Meat the Future: Investigating the Determinants of Willingness to Try In-Vitro Meat

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Abstract:
Conventional meat production practices often raise ethical questions concerning animal welfare and environmental consequences. In-vitro meat (IVM), also known as "cultured meat" could be a suitable substitute as producers aim to imitate the color, nutritional value, flavor and texture of conventional meat. However, research on the factors influencing consumers' adoption of IVM is limited. As the introduction of IVM into the diets of consumers hinges on trying it, this study investigates determinants of consumers´ willingness to try IVM. We develop and test a conceptual model based on the Theory of Consumption Values, integrating food neophobia as a moderator. Our results show that functional, emotional and epistemic values of IVM are positively related to willingness to try. The positive effect of epistemic value is inhibited by food neophobia. Marketers should thus highlight the functional (i. e. nutritional) and emotional benefits of IVM in comparison to conventional meat.[1]

Keywords: Meat Alternatives, In-vitro meat, Food neophobia
Track: Consumer Behavior

[1] A similar version of this paper has been submitted to "2025 AMS World Marketing Congress".

1. Introduction

Human activities are the largest contributor to emissions affecting global warming (European Commission 2024) with one major factor being the production and consumption of food especially meat (Tuomisto, 2018). Livestock farming alone is responsible for approximately 14.5 % of greenhouse gases (FAO 2017). The effects of meat production go beyond the emission of greenhouse gases as it also negatively impacts biodiversity and water depletion (Tuomisto, 2018). In addition, livestock farming is associated with ethical and moral concerns. This is due to the fact that meat production and conventional animal husbandry is often associated with animal suffering (Anomaly, Browning, Fleischman, and Veit, 2024; Hale, Dueñas-Ocampo, and Lee, 2024). Consequently, there have been notable shifts in consumer diets in reducing meat consumption (Kerslake, Kemper, and Conroy, 2022). There are also health consequences associated with meat consumption as it can increase the risk of cardiovascular diseases or cancer (Willett et al., 2019). Despite concerns regarding health, morality and animal welfare, a large proportion of people continue consuming meat (Buttlar & Walther, 2018).

Addressing these problems, a number of plant-based protein sources (e. g. seitan or tempeh) and insect-based foods have been made available to consumers as more sustainable meat alternatives (Jetzke, Bovenschulte, and Ehrenberg-Silies, 2016; Dupont, Harms, and Fiebelkorn, 2022; Hwang, You, Moon, and Jeong, 2020; Onwezen, van den Puttelaar, Verain, and Veldkamp, 2019). Another forthcoming innovative alternative to conventional meat is in-vitro meat (IVM) also known as “cultured meat”, “clean meat” or “lab grown meat” (Verbeke et al. 2015; Weinrich, Strack, and Neugebauer, 2019). Producing IVM, muscle stem cells are taken from living animals and then supplied with nutrients and stimulated to grow in a bioreactor under controlled conditions (Tuomisto, 2018). Ideally, through technical progress IVM could be comparable to conventional meat in terms of color, nutritional value, flavor, aroma, texture and palatability (Kadim, Mahgoub, Baqir, Faye, and Purchas, 2015). This type of meat could present a more environmentally friendly, healthier and ethically acceptable alternative to conventionally produced meat (Bryant, 2020; Fu, Zhang, Whaley, and Kim, 2023; Mattick, Landis, and Allenby, 2015; Wilks, Phillips, Fielding, and Hornsey, 2019). Currently, IVM is only available in a few countries (i. e. Singapore) (Waltz, 2021; Rombach et al. 2022). Compared to plant-based meat substitutes, IVM is not yet permitted in the European Union and therefore not available to consumers (Mancini & Antonioli, 2019).

Although prior research has explored IVM consumption, the impact of consumption values on the willingness to try IVM (WTT) has not yet been investigated. Due to the fact that IVM is not yet available on the European market, this study focuses on the WTT. Applying the Theory of Consumption Values this study aims to make practical contributions by getting a more comprehensive understanding of consumers' choice behavior regarding IVM. Understanding the consumption values influencing the WTT is important to properly promote IVM in the future and encourage consumers' acceptance of IVM. The study also aims to make a theoretical contribution, extending the theory by including a domain specific moderator.

2. Theoretical Background

The Theory of Consumption Values, first introduced by Sheth, Newman, and Gross (1991), aims to predict, explain and describe the consumption behavior of consumers – why consumers buy or do not buy specific products or choose a product over an available alternative. The theory is not tied to a specific product type and can thus be used for different products and categories (i. e. consumer durables, industrial goods or services). Sheth et al. (1991) examined five consumption values influencing the choice behavior of a consumer: Functional Value (FV), Social Value (SV), Emotional Value (EMV), Conditional Value (CV), and Epistemic Value (EPV). Either one of the values or all values can have an influence on consumers' decision (Sheth et al. 1991). The theory has already been used in the context of food investigating the consumption of organic food, local food, superfoods and also plant-based meat (Hussain et al. 2023; Kushwah, Dhir, and Sagar, 2019; Liu, Meng-Lewis, Ibrahim, and Zhu, 2021; Saini, Prakash, Zafar Yaqubb, and Agarwal, 2024). This study is the first to apply the Theory of Consumption Values in the context of IVM.

