



# Consumer acceptance of insect-based foods in the Netherlands: Academic and commercial implications



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## ABSTRACT

Despite growing interest in the use of insects as food, uptake of insect-based foods in Europe is low. Existing research into Western consumer acceptance of insects as food tends to emphasise the role of individual cognition in food choice at the expense of social or contextual factors, and typically frames consumer acceptance as a general issue, rather than relevant only for relatively few early adopters. This paper outlines empirical work, theoretically and methodologically informed by a critical appraisal of previous research, with consumers of insect-based convenience foods in the Netherlands. Reported initial motivations for trying insect foods are shown to be substantially different from factors – such as price, taste, availability, and ‘fit’ with established eating practices – which affect repeat consumption. Such factors are congruent with those affecting routine consumption of more conventional foods, indicating that insect foods should be analysed according to similar criteria and should be designed with more practical considerations in mind. Further, a reorientation of consumer acceptance research is proposed. Research should shift from attempts to forecast acceptance and engage with ‘actual’ examples of insect consumption; social, practical and contextual factors affecting food consumption should be emphasised; and – following work on the establishment of other novel foods – early adopters, rather than general populations, should receive greater analytic attention.

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## 1. Introduction

In the face of growing threats to global food security, insects are being considered as a new source of human food and animal feed in Europe and the US (henceforth ‘the West’) (van Huis et al., 2013). The reported benefits of the human consumption of insects as an alternative to conventional food animals are numerous, including comparable levels of protein (Testa et al., 2016), and relatively high – although variable – levels of nutrients and unsaturated fat (Belluco et al., 2013; van Huis et al., 2013) coupled with a lower environmental impact due to lower emissions of greenhouse gases (Oonincx and de Boer, 2012; Testa et al., 2016) and lower land requirements during production (Oonincx and de Boer, 2012). Yet despite the apparent viability of insects as a sustainable alternative to conventional protein sources, a number of obstacles to their widespread use as human food in the West remain. The ecological benefits (Lundy & Parella, 2015) and ‘healthiness’ (Payne, Scarborough, Rayner, & Nonaka, 2016) of food insects relative to

conventional sources of animal-based protein are debated; further research into the nutritional content (Shockley & Dossey, 2013; Payne, Scarborough et al., 2016; Testa et al., 2016), safety, and allergenicity of food insects is needed (Belluco et al., 2013; Finke, Rojo, Roos, van Huis, & Yen, 2015; Testa et al., 2016); development and automation of rearing and processing technologies is required (Rumpold & Schlüter, 2013); and current EU legislation is prohibitive<sup>1</sup> (Belluco et al., 2013; Finke et al., 2015). In addition, the issue of consumer acceptance remains problematic.

Existing research on Western consumer acceptance of insects as food is largely situated within consumer psychology (or cognate disciplines), and generally proceeds from the epistemological position that predominates within that intellectual tradition: that is,

<sup>1</sup> Currently the sale of products which contain processed insects is prohibited in most EU countries, as insects fall within the remit of pre-existing EU legislation designed without explicit reference to them. Following industry lobbying (C. Kyndt, personal communication, 29 September 2015) and subsequent consideration by national food safety authorities, The Netherlands and Belgium currently both permit the sale of foods containing certain processed insect species (Bureau Risicobeoordeling & Onderzoeksprogrammering, 2014; Ngonlong, Bergen, & Keppens, 2014).

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an emphasis on the individual as the locus of 'food choice', a corresponding lack of emphasis on the role of social, practical and contextual factors, and the employment of research methods which assume that people have relatively stable attitudes, values and preferences which exert a significant influence on food consumption across a range of social contexts.

This paper argues that research into Western consumer acceptance of insects as food would benefit from a considerable shift in emphasis if it is to more fully elucidate the factors affecting such acceptance. In what follows, existing research in the area is critically assessed, and two main limitations are identified. Empirical material from a study of consumers of insect-based convenience food in the Netherlands is presented, and used to substantiate the central arguments of the paper: that present research is epistemologically and methodologically limited in its focus on the individual, rather than social, practical and contextual factors, and requires a reorientation in order to more fully explain Western consumer acceptance of insects as food; that future research should not focus on levels of acceptance in general populations, but rather on the factors affecting uptake of insects as food in those who are already willing to eat them; and that 'acceptance' is not simply a case of getting people to try insects once but rather to integrate them into their diets, which requires attention to a number of factors that are not fully addressed in current research or by current commercial efforts to introduce insect-based foods.

So far the majority of consumer research in the West has focused on consumer acceptance as primarily a psychological or sensory issue. Research has investigated Westerners' general reluctance to consume insects or insect-based foods (Hartmann, Shi, Giusto, & Siegrist, 2015; Ruby, Rozin, & Chan, 2015) or willingness to adopt them as a meat substitute (Hartmann et al., 2015; Schösler, de Boer, & Boersema, 2012; Vanonhacker, van Loo, Gellnyck, & Verbeke, 2013; Verbeke, 2015), typically in relation to traits such as disgust sensitivity or food neophobia, characteristics such as demographics, and other attitudes, both food-related and more general. This type of research identifies those who are more sympathetic to the use of insects as food as being low in disgust sensitivity and food neophobia (Hartmann et al., 2015; Ruby et al., 2015; Verbeke, 2015), higher in 'sensation seeking' traits (Ruby et al., 2015), male (Hartmann et al., 2015; Ruby et al., 2015; Schösler et al., 2012; Verbeke, 2015), already familiar with eating insects (Hartmann et al., 2015; Verbeke, 2015), and having a relatively high convenience orientation (Verbeke, 2015). Those with an expressed intention to reduce meat consumption have been found to be more likely to report willingness to consume insects (Verbeke, 2015), as have those with an interest in the environmental and health aspects of their diets (Verbeke, 2015) or a belief that insects are good for the environment and relatively healthy or nutritious (Sogari, 2015; Ruby et al., 2015). Curiosity is also reported as a strong motivating factor (Sogari, 2015).

Levels of acceptance of insects as a human foodstuff are generally found to be low (Schösler et al., 2012; Vanonhacker et al., 2013; Verbeke, 2015), other than in Ruby, Rozin and Chan's (2015) study, which found that 64% of American research participants were reportedly willing to consume some form of insect-based food. Studies have also identified contradictory findings relative to age, with youth predicting acceptance in some cases (Verbeke, 2015) but not others (Hartmann et al., 2015). Substantial differences in findings are possibly attributable to differences in the country of study and research design (Payne, Dobermann et al., 2016).

Existing research also investigates how the sensory properties of different insect foods affect their acceptance in the West. Survey-based research identifies a poor expected sensory experience as a factor behind the rejection of insects as food (Hartmann et al., 2015; Ruby et al., 2015) and a greater anticipated acceptance of foods in

which insects are incorporated as a processed ingredient rather than presented whole (Gmuer, Nuessli Guth, Hartmann, & Siegrist, 2016; Hartmann et al., 2015; Ruby et al., 2015) or which resemble familiar foods (Hartmann et al., 2015).

