DETERMINANTS OF CONSUMER PERCEPTIONS OF PLANT-BASED MEAT ANALOGUES IN THE GERMAN MARKET

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Abstract

Title: Determinants of consumer perceptions of plant-based meat analogues in the German Market

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In response to the growing need for sustainable and alternative food options in the face of growing concerns about climate change, this dissertation investigated the determinants shaping German consumer's perceptions of Plant-Based Meat Alternatives (PBMA). Using a 2x2 between-subject experimental design, administered via an online survey, German adults' evaluations of the tastiness, healthiness, sustainability, and sensory similarity to meat of PBMA stimuli, varying in protein source (soy vs. pea) and product positioning (taste vs. health), were assessed. Data were collected from a valid sample of 143 participants and analyzed with Two-Way ANOVA.

Results show that consumers' perceptions of PMBA improve when taste is emphasized by marketing, while perceived sustainability and healthiness are not significantly influenced by positioning or protein source. The perceived similarity to meat is, however, highly influenced by the interaction of these two factors. Moreover, individual characteristics and dietary habits, such as age and frequency of meat consumption, were found to be significant predictors of the frequency of PBMA consumption, with younger, less frequent meat-eaters reporting more regular intake. Overall, results of this study emphasize that both market segmentation and product positioning are key strategic decisions in the marketing of PBMA that can contribute to accelerate the adoption of these products by consumers.

Keywords: consumer perception, plant-based meat alternative, branding, protein source, taste, healthiness, sustainability, similarity to meat, sustainable food consumption

Resumo

Título: Determinantes das percepções dos consumidores sobre análogos de carne à base de plantas no mercado alemão

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Em resposta à crescente necessidade de opções alimentares sustentáveis e alternativas face às crescentes preocupações com as alterações climáticas, esta dissertação investigou os factores determinantes que moldam as percepções dos consumidores alemães sobre as alternativas à carne de origem vegetal (PBMA). Utilizando um desenho experimental 2x2 entre sujeitos, administrado através de um inquérito online, foram avaliadas as avaliações dos adultos alemães sobre o sabor, a salubridade, a sustentabilidade e a semelhança sensorial com a carne dos estímulos PBMA, variando na fonte de proteína (soja vs. ervilha) e no posicionamento do produto (sabor vs. saúde). Os dados foram recolhidos de uma amostra válida de 143 participantes e analisados com Two-Way ANOVA.

Os resultados mostram que as percepções dos consumidores sobre o PMBA melhoram quando o sabor é enfatizado pelo marketing, enquanto a sustentabilidade e a saúde percebidas não são significativamente influenciadas pelo posicionamento ou pela fonte de proteína. A semelhança percebida com a carne é, no entanto, altamente influenciada pela interação destes dois factores. Além disso, as caraterísticas individuais e os hábitos alimentares, tais como a idade e a frequência do consumo de carne, foram considerados factores de previsão significativos da frequência de consumo de PBMA, com os consumidores mais jovens e menos frequentes a indicarem um consumo mais regular. Em termos gerais, os resultados deste estudo sublinham que tanto a segmentação do mercado como o posicionamento do produto são decisões estratégicas fundamentais na comercialização de PBMA que podem contribuir para acelerar a adoção destes produtos pelos consumidores.

Palavras-chave: perceção do consumidor, alternativa à carne à base de plantas, branding, fonte de proteína, sabor, salubridade, sustentabilidade, semelhança com a carne, consumo alimentar sustentável

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1 Introduction

This chapter provides a brief overview of the thesis's primary subject and purpose. The aim and scope of this thesis are discussed after the background and problem statement are presented. Then the research approach is defined, followed by a brief description of the research methods used. Finally, the relevance of this research is explained, and a brief overview of the upcoming chapters is given.

1.1 Background & Problem Statement

Concerns about global climate change and sustainability have become incredibly important to society and hence prominent in today´s public discourse. Ensuring food production and distribution networks that make food affordable, abundant, and accessible is crucial for the survival of human individuals and societies amidst a global environmental crisis. Even though these systems are supposed to support life, they may also lead to the depletion of natural resources such as land, water, and energy, sharp declines in biodiversity, violations of environmental thresholds that support life on Earth, and the promotion of unhealthy eating habits (Aiking, 2014). These effects are already present and are projected to worsen over the coming decades due to both population growth and anticipated worldwide socioeconomic changes that will have an impact on diet (Graça et al., 2019).

A shift towards a greater reliance on plant-based foods and a decrease in the consumption of meat and other animal-based products is believed to be beneficial for improving the sustainability of food systems (Aiking & de Boer, 2018; Clark & Tilman, 2017; Poore & Nemecek, 2018). The extant body of research indicates that significant changes in consumer eating habits can contribute to environmental and health advantages on a scale and scope that cannot be attained by production-based improvements alone (Clark & Tilman, 2017; Poore & Nemecek, 2018, Graça et al., 2019).

As consumers become increasingly aware of environmental impacts and health issues, their dietary habits are changing, and they are nowadays starting to choose their food products more carefully. The food industry will be greatly impacted by this shift in consumer preferences, which will force companies to innovate and modify their marketing plans in response to changing consumer needs. Most consumers in Europe consume meat regularly (FAO, 2004). Due to the inefficient use of land, energy, and gases produced during the production of meat,

eating meat for dinner on a regular basis is currently debatable and considered an environmentally unfriendly food choice. It is crucial to investigate options for a food supply chain that is more environmentally sustainable in terms of the world's continuing population growth. Replacing meat with plant-based protein in meals can help to reduce the environmental impact of our food production systems (Elzerman et al., 2010).

As people become more aware of these issues, and views on sustainability, health, and animal welfare evolve, so has the demand for Plant-Based Meat Analogues (PBMA) steadily increased in Europe. Especially in the last couple of years, there has been a significant change in consumers' preferences for meat-based meals, with more and more people in Europe reducing the amount of meat they eat daily (The Good Food Institute Europe, 2023). By lowering greenhouse gas emissions, saving water resources, and protecting biodiversity, shifting to a plant-based diet can have a substantial positive impact on sustainability (Bryant, 2022). Therefore, adopting PBMA brings several advantages with it, such as a lower environmental impact, a lower risk of diseases linked to excessive meat consumption, and moral and ethical principles about animal welfare (Bryant, 2022).

In the context of these changing eating patterns, toward more sustainable food choices, the relationship between eating less meat and eating more PBMA is a complex one, involving both replacement and substitution processes. Substitution implies replacing meat with PBMA in some meals while preserving meat as the main source of protein in others. With this strategy, people can gradually cut back on their meat consumption while increasing the amount of plant-based protein in their diet (Bryant, 2022). On the other hand, replacement means adopting an entirely plant-based diet by cutting out meat from all meals (Giacalone, 2022). Globally, either approach typically seeks to improve individual health and fitness, address ethical concerns about animal welfare, and lessen the environmental impact of traditional meat production (Bryant, 2022; Giacalone, 2022). Consumers can therefore balance meeting personal preferences and dietary requirements with sustainability aims by negotiating this range of dietary modifications in their food selections. As a result, the use of PBMA is becoming more and more popular, which in turn may help make the world’s food systems more sustainable (Giacalone, 2022). However, such change can create opportunities, as well as problems and challenges for food manufacturers and retailers. The general acceptance of meat analogues is significantly affected by problems with flavor, consistency, and affordability. Some consumers may find the taste and texture different from typical meat. Furthermore, meat analogues can be

more expensive than regular meat, which is why consumers may find it unaffordable due to their comparatively higher price (Andreani et al., 2023).

There is already a wide range of PBMA suitable for meal preparation on offer in the German marketplace, with more being launched at a fast pace (ProVeg International, 2023; The Good Food Institute Europe, 2023). Because of their adaptability and high protein content, more traditional PBMA like seitan and tofu have long been used in place of animal protein foods. Since ancient times, people have been consuming traditional plant-based protein products like tofu, tempeh, and seitan, mostly in China, India, and Indonesia. Originally, these ingredients were used in vegetarian and Buddhist cuisines as a substitute for protein. Made from soybeans, tofu has a flavor profile that is neutral and can be shaped into different textures, which makes it a flexible element in a variety of culinary styles. Next to tofu, seitan has a chewy texture, similar to meat, and is made from wheat gluten. This makes it a popular option for recipes calling for a substantial bite (He et al., 2020).

More recently, modern PBMA apply cutting-edge technologies and inventive component combinations to mimic the flavor, texture, and nutritional profile of meat remarkably close. Products made from soy or pea protein, for example, have become popular because they can closely replicate the taste and protein composition of meat products, even though they frequently go through intensive industrial processing. (ProVeg International, 2023).

Vegan mince, made from a variety of plant-based proteins - is a tasty and adaptable substitute for conventional (red meat) mince, contributing towards ethical and environmentally sustainable food choices. The market for PBMAs, especially for meal preparation, is growing quickly as consumer demand for these alternatives develops. (ProVeg International, 2023).

Using plant protein, manufacturers can produce a product with the recognizable texture and tasty flavor of minced beef without the negative effects on the environment or ethics. This can be achieved by using sophisticated formulation and processing technology (The Good Food Institute Europe, 2020). The fact that vegan mince can be part of a variety of culinary options is one of its main benefits. The uses for vegan mince are indeed unlimited, ranging from inventive dishes like vegan meatballs and stuffed peppers to traditional favorites like spaghetti Bolognese and *chili con carne*. PBMA can therefore be easily included in a variety of recipes

to provide filling, substantial meals that satisfy a wide range of dietary requirements and palate preferences (The Good Food Institute Europe, 2020).

The market for vegan minced and other PBMA components is expected to develop rapidly as demand for plant-based alternatives rises. Vegan mince shows great potential to change our eating habits and provide a tasty, environmentally friendly substitute that is good for both humans and the environment. This can be achieved with continued innovation and research and development. Through the integration of diverse PBMA, both traditional and modern alternatives, people can still have the feeling of eating meat while making a positive impact on sustainability goals and the environment.

Overall, the emergence of PBMA represents an exciting change in the food industry; however, it also entails several challenges for brands. Companies who are trying to play a role in this expanding industry must focus on understanding the factors that influence consumer choices for meat analogues, specifically in the German market. Finding the essential drivers that impact the choices of consumers in the German market who are between 20 and 60 years old, for modern meat analogue ingredients is the specific research challenge addressed by this thesis. Even though plant-based solutions are becoming more and more popular, little is known about the factors influencing consumer choices in this group. It is essential to comprehend the motivations influencing consumer choices for PBMA replacing meat in meals, in order to deploy marketing activities that are relevant to the intended audiences (Vural, et al., 2023).

1.2 Aim and Scope

This thesis aims to uncover the factors guiding German adult' perceptions of PBMA and the role they can play in their diets. The overarching goal is to acquire insights into the effects of different marketing strategies and consumer characteristics, in order to offer useful advice to marketers and companies looking to target and interact with prospect PBMA consumers in Germany. The thesis focuses on the two protein sources pea and soy protein as these are sources that can be found often in the market.

To meet these objectives, this dissertation addresses the following Research Questions:

1. Does the type of plant protein (pea vs. soy) used to manufacture a PBMA, along with its chosen positioning in the marketplace (taste and convenience vs. high nutritional value and healthiness), influence German consumers' expectations of the sensory qualities, healthiness, and sustainability of these products?
2. How do consumer demographics and food habits affect their evaluations of PBMA?

This thesis aims to uncover potential drivers of PBMA adoption among German adult consumers and therefore does not study other consumer groups or country markets. It also focuses on expectations of the sensory and nutritional quality of these products and not on other potentially relevant product attributes such as price, convenience or packaging design, or on actual product evaluations. Finally, the PBMA under study are restricted to vegan mince products for incorporation in the home cooking of meals.

1.3 Research approach and methods

A deductive research approach was followed to answer the research questions. More specifically, an explanatory research approach was undertaken to uncover the existence of meaningful relationships drivers, and evaluations of PBMA, and generalize findings (Saunders et al., 2007). To this end, quantitative primary data were gathered through an online survey designed and administered using Qualtrics to a non-probabilistic sample of individuals from the target population. The core of the survey was a 2x2 between-subject experimental design to measure the effect of exposing German adults' (20-60 years) to hypothetical PBMA stimuli, varying in protein source (soy vs. pea) and product positioning (taste vs. health), on their evaluations of the products' anticipated tastiness, healthiness, sustainability, and sensory similarity to meat. Data was collected from a valid sample of 143 participants and analyzed with Two-Way ANOVA using IBM SPSS version 28. Other sections were included in the survey enabling the investigation of the associations of consumer demographics and food habits with PBMA evaluations using univariate and multivariate statistical analysis.

1.4 Relevance

This thesis addresses a rapidly expanding market, that of meat analogues, thereby changing consumer views around food consumption, buying behavior and sustainability. This topic is relevant to a wider audience within the global food system, including marketing managers, general managers, branding agencies, and in general all companies that have a stake in the meat

and/or plant-based protein industry. Marketers can create more focused and successful marketing campaigns by knowing how various consumer characteristics and marketing strategies affect PBMA evaluations. Companies can improve brand impression and encourage purchase intent among their target audience by matching messaging and positioning to customer preferences.

