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The psychology of eating insects: A cross-cultural comparison between Germany and China

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ABSTRACT

Based on their high nutritional value and low production costs, insects are an excellent and sustainable source of animal protein. In contrast to countries such as China, in Western societies, the consumption of insects is not rooted in traditional diet. Data for the present study was collected from adults in Germany ($n = 502$) and China ($n = 443$). A cross-cultural comparison was conducted based on consumers' willingness to eat different insect-based, processed (e.g., cookies based on cricket flour) and unprocessed (e.g., crickets) food. The influence of food neophobia on consumers' willingness to eat insects was examined. The Chinese rated all insect-based food more favourably with regard to taste, nutritional value, familiarity and social acceptance compared with the Germans. Also, they indicated greater willingness to eat the tested food products, and no differences were observed between their ratings of processed and unprocessed food. The Germans reported higher willingness to eat the processed insect-based foods compared to the unprocessed foods. Further results revealed that low scores for food neophobia, positive taste expectations, high scores for social acceptance and experiences with eating insects in the past were significant predictors of consumers' willingness to eat insects in both countries. Consequently, the introduction of insects as a food source in Western societies seems more likely to succeed if insects are incorporated into familiar food items, which will reduce neophobic reactions and negative attitudes towards insect-based foods.

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1. Introduction

Increases in the global food demand and the accompanying environmental burden necessitate the establishment of food production systems that are efficient and sustainable. The conventional production of animal protein in Western countries consumes significant resources and is ethically questionable. Animal protein is an important dietary component not only for Western societies but also for many demographic groups all over the world. Interest in alternative protein sources of high nutritional value, such as edible insects, has increased remarkably in recent years (Caparros Looy, Dunkel, & Wood, 2014; Megido et al., 2014; Van Huis et al., 2013; Vanhonacker, Van Loo, Gellynck, & Verbeke, 2013). In fact, in varying degrees according to the species, metamorphic stage and feeding, some insects contain high value protein and essential amino acids, have a high vitamin and mineral content, have low cholesterol concentrations compared to some

meat-based animal products and have favourable $n-3/n-6$ fatty acid and polyunsaturated fatty acid/saturated fatty acid ratios (Belluco et al., 2013; Verkerk, Tramper, van Trijp, & Martens, 2007). At the same time, production requirements for insect farming are low, requiring little water and space, and the biomass conversion rate is better than that of most animals (Van Huis et al., 2013). The combination of high nutritional value, smaller environmental footprint and low production costs makes insects particularly interesting as 'mini-livestock' (De Folliart, 1995) suitable for human and animal nutrition all over the world (Van Huis et al., 2013).

Entomophagy, or the eating of insects, was and still is an important dietary behaviour in many parts of the world, including Africa, Latin America and Asia (Van Huis et al., 2013). In Western societies, however, the consumption of insects is not rooted in traditional diet. Thus far, conscious consumption of edible insects is restricted to experimental restaurants as a delicacy (Verkerk et al., 2007); specialised food items based on insect protein (e.g., protein powder for muscle growth); or incorporation into familiar products as a fun ingredient (e.g., insect-embedded lollipops). Previous research on the acceptance of insects as food was

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focussed on European consumers (Caparros Megido et al., 2014; Schösler, de Boer, & Boerema, 2012; Vanhonacker et al., 2013; Verbeke, 2015; Yen, 2009), and lacks cross-cultural studies (Shan et al., 2015). Therefore, a central focus in the present study is a comparison of two countries, i.e. Germany and China, with different cultural exposures to insects as food (Zhang, Tang, & Cheng, 2008), to explore consumers' perceptions and cognitive associations with insects. By contrasting the two, we can better understand the similarities and differences in evolutionary associations, individual experiences and cultural representations (Lockwood, 2013) of insect-based food, which is paramount to establish its widespread consumption.

1.1. Consumption of insects in China and Western countries

The tradition of eating insects in China dates back more than 3000 years and has outlasted various dynasties (Chen, Feng, & Chen, 2009; Zhi-Yi, 1997). Various insect species, based on local preferences, were collected, prepared and used as a nutritive source, medicine and delicacy in mainly rural parts of China (Harris, 1998; Zhi-Yi, 1997). In the present day, the knowledge and tradition of the consumption of insects has been lost; their regular consumption is now restricted to few regions in China such as the minority area of the Yunnan province (Chen et al., 2009). The globalisation of food markets, improvements in food technology and the Western influence on China's cuisine have resulted in changes in food customs and the traditional food system (Yen, 2009). Following improvements to the economic conditions in China, people can now afford more varieties of different foods, so their nutrition has undergone a transition, especially in cities where people are exposed to a more diversified food culture. Nowadays, the consumption of insects can no longer be considered a common food practice in China (Zhi-Yi, 1997). Nevertheless, the Chinese respondents are likely to be more familiar with the idea of consuming insects because it is part of their culinary tradition and thus manifested in their cultural consciousness.