Studies that engage participants in the consumption of insect-based foods also find that acceptance is higher when insects are concealed (Lensvelt & Steenbekkers, 2014; Schouteten et al., 2016; Sogari, 2015; Tan et al., 2015) or presented in familiar forms (Tan et al., 2015) and flavours (Caparros Megido et al., 2013), when participants have eaten insects previously (Lensvelt & Steenbekkers, 2014; Verneau et al., 2016) and in males (Verneau et al., 2016). A prominent argument in the field is that taste is likely to be of substantial importance in determining whether insect-based foods are accepted or not (Deroy, Reade, & Spence, 2015; Hartmann et al., 2015; Schouteten et al., 2016; Tan et al., 2015), with poor taste being found to have a negative impact on acceptance in sensory research (Schouteten et al., 2016). Tan, Fischer, van Trijp, and Stieger (2016), however, found that the cultural 'appropriateness' of insect-based burgers appeared to exert a greater influence on willingness to consume them again than factors such as taste, neophobia or gender.

The effect of cultural context on people's amenability to consume insects has received more limited engagement in recent scholarship. Cross-cultural consumer studies do exist (Hartmann et al., 2015; Lensvelt & Steenbekkers, 2014; Tan et al., 2015; Verneau et al., 2016), but as the primary focus of these studies is on individual psychological factors and associations, or sensory evaluations, the influence of the socio-cultural environment is generally explored only through its hypothesised reflection in individual responses towards attributes of insects as food, rather than being systematically investigated (e.g. Verneau et al., 2016, p. 5–6). An exception is a study by Tan et al. (2015), which goes into greater depth in tracing the specific ways in which one's socio-cultural environment affects acceptance of insects as food, and elucidates interesting socio-cultural differences related to exposure to insects, both edible and non-edible. For example, rejection of mealworms as food by research participants in rural Thailand due to associations with decaying matter was not reflected in accounts from Dutch participants. The latter group were instead generally more resistant to whole insects due to their relative lack of cultural exposure, both culinary and otherwise.

Research outside the discipline of consumer psychology tends to position consumer acceptance of insects as food within the broader question of 'edibility', which encompasses a wide range of factors. Stock, Phillips, Campbell, and Murcott (2016), for example, demonstrate how the positioning of insects as edible in Western markets must arise out of a web of contingent and often supra-individual factors, including conventional food-related concerns such as supply, distribution, and retail, as well as factors such as the material properties and regulatory position of food insects. Sexton (2014) discusses how the edibility of cultured meat and edible insects may be achieved, suggesting this is likely to arise from an assemblage of material and immaterial factors including preparation, transport, and retail methods of products, prevailing trends in public taste, and the design of products, spaces, and packaging. Edibility is co-produced by a range of actors in the agri-food network: it is not a fixed or inherent property, but rather something that is constructed and negotiated (Sexton, 2014; Yates-Doerr, 2015).

Socially contextual research into the consumption of insects tends to be confined to historical or anthropological studies into non-Western areas, such as the Asia Pacific region (Durst, Johnson, Leslie, & Shono, 2010; Yen, 2015), South America (Onore, 1997; Ramos-Elorduy, 1997), or sub-Saharan Africa (Ayieko, Ndonga, & Tamale, 2010; Raffles, 2010). A recent review of North American

entomophagy (Schrader, Ooninx, & Ferreira, 2016) provides a comprehensive account of indigenous and settler insect consumption, but is confined to historical rather than contemporary analysis. Studies which provide empirical data on insect consumption in the contemporary West are scarce, no doubt because until recently it was an uncommon practice. Isolated examples include the importing of particular insect species for sale to Asian communities in the United States (DeFoliart, 1992) and the consumption of bee brood by Czech beekeepers (Bednářová, Borkovcová, Mlček, Rop, & Zeman, 2013), or of moths by children in parts of rural Italy (Dreon & Paoletti, 2009; Zagrobelny et al., 2009), although the latter practice seems to have ended by the 1970s. Despite the recent growth of Western interest in entomophagy, there is a dearth of systematic research on the consumption of any of the new insect-based products. The present paper seeks to make a contribution in this area.

Within the existing literature on Western consumer acceptance of insects as food, two general tendencies are identifiable: an analytic emphasis on the individual consumer, and the treatment of consumer acceptance as a general issue. Each of these, it is argued, should be subject to critical scrutiny, particularly during the design of future research.

Consumer acceptance tends to be treated as something which inheres largely in the individual. Studies examine the degree to which individual attitudes, preferences or traits – such as disgust sensitivity or food neophobia – are associated with one's inclination to consume insects (Hartmann et al., 2015; Ruby et al., 2015; Schösler et al., 2012; Schouteten et al., 2016; Sogari, 2015; Vanonhacker et al., 2013; Verbeke, 2015; Verneau et al., 2016). Naturally there is a degree of variability within this body of work regarding the degree of emphasis accorded to cognitive factors: for example, the suggestion that information provision may positively affect acceptance (Lensvelt & Steenbekkers, 2014; Sogari, 2015; Verneau et al., 2016) has met with disagreement from those who question the extent to which cognitive arguments are likely to affect uptake of insect-based food (Hartmann et al., 2015; Tan et al., 2016; Verbeke, 2015). Studies in this vein also recognise and attempt to gauge the likely influence of other factors on acceptance such as demographics, product attributes, or cultural context, but still on the whole accord primacy to the psychology and preferences of the individual consumer.

Even in work which foregrounds the role of affective, emotional, or non-conscious psychological processes in directing food choice (Gmuer et al., 2016; Schouteten et al., 2016; Verneau et al., 2016), the locus of consumer acceptance is nevertheless held to be *individual choice at the point of consumption*, emphasising cognitive rather than contextual factors. These latter studies acknowledge the difficulty in forecasting 'actual' consumption from web- or lab-based research, but nevertheless imply a substantial degree of coherence between participants' evaluations and their future consumption behaviour. This type of work holds that consumer attitudes or responses are remarkably durable and coherent across different social contexts, and downplays the extent to which food consumption – in the context of 'real life' mundane eating practices – is influenced by social and practical factors, as well as by products themselves.

While generally neglected, it is important to clarify that contextual factors or product attributes (including factors such as availability) are acknowledged by some researchers (e.g. Lensvelt & Steenbekkers, 2014, p. 545–6). Foremost among these factors is taste. Hartmann et al. (2015), for example, note that the sensory properties of insect foods are likely to be more influential than perceived nutritional benefits (see also Tan et al., 2015; Verbeke, 2015). It is simply that product attributes beyond taste – such as the price and specific form of insect foods – and, to a greater extent,

contextual factors and the influence of existing social or culinary practices, tend to be accorded less analytic emphasis within the existing literature than individual attitudes or preferences.

While attitudes towards food, individual dispositions, and the sensory evaluation of foods are unarguably important aspects of the formation and maintenance of diets, the degree of emphasis placed on the role of the individual in food selection in recent consumer acceptance research can be critiqued by those who emphasise the habitual, embodied aspects of food provisioning, the importance of social practices in directing food consumption, and the influence of one's social and cultural, as well as physical, environment in directing mundane consumption (Delormier, Frohlich, & Potvin, 2009; Halkier, 2010; Halkier & Jensen, 2011; Molander, 2011; Southerton, Warde, & Hand, 2004; Warde, 2005; 2016). For example, Halkier and Jensen (2011) argue that food consumption is highly relational, arising from the intersection of a range of other practices such as work, school, care, and socialising. Halkier (2010, p. 36) sees food consumption as being dependent upon practical and social 'do-ability', given the constraints of one's social and material environment. Indeed, the notion of 'food choice' itself is problematic (especially for those on limited budgets, but also more generally), as it emphasises individual decisions rather than the socially embedded nature of much food-related behaviour.