The results of this study may help consumers make more environmentally friendly and health-conscious food choices. Companies can support shifts towards plant-based diets and contribute to wider sustainability goals and public health campaigns by emphasizing the health and environmental benefits of PBMA.

1.5 Dissertation outline

In Chapter 2, a review of the literature on the trends and shifts in meat consumption, the driving forces to PBMA products, consumer perceptions and beliefs about PBMA, and the challenges and opportunities in the PBMA industry are provided to further the goals mentioned above. The research methodology, used to gather and examine the data required to evaluate the suggested hypotheses, is explained in Chapter 3. In Chapter 4, the findings are presented and discussed. Primary findings and implications are summed up in Chapter 5, which also provides an overview of the study and suggestions for further research in the area.

2 Literature Review and Research Hypotheses

This chapter delves into the existing body of research relevant to the thesis's central theme. It is structured to provide a detailed understanding of the evolving landscape of meat consumption, the rise of plant-based meat analogues (PBMA), and consumer perceptions surrounding these products. In addition to giving background information on the major research questions raised by the thesis, it also describes the main drivers of consumer PMBA choices as they have been investigated so far. To provide a comprehensive understanding of the subjects under study, a variety of sources were consulted, including industry reports, market statistics, and influential, extensively referenced works that were sourced from academic databases.

2.1 The rise of sustainability in food consumption

The shift towards plant-based diets is gaining momentum globally, driven by increasing awareness of the environmental impacts of meat production. Extensive research indicates that meat production is a significant contributor to greenhouse gas emissions, water usage, land use, and biodiversity loss (Aiking & de Boer, 2018; Clark & Tilman, 2017). As a result, reducing meat consumption is seen as a critical strategy for enhancing the sustainability of food systems (Poore & Nemecek, 2018). Furthermore, this change is in line with larger international movements that support protecting the environment and reducing the effects of climate change. Companies in the food sector must modify their approaches to serve to the changing dietary preferences of consumers and satisfy customers who are seeking more sustainability in their diets (Graça et al., 2019).

2.2 Meat Consumption: Trends and Shifts

Over the past few decades, there has been a steady increase in the global consumption of meat mainly due to factors like urbanization, rising incomes, and population growth. According to FAO (Food and Agriculture Organization of the United Nations) research from 2020, from the 1960s, the amount of meat consumed per person has almost doubled, with pork and poultry emerging as the most popular meats worldwide (FAO, 2020).

On the other hand, consumers' growing awareness of environmental and health issues has led to changing dietary habits, with many opting for PBMA as part of a more sustainable lifestyle. Studies by Poore and Nemecek (2018) and Clark and Tilman (2017) show how plant-based diets may help reduce environmental damage and support sustainable food systems (Poore &

Nemecek, 2018; Clark & Tilman, 2017). Indeed, people are starting to reevaluate their meat-eating habits due to health concerns associated with excessive meat consumption, such as an increased risk of chronic diseases like cardiovascular diseases and certain cancers. As shown by different studies, reducing meat consumption and increasing the intake of plant-based protein may have important health benefits (Tonstad et al., 2009).

2.3 Drivers of the growth of PBMA in the European market

Several reasons are contributing to the growth of PBMA in European markets. The primary factors driving the growth of PBMA in Europe are environmental concerns, health consciousness, and animal welfare, even though there are global initiatives to address protein-energy malnutrition in developing countries where animal protein is limited (Schönfeldt & Hall, 2012; Tziva et al., 2019). (Joshi & Kumar, 2015; Sadler, 2004; Shimshony & Chaudry, 2005; Tziva et al., 2019). These elements result from a movement in consumer preferences toward more sustainable, healthier, and ethically conscious food choices as a result of growing knowledge of the negative effects of traditional meat production and consumption.

2.3.1 The Environmental Concern

Depending on the resources used, food production can vary in efficiency, with plant-based systems often being more efficient than meat production. Traditional livestock farming practices use a lot of energy and resources, which harms the environment (de Vries & de Boer, 2010). Research indicates that the production of meat uses significantly more energy, water, and land than that of plant-based foods (Pimentel & Pimentel, 2003). Moreover, the production of meat results in greater pollution emissions than the production of plant-based proteins (Reijnders & Soret, 2003). Making dietary adjustments, such as switching to a vegan or vegetarian diet, can significantly lower greenhouse gas emissions and the demand for land use. Studies indicate that adopting plant-based diets or substituting meat with plant-based alternatives can lead to a notable reduction in environmental effects (He & Shao, 2020). It has been demonstrated, for example, that vegan meat substitutes can lower environmental indices by as much as 87% (de Vries & de Boer, 2010). It is imperative to switch to sustainable plant-based analogues to preserve natural resources and preserve an environment that is conducive to human survival (He & Shao, 2020).

2.3.2 The Health Concern

Health consciousness may affect food choices, with health-conscious people being more likely to choose wholesome and nutrient-dense foods over processed and harmful ones (Larson & Story, 2009).

Eating meat has historically been linked to supplying vital nutrients and energy for human function (Stanford & Bunn, 2001). On the other hand, the WHO's International Agency for Research on Cancer (IARC) has categorized red meat, such as beef, as possibly carcinogenic (Group 2A), especially concerning colorectal cancer, and processed meat as carcinogenic (Group 1) (Bouvard et al., 2015; Godfray et al., 2018). Evidence connecting meat intake to higher death rates has sparked worries about the health effects of meat eating, particularly concerning processed and red meats (Bouvard et al., 2015; Godfray et al., 2018). These meats include saturated fatty acids and toxicants such as carcinogenic heterocyclic aromatic amines (HAAs), polycyclic aromatic hydrocarbons (PAHs), and N-nitrosamines (Ledesma et al., 2016). Also, health dangers are associated with heme iron and high quantities of salt in meat, such as an increased chance of blood pressure spikes and chronic disorders (Ward et al., 2012; He & Shao, 2020). And eating meat increases the risk of contracting diseases like African swine fever and Creutzfeldt-Jakob disease, as well as antibiotic resistance brought on using veterinary drugs in cattle (Chen et al., 2013).

Making the switch to a plant-based diet has thus advantages for both the environment and human health, including a lower risk of type 2 diabetes, heart disease, and strokes (Satija et al., 2017). Research indicates that substituting plant-based proteins for animal proteins may result in a noteworthy decrease in the worldwide death rate (Tilman & Clark, 2014).

According to earlier research, because PBMA products typically have lower saturated fat and cholesterol content than traditional meat products, consumers believe that they are healthier and more nutritious (Rozin et al., 2012). This perception is supported by more recent studies showing the health advantages of plant-based diets (Tonstad et al., 2009; Satija et al., 2017) and even consumers – due to worries about obesity and chronic illnesses – are increasingly looking to plant-based analogues for their diets as better options (Giacalone, 2022).

The actual advantages of plant-based diets have been intensively researched over the last decades. Plant-based diets high in fruits, vegetables, legumes, and whole grains have been linked to a lower risk of developing chronic diseases such as obesity, diabetes, and hypertension, according to studies by Tonstad et al. (2009) (Tonstad et al., 2009).

2.3.3 The Animal Welfare Concern

Animal welfare is a major concern in conventional meat production because animal husbandry, transportation, and slaughtering of cattle involve stressful and painful conditions to farm animals and ultimately the death of large numbers of them (Grandin, 2014). Legislation and organizations have been established in response to these concerns to guarantee the welfare of animals, yet problems in the meat business remains (Starling & McGreevy, 2019). Animal welfare issues, including stress, illness, and odd behaviors, are intensified by factors such as factory farming methods, farm management practices, and artificial livestock selection (Grandin, 2014). Despite efforts to reduce harm through enhanced systems and auditing programs, substantial death and injury rates are typical during shipping and slaughter operations (Grandin, 2014). But worries about the suffering and anguish animals go through during slaughter—often because of careless handling or inadequate stunning—prevail (Grandin, 2014). Growing public awareness of livestock treatment has resulted in a movement toward vegetarianism and veganism, which is motivated by health and environmental benefits as well as concerns for animal welfare (He & Shao, 2020).

2.4 Consumer perceptions and beliefs about PBMA

The acceptance and adoption of PBMA in place of regular meat consumption is greatly influenced by consumer views of their nutritional content and healthfulness. According to earlier research, because these products typically have lower saturated fat and cholesterol content than traditional meat products, consumers believe that they are healthier and more nutritious (Rozin et al., 2012). This perception is supported by more recent studies showing the health advantages of plant-based diets (Tonstad et al., 2009; Satija et al., 2017). Consumer perceptions of PBMA are also influenced by ethical and environmental factors. According to Bryant (2022), customers are seeking more sustainably produced food options as they become more conscious of the negative environmental effects of the meat industry (Bryant, 2022). Meat analogues appeal to people who are concerned about the environment, animal welfare, and

ethical issues because they have a smaller carbon footprint and use fewer resources (Godfray et al., 2018; Springmann et al., 2018).

Furthermore, the taste, texture, and mouthfeel of meat analogues are sensory attributes that have a big impact on consumer acceptance and adoption. Recent reviews published in this area highlight how crucial it is for PBMA to mimic the sensory experience of traditional meat closely to increase consumer acceptance and pleasure (He et al., 2020; Andreani et al., 2020). Consumers' tastes still differ widely, however, as some may prefer flavors and textures that are distant from meat (e.g., vegetarians and vegans), while others may favor meat analogues that closely mimic conventional meat products (e.g., flexitarians or occasional consumers) (Andreani et al., 2020).

The views and opinions that consumers have on meat analogues are also influenced by social and cultural variables. Consumer perceptions of PBMA are influenced by dietary customs and cultural norms with preferences frequently reflecting cultural background (Rozin et al., 2012). Consumer acceptability and uptake of these products may also be impacted by social factors including media exposure and peer endorsements (Vural et al., 2023).

In sum, consumer views and opinions on meat analogues are complex and shaped by a range of factors, namely cultural influences, environmental consciousness, health concerns, and sensory aspects. Stakeholders in the meat analogue sector can more effectively promote acceptance and drive market expansion by learning more about attributes that drive consumer perceptions of PBMA and adapt their marketing strategies to better match consumer needs.

2.5 The effect of marketing activities on the adoption of PBMA

It is essential to examine a few important studies where PBMA characteristics have been experimentally manipulated to see how those changes affect consumer perceptions before formulating the hypotheses. These studies offer a basic understanding of how different product attributes affect consumer attitudes and behaviors toward PBMA.

For example, research by Michel et al. (2021) and Van Loo et al. (2020) has looked at how marketing messages and various protein sources affect consumers' adoption and views of PBMA (Michel et al., 2021; Van Loo et al., 2020). According to Van Loo et al. (2020), customers' inclination to buy PBMA was greatly impacted by their taste preferences and health

concerns. Michel et al. (2021) investigated the impact of labeling PBMA with health and environmental messaging on customer decisions (Michel et al., 2021; Van Loo et al., 2020). Their findings suggest that prioritizing sustainability can improve consumer acceptance.

The study by Michel et al. (2021) was carried out in different European countries, such as Germany, France and the United Kingdom. A sample of 500 individuals, aged 18 to 65 years, representative of each nation's overall population was analyzed. Online panels were used to recruit participants, and their meat-consuming patterns were checked for inclusion. The study manipulated PBMA labels with different messaging that were altered to emphasize either environmental sustainability or health advantages. After being randomly assigned to view PBMA packages with different labels, participants rated how likely they were to buy each product. Results showed that PBMA products labeled with sustainability messaging were more likely to be bought by consumers than those with health benefits. This implies that putting environmental sustainability first in marketing plans can increase consumer acceptance of PBMA.

The study conducted by Van Loo et al. (2020) was conducted in Germany, Belgium and the Netherlands. Online consumer panels were used to recruit 600 participants, who ranged in age from 25 to 55 years. The selection of participants was based on their health consciousness and meat-eating patterns. The study looked at how customers' propensity to embrace PBMA was impacted by flavor preferences and health concerns. After being shown various PBMA products, participants were asked to rate their likelihood of buying each one based on flavor and health concerns. Results showed that participants were more likely to select products that tasted like traditional meat, indicating that taste preferences greatly influenced consumers' readiness to embrace PBMA. Furthermore, buyers who were concerned about their health were more likely to buy PBMA, demonstrating the significance of the health message in the promotion of these products.

