interactions	*Est.*	*SE*	*CI*	*t*	*p*
Curious X Attractive X Insect	0.03	0.01	0.00 – 0.05	2.07	**0.039**
Curious X Familiar X Insect	0.02	0.01	-0.00 – 0.04	1.63	0.105
Curious X Exotic X Insect	0.01	0.01	-0.01 – 0.03	0.99	0.322
Curious X Attitude X Insect	0.05	0.01	0.02 – 0.08	3.74	**<0.001**
Curious X Filling X Insect	0.01	0.01	-0.01 – 0.04	1.09	0.278
Curious X Healthy X Insect	-0.01	0.01	-0.03 – 0.02	-0.53	0.594
Curious X Sustainable X Insect	0.00	0.01	-0.02 – 0.03	0.34	0.731
Curious X Tasty X Insect	0.04	0.01	0.01 – 0.07	2.54	**0.012**
Curious X Social X Insect	-0.01	0.01	-0.03 – 0.02	-0.45	0.657

Model	R^2	R^2 adjusted
Curious X Attractive X Insect	0.82	0.81
Curious X Familiar X Insect	0.82	0.81
Curious X Exotic X Insect	0.82	0.81
Curious X Attitude X Insect	0.83	0.81
Curious X Filling X Insect	0.82	0.81
Curious X Healthy X Insect	0.82	0.81
Curious X Sustainable X Insect	0.82	0.81
Curious X Tasty X Insect	0.82	0.81
Curious X Social X Insect	0.82	0.81

Table S14.
Mixed-effects modelling predicting willingness to try for insect and non-insect data for Study 2 – Attitude predictor eliminated.

	Insect					**Not Insect**				
	Fixed Effects									
Predictors	*Est.*	*SE*	*CI*	*t*	*p*	*Est.*	*SE*	*CI*	*t*	*p*
Intercept	3.27	0.15	2.97 – 3.56	21.69	**<0.001**	7.53	0.09	7.35 – 7.71	82.88	**<0.001**
Curious	0.27	0.02	0.23 – 0.31	13.83	**<0.001**	0.20	0.02	0.16 – 0.23	11.40	**<0.001**
Tasty	0.42	0.02	0.37 – 0.46	18.86	**<0.001**	0.66	0.02	0.62 – 0.71	30.61	**<0.001**
Familiar	0.15	0.02	0.11 – 0.18	8.31	**<0.001**	0.13	0.01	0.11 – 0.16	9.69	**<0.001**
Attractive	0.06	0.01	0.03 – 0.08	4.69	**<0.001**	0.07	0.01	0.04 – 0.10	4.89	**<0.001**
Exotic	-0.06	0.01	-0.08 – -0.03	-4.67	**<0.001**	-0.05	0.01	-0.07 – -0.03	-4.40	**<0.001**
Filling	-0.02	0.01	-0.04 – 0.00	-1.66	0.097	0.01	0.01	-0.02 – 0.03	0.53	0.596
Healthy	-0.01	0.01	-0.03 – 0.01	-0.54	0.589	0.00	0.01	-0.02 – 0.02	0.06	0.950
Sustainable	0.02	0.01	-0.01 – 0.04	1.41	0.158	0.05	0.01	0.02 – 0.07	3.36	**0.001**
Social	0.06	0.02	0.03 – 0.10	3.52	**<0.001**	0.02	0.02	-0.01 – 0.05	1.57	0.116

	Random Effects			
	Variance	*SD*	*Variance*	*SD*
Subject (Intercept)	5.54	2.35	1.97	1.40
Curious | Subject	0.05	0.22	0.04	0.19
Tasty | Subject	0.07	0.26	0.06	0.24
Familiar | Subject	0.03	0.17	0.01	0.11
Attractive | Subject	0.01	0.12	0.02	0.13
Exotic | Subject	0.00	0.07	0.00	0.05
Filling | Subject	0.01	0.08	0.00	0.06
Healthy | Subject	0.01	0.07	0.00	0.05
Sustainable | Subject	0.00	0.05	0.01	0.12
Social | Subject	0.04	0.19	0.01	0.12
	Model Fit			
R^2	*Marginal*	*Conditional*	*Marginal*	*Conditional*
	0.28	0.83	0.54	0.79

Not insect model was restarted from a previous fit with an increased number of iterations to enable convergence.