If we consider the issue of consumer acceptance from this perspective, some limitations of the current body of research are illuminated. Factors such as price, availability, and a product's degree of fit with existing eating habits – which evidently exert a substantial influence on mundane food consumption – tend to be positioned as 'product attributes' within work that otherwise foregrounds individual attitudes and preferences (e.g. Lensvelt & Steenbekkers, 2014). Although price and availability (Lensvelt & Steenbekkers, 2014; Looy, Dunkel, & Wood, 2014) of products are recognised within the existing literature as having a likely bearing on the adoption of insects as food, as is the degree of fit which insect foods have with existing culinary practices and knowledge (Looy et al., 2014), these factors have not hitherto been foregrounded in consumer acceptance research. Practice-based accounts of food consumption (Delormier et al., 2009; Halkier, 2010; Halkier & Jensen, 2011; Molander, 2011), system-level analyses of insects as food (Shelomi, 2015), and accounts of the construction of 'edibility' (Sexton, 2014; Stock et al., 2016) all indicate that supra-individual factors are likely to be at least as important as individual ones when determining whether or not insects are successfully incorporated within existing dietary routines.

A shift in epistemological emphasis, away from individual attitudes and preferences towards the contextually embedded, practical realities of food consumption, may also necessitate new methodological approaches. Web-based surveys and controlled taste sessions, for example, cannot tell us how insect-based foods will actually work in social context. The provision of information about insect-based foods for participants in a controlled study may be associated with greater acceptance of such foods (Lensvelt & Steenbekkers, 2014; Schouteten et al., 2016; Verneau et al., 2016), but people's use of information in the 'real life' context of food provisioning and consumption is much more fragmentary and contingent (Warde, 2016). Simply informing consumers about the relative benefits of eating insects is manifestly insufficient to induce consumption (Hartmann et al., 2015; Tan et al., 2015; Tan et al., 2016). Having recognised this point, it follows that more empirical studies of 'actual' instances of insect consumption in the West are necessary, as the kind of effects observed in controlled studies may not be reflected when products are situated within the context of mundane food practices.

This is not to say that much of the existing body of consumer acceptance research should be disregarded. Large-scale surveys are

useful in identifying likely ‘early adopters’<sup>2</sup> of insects as food (Hartmann et al., 2015; Verbeke, 2015), and sensory tests offer a useful resource in the development of insect-based products (Caparros Megido et al., 2013) that are both tasty and culturally appropriate (Tan et al., 2016). These are important areas of research for efforts to develop insects as human food in the West. It is simply that a link between reported willingness to consume insect-based foods and ‘actual’ future consumption must not be assumed. The influence that social practice, social context and the specific characteristics of particular products exert on food consumption requires empirical research. As Payne, Dobermann et al. (2016) note, the lack of coherence in the findings of recent consumer acceptance research is probably due to the influence of the widely different methodologies, contexts, and products used in those studies.

The second broadly identifiable trend in the existing literature is that consumer acceptance of insects as food is treated as a *general* issue. Although few studies have empirically assessed the overall levels of consumer acceptance of insects as food in general population samples (Ruby et al., 2015; Verbeke, 2015), across the literature the key to gaining Western consumer acceptance is largely framed as a question of identifying and reducing obstacles to wider acceptance in whole populations. Scholars identify a need to counter the Western cultural stigma associated with the consumption of insects (Costa-Neto & Dunkel, 2016; Hartmann et al., 2015; Lensvelt & Steenbekkers, 2014; Looy & Wood, 2006; Mlček, Rop, Borkovcová, & Bednářová, 2014; Shockley & Dossey, 2013), via strategies to educate the public (Costa-Neto & Dunkel, 2016; Looy & Wood, 2006; Rumpold & Schlüter, 2013), change attitudes (Costa-Neto & Dunkel, 2016; Lensvelt & Steenbekkers, 2014; Looy & Wood, 2006; Looy et al., 2014; Shockley & Dossey, 2013; Verneau et al., 2016; Yen, 2009) and overcome disgust (Belluco et al., 2013) or neophobic reactions in Western consumers (Hartmann et al., 2015; Shockley & Dossey, 2013). Costa-Neto and Dunkel’s assertion that “There is a need to eradicate or greatly reduce the Western-driven stigma over the use of insects as food” (Costa-Neto & Dunkel, 2016: 54) is a fairly typical example of how the issue of consumer acceptance is framed.

Yet to conceive of an entire population – or even substantial parts of one – as the appropriate target for efforts to introduce a new food may be misguided. Instead, it is the ‘early adopters’ that most merit scholarly attention. Before one can start to think about increasing the general acceptability of a particular food, some degree of established consumption must be achieved, however small, on which greater acceptance can be built. This approach does not emphasise *reducing or changing negative attitudes* in the general population, but *increasing the positive and distinctive attributes* of insect-based foods, such as their taste (Deroy et al., 2015), so that a relatively small but established number of repeat consumers can be attained. In an excellent analysis of the problems facing the societal diffusion of insect-based foods, Shelomi (2015) makes the point that poor availability is likely to hamper Western uptake of insects as food as well. He argues that while there has been an overwhelming focus on efforts to increase demand for, and acceptance of, edible insects in general, “[t]hese efforts ignore the fact that changes in values are often supply driven, and not the other way around” (Shelomi, 2015, p. 315). Indeed, supplier-induced demand has elsewhere been identified as a defining aspect of the successful establishment of new food products within Western diets (Mintz,

1986). While it is crucial to acknowledge that supply-side changes in food distribution cannot alone account for a new food’s popularity – the “[c]onsumption and production” of food, Murcott (2001, p. 11) argues, “are mutually constitutive” – historical evidence suggests that demand for new foodstuffs is nevertheless substantially affected by increases in supply (Ellis, Coulton, & Mauger, 2015; Mintz, 1986). A particular food must be widely available if it is to become an accepted and integrated part of people’s diets.

Whether or not, as Shelomi asserts, edible insects are a “failed innovation” (2015, p. 314) is open to debate, but it remains that in scholarly and commercial efforts to develop insect-based foods greater attention could profitably be paid to foods that have previously been ‘novel’ and that have gradually gained widespread acceptance in the West. Studies of this type tend to show that new foods gain popularity in one small segment of society first, before diffusing further. This has evidently been the case with sugar (Mintz, 1986), tea (Ellis et al., 2015; Mintz, 1986), sushi (Corson, 2008; Issenberg, 2008), and white bread (Mennell, 1996). Such diffusion is manifestly not attributable to simple attitudinal change, but rather to changes in price, availability, symbolic value, and social practices associated with the novel foods in question (Ellis et al., 2015; Mennell, 1996; Mintz, 1986). Importantly, novel foods do not remain fixed as diffusion occurs, but rather change and develop during the process of diffusion, as indeed other innovations – such as the domestic freezer – do as well (Shove & Southerton, 2000).

The two tendencies in the literature identified above are therefore open to critique on the grounds that a) food choice is not solely an individual matter, but rather is also substantially dependent on price, availability, habit, routine, social context and social practice, and b) that research into consumer acceptance would be well served by focusing on early adopters rather than general populations, as it is the early adopters who ultimately determine if a novel food will stand or fall. These points provide the general theoretical context for the explanation of the empirical work which constitutes the remainder of this article, a study of consumers of insect-based convenience foods in the Netherlands.