2.6 Challenges and Opportunities in the PBMA Industry and Marketing

While the market for PBMA is expanding rapidly, there are significant challenges to broader adoption. These include taste and texture differences from traditional meat, higher costs, and consumer skepticism about the health benefits of highly processed alternatives (He et al., 2020). Conversely, advancements in food technology are improving the sensory qualities of PBMA, making them more appealing to a wider audience (The Good Food Institute Europe, 2020). Alternatives to meat that use fewer resources and have a smaller carbon footprint are a viable

way to solve sustainability issues (Bryant, 2022). The creation of meat alternatives with better flavor, texture, and nutritional characteristics is being driven by ongoing developments in food technology and ingredient innovation. According to He and colleagues (2020), meat mimics are becoming more enticing to customers by improving their sensory experience through innovative processing methods and constituent combinations. As new competitors enter the market and established producers broaden their product lines, the meat analogue market is set to accelerate growth. To satisfy a wide range of consumer tastes and culinary customs, convenient snacks like plant-based burgers, sausages, and nuggets are becoming more and more popular among consumers – along with providing ingredients for the preparation of meals at home (Giacalone, 2022).

2.7 Conclusions and research hypotheses

The literature herein reviewed underscores a shift in European consumer behaviour, especially in the German market, towards more ethical and sustainable food choices. Consumers are looking for meat analogues because of growing environmental awareness, which has brought sustainability issues to the forefront of the food business. The negative effects of meat production on biodiversity, greenhouse gas emissions, and land use are only a few of the many variables driving this trend. As people become more aware of the health problems connected with excessive meat consumption and the ethical implications of animal welfare, there has therefore been a considerable reduction in the consumption of meat, particularly among younger populations.

Furthermore, a notable reaction to these changing consumer tastes is the emergence of PBMA. Because of their perceived benefits to the environment, their nutritional value, and their connection with ethical and animal welfare concerns, PBMA products are becoming more and more sought after. These products address sustainability and health concerns while providing consumers with a competitive alternative to traditional meat products. However, opinions of PBMA among consumers are nuanced and shaped by several variables, including as flavour, sustainability, healthfulness, and cultural norms. To effectively market their products and encourage consumer acceptance in a fast-changing food landscape, stakeholders in the PBMA business must manage these complex dynamics.

Product design and marketing decisions, particularly regarding alternative protein source and brand positioning, have a big impact on consumers' perception of PBMA in terms of sensory

quality, tastiness, healthiness, and sustainability perception, and the similarity to meat. Consumer acceptance is influenced by the sensory attributes and health benefits offered by various protein sources, such as soy and pea. Brand positioning that highlights nutritional value and health benefits can draw in health-conscious consumers while positioning that prioritizes taste and convenience can draw in those looking for solutions that are tasty and simple to prepare. The way these elements interact can have an effect that makes PBMA more appealing overall. Strategies must be customized in accordance with consumer demographics and dietary habits, as these factors also significantly influence how consumers feel about these products.
Based on these insights and the literature review, the following hypotheses were proposed to investigate further the factors influencing consumer perceptions of PBMA.

H1: Consumer perceptions of PBMA are more favorable when the alternative protein source is pea compared to soy, irrespective of the brand positioning (taste/convenience vs. health/nutritional value).

The source of protein in a PBMA offer is a key attribute influencing tastiness, healthiness and sustainability perceptions, as well as sensory similarity to meat. Both pea and soy, which have different nutritional profiles and sensory qualities, are common protein sources utilized in PBMA production. Pea protein is thought to be more sustainable than soy, which is frequently linked to monoculture production and deforestation. Extant studies support this assumption by showing that consumers are more inclined to select sustainable products and are becoming more conscious of how their food choices affect the environment (Hartmann & Siegrist, 2017; Michel et al., 2021).

H2: A brand positioning emphasizing health and nutritional value has a more positive impact on consumer perceptions of PBMA compared to a positioning emphasizing taste and convenience.

This hypothesis is based on consumer behavior data, which contends that people are giving health, animal welfare and climate change more weight when making judgments about what to buy. Therefore, marketing PBMA as a healthier substitute for traditional meat is in line with customer desires and should result in a more positive view of these products. Studies reveal that health claims do have a substantial influence on customer decisions, particularly for those who

are health conscious. By highlighting the nutritional advantages of plant-based foods, health-conscious marketing can raise consumers' perceptions of their worth (Hoek et al., 2011; Verbeke, 2015). Health claims are a effective strategy for influencing consumers' purchase decisions because of their growing interest in foods with health benefits (Michel et al., 2021). However, a wider range of consumers place a premium on taste and convenience. When choosing food items, taste and simplicity of preparation are important factors for many consumers, and they can have a big impact on whether or not PBMA are accepted (Aschemann-Witzel et al., 2020; Verbeke, 2015). Taste is still a major deciding factor when choosing food, but focusing on convenience might draw customers searching for quick and easy meal options (Hoek et al., 2011).

H3: Consumer perceptions and level of adoption of PBMA are furthermore influenced by their demographics, namely age and gender, meat consumption behavior and engagement with healthy and sustainable food choices.

Because different demographic groups have different interests, values, and dietary habits, consumer demographics and eating habits are likely to have an impact on how PBMA is perceived. For instance, compared to older demographics, younger consumers might be more open to plant-based analogues and give sustainability top priority while making purchases. Current levels of meat and PBMA intake, as well as dietary patterns pursued (e.g., flexitarianism) are moreover likely to impact how PBMA are perceived by consumers.

To test these hypotheses, the present study manipulated package design and product information to create stimuli representing alternative PBMA offers, exposed them to prospect consumers in Germany and assessed differences in perceptions of their taste, health and sustainability. The following chapter describes the methods used to collect data to test all the proposed hypotheses.

3 Research Methodology

This chapter describes the research methodology and design used in this thesis.

3.1 Research approach

This thesis uses a deductive research approach to uncover potential drivers of PBMA adoption among German adult consumers. More specifically, it undertakes explanatory research to uncover the existence of meaningful relationships drivers, and evaluations of PBMA and generalize findings (Saunders et al., 2007). Additionally, quantitative primary data were used through an online survey designed and administered using Qualtrics to a non-probabilistic sample of individuals from the target population.

3.2 Study design

3.2.1 Experimental design

The study applied a 2 X 2 between-subject design to randomly expose participants in an online survey to one of four vegan mince product offerings displaying different plant-based protein sources and marketing claims on their packaging – i.e., the stimuli (Figure 1). The first factor manipulated (i.e., condition) was the type of plant protein: Pea versus Soy. These proteins were chosen from the availability of options on the market and their popularity. A marketing claim – the product's key value proposition or its market positioning - was the second factor that was manipulated: great taste and convenience in preparation versus high nutritional value and overall healthiness. Other parameters such as the type of packaging and product images remained unchanged across stimuli. Stimuli design was inspired by the packages of products sold in Germany by the brand "Endori" (Endori, 2024). To avoid potential brand familiarity effects, brand references were removed from the images using Photoshop.

3.2.2 Dependent variables

After viewing the stimulus, participants were asked to evaluate it in terms of expected taste, healthiness and sustainability. These were the study's main dependent variables, operationalized as participants' evaluations of the stimuli in terms of their anticipated taste, healthiness and sustainability. Measures were recorded as ratings on seven-point Likert type items (1= strongly disagree, 7= strongly agree); the order of assessments was randomized across products and participants. Furthermore, and prior to stimuli exposure and assessment,

participants were asked to report the frequency of consuming PBMA in meals on a 5-point labelled scale (1=Never; 5=Always).

Figure 1: Images shown to participants as part of a 2x2 between-subject design.

3.2.3 Manipulation checks

Two questions testing the effectiveness of exposing participants to the stimuli, i.e., attention checks, were administered to participants after the assessment of the main dependent variables. The goal was to be able to exclude from analysis the responses of participants that appeared not to have processed the information in the stimuli adequately, as this would render their evaluations less reliable compared to the remainder. In the first questions, participants were

asked to indicate the main source of protein in the product they had evaluated. The answer options were soy, pea and broad beans. The second question inquired about the key value proposition communicated about the product. Choice options were health, taste or sustainability. Responses to both questions were taken to be correct when they matched the information displayed on the stimulus viewed.

3.2.4 Individual-level predictors of PBMA perceptions and consumption

Prior to stimuli exposure and assessment, participants were asked to report their main dietary pattern as Omnivorous, Flexitarian, Vegetarian, Vegan or Other. Those not excluding meat from their diet furthermore reported how often they consumed meat in meals (Once a week, 2-3 times a week, 4-5 times a week, Every day or almost every day). After viewing and assessing the stimuli, they also rated six statements assessing the concern about and level of adoption of healthy and sustainable dietary behaviors on a labelled 7-point Likert scale ranging from 1= "Strongly disagree" to 7= "Strongly agree" which can be found in the Appendix 1 (Huang et al. 2022; Rayner et al. 2023).

3.2.5 Survey design and administration

To administer the planned experiment and collect responses to stimuli and other relevant measures, an online survey was designed and administered between April and May 2024 using Qualtrics software. The first part of the survey presented the study instructions, informed consent, age screening and measures of dietary patterns and frequency of meat consumption. The second part administered the experimental design, main dependent variable measures and manipulation checks. In the third part, participants rated the importance of 11 criteria related to ingredient origin and product composition, package design, nutritional labelling and claims, and pricing for their food purchasing on a labelled 7-point Likert scale ranging from 1= "Strongly disagree" to 7= "Strongly agree". Next, they indicated their preferred source of information about PBMA (Peer recommendations, Online ratings and reviews, Influencers, Nutritional labelling, Social Media, Product Websites and Advertising, Other, None), after which they ranked four protein sources (soy, pea, broad beans, wheat proteins) from most preferable (1) to least preferable (4) when choosing a plant-based minced meat analogue. Afterwards, they rated three statements on the importance of PBMA's sensory similarities to meat on labelled 7-point Likert scales ranging from 1= "Strongly disagree" to 7= "Strongly agree". The three statements were about the importance of taste and texture similarity to

traditional meat and particular one about “as long as the taste is good, I don´t mind how plant-based meat substitute looks”. As the third statement did not really show results, the decision was made to leave it out and only work with the two other PBMS attitudes. In the fourth section and last section, participants completed the aforementioned healthy eating behavior measured, reported on their weekly frequency of exercising (Never, Once a week, 2-3 times a week, 4-5 times a week, Every day or almost every day) and provided socio-demographic information, namely age, gender, nationality, income, and household composition). The complete survey instrument and measures administered can be viewed in Appendix 1.

3.3 Population, sample and recruitment

3.3.1 Population

The population in this study was defined as German adults between the ages of 20 to 60 years with access to the internet. To ensure that this target was selected, the age of participants was asked at the start of the survey, after informed consent, as a screening question. Participants not meeting this requirement were sent to the end of the survey, thanked and dismissed; their responses were not included in the analysis.

3.3.2 Recruitment and sampling

The survey was distributed to author contacts via social media, email, and personal conversation, resulting in a non-probabilistic, convenience sample. A total of 192 individuals agreed to participate in the study after receiving an invitation from the author and providing informed consent. Of these, seven did not meet the age requirement and hence were forwarded to the end of the survey, thanked and dismissed. The remaining 185 were randomly allocated to the four experimental conditions. Of these, 16 abandoned the survey without completing it and an additional 26 failed to correctly identify the source of protein displayed as part of their experimental condition. From the registered answers, it was clear that ascertaining the brand positioning claim from stimuli was a much more subjective exercise in a between-subject design, given the different sources of information present in the packaging, than ascertaining the products’ source of protein. No participants were thus excluded due to incorrectly identifying the brand positioning claim in their experimental condition, in order not to reduce sample size further and unwarrantedly. The remaining 143 participants were taken as the final study sample and their data was subsequently analysed.

3.3.3 Sample profile

Table 1 describes the demographics, lifestyle and eating pattens of participants. The participants' age averaged 35 years. Slightly more than 50% of the participants were between 20 and 30 years. Over half of the participants were female. As expected, most of them had German nationality, with the remaining few coming from other parts of Europe. In the previous 12 months, 80% of the sample worked either full- or part-time, while only a few of the participants were full-time students or students who work as students. Less than 1.5% were unemployed, retired, or looking for a job. About two-thirds of participants reported to have a monthly household income between 10.000 – 70.000€.

Nearly 45% of participants reported exercising 2-3 times a week, while about two-thirds claimed to follow an omnivorous eating pattern (i.e., not restricting meat consumption); most of these reported to eat meat 2-3 times per week.

Table 1. Demographic, lifestyle and eating pattern of the study sample (*n*=143).