In the following section we will derive hypotheses on the basis of the Theory of Consumption Values. However, as IVM is not yet available in the European Union (Mancini & Antonioli, 2019) this study does not take CV into account. This is due to the fact that CV is created by specific situations or a set of circumstances and without the availability of IVM there are currently no specific conditions to refer to (Sheth et al., 1991).

FV is assessed to be the primary driver of a consumer's choice and is described as the perceived utility of an alternative resulting from its functional, utilitarian or physical performance like reliability, durability, and price (Sheth et al., 1991). Studies have already shown that the quality of food plays a strong role in consumers' decisions (Choe & Kim, 2018). FV has also already been expanded in the context plant-based meat alternatives with a

focus on nutritional aspects (Saini et al. 2024). Liu et al. (2021) showed that FV including quality and nutritional aspects influence the relative advantage of superfoods. Prior research regarding IVM implicated that the quality of food including nutritional value is an important aspect for seeing IVM as a sustainable substitute for conventional meat from a consumer's perspective (Fu et al., 2023). Therefore, we assume a positive effect of FV on the WTT (H1).

The SV of an alternative depends on its association with a positively or negatively stereotyped demographic, socio-economic and cultural-ethnic group (Sheth et al., 1991). Dupont et al. (2022) showed that subjective norm influences the willingness to consume a cultured meat burger. Further, consumption of sustainable food can carry social value (Costa, Zepeda, and Sirieix 2014). Since IVM is considered a more sustainable, more ethical and healthier alternative to conventional meat, it may also enhance the consumers' image (e. g. Bryant, 2020). Thus, we hypothesize a positive effect of SV on the WTT (H2).

The perceived utility resulting from the ability of an alternative to arouse feelings or affective states is defined as EMV. An alternative provides EMV if it is associated with certain feelings or if it triggers or maintains these feelings (Sheth et al., 1991). In prior studies, EMV has been shown to influence food choice (Hussain et al., 2023; Saini et al. 2024). A recent study regarding plant-based meat consumption demonstrates that emotionally motivated behaviors like guilt avoidance have a significant influence on consumers' purchase intention (Bhattacharyya, Balaji, and Jiang, 2023). As IVM could be considered more ethical and may provide a similar kind of EMV, we assume that EMV positively effects the WTT (H3).

EPV can be defined as the perceived utility of an alternative in arousing curiosity, offering novelty and/or satisfying the desire for knowledge. Both completely new experiences and simple diversions can be combined with EPV (Sheth et al., 1991). Food curiosity has been shown to significantly influence consumers' behavior regarding meat alternatives (Bhattacharyya et al., 2023; Davitt, Winham, Heer, Shelley, and Knoblauch, 2022; Ford, Gould, Danner, Bastian, and Yang, 2023). This also applies for IVM as prior research finds a significant positive influence of food curiosity on the WTT and purchase intention towards IVM (Hwang et al., 2020; Rombach et al., 2022). For this reason, we assume a positive effect of EPV on the WTT (H4).

With respect to the need of domain specific development of the Theory of Consumption Values, we seek to extend the theory by integrating food neophobia (FN) into the model as it is a frequently discussed construct in the context of novel foods (Choe & Cho, 2011; Schickenberg, Van Assema, Brug, and De Vries, 2008). FN is defined as an aversion and/or a tendency to avoid new foods and describes the fear of novel food (Dupont and Fiebelkorn

2020; Pliner & Hobden, 1992) FN has already been shown to have a negative direct effect on the WTT as well as the acceptance of IVM (Dupont & Fiebelkorn, 2020; Dupont et al., 2022; Rombach et al., 2022; Siegrist & Hartmann, 2020). However, FN may further interact with EPV as EPV represents the novelty that consumers who are high in FN seek to avoid. Thus, we posit that FN negatively moderates the effect of EPV on the WTT (H5).

3. Method

To test our conceptual model, an online questionnaire was used incorporating slightly modified measures from prior research (7-point-Likert-type). WTT was measured with a single item adapted from Yamada et al. (2012). FV (Liu et al., 2021), SV (Sweeny & Soutar, 2001), EMV (Sweeny & Soutar, 2001), EPV (Roh, Seok, and Kim, 2022) and FN (Siegrist, Hartmann, and Keller, 2013) were measured on multi-item scales. All scales were translated into German and adapted to the context of IVM. The questionnaire was divided into three parts: First, all participants were shown a definition of IVM ensuring the same level of knowledge. Next, participants answered questions on WTT, FV, SV, EMV, EPV and FN. The questionnaire concluded with a set of demographic questions. A cognitive pretest was conducted in order to assess the comprehensibility and clarity of the questionnaire. As a result, items were reworded for clarity and the definition of IVM was adjusted. Furthermore, the results of the quantitative pretest showed adequate scale reliability and validity.