## 2. Methods

This paper is based on 33 semi-structured interviews with Dutch consumers of the Insecta range of insect-based convenience foods, produced by the Belgian company Damhert Nutrition (<http://www.damhert.be/en/shop/insecta>). The range includes burgers, nuggets, schnitzel and ‘pittige punten’ (a spicy triangular product, similar in appearance to a hash brown or potato croquette), all of which are made with vegetables and 13–15% ground-up buffalo worms, the larvae of the *Alphitobius diaperinus* beetle. The buffalo worms are not visible, and – in the author’s opinion – the taste of buffalo worms is not particularly prominent, and likely to be identifiable only to those who have previously eaten the insects in their whole form. The products require cooking in a comparable way to conventional vegetarian convenience foods. For example, the Insecta burger is cooked by frying for two to three minutes, or heating in an oven for nine minutes.<sup>3</sup> The Insecta products were available in branches of Jumbo, a Dutch national supermarket chain, during 2015. They were typically stocked alongside other ‘meat substitute’ products such as soy- or vegetable-based convenience foods.

In order to recruit participants, small recruitment cards were

<sup>2</sup> The term ‘early adopters’ is used in this paper to refer to consumers who are among the first to adopt a new food. The term’s usage here is more general than its use within ‘diffusion of innovations’ research (e.g. Shelomi, 2015), where it refers to the second wave of innovation diffusion after a small number of ‘innovators’ have first adopted the practice.

<sup>3</sup> A number of high-quality images of the Insecta burger, including a cross-section of the cooked product, are available at <http://glowofbeauty.nl/insectenburger/>.

added to packs of Insecta sold across all branches of Jumbo during September and October 2015. The cards explained that consumers of the insect-based foods were sought for an interview, and that on completion of an interview they would receive a small cash remuneration.

Registered individuals were contacted in Dutch to ask if they wished to proceed with an interview, and if they were comfortable conducting an interview in English. 10 interviews were conducted in Dutch by a research assistant, and 23 interviews were conducted in English by the author. Interviews were all conducted in person at a location of the participant's choosing, except one of the Dutch interviews, which was conducted via Skype. Interviews were recorded with audio recorders. The research received approval from the University of Sheffield's internal ethics committee, and participants signed consent forms prior to the interview. All interviews were transcribed and the Dutch interviews were translated into English. The transcribed interviews were coded by the author using NVivo.

A basic interview schedule asked direct questions about the product, such as why it was chosen, how it was eaten, whether it was enjoyed, and whether it would be bought again, plus some broader questions about meals typically eaten, dietary preferences, and how food was provisioned.

It is important to acknowledge here that the following analysis is based on participants' reported – rather than 'actual' – food consumption and associated practices, although in the interest of readability the paper refers to what people do, rather than what they say they do. Jerolmack and Khan (2014) have argued convincingly that it is a fallacy to assume a direct link between reported accounts of behaviour and the practical reality of that behaviour. Further, interviews (and indeed other modes of social research) are not static examples of 'objective' data, but rather are co-produced between interviewer and interviewee (Pink, 2012). To assume a perfect account of consumer behaviour is unproblematically accessible via reported accounts is to make assumptions about the relationship between talk and action comparable to those which prevail in much of the consumer acceptance work discussed in the foregoing literature review. However, a defence of the use of interview methods in this context can be advanced along the following lines.

Firstly, the present study uses reported accounts to investigate what participants *have* done, rather than what they think they *might* do. This approach is rare in existing work on Western consumer acceptance of insects as food, and it is argued that it represents a needed addition to the literature. Studies which use reported accounts to investigate participants' 'willingness to eat' insect-based foods (e.g. Gmuer et al., 2016), by contrast, assume that imaginary eating events are equally amenable to investigation via self-report, which is arguably somewhat more problematic. Secondly, it is important to address the argument that the embodied, habitual nature of many social practices leads to deficiencies in spoken accounts of them (e.g. Martens, 2012). This potential methodological drawback is important to acknowledge, but there are numerous examples of insightful work on food and social practices that use interview data as a significant (if not always exclusive) component (Evans 2012; Halkier & Jensen, 2011; Meah & Watson, 2013; Warde, 2016).

The themes outlined below represent the strongest aspects to have emerged from the data, and while they cannot necessarily be said to represent the most salient factors for all consumers of insect-based convenience foods, they are a strong, empirically-grounded set of themes which are likely to reflect the broader group of consumers of insect-based convenience foods from which

this group of participants was drawn.

### 3. Results

#### 3.1. Overview of participants

In line with the theoretical foundation of the research, analysis focused on participants' reported *practices* rather than attributes such as demographic background. Nevertheless, some prominent themes among accounts of participants' general dietary orientations were evident. These are briefly outlined here, alongside key aspects of participants' food consumption practices, to provide context to the following analysis.

A preference for organic food was commonly reported among participants (mentioned by 42% of the group), as were conscious efforts to eat healthily and to get enough nutrients and protein, and an interest in trying new foods. A number of participants also explicitly connected their concern for the environment with their food and lifestyle choices, such as trying not to use their car more than necessary.

Although explicit reference to 'environmentally-friendly' behaviour was only made by around a quarter of participants, almost all of the participants were to some extent ethically-informed food consumers. That is, the majority of them reported considering the ethical implications of their diets, and making efforts to contribute towards the improvement of animal welfare or the environment through their food choices where feasible. Participants fell into four broad categories: meat eaters, who ate meat daily or almost daily and made no effort to reduce their meat consumption (15%); meat-reducers, who ate meat frequently but were making efforts to reduce their meat consumption (12%); those with a mixed diet, who ate a mixture of meat and non-meat dishes, often having around three non-meat days a week (40%), some of whom self-defined as 'flexitarian'; and self-declared 'vegetarians', many of whom ate fish as well as insects (21%) as well as some who did not (12%). The finding that some participants self-reported as vegetarian but were prepared to eat insects is explored further below.

Repeat consumption of Insecta products was relatively low, with the majority of participants having tried Insecta once (58%) or more than once but not regularly (18%). Apropos of this latter group it should be noted that several participants had initially tried Insecta only once but felt that they should try another product since they knew they were going to be interviewed. As such the 'true' quantity of people who had only tried Insecta once, without being affected by the research process, is higher than the present data indicate. The consumption of Insecta products at least semi-regularly was relatively low (24%), with the highest consumption being once every two weeks, weekly, or twice a week (all 3%).

The types of meals people prepared with Insecta products were largely similar. The most common way in which Insecta products were eaten was part of the traditional 'aardappel-vlees-groente' (potato-meat-vegetable) meal configuration, henceforth referred to as the 'AVG'. Insecta was often incorporated into this type of meal (55%) or in a version of this meal type, for example with pasta, rice or grains instead of potatoes (27%). Outside of the AVG format the Insecta burgers were prepared as one would a conventional burger, between two pieces of bread (27%). Occasionally more creative use of Insecta products was made, for example with participants slicing them up and adding them to tortillas or stir fry dishes (9%). One participant ate the schnitzels as a snack with mayonnaise, in the style of the *bitterballen* that are a popular bar snack in the Netherlands.

### 3.2. Initial motivations for consumption of insect-based foods

In a reflection of Sogari's (2015) findings, the main reported motivations for trying Insecta products were a general interest or curiosity (42%) and a feeling that Insecta products were more environmentally-friendly or sustainable than conventional meat products (33%).