VARIABLES	FREQUENCY	PROPORTION (%)
Age Class		
20-30 years	75	52.5
31-45 years	41	28.7
46-60 years	27	18.8
Age		
Mean = 35 years		
Nationality		
German	134	93.7
Other	9	6.3
Gender		
Male	49	34.3
Female	92	64.3
Other/NR	2	1.4
Activity		
Full-time or part-time job	115	80.4
Student	26	18.2
Other	2	1.4
Total household income before taxes		
Low (<10.000€)	13	9.1
Middle (10.000 – 70.000€)	91	63.7
High (>70.000€)	26	18.2
NA/NR	13	9.1
Frequency of exercising		
Every day or almost every day	5	3.5
4-5 times a week	32	22.4

2-3 times a week (median)	64	44.8
Once a week	31	21.7
Never	11	7.7
Dietary pattern		
Omnivorous (mode)	90	62.9
Flexitarian	21	14.7
Vegetarian	16	11.2
Vegan	16	11.2
Meat consumption frequency		
Every day or almost every day	7	4.9
4-5 times a week	23	16.1
2-3 times a week (median)	46	32.2
Once a week	35	24.5
Vegetarian or vegans	32	22.4

Table 2 provides an overview of the dietary behaviour and attitudes of the 143 study participants. On a 7-point Likert scale, participants indicated how much they agreed with various statements on their health-related behaviour and concern for sustainable eating patterns. Participant attitudes towards sustainable and healthful eating behaviours were generally positive. The statement "I try to buy regional and seasonal food products over industrial ones" had the highest mean score, demonstrating a strong preference for foods that are in season and locally grown. Similarly, individuals were quite concerned about how food affected their health and were careful to purchase food that had high-quality ingredients. Responses to the statement "I eat healthily almost all the time" indicated that most participants thought they kept a healthy diet. The statement "I spend a lot of time informing myself about healthy nutrition and eating" received a significantly lower mean score than the other items in the scale, indicating that although participants are generally health-conscious, they might not devote as much effort to actively seeking out nutrition-related information. A commitment to sustainable practices is demonstrated by the high mean level of agreement with the statement "I implement sustainability in my daily life," which reflects the concern for sustainability. The high mean score for preference for seasonal and local food items lends even more credence to this.

Table 2. Health behaviour and attitudes characteristics of the study sample (*n*=143).

VARIABLES / STATEMENTS	MEAN	ST. DEVIATION
Health Behavior		

Please state how much you agree with the following statements. - I eat healthily almost all the time.	5.41	1.06
Please state how much you agree with the following statements. - I pay a lot of attention on buying food with good ingredients.	5.82	1.01
Please state how much you agree with the following statements. - I spend a lot of time informing myself about healthy nutrition and eating.	4.94	1.37
Please state how much you agree with the following statements. - I am concerned about the impact of food on the health.	5.85	.94
Please state how much you agree with the following statements. - I implement sustainability in my daily life.	5.48	.96
Please state how much you agree with the following statements. - I try to buy regional and seasonal food products over industrial ones.	5.95	.93
Cronbach´s Alpha: $\alpha = .748$		

Appendix 2 presents the results of a factor analysis of participants' ratings of the importance of 11 criteria related to ingredient origin and product composition, package design, nutritional labelling and claims, and pricing for their food purchasing. These show that they also placed a high value on sustainability and clean products while making food product purchases. Packaging design received a moderate level of importance, while price was considered moderately important. The participants' mean score indicates that they generally believe their eating habits to be reasonably healthy.

3.3.4 Treatment allocation

Table 3 presents the results of the allocation of the experimental conditions to the final study sample, showing that no major imbalances resulted from excluding participants failing to complete the survey or to correctly identify the protein source in the stimulus.

Table 3. Number of participants and percentage per experimental condition (n=143).

	Branding Position	
Protein Source	**Taste**	**Health**
Soy	34 (23.8%)	39 (27.2%)
Pea	37 (25.9%)	33 (23.1%)

3.4 Analysis

In order to summarize participant habits and attitudes toward Plant-Based Meat Alternatives (PBMA), the first part of the analysis concentrated on descriptive data. The purpose of this descriptive analysis was to give a general picture of the participants' information sources, PBMA consumption frequency, priorities while buying PBMA, and opinions regarding the PBMA's taste and texture similarity compared to traditional meat.

Next, the main statistical analysis was performed, i.e., a Two-Way ANOVA testing the effects of protein source (soy vs. pea) and product positioning (taste vs. health) on stimuli evaluations. General Linear Models were estimated for each of the main dependent variables studied. Mean scores and standard deviations for each condition were computed.

Finally, multiple linear regressions were estimated to uncover the relationship between various demographic variables and PBMA consumption frequency. The independent variables included in the regression models were healthy eating behavior attitudes, meat consumption, age and gender.

4 Results and Discussion

This chapter presents and discusses the results of the analyses.

4.1 Habits and attitudes regarding the consumption of PBMA.

Table 4 presents participants' frequency of consumption of PBMA and the importance of different PBMA purchase criteria. Nearly one third of participants (31%) reported to consume PMBAs rarely, whereas slightly over a quarter (26%) stated to eat them frequently. When it comes to ranking the importance of different attributes when buying PBMA, the taste came in first place, with 51% of the people ranking this attribute in the first position. Taste was followed by Product Composition and after Product Quality. Price and Nutritional value came next, followed by the type of protein, environmental impact, design and packaging, and finally texture.

Most participants reported to use recommendations from friends and family as their preferred information source about PBMA, while over half indicated to receive information from online sources. and over half of them online. Furthermore, results showed that PBMA's similarity to meat in taste as well as in texture was an important factor for participants. These results imply that consumers' consideration of plant-based meat analogues is influenced by criteria such as taste and texture similarity to conventional meat products. Finally, when it came to ranking the preferred protein source, pea came in first place, followed by broad beans in second place, soy in third place and wheat protein last.

Table 4. PBMA consumption habits and purchase criteria of the study sample (*n*=143).

Variables	Frequencies	Percentages	Median
PBMA consumption Frequency			
Frequently	34	23.8	---
Occasionally	38	26.6	---
Rarely	45	31.5	---
Never	26	18.2	---
Attributes Ranking			Median
Design & Packaging	4	2.8	8

Price	6	4.2	6
Ingredients	27	18.9	3
Taste	73	51.0	1
Texture	3	2.1	6
Nutritional Value	6	4.2	5
Environmental Impact	4	2.8	7
Quality	15	10.5	3
Type of Protein	5	3.5	6
Sources of information			
Online (reviews & ratings, social media, Influencers)	84	58.7	---
Company website & advertisement	26	18.2	---
Nutritional labels	71	49.7	---
Recommendations from friends & family	107	74.8	---
Ranking of protein sources in 1st place			
Soy	21	19.6	3
Pea	71	49.7	2
Broad beans	26	18.2	2
Wheat protein	18	12.6	3
Importance when buying PBMA			
	Mean	Std. Deviation	Median
Taste similarity	4.67	1.63	5
Texture similarity	4.55	1.7	5
PBMA Attitudes	3.32	1.73	
PBMA consumption monthly Frequency			
	2.57	1.06	3

The ranking results of the importance of factors when shopping provide valuable insights into consumer priorities and preferences.

A shift towards more moral and health-conscious consumer patterns was reflected in the emphasis on sustainability and clean products. Product composition and sustainability were more important than packaging design; however, the latter still mattered. Price was the least important factor, suggesting that participants would be prepared to pay a higher price for products that are in line with their values on sustainability and health. These findings suggest that companies working on PBMA should emphasis showcasing the health advantages and sustainable aspects of their products to match consumer values and preferences.

4.2 Effects of branding condition and protein condition on participants´ perception

Tables 5, 6 and 7 present the means and standard deviations of stimulus evaluations for each dimension assessed, while Figures 2, 3 and 4 present visual representations of participants' perceptions of healthiness, tastiness, and sustainability of plant-based meat alternatives (PBMAs), based on the protein source (soy or pea) and branding positioning (taste-focused or health-focused).

As shown in Table 5 and Figure 2, the perception of soy protein's healthiness remains relatively stable across both branding strategies, with little variation between the taste- and health-focused positioning. However, for pea protein, there is a noticeable decrease in perceived healthiness when the product is positioned with a health focus compared to a taste focus. This indicates that, while Pea protein may be perceived less favourably when its health benefits are emphasized, possibly because of consumer biases or unmet expectations related to the health positioning, Soy protein is consistently perceived as healthy regardless of branding. These findings highlight the significance of carefully considering protein source and branding strategy in marketing plant-based meat substitutes.

Table 5. Perception of PBMA Healthiness (*n*=143).

	Branding Position	
Protein Source	**Taste** (Mean ± St. Deviation)	**Health** (Mean ± St. Deviation)
Soy	4.9 ± 1.2	4.9 ± 1.6
Pea	4.9 ± 1.4	4.2 ± 1.6

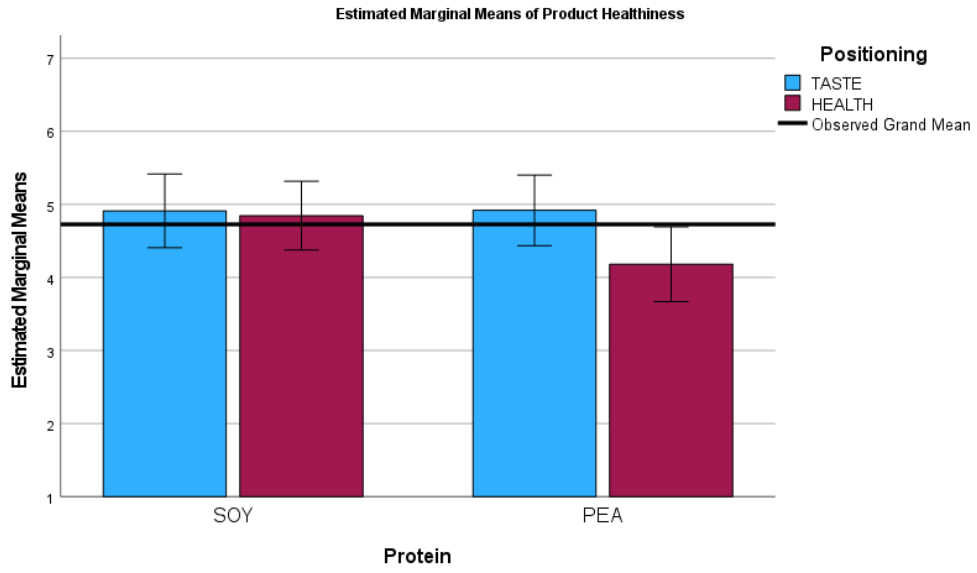

Figure 2. Perception of PBMA Healthiness (*n*=143).

Some interesting distinctions are revealed by the results of product taste evaluations for PBMA based on branding positioning and protein source in the stimulus, as seen in Table 6 and Figure 3. According to the results, consumers generally view soy and pea proteins to be tasty and therefore the perception of tastiness for both soy and pea proteins is generally positive. However, if a product's branding emphasizes taste, this perception may be slightly raised. Additionally, the data point to the possibility that Pea protein, which performs marginally better than Soy protein when taste is the focus, may benefit especially from taste-focused branding. All in all, these findings highlight how taste-focused branding has the power to favourably affect consumers' opinions about how tasty plant-based meat alternatives are, independent of the source of protein.

Table 6. Perception of PBMA Tastiness (*n*=143).

	Branding Position	
Protein Source	**Taste** (Mean ± St. Deviation)	**Health** (Mean ± St. Deviation)
Soy	5.9 ± 0.9	5.7 ± 0.9
Pea	6 ± 1	5.7 ± 1.4

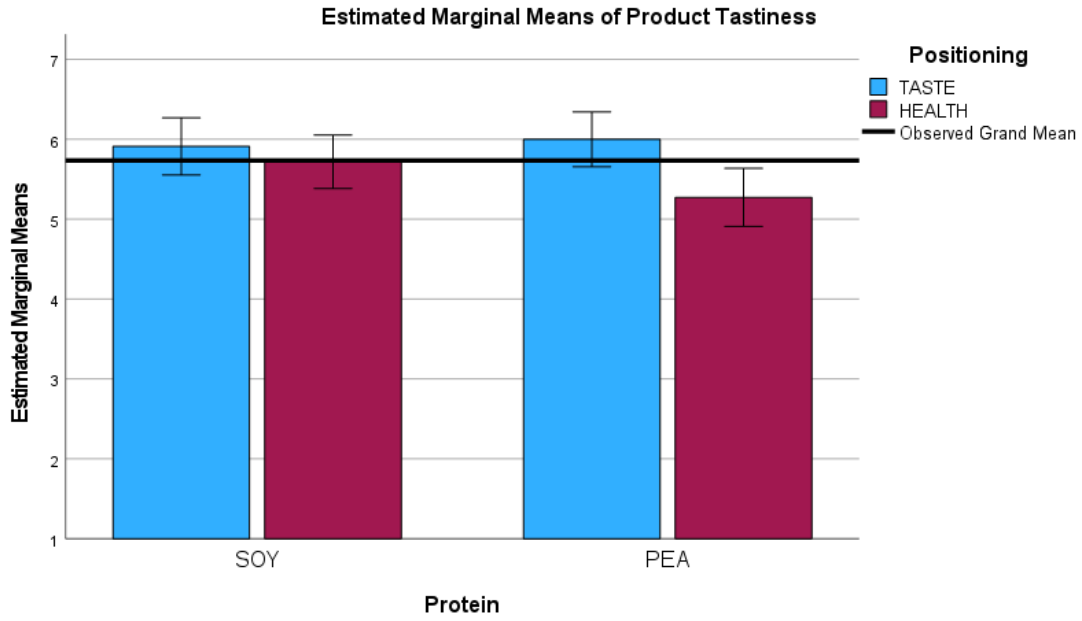

Figure 3. Perception of PBMA Tastiness (*n*=143).