In Western societies' nutritional evolution, insects were rarely experienced as an edible food source, and they are compulsively rejected as non-food, unclean and a health risk associated with food contamination and filthiness (Kellert, 1993; Looy et al., 2014). These internalised defensive reactions towards insects are reflected in low willingness-to-eat ratings in previous studies. Studies in this area have focused on people's willingness to substitute meat with insects (Schösler et al., 2012; Vanhonacker et al., 2013; Verbeke, 2015). In a Belgian study, more than 65% of meat consumers disagreed with the idea to substitute meat with insects (Verbeke, 2015). In another study about meat substitution options in the Netherlands, attractiveness ratings and the likelihood of actually preparing the meals were the lowest for dishes including locusts or fried mealworms (Schösler et al., 2012). In addition, insect protein received the lowest ratings compared to other sustainable food choices by Flemish consumers in terms of what they were willing to buy and pay for (Vanhonacker et al., 2013). The public aversion towards insects in Western societies makes the establishment of insects as a widespread food source, and meat substitute in particular, very challenging.

1.2. Factors influencing willingness to eat insects

A consumer's acceptance or non-acceptance of a product is determined by various beliefs and perceived attributes of the product, which are considered in food decision-making (Tuorila, 1997), and thus are involved in the developmental process of preferences. Cultural influences on attitudes and beliefs as well as the meaning and social appeal of food also have a significant impact on consumption (Rozin, 1988). Culture, social norms and previous

experiences shape the boundaries of what is considered edible or inedible (Rozin & Fallon, 1980). Items that are considered inedible, such as insects, can elicit a strongly affect-laden disgust response when people imagine ingesting them. This socio-culturally transmitted defence mechanism (Rozin, 1996) aims to protect the body from contact with potentially noxious substances (Miller, 2004). The visual appearance of a food can also trigger a disgust-based food rejection. Rozin and Fallon (1987) postulated that prominent reminders of a food's origin as an animal food (its 'animalness') are core elicitors of a disgust response. The vision of an entire cricket, with its extraordinarily big legs, in someone's mouth, or a silkworm with its slimy surface, might elicit fear and disgust in consumers. Next to reminders of animalness, perceived mouth feeling and aversive textural properties are the most important characteristics that lead to food being rejected based on disgust (Martins & Pliner, 2006). Therefore, there is reason to believe that people would be more willing to eat products made with processed insects because the origin and disgusting attributes are less prominent.

Numerous other attributes can influence the acceptance of food, such as nutritional value, quality and beneficial health effects as well as expected taste and geographic origin (Barrena & Sánchez, 2013), but are under-researched constructs as antecedents of willingness to eat insects. In the present study, we focused on the following four attributes of insects as food: nutritional value, taste, familiarity and social acceptance. Attitudes about the health value of substances can be a driver for consumption. However, health motivation and knowledge about the nutritional value of the product are important prerequisites. Expected or experienced sensory appeal is another dimension of acceptability (Pilgrim, 1957; Raats, Dailliant-Spinnler, Deliza, & McFie, 1995). Of course, negative taste expectation is a strong incentive to avoid a substance. Furthermore, the cuisine within a cultural group is the result of adaptations to a particular environment. Again, cuisine determines cultural food rules and thus what can be served and is socially acceptable. Whether or not a food is socially valued and considered as culturally familiar is likely to have an impact on its acceptance as well. By focussing on these four dimensions, further insights can be gained into whether different cultural exposures to insects as food lead to different attitude ratings. Thus, this study will reveal distinguishing factors in the evaluation of insects as food as well as drivers of their appeal as food.

Previous experiences with a product have an impact on the individual's attitudes towards a product, of course. Also, underlying psychological factors connect attitudes towards a product to consumer behaviour. Insects are a novel, unfamiliar food for European consumers, and unfamiliar food that deviates from cultural norms can evoke rejection and avoidance. This 'innate' response to the unfamiliar is a characteristic feature of eating organisms, and it was once an important survival mechanism to prevent the ingestion of potentially poisonous substances (i.e., the internal gatekeeper) (Pliner & Hobden, 1992; Rozin, 1990). Consumers can vary greatly in their attitudes towards novel foods (Dovey, Staples, Gibson, & Halford, 2008). Food neophobia as an individuals' behavioural tendency naturally starts in early childhood. Although it decreases with age through positive food experiences, it can be present in adults as well. Food neophobia is associated with decreased levels of willingness to eat a novel food (Tuorila, Lähteenmäki, Pohjalainen, & Lotti, 2001) and plays a crucial role in the establishment of insects as foods (Verbeke, 2015). Food rejection can be motivated by negative taste expectations (Fallon & Rozin, 1983), low levels of expected enjoyment (Raudenbush & Frank, 1999) and uncertainty about the origin of the product (Tuorila, Meiselman, Bell, Cardello, & Johnson, 1994). Unfamiliar food, especially of an animal nature, is likely to be rejected due to feelings of disgust, expected distaste and

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