*When you look at sustainability, I think it is a very good alternative. For the pressure we put on our livestock, all those kinds of things. So that's why I thought, "it is meat, but it is responsible".*

Jelmer, meat reducer

The level of reported environmental motivation for trying Insecta was high (33%) when compared to the main dietary motivations of price, taste, and quality that are frequently identified in previous research (Food Standards Agency, 2016). Indeed, studies with UK consumers indicate that the number of participants who reportedly foreground ethical or environmental impacts when choosing particular food products is low. A market research survey that asked people to choose from a pre-defined list of factors puts the figure at 19% (IGD, 2013). Another study, which (like the present research) did not provide participants with a list of factors to choose from, found that only 2% reported being influenced by environmental considerations when buying food (Food Standards Agency, 2008). As such, the present data indicate that those likely to try insect-based foods probably have a higher than average level of environmental concern, which is to some extent manifest in their dietary orientation and preferences. The most significant way in which this manifested itself was in relation to meat consumption. As explained above, among the participants were a notably large number of meat-reducers. On this evidence it seems that the target market for insect-based convenience foods is people who are closer to being 'flexitarian' than average. Nevertheless, as is shown below, the strong environmental motivations for initially trying Insecta were not alone sufficient to ensure repeat purchase.

A feeling that Insecta products were good for one's health also reportedly prompted initial consumption (24%), in line with Sogari's (2015) findings. For meat-eaters this was generally because they are lower in fat than conventional meat, whereas for vegetarians (who were nonetheless prepared to eat insects), or those with mixed diets, it was generally because Insecta were seen as being relatively high in protein and nutrients compared to other 'meat alternatives', such as veggie burgers.

*When I would have two different kinds of meat, I would definitely look at the ingredients, and what it consists of. And I would always pick the one that contains less fat and more protein. That's why I'm not too fussed about trying insect products, cos I know that they contain a lot of protein. They could very well be a substitute of my regular meat.*

Co, meat reducer

*I am a vegetarian so I always eat meat substitutes instead of normal meat, that is, if I eat meat substitutes ... I saw that in this insect burger were a lot of proteins, relatively. So that was for me actually a reason to try it for the first time.*

Willemijn, vegetarian (no fish)

Participants also reported being motivated to try Insecta products because they would introduce novelty or variety (18%) into their diets.

*That was also the main reason why I wanted to try it. To taste something different.*

Sofie, meat eater

### 3.3. Factors affecting repeat consumption of insect-based foods

One of the key findings was that the motivations for trying Insecta products and the factors that affected their repeat consumption were quite different. While initial trying of the foods tended to be prompted either by curiosity or by rationalised principles such as a desire to reduce the environmental impact of one's diet, the degree of repeat consumption was chiefly influenced by a number of more practical factors that one would expect to be associated with the consumption of more conventional food products: price, taste, availability, and degree of fit with current eating habits. Another key factor related to the perceived status of insect-based foods as a source of healthy, ethical protein, particularly as a 'non-meat' source of protein for those who excluded certain animal species from their diets or tried to reduce their meat intake. The factors affecting repeat consumption did not tend to work in isolation, but rather were woven together in the positioning of Insecta as a food which was (or was not) repeatedly consumed.

#### 3.3.1. Price

At the time of the interviews, the price of Insecta was relatively high: a pack of two insect-based burgers cost around €4, more than most equivalent vegetarian (€2–3) or meat (€1–3) products. Around a third of participants (36%) found the insect foods to be prohibitively expensive. Just under half mentioned the relatively high price, but said that it would not alone hinder future purchase (45%). Although for the majority of people price alone would not hinder purchasing (64%), it was often considered to be one of a range of intersecting factors that together hampered future purchasing. Rolf (mixed diet), a relatively regular consumer of Insecta products, remarked that

*For me it's more of a – I wouldn't say luxury item, because it's not at a restaurant or something – but even though it's just €4 I always think ok, I will not buy it as much as if it was €2.50 or €3.*

#### 3.3.2. Taste

Opinions about the taste of Insecta products were divided. Around a third of participants said that they liked the taste and that it was a reason they would buy the products again (30%); the same proportion said that they disliked the taste and that it was a reason that they would not buy the products again (30%); and a slightly larger group were ambivalent about the taste, saying it was "fine" or "ok" (39%). Within this last group of participants, some found the taste "low" or "flat", but suggested that this meant the products could be "combined with anything" or you could "add your own flavours". Repeat consumers generally liked the taste, although one participant regularly consumed Insecta despite being ambivalent about it. For him, Insecta represented a high-protein, 'non-meat' foodstuff that was easily integrated within a favourite vegetarian meal and compatible with his lactose intolerance. In this instance, the taste of Insecta products did not have a significant bearing on his repeat consumption of them.

#### 3.3.3. Availability

Participants commonly remarked that the low availability of

products meant that they were able to buy them less frequently than they would have liked, in line with Shelomi's (2015) argument that the low availability of insect-based foods leads to 'passive rejection' of them. Different dimensions to the idea of 'availability' were evident. Some participants commented that their intention to purchase Insecta products had been impeded by Jumbo being out of stock:

*I found a few times that I thought: 'I think I'll buy an insect burger, it's not available, well there goes that plan'.*

Pieter, meat reducer

Others mentioned that they did not live or work near enough to a Jumbo store to be able to buy them easily, or that their daily lives were sufficiently variable that they did not always buy food from the same places (27%):

*I buy them [Insecta] when I do my shopping in [town], but that's only occasionally when I happen to visit my mother on a weekday. But sometimes I visit her in the evening and I can't buy anything [there]. I try to plan that occasionally, but ... And then I work at different places so most of the time I do my shopping somewhere on the way back home. And one day I pass a Jumbo, the other day I pass Albert Heijn [supermarket], and the other day I passed a Co-op [supermarket]. So that depends on where I am.*

Margeet, vegetarian (eats fish)

The idea of availability also related to the variety of products available. Participants mentioned that they might buy more if there was a greater variety sold (12%). When asked if there was anything about Insecta that prevented her from buying them again, Jasmijn (mixed diet), said:

*No, not really. I would prefer if the Jumbo had more types of the Insecta things, because they really had one choice, so it's not really something I would buy every week because well, it becomes boring.*

Co (meat reducer) mentioned that despite being aware of Insecta's existence he had not found the burger for a long time, because he does not often shop from the vegetarian/meat-replacement aisle. He suggested that if the Insecta products were located by the conventional meat then they would be easier to find. While this may be the case for him, the majority of participants seemed to expect to find the products near the meat substitutes, so the placement of Insecta in Jumbo stores was for most people appropriate. As Mariska (mixed diet) said:

*For me it [Insecta] is a meat substitute, definitely. Just as I think tempeh is in the right place [in the vegetarian section], and tofu, to me that is logical. I do not know where I would go look for it otherwise. I would not look for it in the meat segment.*

This is potentially an important finding, as appropriate category management for insect-based products (and indeed other novel foods) in future will be crucial. Although the marketing of insect-based products as a vegetarian option or 'meat substitute' has attracted criticism in the Netherlands (Partij voor de Dieren, 2014), the decision made by Jumbo's category managers to place Insecta among meat substitute products seems to have been the correct one, given the expectations of participants in this study. Insecta products seemed to occupy a place between 'meat' and 'not meat' in participants' minds, and as 'non-meat' in participants' eating practices. Following this finding, and work which has suggested

that insects are unlikely to represent a direct replacement for conventional meat in the near future (Verbeke, 2015), it appears that the most appropriate category management of insects would be to position them as a more ethical protein source than conventional meat, but not necessarily one that is 'fully' vegetarian, thus targeting consumers who adopt an ethically-motivated reduction in meat without completely precluding the consumption of animals.