As shown in Table 7 and Figure 4 show, subtle changes in consumer perceptions of the sustainability of PBMAs are observed based on both the protein source and branding position. Soy-based PBMAs are perceived as somewhat more sustainable when advertised with a taste focus compared to a health focus. Similarly, taste-focused branding for pea-based PBMAs resulted in a higher sustainability rating compared to a health-focused strategy. It's interesting to note that under both branding positions, pea protein was perceived as having a somewhat higher sustainability than soy protein. According to these results, PBMAs' perceived sustainability could be improved by a taste-centric branding approach, especially for goods that contain pea protein.

Table 7. Perception of PBMA Sustainability (*n*=143).

	Branding Position	
Protein Source	**Taste** (Mean ± St. Deviation)	**Health** (Mean ± St. Deviation)
Soy	4.7 ± 1.3	4.4 ± 1.3
Pea	4.8 ± 1.4	4.4 ± 1.5

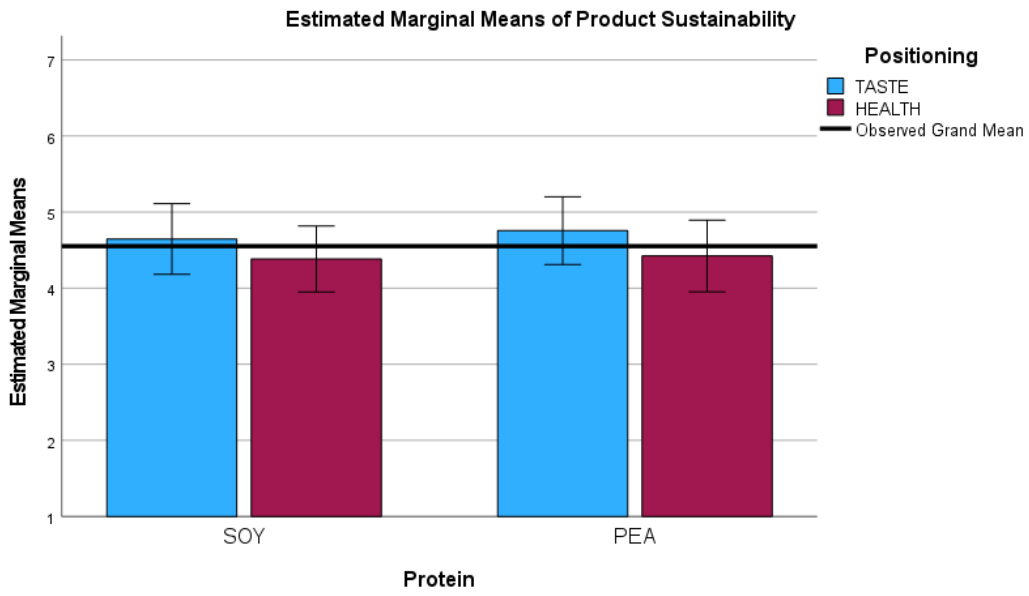

Figure 4. Perception of PBMA Sustainability (*n*=143).

4.3 Discussion of experimental results

In this experiment, I analysed how different branding and protein source conditions influenced participants' perceptions of product healthiness, tastiness, and sustainability. I employed a general linear model to conduct a two-way ANOVA, starting with the perception of product healthiness. The results showed that neither the main effect of the protein source nor the branding condition had a significant impact on how healthy participants perceived the product to be. Specifically, the main effect of the branding condition was not significant, nor was the main effect of the protein source. Additionally, the interaction between protein source and branding condition was not significant. Although there was a slight difference in perceptions under different conditions, this difference was not statistically significant, potentially due to an insufficient sample size.

A similar analysis for tastiness was conducted, and the results were more telling. In this case, one main effect—the branding condition—was significant. As expected, when the packaging highlighted the product as tasty, participants rated it as significantly tastier. However, no notable changes were observed in sustainability perception across the different conditions.

To further explore the data, a variable based on participants' meat-eating habits was created, categorizing them into unrestricted meat eaters and restricted/non-meat eaters. While this

variable was not part of the original hypothesis, we investigated whether it had any impact on participants' perceptions. When this variable was included in the model, it had no significant effect on the perception of healthiness or tastiness (as detailed in the appendix 3).

However, the inclusion of meat-eating status revealed interesting findings in the context of sustainability perceptions. A significant three-way interaction emerged, indicating that meat-eating status influenced how participants perceived the sustainability of different protein sources. For participants who restricted or avoided meat, pea protein with a tastiness branding was perceived as the most sustainable option, particularly when compared to soy protein or pea protein with a health branding. The most pronounced difference was observed with pea protein, which was considered much more sustainable when branded for tastiness than for health.

On the other hand, for participants who consumed meat, these effects were less pronounced. They generally perceived soy protein with a tastiness branding as the most sustainable option, while the pea protein's positioning made little difference.

These findings suggest that meat-eating status may be linked to broader concerns about animal welfare and sustainability. Participants who avoided meat appeared more informed about the environmental impact of different protein sources. For these individuals, the sustainability of pea protein was evident regardless of the product's positioning. Conversely, for meat eaters, the sustainability perception was more influenced by the branding condition, particularly with soy protein.

In summary, three key findings emerged from the experimental results:

1. **Healthiness Perception**: Pea protein was consistently perceived as less healthy, potentially due to associations with higher sugar content. This perception could disadvantage pea protein as a meat replacement, despite its actual health and sustainability benefits. Participants seemed to recognize pea protein as energy-rich legumes, which may have influenced their perceptions.

2. **Tastiness Perception**: Branding a product as tasty significantly increased its perceived tastiness. This suggests that companies should emphasize taste in their packaging to enhance consumer appeal.

3. **Sustainability Perception**: The impact of sustainability branding depends on the target audience. For consumers who do not eat meat, highlighting the tastiness of pea protein

could yield the most substantial results. However, for meat eaters, soy protein might be a better focus, and health-related claims should be avoided, as they do not significantly influence perception.

Overall, these findings highlight the nuanced ways in which branding and protein source interact with consumers' dietary habits to shape their perceptions of product healthiness, tastiness, and sustainability.

4.4 Demographic factors that predict the frequency of consuming PBMA

The results of the demographic factors that predict the frequency of consuming PBMA are presented in Table 8.

Table 8. Demographic predictors.

Predictor	Coefficient (B)	Std. Error	t	Sig.
Constant	4.642	.817	5.683	<.001
Mean Healthy eating behaviour	-.077	.125	-.613	0.541
Age	-.018	.007	-2.359	.020
Gender	-.208	.177	-1.175	.243
Meat consumption frequency	-.474	.104	-4.572	<.001

The results revealed several significant predictors. The results showed that age was found to be a negative predictor, indicating that older people generally consume PBMA less frequently than younger ones. This study implies that dietary preferences are influenced by age, with younger people maybe being more open to plant-based alternatives. Another negative predictor was the frequency of meat consumption, suggesting that those who eat meat more often are less likely to include PBMA in their diets. This finding supports the theory that eating habits are a significant factor in influencing food preferences, as those who regularly consume meat exhibit a lower propensity to switch to plant-based diets. What was interesting, was that the consumption frequency of PBMA was not predicted by gender. Therefore, this study implies that dietary preferences for plant-based foods may not be significantly influenced by a person's gender. Furthermore, there was no significant correlation between the frequency of PBMA consumption and healthy eating behaviour. This result implies that individuals' attitudes toward healthy eating may not directly influence their choices regarding PBMA.

Overall, results show that age and meat consumption frequency are the two main demographic factors influencing the frequency of PBMA usage. These results show how important it is to take demographic factors into account when analysing dietary preferences.

5 Conclusion and Limitations

The main findings and conclusions based on the results will be described in this chapter. As a final step, limitations and suggestions for further research will be presented.

5.1 Conclusions

This study has shown results on consumer attitudes, behaviours, and perceptions about PBMAs. The results draw attention to a number of crucial issues that businesses in the food industry and consumers alike must consider.

Initially, the research showed that customers place a far higher importance on flavour than other factors such as price, nutritional content, and environmental effect when selecting PBMAs. This implies that in order for PBMAs to be accepted more widely, they need to taste a lot like real meat. Moreover, the significance of textural resemblance to traditional meat products was also highlighted, highlighting the necessity for PBMAs to provide a sensory experience that meets the expectations of meat-eaters.

Secondly, the study revealed that consumers' perceptions are greatly influenced by positioning, especially when it comes to taste. Taste-focused brands were consistently thought to be more appealing than those with a focus on health advantages. This suggests that companies should concentrate their branding efforts on stressing taste rather than health features in order for PBMAs to appeal to a wider audience, especially those who might be suspicious about plant-based diets.

Interestingly, the study also revealed a complex correlation between the source of protein and the opinions of consumers. While pea protein's perceived healthiness varied depending on how it was marketed, soy protein was usually thought to be nutritious independent of branding. This implies that marketers should carefully evaluate and take it into account the possibility that consumer expectations or biases may affect how various protein sources are perceived.

Additionally, the examination of demographic variables showed that younger consumers are more likely to accept PBMAs, whereas elderly people and meat eaters are less likely to do so. The significance of reaching out to younger, more accepting customers who could be more inclined to embrace plant-based substitutes is underscored by this demographic trend.

Last, there was no discernible correlation between the frequency of PBMA consumption and gender or healthy eating practices according to the study. This suggests that PBMAs could be

appealing to a broad spectrum of customers, irrespective of their general attitude toward healthy eating or gender.

In summary, traditional meat-eaters must be satisfied with the flavour and texture of PBMAs in order for them to be successful in the market. Businesses should give taste-focused branding first priority and pay close attention to how customers see various protein sources. Targeting younger consumers, who are more receptive to dietary modifications, may also help to accelerate the uptake of plant-based substitutes. Overall, this study highlights how flavour, branding, and consumer perceptions interact intricately in the changing plant-based food market.

5.2 Limitations and future research

As mentioned above, there are certain limitations to this study. Even though 194 individuals took part in the survey overall, there were only 143 valid observations found once the data was cleaned, making the sample size relatively small. Due to inaccurate manipulation checks and missing responses, the sample size was reduced, which might have limited how broadly the results could be applied. A higher sample size may increase the capacity to identify additional significant effects and interactions, even though the study was able to identify significant effects for taste and one for the importance of similarity to meat. Therefore two effects were strong enough, that even with a small sample size, they were detectable. However, additional significant effects might have been detected if the sample size was bigger.

Another limitation was related to the second manipulation check in which it seemed that participants frequently misunderstood or misinterpreted the product's claim. A misinterpretation of the claim might have produced findings about the impact of marketing statements that were less noteworthy or equivocal. This misunderstanding may explain, why some claim effects were not statistically significant, as expected. In order to ensure that participants fully interpret the information presented, future studies should concentrate on enhancing the clarity of manipulation checks and instructions.

To improve the results, larger and more diverse sample sizes should be the goal of future research. More significant effects and interactions that were missed in the current study might be found with a larger dataset. Improving the implementation of manipulation checks and

giving clearer instructions could help reduce misunderstandings and provide more reliable data. By addressing these limitations future research can provide a better understanding of the factors affecting PBMA consumption and the consumer perception.

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Appendix

Appendix 1: Survey Flow

Thesis final

Start of Block: Welcome

Welcome Dear participant,

Thank you for participating in my study. 🤗

This research is being conducted as part of my thesis on **consumer choices in the plant-based meat substitute market.** I am conducting this study as part of my master's thesis at the Católica Lisbon School of Economics.

This survey will take about **7 minutes** to complete and consists of a few questions. It is **anonymous** and will be treated confidentially. The data will be used only for research purposes. Please **answer the survey without any interruption.**

If you have any questions or comments, please feel free to contact me via email: p-knauer@ucp.pt

Thank you for your time and I appreciate your valuable input.

By proceeding with this survey, you are giving your explicit consent to take part in this study.

Page Break

Screening Question **Are you between 20 and 60 years old?**

1 Yes (1)
2 No (2)

Skip To: End of Survey If Are you between 20 and 60 years old? = No

End of Block: Welcome

Start of Block: Food Behaviour

Diet What is your **type of diet**?

1 Omnivorous (eat everything) (1)
2 Flexitarian (2)
3 Vegetarian (3)
4 Vegan (4)
5 Other (please specify) (6) _____

Page Break

Display This Question:

If What is your type of diet? = Omnivorous (eat everything)

Or What is your type of diet? = Flexitarian

Or What is your type of diet? = Other (please specify)

Meat frequency **How often do you eat meat** on a weekly basis?