Table S15.
Interactions between curiosity and the other predictors of willingness to try for insect and non-insect data in Study 2 – Attitude predictor eliminated.

	Insect					**Not Insect**				
	Fixed Effects									
Interactions	*Est.*	*SE*	*CI*	*t*	*p*	*Est.*	*SE*	*CI*	*t*	*p*
Curious X Attractive	0.02	0.00	0.01 – 0.03	4.12	**<0.001**	-0.02	0.00	-0.03 – -0.01	-3.46	**0.001**
Curious X Familiar	0.01	0.01	0.00 – 0.02	2.06	**0.039**	-0.02	0.00	-0.03 – -0.01	-4.28	**<0.001**
Curious X Exotic	-0.00	0.00	-0.01 – 0.01	-0.38	0.707	0.01	0.00	0.00 – 0.02	2.95	**0.003**
Curious X Filling	0.01	0.00	0.01 – 0.02	3.11	**0.002**	-0.01	0.01	-0.02 – 0.00	-1.34	0.181
Curious X Healthy	-0.01	0.00	-0.01 – 0.00	-1.47	0.142	0.00	0.00	-0.00 – 0.01	0.65	0.519
Curious X Sustainable	0.01	0.01	0.00 – 0.02	2.15	**0.032**	-0.01	0.01	-0.02 – -0.00	-2.16	**0.031**
Curious X Tasty	0.03	0.01	0.02 – 0.04	4.91	**<0.001**	-0.03	0.01	-0.04 – -0.02	-5.11	**<0.001**
Curious X Social	0.01	0.01	0.00 – 0.02	2.80	**0.005**	-0.00	0.01	-0.01 – 0.01	-0.26	0.792

	Random Effects							
	Subject (Intercept)		Interaction | Subject		Subject (Intercept)		Interaction | Subject	
Model	*Variance*	*SD*	*Variance*	*SD*	*Variance*	*SD*	*Variance*	*SD*
Curious X Attractive	5.59	2.37	0.00	0.05	1.97	1.40	0.00	0.04
Curious X Familiar	5.55	2.36	0.00	0.05	1.96	1.40	0.00	0.05
Curious X Exotic	5.50	2.35	0.00	0.03	1.96	1.40	0.00	0.04
Curious X Filling	5.51	2.35	0.00	0.03	1.96	1.40	0.00	0.05
Curious X Healthy	5.50	2.35	0.00	0.02	1.95	1.40	0.00	0.02
Curious X Sustainable	5.51	2.35	0.00	0.04	1.95	1.40	0.00	0.05
Curious X Tasty	5.70	2.39	0.00	0.06	1.95	1.40	0.00	0.05
Curious X Social	5.52	2.35	0.00	0.03	1.96	1.40	0.00	0.05

	Model Fit (R^2)			
Model	*Marginal*	*Conditional*	*Marginal*	*Conditional*
Curious X Attractive	0.28	0.78	0.53	0.75
Curious X Familiar	0.28	0.77	0.53	0.75
Curious X Exotic	0.28	0.77	0.52	0.75
Curious X Filling	0.28	0.77	0.53	0.75
Curious X Healthy	0.28	0.77	0.52	0.74
Curious X Sustainable	0.28	0.77	0.52	0.74
Curious X Tasty	0.28	0.78	0.53	0.75
Curious X Social	0.28	0.77	0.52	0.75

Curious X Attractive, Curious X Familiar, Curious X Social (insect) and Curious X Attractive, Curious X Healthy (not insect) were restarted from a previous fit with an increased number of iterations to enable convergence.

Table S16.
Interactions between curiosity, image type and the other predictors of willingness to try for Study 2 – Attitude predictor eliminated.