### 3.3.4. Degree of fit with current eating patterns

This factor was particularly significant. Put simply, if participants typically ate large amounts of vegetarian convenience foods, it was easy for them to integrate Insecta products into their diets, because it did not involve the reconfiguration of meals or the acquisition of new culinary skills. Conversely, participants who did not eat significant quantities either of vegetarian convenience foods or of other similar products, such as conventional meat burgers, found that the Insecta products did not integrate easily into their diets. Insecta products were treated by the majority of participants as being broadly equivalent to vegetarian convenience foods, rather than meat products.

The degree of fit with participants' current eating patterns is difficult to quantify. Clearly it would be difficult for people to provide some kind of standardised indication of how well Insecta products were fitting into their diets. In the present analysis, degree of fit has been assessed in relation to how well Insecta integrated into participants' prevailing modes of cooking, including their routinely consumed meal types and products, shopping habits, and typical preparation techniques. Participant diets can be usefully grouped in three ways: those that were a good fit with Insecta, those that were a poor fit, and those that were in a sense both a good and a poor fit.

Most people's diets were, in the abstract, a good fit with Insecta products (64%). Of these participants, most were vegetarian or had a mixed diet (89%). Most of them frequently ate vegetarian convenience foods, such as veggie burgers, usually within the AVG format or a modified version of it (such as using pasta or grains instead of potatoes). Angela (vegetarian, no fish) was a particularly good example of how Insecta products were being integrated into existing reduced meat or meat-free diets. She was a vegetarian who did not eat fish but was happy to eat insects. She ate vegetarian convenience foods five or six times per week in the AVG format which often included vegetarian burgers, so Insecta products fitted seamlessly into her established eating patterns.

The diets that were a poor fit with Insecta products (18%) were generally of the more 'foodie' type. These people tended to put much less emphasis on the convenience aspect of food, and more on the taste and the use of 'proper' ingredients. They all reported that it was normal for them to cook from basic ingredients, and thus pre-made products featured little in their diets. Most of them mentioned that they simply did not eat many burgers or ready-made products:

*I actually eat very little ready-made products. I do a lot of cooking with basic products. So one of these ready-made burgers is fun and easy, and if I'm on holiday in the Netherlands I would buy it more easily than when I'm at home. Because at home I always cook with basic products.*

Els, mixed diet

Not all diets that were a poor fit with Insecta were highly varied, 'foodie' type diets. Mariete (mixed diet) did not cook a huge variety of dishes relative to other participants, but nevertheless explained not buying Insecta again as a result of its limited applications,

which did not fit with her regular use of ‘ingredient’-type vegetarian products such as soy-based imitation chicken pieces:

*It's a full product that you can't really use in a dish, the same way you can use little bits of chicken for example, or the meat replacement chicken, or like strips of meat that you just toss in a big pan. The Insecta products are just too big to do anything interesting with.*

A number of diets were simultaneously a good fit and a poor fit with Insecta (18%). Sometimes this meant that Insecta had not been eaten more than once. For example, Ruben (vegetarian, no fish) regularly ate vegetarian convenience foods, a meal pattern into which Insecta would fit easily: however, he reported that he was happy with the seven or eight meals that made up his current culinary routine, and saw no reason to change it by incorporating Insecta products, even though he found them appealing for taste and environmental reasons. Further, he typically used ‘ingredient’ type meat substitutes, such as a soy-based mincemeat-style product, which meant he ate relatively few burger-style products. On the other hand, sometimes the apparent lack of fit between Insecta and people’s diets did not prevent Insecta from being repeatedly consumed. For example, Willemijn (vegetarian, no fish) always cooked meat-free meals from basic ingredients and rarely used pre-made vegetarian products. However, due to concerns about her protein intake, she had begun deliberately buying products such as Insecta even though they did not fit so well into the type of dishes she was used to making. These examples, of participants whose consumption of Insecta products had a somewhat awkward relationship with their established dietary routines, illustrate well how the interplay of different factors can affect their consumption: products can be a good or a bad fit with people’s cooking habits, but this does not in itself determine whether or not they are eaten more than once. It should also be borne in mind that even among people whose dietary routines were a good fit with Insecta (64%) there were additional confounding factors that frequently prevented Insecta being integrated into regular culinary routines.

### 3.3.5. Household composition and family circumstances

Participants’ domestic circumstances played a significant role in the extent to which Insecta products were incorporated into diets, and also the manner in which this was achieved. Where participants were members of a multiple occupancy household who regularly shared meals – typically as part of a family who lived and ate together – the issue of such meals ‘fitting in’ with other household members’ dietary requirements, in terms of both taste and nutrition, was raised.

For a number of participants, the diets of other household members were a consideration when buying and cooking Insecta products, but did not significantly inhibit consumption (21%). Most of these people were the lone consumer of Insecta products or vegetarian products in a couple or a family. Often, for example, a couple would eat most of the same meal, but one would have an Insecta product or vegetable-based product, whereas the other would have a meat product. The way in which meals were organised meant that people’s different preferences could be easily accommodated, even if one or more household members were antipathetic towards Insecta. Margeet (vegetarian, eats fish), for example, cooked the same vegetables and rice for her whole family, but different protein elements for herself and her eldest daughter (both vegetarian) and her husband, son and youngest daughter (all meat eaters).

A smaller number of participants stated that the need to accommodate co-residents’ preferences within shared meals specifically inhibited their consumption of Insecta (12%). For example,

Jelmer (mixed diet) remarked that “it tasted fine, but the children are less enthusiastic, haha. Yes, that’s important”.

A third of participants lived alone and/or cooked only for themselves (33%). Substantially more of this sub-group reported Insecta fitting easily into their diets (82%), relative to those who regularly share meals or cook for others (57%). Rianne (vegetarian, eats fish), for example, was a student who lived in shared accommodation but cooked and ate individually. As such she did not have to organise her meals to account for the preferences of her housemates. Although they were reportedly “too afraid” to try Insecta, this did not affect Rianne’s consumption of the products, because the other occupants of her house were not routinely accommodated within her daily cooking. The relative ease with which Insecta products were integrated within single-person culinary routines suggests that the absence of having to accommodate other people’s preferences may contribute significantly to the uptake of novel foods such as Insecta. As such, the data supports other research which indicates the configuration of diets is not simply a matter of individual choice, but rather the result of competing social practices and ethical concerns, such as care for one’s family (e.g. Halkier, 2010; Molander, 2011). In cases where co-residents must be accommodated within shared meals, routine integration of new and potentially divisive foodstuffs is manifestly more difficult to achieve.

### 3.3.6. Insects as an ethical source of protein

The tagline on the packaging of Insecta products – “Go Green – High Protein” – neatly encapsulates the way in which Insecta’s perceived status as an ethical, high protein food was associated with their repeat consumption. The high protein content of the products relative to comparable vegetarian convenience foods was explicitly mentioned by several participants as a factor that encouraged repeat purchase (15%). (The burgers contain 23.4 g of protein per 100 g, around 8 g higher than a soy-based burger frequently purchased by a number of participants.) Willemijn, for example, explained that “the combination that there are a lot of proteins in it and it is just very tasty, that’s why I buy it often”. All except one of these participants was either a vegetarian or had a mixed diet: these kind of participants were generally explicit about making sure their diet included, as Mariska said, “all your complete proteins”. Yet it was Insecta’s perceived status as an *ethical* protein source that appeared to have a greater bearing on repeat consumption. There were both environmental and animal welfare dimensions to this perceived ethical quality.