3 Every day or almost every day (4)
4 4-5 times a week (3)
5 2-3 times a week (2)
6 Once a week (1)

Page Break

Eat PBMA **How often do you eat plant-based meat analogues?**

7 Always (5)
8 Frequently (4)
9 Occasionally (3)
10 Rarely (2)
11 Never (1)

End of Block: Food Behaviour

Start of Block: Experiment Intro

Experimental Design **We would like to know <u>your opinion about a plant-based minced meat product</u>, which we will show you next.**
Please view this product carefully, PAY ATTENTION to all the information given on the package, and give us your honest opinion about it.

End of Block: Experiment Intro

Start of Block: Exp SOY TASTE

Soy - Taste

DV Soy Taste Please state **how much you agree** with the following statements:

	Strongly agree (7)	Agree (6)	Somewhat agree (5)	Neither agree nor disagree (4)	Somewhat disagree (3)	Disagree (2)	Strongly disagree (1)
This product looks healthy. (1)	12	13	14	15	16	17	18
This product looks tasty. (2)	19	20	21	22	23	24	25
This product looks sustainable. (3)	26	27	28	29	30	31	32

Page Break

MCHECK1 ST The product you just evaluated contained **which protein?**

33 Pea (1)
34 Soy (2)
35 Broad bean (3)

MCHECK2 ST The product you just evaluated had **a claim about what?**

36 Health (1)
37 Taste (2)
38 Sustainability (3)

End of Block: Exp SOY TASTE

Start of Block: Exp SOY HEALTH

SOY HEALTH
DV SOY HEALTH Please state how much you agree with the following statements:

	Strongly agree (7)	Agree (6)	Somewhat agree (5)	Neither agree nor disagree (4)	Somewhat disagree (3)	Disagree (2)	Strongly disagree (1)
This product looks healthy. (1)	39	40	41	42	43	44	45
This product looks tasty. (2)	46	47	48	49	50	51	52
This product looks sustainable. (3)	53	54	55	56	57	58	59

Page Break

MCHECK1 SH The product you just evaluated contained **which protein?**

60 Pea (1)
61 Soy (2)
62 Broad bean (3)

MCHECK 2 SH The product you just evaluated had **a claim about what?**

63 Health (1)
64 Taste (2)
65 Sustainability (3)

End of Block: Exp SOY HEALTH

Start of Block: Exp PEA TASTE

PEA TASTE

DV PEA TASTE Please state **how much you agree** with the following statements:

	Strongly agree (7)	Agree (6)	Somewhat agree (5)	Neither agree nor disagree (4)	Somewhat disagree (3)	Disagree (2)	Strongly disagree (1)
This product looks healthy. (1)	66	67	68	69	70	71	72
This product looks tasty. (2)	73	74	75	76	77	78	79
This product looks sustainable. (3)	80	81	82	83	84	85	86

MCHECK1 PT The product you just evaluated contained **which protein?**

87 Pea (1)
88 Soy (2)
89 Broad bean (3)

MCHECK2 PT The product you just evaluated had **a claim about what?**

90 Health (1)
91 Taste (2)
92 Sustainability (3)

End of Block: Exp PEA TASTE

Start of Block: Exp PEA HEALTH

PEA HEALTH

DV PEA HEALTH Please state **how much you agree** with the following statements:

	Strongly agree (7)	Agree (6)	Somewhat agree (5)	Neither agree nor disagree (4)	Somewhat disagree (3)	Disagree (2)	Strongly disagree (1)
This product looks healthy. (1)	93	94	95	96	97	98	99
This product looks tasty. (2)	100	101	102	103	104	105	106
This product looks sustainable. (3)	107	108	109	110	111	112	113

Page Break

MCHECK 1 PH The product you just evaluated contained **which protein?**

114 Pea (1)
115 Soy (2)
116 Broad bean (3)

MCHECK 2 PEA HEALTH The product you just evaluated had **a claim about what?**

117 Health (1)
118 Taste (2)
119 Sustainability (3)

End of Block: Exp PEA HEALTH

Start of Block: Grocery Shopping

Food Purchase1 Please indicate what things are important to you <u>when buying food</u>.

	Strongly agree (7)	Agree (6)	Somewhat agree (5)	Neither agree nor disagree (4)	Somewhat disagree (3)	Disgree (2)	Strongly disagree (1)
The packaging and design are very important to me when purchasing food. (1)	120	121	122	123	124	125	126
I prefer a clean design over an exciting one. (2)	127	128	129	130	131	132	133
I prefer a sustainable packaging. (3)	134	135	136	137	138	139	140
When seeing organic seals on the packaging, I tend to buy the product more. (4)	141	142	143	144	145	146	147
The design of the package is the first thing I look at. (5)	148	149	150	151	152	153	154

An appealing design always makes me buy the product. (6)	155	156	157	158	159	160	161

Food Purchase 2 Please indicate **what things are important to you <u>when buying food.</u>**

	Strongly agree (7)	Agree (6)	Somewhat agree (5)	Neither agree nor disagree (4)	Somewhat disagree (3)	Disagree (2)	Strongly disagree (1)
Organic ingredients in food products are important to me. (1)	162	163	164	165	166	167	168
I pay attention to the country of origin of the ingredients in food. (2)	169	170	171	172	173	174	175
I prefer fewer ingredients in a food product rather than a long list of ingredients. (3)	176	177	178	179	180	181	182
I don´t mind paying more for a food product that has good quality and is healthy. (4)	183	184	185	186	187	188	189

The price is the first thing I look at when purchasing food. (5)	190	191	192	193	194	195	196

End of Block: Grocery Shopping

Start of Block: Meat Substitutes

Info PMBS What **sources of information about plant-based meat substitutes** do you typically consult? (select all that apply)

6 Online reviews and ratings (1)
7 Company websites or advertisements (2)
8 Social media (3)
9 Influencers (4)
10 Nutritional labels (5)
11 Recommendations from friends and family (6)
12 None (8)
13 Other. Which? (7) _____

PBMA Protein **Please rank the following protein sources, from <u>most preferable (1)</u> to least preferable (4)** when choosing a **plant-based minced meat analogue**:

_____ Soy (1)
_____ Pea (2)
_____ Wheat proteins (3)
_____ Broad beans (4)

PBMA Attitudes Please indicate how much you agree with the following **statements about <u>plant-based meat analogues</u>**:

	Strongly agree (7)	Agree (6)	Somewhat agree (5)	Neither agree nor disagree (4)	Somewhat disagree (3)	Disagree (2)	Strongly disagree (1)
In a plant-based meat substitute, the texture similarity to a traditional meat product is an important aspect to me. (1)	197	198	199	200	201	202	203
As long as the taste is good, I don´t mind how a plant-based meat analogue looks. (2)	204	205	206	207	208	209	210

In a plant-based meat analogue, the taste similarity to a traditional meat product is an important aspect to me. (3)	211	212	213	214	215	216	217

PBMA Attributes **Please rank how important the following factors are** in your **decision to buy a plant-based meat analogue**, from most important (1) to least important (9).

_____ Design and Packaging (1)
_____ Price (2)
_____ Ingredients (3)
_____ Taste (4)
_____ Texture (5)
_____ Nutritional Value (6)
_____ Environmental Impact (7)
_____ Quality (8)
_____ Type of Protein (9)

End of Block: Meat Analogues

Start of Block: Health Behaviour

Health Attitudes Please state **how much you agree with** the following statements.

	Strongly agree (7)	Agree (6)	Somewhat agree (5)	Neither agree nor disagree (4)	Somewhat disagree (3)	Disagree (2)	Strongly disagree (1)
I eat healthily almost all the time. (1)	218	219	220	221	222	223	224
I pay a lot of attention on buying food with good ingredients. (2)	225	226	227	228	229	230	231
I spend a lot of time informing myself about healthy nutrition and eating. (3)	232	233	234	235	236	237	238
I am concerned about the impact of food on the health. (4)	239	240	241	242	243	244	245
I implement sustainability in my daily life. (5)	246	247	248	249	250	251	252
I try to buy regional and seasonal food products over industrial ones. (6)	253	254	255	256	257	258	259

Exercise Freq Please indicate **how often you exercise**, on a weekly basis:

260 Everyday or almost everyday (5)
261 4-5 times a week (4)
262 2-3 times a week (3)
263 Once a week (2)
264 Never (1)

End of Block: Health Behaviour

Start of Block: Demographics

Age How old are you?

_____

Page Break

Gender Please indicate your gender:

265 Male (1)
266 Female (2)
267 Non-binary / third gender (3)
268 Prefer not to say (4)

Page Break

Nationality Please state your nationality:

_____

Page Break

Job status What describes your employment status over the last 12 months?

269 Working full time (7)
270 Working part time (6)
271 Student (4)
272 Working Student (5)
273 Unemployed and looking for work (2)
274 Stay at home parent (3)
275 Retired (1)
276 Other: (8) _____

Page Break

Household Which best describes your household composition?

277 Living alone (1)
278 Living with family (2)
279 Living with friends / roommates / partner (3)
280 Other (please specify): (4) _____

Page Break

Income class Please indicate your individual annual income, before taxes

281 Under 10.000€ (1)
282 10.000 - 40.000€ (2)
283 40.000 - 70.000€ (3)
284 70.000 - 100.000€ (4)
285 100.000€ - 150.000€ (5)
286 More than 150.000€ (6)
287 Don't know/Don't want to answer (7)

End of Block: Demographics

Appendix 2: Grocery Shopping criteria

VARIABLES / STATEMENTS	MEAN	ST. DEVIATION
Please indicate what things are important to you when buying food. - The packaging and design are very important to me when purchasing food.	4.12	1.65
Please indicate what things are important to you when buying food. - I prefer a clean design over an exciting one.	5.1	1.1
Please indicate what things are important to you when buying food. - I prefer a sustainable packaging.	5.5	1.1
Please indicate what things are important to you when buying food. - When seeing organic seals on the packaging, I tend to buy the product more.	5.15	1.4
Please indicate what things are important to you when buying food. - The design of the package is the first thing I look at.	4.4	1.63
Please indicate what things are important to you when buying food. - An appealing design always makes me buy the product.	4.25	1.65
Please indicate what things are important to you when buying food. - Organic ingredients in food products are important to me.	5.52	1.24
Please indicate what things are important to you when buying food. - I pay attention to the country of origin of the ingredients in food.	5.1	1.43
Please indicate what things are important to you when buying food. - I prefer fewer ingredients in a food product rather than a long list of ingredients.	6.3	.997
Please indicate what things are important to you when buying food. - The price is the first thing I look at when purchasing food.	4.2	1.47
Food_Purchase_2_4_rec	2.22	1.11

	Mean ± St. Deviation	
Importance Package & Design	4.27	
Importance Sustainability	5.39	
Importance Clean product	5.49	
Importance Price	3.21	

Appendix 3: Univariate Analysis of Variance

Product Healthiness:

Descriptive Statistics

Dependent Variable: Product Healthiness

Protein	Positioning	MeatEatingClass	Mean	Std. Deviation	N
SOY	TASTE	No	4.71	1.069	14
		Yes	5.05	1.356	20
		Total	4.91	1.240	34
	HEALTH	No	5.19	1.276	16
		Yes	4.61	1.751	23
		Total	4.85	1.582	39
	Total	No	4.97	1.189	30
		Yes	4.81	1.577	43
		Total	4.88	1.423	73
PEA	TASTE	No	5.43	1.158	14
		Yes	4.61	1.530	23
		Total	4.92	1.441	37
	HEALTH	No	4.11	1.453	9
		Yes	4.21	1.744	24
		Total	4.18	1.648	33
	Total	No	4.91	1.411	23
		Yes	4.40	1.637	47
		Total	4.57	1.575	70
Total	TASTE	No	5.07	1.152	28
		Yes	4.81	1.452	43
		Total	4.92	1.339	71
	HEALTH	No	4.80	1.414	25
		Yes	4.40	1.740	47
		Total	4.54	1.635	72
	Total	No	4.94	1.277	53
		Yes	4.60	1.613	90
		Total	4.73	1.502	143