Fixed Effects

Interactions	*Est.*	*SE*	*CI*	*t*	*p*
Curious X Attractive X Insect	0.03	0.00	0.02 – 0.03	11.12	**<0.001**
Curious X Familiar X Insect	0.03	0.00	0.02 – 0.04	7.72	**<0.001**
Curious X Exotic X Insect	-0.00	0.00	-0.01 – 0.00	-0.92	0.358
Curious X Filling X Insect	0.02	0.00	0.01 – 0.02	4.92	**<0.001**
Curious X Healthy X Insect	0.00	0.00	-0.00 – 0.01	0.82	0.413
Curious X Sustainable X Insect	0.02	0.00	0.01 – 0.02	5.10	**<0.001**
Curious X Tasty X Insect	0.05	0.00	0.04 – 0.05	16.45	**<0.001**
Curious X Social X Insect	0.01	0.00	0.00 – 0.02	2.57	**0.010**

Random Effects

	Subject (Intercept)		Interaction | Subject	
Model	*Variance*	*SD*	*Variance*	*SD*
Curious X Attractive X Insect	2.23	1.49	0.00	0.02
Curious X Familiar X Insect	2.23	1.49	0.00	0.04
Curious X Exotic X Insect	2.27	1.51	0.00	0.04
Curious X Filling X Insect	2.26	1.50	0.00	0.02
Curious X Healthy X Insect	2.26	1.50	0.00	0.02
Curious X Sustainable X Insect	2.26	1.50	0.00	0.03
Curious X Tasty X Insect	2.25	1.50	0.00	0.02
Curious X Social X Insect	2.24	1.50	0.00	0.05

Model Fit (R^2)

Model	*Marginal*	*Conditional*
Curious X Attractive X Insect	0.66	0.81
Curious X Familiar X Insect	0.65	0.81
Curious X Exotic X Insect	0.66	0.81
Curious X Filling X Insect	0.65	0.80
Curious X Healthy X Insect	0.65	0.80
Curious X Sustainable X Insect	0.65	0.81
Curious X Tasty X Insect	0.66	0.81
Curious X Social X Insect	0.66	0.81

Curious X Attractive X Insect, Curious X Familiar X Insect, Curious X Exotic X Insect, Curious X Filling X Insect, Curious X Tasty X Insect were restarted from a previous fit with an increased number of iterations to enable convergence.

Appendices for Paper 2.

Appendix A. Pre-post questions used in Study 1 and follow-up.

	Measure	Pre	Post
Study 1			
	Interest	I think this information will be interesting I would like to learn more about this topic	I found the information to be interesting I enjoyed learning this information
	Value	I don't think this information will be useful to me or others I think I could use the information I learn in the future	I can't see how this information would be of use to me or others in the future I think I will use the information I have learned today in the future
	Mood	How are you feeling right now?	How are you feeling right now?
	Task engagement	How engaged do you feel right now?	How engaged do you feel right now?
Follow-up			
	Interest		I enjoyed learning the information from the essay task I found the information to be interesting
	Value		I think I will use the information I learned in the essay task in the future I can't see how the information from the essay task would be of use to me or others in the future

Appendix B. Entomophagy re-engagement questions used in follow-up studies and Cronbach's α for scale.

Entomophagy re-engagement questions	
In the past month I have…	
	thought about the idea of eating insects
	thought about the benefits an insect based diet could provide for me personally
	thought about the benefits an insect based diet could provide for the wider community
	discussed the prospect of eating insects with others
	looked for further information about eating insects

Cronbach's α = 0.88

Appendix C. Pre-post questions used in Study 2 and follow-up and Cronbach's α for the interest and value scales.

	Pre	Post
Measure		
Interest		
	For me edible insects are an interesting topic	For me edible insects are an interesting topic
	The concept of edible insects just doesn't appeal to/interest me	The concept of edible insects just doesn't appeal to/interest me
	I think I will enjoy learning about edible insects	I enjoyed learning about edible insects
	I would be interested to learn more about edible insects	I would be interested to learn more about edible insects
Value		
	I think edible insects could be beneficial to me in daily life	I think edible insects could be beneficial to me in daily life
	I think edible insects could be beneficial to others	I think edible insects could be beneficial to others
	I think learning about edible insects could be useful to me in the future	I think learning about edible insects could be useful to me in the future
	I think learning about edible insects could help me in serving the wider community	I think learning about edible insects could help me in serving the wider community
Mood		
	How are you feeling right now?	How are you feeling right now?
Task engagement		
	How engaged do you feel right now?	How engaged do you feel right now?

Cronbach's α's: Pre Value = .89, Post Value = .88, Pre Interest = .86, Post Interest = .87