Participants felt that Insecta was substantially better for the environment than conventional meat products, largely due to the lower emissions and resource use associated with the rearing of insects compared to livestock.<sup>4</sup> This was expressed across the range of dietary types identified, from ‘full-time’ meat-eaters to vegetarians, including those who did not eat fish. A small number of participants (6%) reported that they routinely ate Insecta products despite not finding the taste particularly appealing, partly because they represented an environmentally-friendly meat replacement.

<sup>4</sup> The extent to which food insects are ‘better’ for the environment than other protein sources has been debated. Despite requiring much less land to grow than conventional livestock, it has been argued that the proposed environmental benefits of insect rearing relative to livestock rearing are dependent on the identification of a substrate that is less resource-intensive than existing sources of commercial animal feed (Lundy & Parella, 2015), which are currently used by a number of companies rearing insects in Europe (Hubert & Arsiwalla, 2016). Nevertheless, the prevailing discourse surrounding the Western consumption of insects is that it represents a more ‘sustainable’ food choice than conventional meat, a point which has been emphasised in the marketing of Insecta products (e.g. <http://www.damhert.be/en/shop/insecta>).

Insecta products were also deemed to be more 'ethical' than conventional types of meat because of insects' perceived lack of sentience and capacity to suffer. That meat-eating participants were prepared to eat insects is perhaps not surprising (beyond the relative unusualness of the food): what is potentially more significant is that some self-defined vegetarians, who were reportedly motivated by concerns for the welfare of other animal species, deemed insects an ethically permissible source of food. This appeared to be related to the ambiguity of insects' status as an 'animal' for participants, which included both meat-eaters and vegetarians. As Co (meat reducer) said: "I guess it's better to eat [Insecta rather than meat products] because no animals were killed", and Pieter (meat reducer) and his girlfriend ate Insecta products on their 'meat-free day'. Els (mixed diet) thought that insects "are animals, but not animals like the real animals." Vegetarian respondents often had difficulty accounting ethically for insects:

*I think that they [insects] don't have so very much brain. So in that respect I think they're more like plants or something. Although I don't like killing a fly if it's not necessary. I try to catch it, put a glass over there and put it outside. But still er, no. Insects are ... well. I don't really consider them being animals. [...] I don't think they have any consciousness ... They're living on reflexes I think. A lot of smaller animals, you think they have some brains, and they, yeah they might have some kind of consciousness. And then I don't like to eat them. But with the insects I, well...*

Margeet, vegetarian (eats fish)

*It's difficult because, why should I eat worms and not eat cows? Is it because they feel less, or because I like them less as a type of animal? But ... yeah. It's easier for me to eat insects than larger animals, I think that's true. [...] Because I think there would be much more animal suffering with mammals, and animals that have more ... have a, maybe have a bigger central nervous system? I don't know. A bigger capacity for suffering.*

Ruben, vegetarian (no fish)

The identification of a group of self-declared vegetarians who eat some animal products reflects earlier work showing that 'vegetarianism' is a diverse concept (Beardsworth & Keil, 1991) which for many self-defined vegetarians does not totally preclude the consumption of meat (Dietz, Stirling Frisch, Kalof, Stern, & Guagnano, 1995). This point has led to calls for vegetarianism to be conceptualised as an 'orientation' rather than an either/or decision (Janda & Trocchia, 2001). The introduction of insect-based foods to Western markets further illustrates the diversity of vegetarianism(s) and demonstrates that basing ethical dietary prescriptions on the perceived capacity of particular species to suffer may become more difficult when dealing with certain 'border' species, such as insects and fish, that are evidently easier to deny mind and moral standing to than cows, sheep, or chickens (Bastian, Loughnan, Haslam, & Radke, 2012).

Although 27% of participants were self-defined vegetarians, all but one were prepared to eat insects. Given that a prominent Dutch vegetarian organisation has stated that they do not consider eating insects to be vegetarian (Vegetariërsbond, 2016), it might reasonably be suggested that consumption of insects by vegetarians in the present study may not be reflected in the wider vegetarian population. This point has potential implications for the broader acceptance of insect-based foods, as it suggests a particular ethical tendency among their consumers: pro-environment, and pro-animal welfare, excepting certain species. In any case, the perceived ethical qualities of Insecta alone were not sufficient to

induce routine consumption. Positive ethical assessments were typically subordinate to a range of intersecting social and practical factors in determining whether or not repeat purchases were made.

### 3.3.7. Interplay of factors

One of the central findings of the research was that none of the factors discussed above worked in isolation. Rather, it was the interplay of factors that determined how frequently people ate Insecta, if indeed they did so more than once.

People who ate insect-based foods at least semi-regularly generally had to have positive versions of all of the above factors present (liking of taste, acceptance of price, etc.) However, if any of these factors were negative (e.g. dislike of taste) or absent (e.g. the products were unavailable), repeat consumption was negatively affected and integration of Insecta products into diets was impaired. It should be noted that occasionally a participant ate the products relatively regularly despite having a problem with a particular aspect of them. Pieter (meat reducer), for example, thought the price was high but was "willing to be an early adopter and pay for the privilege". James (meat reducer) regularly ate the nuggets despite being ambivalent about the taste, because he felt they were an interesting and ethical meat alternative which he could use as a basic ingredient in more complicated dishes. Such exceptions notwithstanding, the presence of one or more negative factors generally precluded repeat consumption.

## 4. Discussion and conclusions

A key conclusion is that there is a disjuncture between the initial motivations behind purchasing insect-based convenience foods and the factors affecting repeat consumption. The initial motivations included a general interest or curiosity, a feeling that Insecta products were more environmentally-friendly or sustainable than conventional meat products, a feeling that Insecta products were good for one's health, and/or the introduction of novelty and variety into diets. These findings support previous research into motivating factors and the likely characteristics of early adopters of insects as food (Sogari, 2015; Verbeke, 2015).

However, most of the main factors affecting repeat consumption were notably more practical and contextual, and associated with the routine consumption of more conventional foods. These were the price, taste, and availability of products, and their degree of fit with established dietary practices, including the accommodation of other people's preferences. Another influential factor more closely related to initial motivations was the status of Insecta products as a source of protein that was seen as more 'ethical' than conventional meat, either for environmental or animal welfare reasons. Repeat consumption typically required the successful interplay of all these factors. Negative factors, such as when participants found the products too expensive and largely unavailable, led to their 'passive rejection' as foods (Shelomi, 2015), despite a willingness otherwise to eat them. The cognitive emphasis implied by 'passive rejection' could perhaps be better conceptualised as a 'failure to integrate' into established eating practices. For most participants, practical, supra-individual factors appeared to exert a greater influence on repeat consumption than more rationalised considerations about the ethical position of insect-based foods. This suggests that product attributes, practical and contextual factors, and considerations of existing dietary practices, habits and routines should receive a greater emphasis in consumer acceptance research than has hitherto been the case.

As noted above, practical factors are acknowledged in some current research on consumer acceptance of insects as food, but they are typically accorded less emphasis than individual psychological factors. 'Acceptance' is not simply a case of whether or not

an individual will eat a particular product once, but also the extent to which that food becomes an accepted and integrated part of their established culinary regimes. This to a large extent depends on product attributes as well as much broader considerations of the diverse, intersecting and habituated social practices in which an individual takes part, including their food provisioning and consumption practices. As [Halkier \(2010\)](#) suggests, the integration of particular foods into dietary practices relies on their 'do-ability': they must be both practically feasible and normatively appropriate. Given the similarities between insect-based foods and conventional foods highlighted in the present study, it is suggested that the same dynamics of integration into people's diets – or of resistance to integration – may be salient for other novel food products as well.