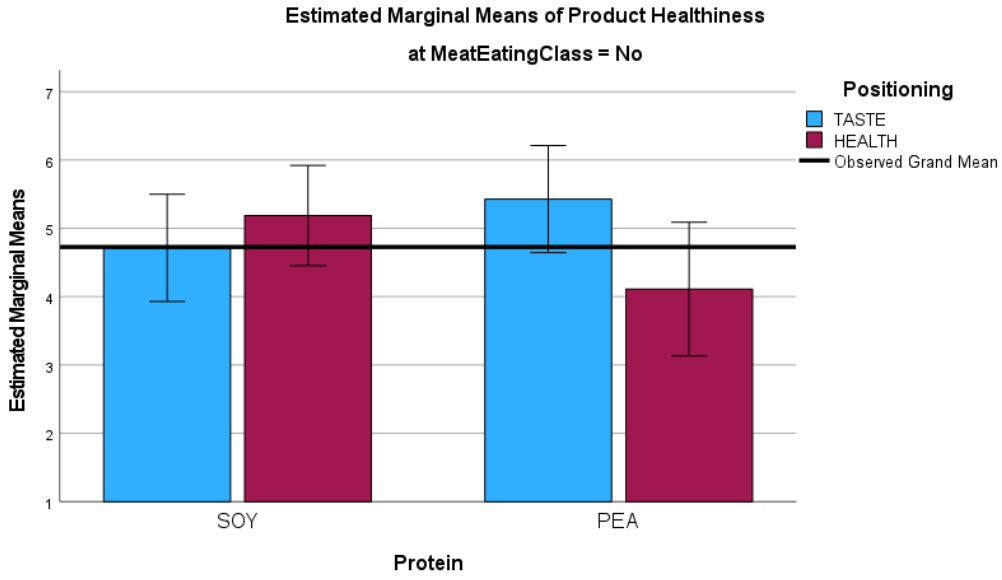
Tests of Between-Subjects Effects

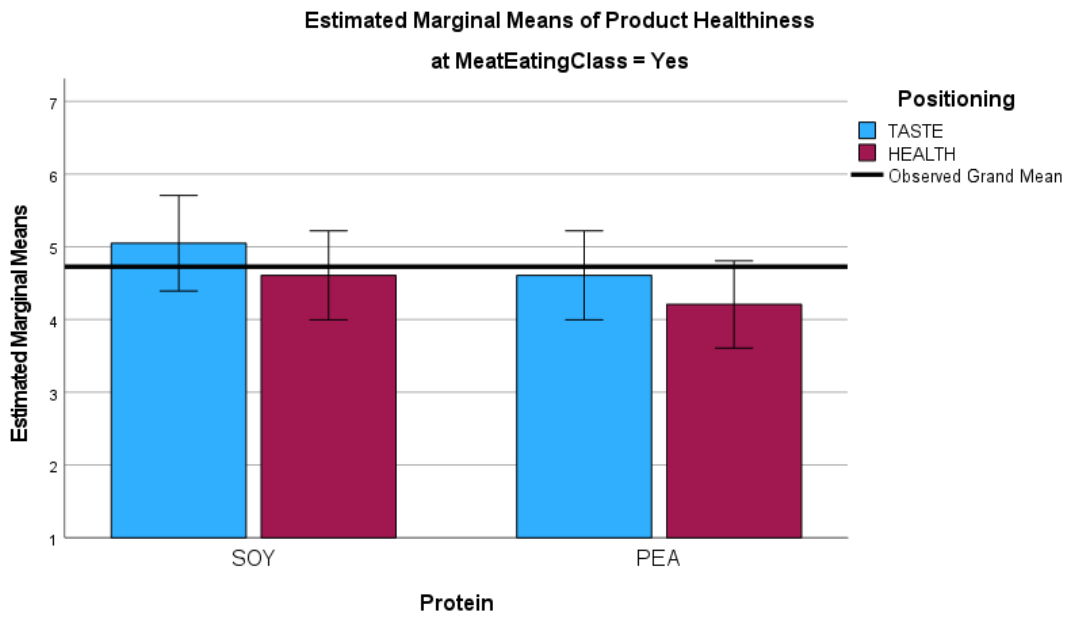
Dependent Variable: Product Healthiness

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[b]
Corrected Model	22.887[a]	7	3.270	1.484	.178	.071	10.386	.607
Intercept	2903.935	1	2903.935	1317.854	<.001	.907	1317.854	1.000
PROTEIN_COND_SOY_PEA	2.927	1	2.927	1.328	.251	.010	1.328	.208
BRANDING_COND_TASTE_HEALTH	5.741	1	5.741	2.605	.109	.019	2.605	.361
MeatEatingClass	1.884	1	1.884	.855	.357	.006	.855	.151
PROTEIN_COND_SOY_PEA * BRANDING_COND_TASTE_HEALTH	6.184	1	6.184	2.806	.096	.020	2.806	.384
PROTEIN_COND_SOY_PEA * MeatEatingClass	.465	1	.465	.211	.647	.002	.211	.074
BRANDING_COND_TASTE_HEALTH * MeatEatingClass	1.344E-5	1	1.344E-5	.000	.998	.000	.000	.050
PROTEIN_COND_SOY_PEA * BRANDING_COND_TASTE_HEALTH * MeatEatingClass	6.776	1	6.776	3.075	.082	.022	3.075	.413
Error	297.477	135	2.204					
Total	3516.000	143						
Corrected Total	320.364	142						

a. R Squared = ,071 (Adjusted R Squared = ,023)

b. Computed using alpha = .05





Product Tastiness:

Descriptive Statistics

Dependent Variable: Product Tastiness

Protein	Positioning	MeatEatingClass	Mean	Std. Deviation	N
SOY	TASTE	No	5.93	.616	14
		Yes	5.90	1.021	20
		Total	5.91	.866	34
	HEALTH	No	5.81	.834	16
		Yes	5.65	1.027	23
		Total	5.72	.944	39
	Total	No	5.87	.730	30
		Yes	5.77	1.020	43
		Total	5.81	.908	73
PEA	TASTE	No	6.29	1.139	14
		Yes	5.83	.887	23
		Total	6.00	1.000	37
	HEALTH	No	5.44	1.333	9
		Yes	5.21	1.414	24
		Total	5.27	1.376	33
	Total	No	5.96	1.261	23
		Yes	5.51	1.214	47
		Total	5.66	1.238	70
Total	TASTE	No	6.11	.916	28
		Yes	5.86	.941	43
		Total	5.96	.933	71
	HEALTH	No	5.68	1.030	25
		Yes	5.43	1.247	47
		Total	5.51	1.175	72
	Total	No	5.91	.986	53
		Yes	5.63	1.126	90
		Total	5.73	1.081	143

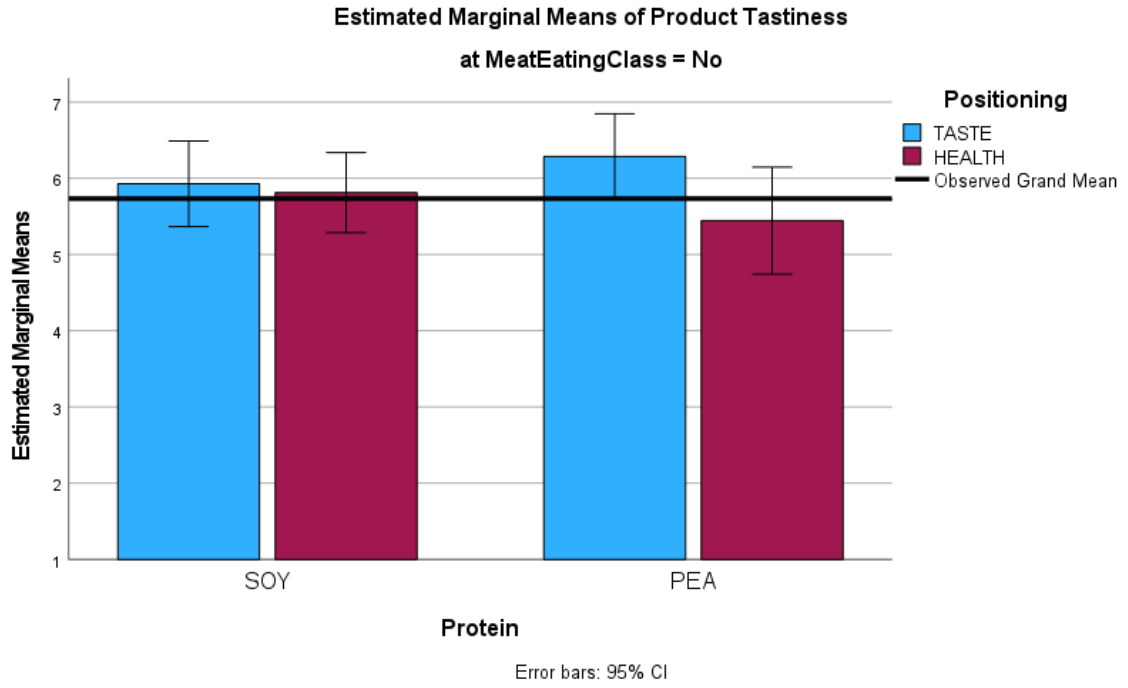
Tests of Between-Subjects Effects

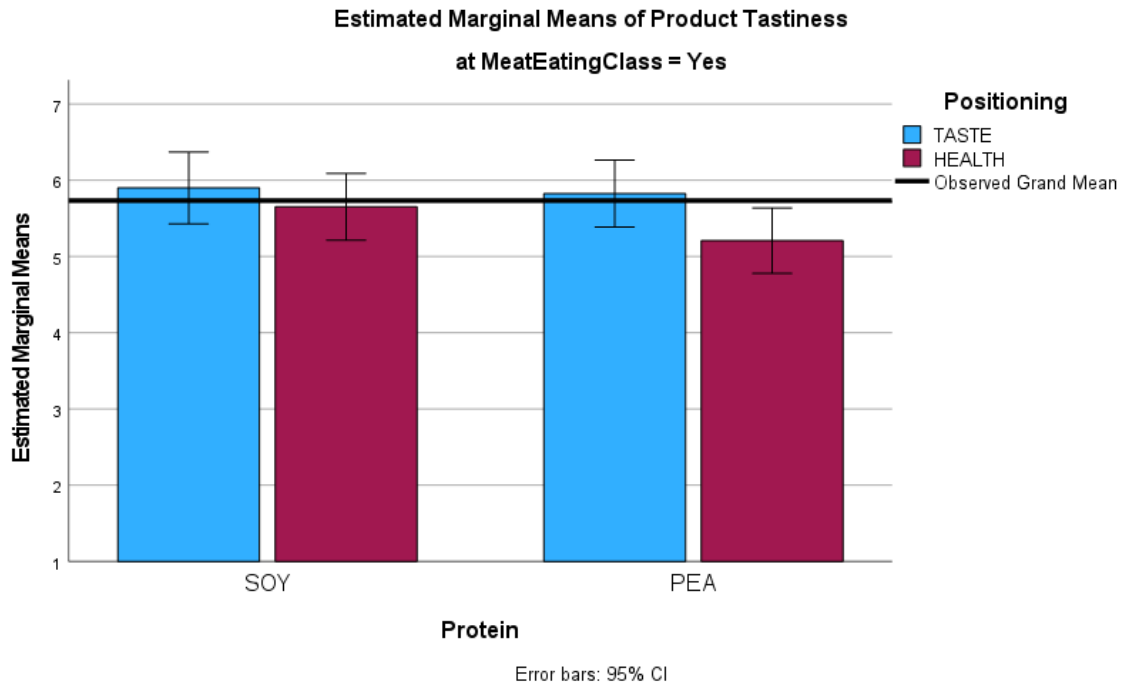
Dependent Variable: Product Tastiness

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[b]
Corrected Model	13.177[a]	7	1.882	1.664	.123	.079	11.647	.667
Intercept	4284.710	1	4284.710	3787.421	<.001	.966	3787.421	1.000
PROTEIN_COND_SOY_PEA	.565	1	.565	.499	.481	.004	.499	.108
BRANDING_COND_TASTE_HEALTH	6.712	1	6.712	5.933	.016	.042	5.933	.677
MeatEatingClass	1.581	1	1.581	1.397	.239	.010	1.397	.217
PROTEIN_COND_SOY_PEA * BRANDING_COND_TASTE_HEALTH	2.422	1	2.422	2.141	.146	.016	2.141	.306
PROTEIN_COND_SOY_PEA * MeatEatingClass	.519	1	.519	.459	.499	.003	.459	.103
BRANDING_COND_TASTE_HEALTH * MeatEatingClass	.017	1	.017	.015	.903	.000	.015	.052
PROTEIN_COND_SOY_PEA * BRANDING_COND_TASTE_HEALTH * MeatEatingClass	.255	1	.255	.225	.636	.002	.225	.076
Error	152.726	135	1.131					
Total	4868.000	143						
Corrected Total	165.902	142						

a. R Squared = ,079 (Adjusted R Squared = ,032)

b. Computed using alpha = .05





Product Sustainability:

Descriptive Statistics

Dependent Variable: Product Sustainability

Protein	Positioning	MeatEatingClass	Mean	Std. Deviation	N
SOY	TASTE	No	4.29	1.139	14
		Yes	4.90	1.294	20
		Total	4.65	1.252	34
	HEALTH	No	4.56	1.263	16
		Yes	4.26	1.287	23
		Total	4.38	1.269	39
	Total	No	4.43	1.194	30
		Yes	4.56	1.315	43
		Total	4.51	1.260	73
PEA	TASTE	No	5.36	.842	14
		Yes	4.39	1.559	23
		Total	4.76	1.402	37
	HEALTH	No	4.11	1.691	9
		Yes	4.54	1.503	24
		Total	4.42	1.542	33
	Total	No	4.87	1.359	23
		Yes	4.47	1.516	47
		Total	4.60	1.469	70
Total	TASTE	No	4.82	1.124	28
		Yes	4.63	1.448	43
		Total	4.70	1.324	71
	HEALTH	No	4.40	1.414	25
		Yes	4.40	1.393	47
		Total	4.40	1.391	72
	Total	No	4.62	1.274	53
		Yes	4.51	1.416	90
		Total	4.55	1.362	143