The final sample of our main study consisted of 261 valid cases (female=69.7%, Mage=48.70, SDage=15.90) after removing straightliners from the sample. Prior to estimating the structural model, we conducted a confirmatory factor analysis using AMOS 29. The measurement model shows an acceptable fit ($\chi 2/df$ =2.042; CFI=.959; RMSEA=.063; SRMR=.055) after removing two items of the employed EPV scale and one item of the employed FN measure. Cronbach's Alpha was above 0.7 for all constructs, factor loadings were above 0.5, average variance extracted (AVE) was above 0.5 for all constructs except FN which had an AVE of 0.36. The square roots of the AVE of each construct were greater than the inter-construct correlations, indicating discriminant validity (Fornell & Larcker, 1981).

4. Results and Discussion

To test our hypotheses structural equation modeling with maximum likelihood estimation was performed using AMOS 29. The structural model (see figure 1) including its control

variables, i. e. age and gender, showed an acceptable model fit ($\chi 2/df=1.981$; TLI=.947; CFI=.959; RMSEA=.061; SRMR=.052). 50.5% of the variance in WTT could be explained showing four significant effects. Results reveal that FV (β=.193, p=.002), EMV (β=.506, p≤0.001) and EPV (β=.160, p=.008) are significantly related to the WTT, supporting H1, H3 and H4. The effect of SV (β=-.048, p=.387) on the WTT was not significant, leading to the rejection of H2. Results show a negative moderating effect of FN on the effect of EPV (β=-.162, p=.015), supporting H5.

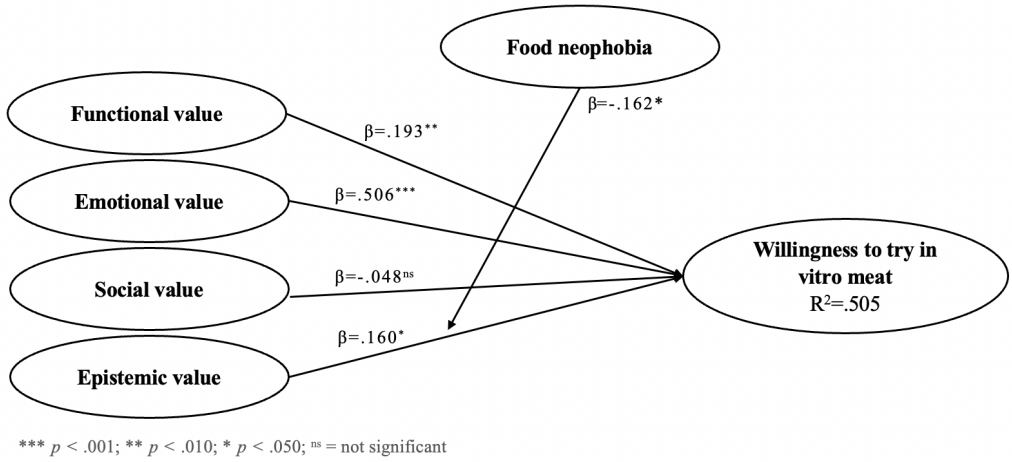

Figure 1: Structural Model

Our results concerning FV support the notion that IVM has to fulfill high standards with regards to quality and nutritional value. Regarding the EMV it can be stated that consumers are more willing to try IVM if they believe that they can consume IVM with a clean conscience and thus derive more pleasure from the consumption experience. Given these results, functional and emotional values should be highlighted in the promotion of IVM. EPV is positively related to WTT indicating that the novelty of IVM can be conducive to the introduction of IVM into the market. However, FN can dampen this effect. Marketers have to be wary of their promotional message as highlighting IVM's novelty could be detrimental to consumers' acceptance as surveys show that a substantial group of consumers can be considered high in FN (Meiselman, King, and Gillette, 2010).

5. Conclusion and Implications for Theory and Practice

IVM can be a more ethical, more sustainable and healthier alternative to conventional meat. In order to successfully position IVM as a suitable meat alternative, understanding consumers´ WTT is crucial. Thus, the aim of this study was to explain which factors influence the WTT while applying and extending the Theory of Consumption Values. Our results show

that FV, EMV and EPV have a significant positive influence on the WTT. However, FN can inhibit the relationship of EPV and WTT. Marketers should consider these aspects in the promotion of IVM and focus their communication on IVM's quality, nutritional value and ethical benefits, while being careful about how communicate its novelty. This study further contributes to the domain specific development of the Theory of Consumption Values by successfully introducing the construct of FN. Future research could investigate how the negative effect of FN can be alleviated so that novel sustainable foods can be more successfully introduced into the market. Further, other individual difference constructs pertaining to food consumption should be investigated.

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