Once insect-based foods are for sale in supermarkets and similar contexts they are subject to the same kind of considerations as more conventional foods. This finding supports previous research which shows that in the case of organic food shopping, participants often prioritise practical factors, such as price, above ethical principles ([Clarke, Cloke, Barnett, & Malpass, 2008](#)). The distinction between factors predicted to affect acceptance of insects and those which manifestly affect repeated consumption also echoes earlier work with genetically modified food in the UK (e.g. [Sleenhoff, Osseweijer, Condry, & Gaskell, 2008](#)).

Among the participants in the present study nobody refused to eat the products because they found them disgusting (although some reported initial trepidation and a disinclination to eat whole insects). The sample was comprised entirely of self-motivated consumers of insect-based foods and thus does not provide data on general levels of acceptance in the Dutch population. Focusing on willing early adopters may however be more productive than trying to gauge factors that will affect acceptance in the general population, because it is these early adopters who will form the kind of initial market for edible insects that [Verbeke \(2015\)](#) discusses.

Those interested in developing insect-based foods for Western markets should be mindful of the fact that trying a food product once does not necessarily mean that people will eat it again, particularly if it is culturally unusual ([Tan et al., 2016](#)). The data presented here suggest that if insect-based foods are to be commercially successful they will need to be at a comparable level of price, tastiness and availability to existing Western foods. Exactly *which* foods will depend on how insects are incorporated into new products. In the case of insect-based convenience foods, for example, it appears that vegetarian convenience foods are the primary reference category against which insect-based versions are judged. People *will* pay a premium for new foods, but only if they have other advantages relative to existing foods ([Shelomi, 2015](#)), such as a distinct and pleasurable taste, as well as the ability to be easily incorporated into existing culinary regimes. The idea that taste should be a key focus of edible insect product development has already been proposed elsewhere ([Deroy et al., 2015](#)), and the data from the present study bear these arguments out. However, as [Tan et al. \(2016\)](#) note, taste alone will not ensure incorporation of insects into Western diets, as cultural appropriateness and contextual factors are also important.

The specific form of the foods that insects are incorporated within appears to have a bearing on their acceptance. Previous research (e.g. [Wansink, 2002](#)) has shown how new or unusual ingredients have been accepted by Western consumers when incorporated into familiar foods. Research on the acceptance of insects as food has also suggested that insects are likely to be more acceptable to Western consumers when they are disguised or incorporated in familiar foods, rather than visible ([Gmuer et al., 2016](#); [Hartmann et al., 2015](#); [Lensvelt & Steenbekkers, 2014](#); [Schösler et al., 2012](#);

[Tan et al., 2015](#)), and some researchers have suggested that incorporation into convenience foods might be one of the most acceptable ways in which to introduce edible insects to Western diets ([Schösler et al., 2012](#); [Verbeke, 2015](#)). However, the data presented here suggest that there are problems with incorporating insects in convenience foods that go beyond the issue of visibility. Clearly there is no 'one-size-fits-all' method for developing new foods: what worked well for organ meat in the 1940s ([Wansink, 2002](#)) may not work in the same way for buffalo worms in the twenty-first century. Other than the obvious differences in social context, all of the factors described above also have a bearing on the uptake of insect-based convenience foods. But it is also possible to engage in some informed speculation about the particular reasons that adding beetle larvae to vegetable burgers does not appear to have been a huge commercial success.

One reason may be the fact that the Insecta range were all 'finished' products – such as burgers and nuggets – rather than 'ingredients' like mincemeat or chicken pieces. As identified above, in some cases the fact that Insecta were 'finished' products precluded their more regular use. A burger-style product can only be prepared in a limited range of ways, which may inhibit its more regular consumption. This was particularly evident for participants in the present study who ate large quantities of meat substitute products but only of the 'ingredient' variety, as these were seen as more versatile and easier to incorporate into a wider range of dishes. As such, if an 'ingredient' type insect-based product were produced, it may be easier for people to integrate it into their culinary routines, which may encourage greater or more regular uptake.

Another reason for the current limited uptake may relate to insects' position as an invisible, 'ethical' protein source. A significant shift in Western consumer focus towards the protein content of foods has been observed in recent years ([Gray, 2015](#); [Scott-Thomas, 2013](#); [Starling, 2015](#)), and the consumption of abstracted forms of protein as a relatively instrumental activity (such as for muscle gain or weight loss) appears from market research sources to be increasingly popular, having branched out from specialised areas such as the exercise market ([Scott-Thomas, 2013](#); [Starling, 2015](#)). Protein may be a particular concern for those looking to replace conventional meat with more ethical alternatives, a possibility suggested by recent increases in sales of plant-based protein ([Crawford, 2015](#); [Gray, 2015](#)), as indeed by the present study. Yet for many vegetarian consumers, insects are still animals, raising ethical problems about eating them (e.g. [Vegetariërsbond, 2016](#)). Insect-based convenience foods seem better suited for the meat-reducer or 'flexitarian' market, or for environmentally-motivated vegetarians who do not completely rule out the consumption of some animals. That some people from this group are buying them is borne out by the empirical data presented above.

Further, currently available 'invisible' insect products such as Insecta do not appear to have a specific insect taste, form, or mode of cooking. In this sense they are arguably serving to introduce the idea of eating insects to Western audiences without a drastic reorientation of culinary practice. But are they really normalising it if so few people eat them, and if one cannot actually *see* the insects? Concealing insects in food, as [Stock et al. \(2016, p. 162\)](#) note, "dilutes the encounter with insects themselves". While the inclusion of insects as an invisible ingredient may lead to a higher willingness to try a particular product, perhaps the absence of a distinct appearance or taste reduces the positive reasons for selecting an insect-based food product in the first place, rather than a cheaper or tastier non-insect equivalent.

Perhaps a more visible insect product that draws on 'authentic' dishes from non-Western contexts would work better, in line with [Deroy, Reade, and Spence's \(2015\)](#) recommendation that an

explicit, gastronomic mode of presentation is adopted in the creation of insect-based dishes. Although fewer Westerners may want to eat something which involves whole insects rather than ground-up ones, the development of insect-based dishes with a distinct and pleasurable taste would provide a reason to eat a meal containing insects rather than another protein, such as chicken or soy. A small but committed group of early adopters of insects as food in the West is likely to be a stronger basis for commercial development – and gradually more widespread acceptance – than a larger group who have only eaten insect-based foods once. The focus of product development should therefore perhaps be on the *quality* and *distinctiveness* of insect-based foods, rather than on trying to gain the highest *quantity* of early adopters possible. Indeed if the products are tasty and distinct, as well as being affordable and easily available, higher levels of consumption are likely to follow.

For those wishing to develop foods with insects as an invisible ingredient, it is important to remember that consumers who want a product with an invisible protein source need a reason to choose one with insects rather than another ingredient. ‘Grand designs’, such as relatively high levels of environmental sustainability, have been shown to be less important than more prosaic factors, such as taste and value for money, in organic food retailing (Clarke et al., 2008). Moreover, as other research has suggested (Hartmann et al., 2015; Tan et al., 2016), environmental reasons are unlikely to be sufficient to encourage the repeat consumption of insect-based foods in any meaningful quantity. Instead, things such as ease of integration with established eating practices, taste, price, and availability are likely to be key reasons for Western consumers to incorporate insects into their diets.

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