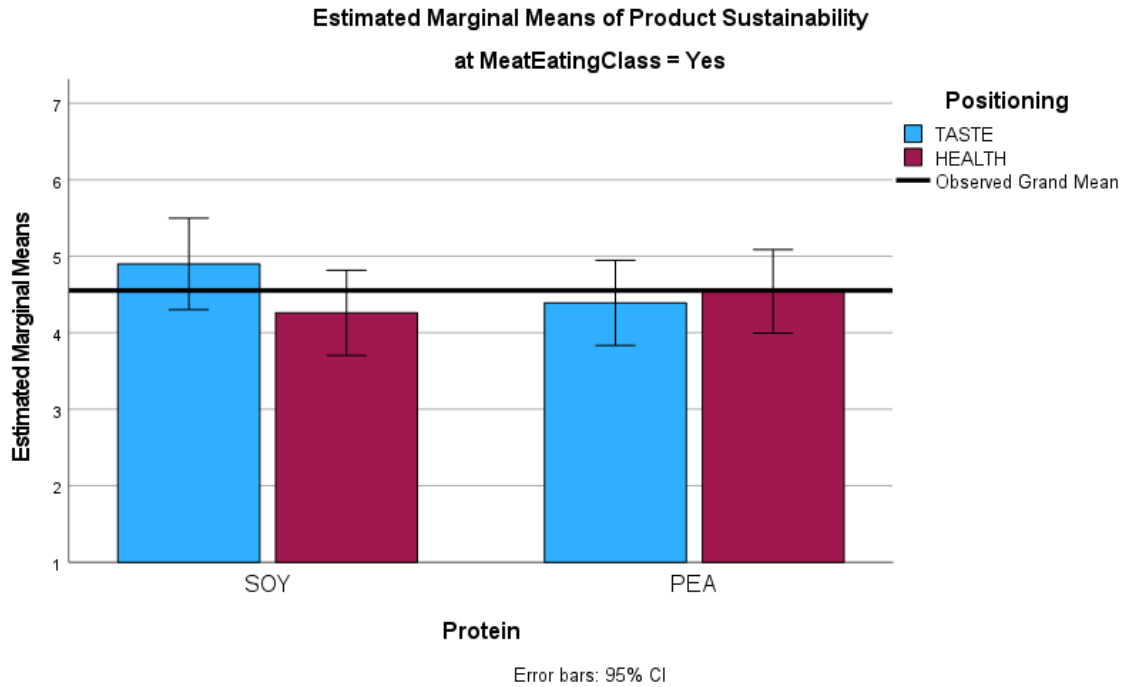
Tests of Between-Subjects Effects

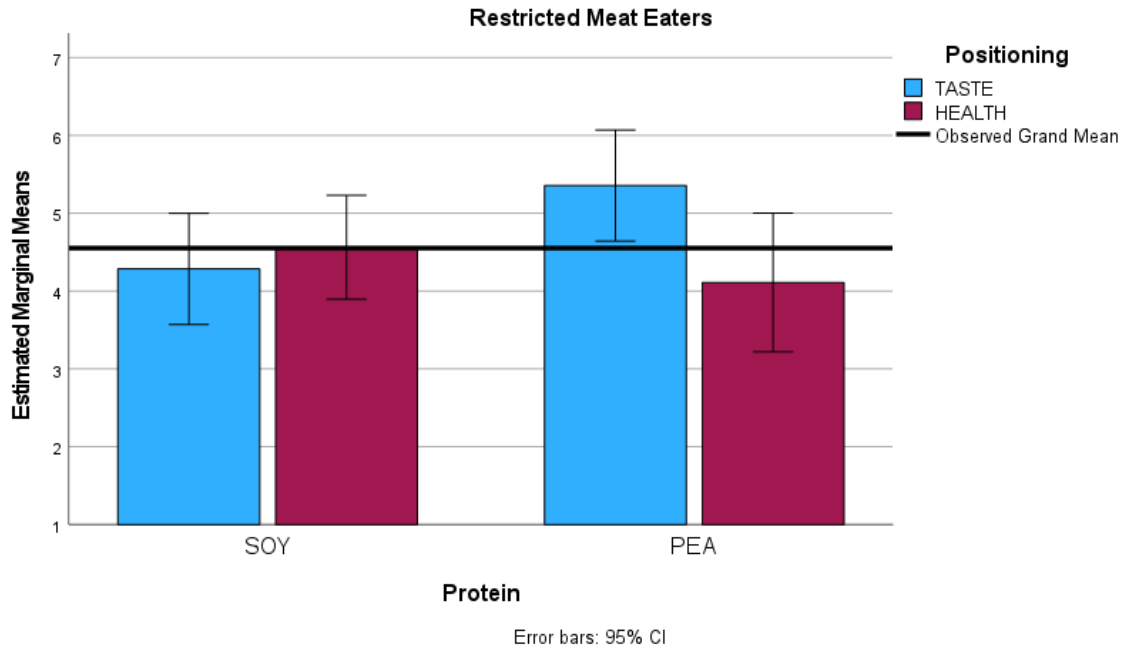
Dependent Variable: Product Sustainability

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[b]
Corrected Model	16.787[a]	7	2.398	1.313	.249	.064	9.191	.545
Intercept	2677.709	1	2677.709	1466.082	<.001	.916	1466.082	1.000
PROTEIN_COND_SOY_PEA	.311	1	.311	.170	.681	.001	.170	.069
BRANDING_COND_TASTE_HEALTH	4.294	1	4.294	2.351	.128	.017	2.351	.331
MeatEatingClass	.100	1	.100	.055	.815	.000	.055	.056
PROTEIN_COND_SOY_PEA * BRANDING_COND_TASTE_HEALTH	1.086	1	1.086	.595	.442	.004	.595	.119
PROTEIN_COND_SOY_PEA * MeatEatingClass	1.452	1	1.452	.795	.374	.006	.795	.143
BRANDING_COND_TASTE_HEALTH * MeatEatingClass	.466	1	.466	.255	.614	.002	.255	.079
PROTEIN_COND_SOY_PEA * BRANDING_COND_TASTE_HEALTH * MeatEatingClass	10.800	1	10.800	5.913	.016	.042	5.913	.675
Error	246.569	135	1.826					
Total	3227.000	143						
Corrected Total	263.357	142						

a. R Squared = ,064 (Adjusted R Squared = ,015)

b. Computed using alpha = .05





Appendix 4: Demographic predictors results

Regression

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	How often do you eat meat on a weekly basis?, How old are you?, Please indicate your gender:, COMPUTE Mean_HealthyEatBeh=MEAN (Health_Attitudes_1, Health_Attitudes_2, Health_Attitudes_3, Health_Attitudes_4, Health_Attitudes_5, Health_Attitudes_6)[b]	.	Enter

a. Dependent Variable: How often do you eat plant-based meat substitutes?

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,465[a]	,216	,186	,855

a. Predictors: (Constant), How often do you eat meat on a weekly basis?, How old are you?, Please indicate your gender:, COMPUTE Mean_HealthyEatBeh=MEAN (Health_Attitudes_1,Health_Attitudes_2, Health_Attitudes_3,Health_Attitudes_4,Health_Attitudes_5, Health_Attitudes_6)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	20,943	4	5,236	7,158	<,001[b]
	Residual	76,067	104	,731		
	Total	97,009	108			

a. Dependent Variable: How often do you eat plant-based meat substitutes?

b. Predictors: (Constant), How often do you eat meat on a weekly basis?, How old are you?, Please indicate your gender:, COMPUTE Mean_HealthyEatBeh=MEAN (Health_Attitudes_1,Health_Attitudes_2,Health_Attitudes_3,Health_Attitudes_4, Health_Attitudes_5,Health_Attitudes_6)

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	4,642	,817		5,683	<,001
	COMPUTE Mean_HealthyEatBeh=MEAN(Health_Attitudes_1, Health_Attitudes_2, Health_Attitudes_3, Health_Attitudes_4, Health_Attitudes_5, Health_Attitudes_6)	-,077	,125	-,059	-,613	,541
	How old are you?	-,018	,007	-,209	-2,359	,020
	Please indicate your gender:	-,208	,177	-,109	-1,175	,243
	How often do you eat meat on a weekly basis?	-,474	,104	-,443	-4,572	<,001

a. Dependent Variable: How often do you eat plant-based meat substitutes?

Appendix 5: Relevant SPSS output

Descriptives

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Product Healthiness	143	1	7	4,73	1,502
Product Tastiness	143	1	7	5,73	1,081
Product Sustainability	143	1	7	4,55	1,362
REGR factor score 1 for analysis 1_item 1 and item 3	143	-2,35974	1,56263	,0000000	1,00000000
Valid N (listwise)	143				

Univariate Analysis of Variance

Between-Subjects Factors

		Value Label	N
Protein	0	SOY	73
	1	PEA	70
Positioning	0	TASTE	71
	1	HEALTH	72

Product Healthiness

Descriptive Statistics

Dependent Variable: Product Healthiness

Protein	Positioning	Mean	Std. Deviation	N
SOY	TASTE	4,91	1,240	34
	HEALTH	4,85	1,582	39
	Total	4,88	1,423	73
PEA	TASTE	4,92	1,441	37
	HEALTH	4,18	1,648	33
	Total	4,57	1,575	70
Total	TASTE	4,92	1,339	71
	HEALTH	4,54	1,635	72
	Total	4,73	1,502	143

Tests of Between-Subjects Effects

Dependent Variable: Product Healthiness

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	12,886[a]	3	4,295	1,942	,126	,040
Intercept	3164,619	1	3164,619	1430,613	<,001	,911
PROTEIN_COND_SOY_PEA	3,843	1	3,843	1,737	,190	,012
BRANDING_COND_TASTE_HEALTH	5,733	1	5,733	2,592	,110	,018
PROTEIN_COND_SOY_PEA * BRANDING_COND_TASTE_HEALTH	4,012	1	4,012	1,814	,180	,013
Error	307,478	139	2,212			
Total	3516,000	143				
Corrected Total	320,364	142				

a. R Squared = ,040 (Adjusted R Squared = ,020)

Product Tastiness

Descriptive Statistics

Dependent Variable: Product Tastiness

Protein	Positioning	Mean	Std. Deviation	N
SOY	TASTE	5,91	,866	34
	HEALTH	5,72	,944	39
	Total	5,81	,908	73
PEA	TASTE	6,00	1,000	37
	HEALTH	5,27	1,376	33
	Total	5,66	1,238	70
Total	TASTE	5,96	,933	71
	HEALTH	5,51	1,175	72
	Total	5,73	1,081	143

Tests of Between-Subjects Effects

Dependent Variable: Product Tastiness

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	10,724[a]	3	3,575	3,202	,025	,065
Intercept	4667,276	1	4667,276	4180,687	<,001	,968
PROTEIN_COND_SOY_PEA	1,134	1	1,134	1,016	,315	,007
BRANDING_COND_TASTE_HEALTH	7,549	1	7,549	6,762	,010	,046
PROTEIN_COND_SOY_PEA * BRANDING_COND_TASTE_HEALTH	2,532	1	2,532	2,268	,134	,016
Error	155,178	139	1,116			
Total	4868,000	143				
Corrected Total	165,902	142				

a. R Squared = ,065 (Adjusted R Squared = ,044)

Product Sustainability

Descriptive Statistics

Dependent Variable: Product Sustainability

Protein	Positioning	Mean	Std. Deviation	N
SOY	TASTE	4,65	1,252	34
	HEALTH	4,38	1,269	39
	Total	4,51	1,260	73
PEA	TASTE	4,76	1,402	37
	HEALTH	4,42	1,542	33
	Total	4,60	1,469	70
Total	TASTE	4,70	1,324	71
	HEALTH	4,40	1,391	72
	Total	4,55	1,362	143

Tests of Between-Subjects Effects

Dependent Variable: Product Sustainability

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	3,490[a]	3	1,163	,622	,602	,013
Intercept	2951,531	1	2951,531	1578,742	<,001	,919
PROTEIN_COND_SOY_PEA	,198	1	,198	,106	,745	,001
BRANDING_COND_TASTE_HEALTH	3,150	1	3,150	1,685	,196	,012
PROTEIN_COND_SOY_PEA * BRANDING_COND_TASTE_HEALTH	,044	1	,044	,023	,879	,000
Error	259,867	139	1,870			
Total	3227,000	143				
Corrected Total	263,357	142				

a. R Squared = ,013 (Adjusted R Squared = -,008)

Similarity to meat (taste and texture)

Descriptive Statistics

Dependent Variable: REGR factor score 1 for analysis 1_item 1 and item 3

Protein	Positioning	Mean	Std. Deviation	N
SOY	TASTE	,1586450	,90470015	34
	HEALTH	-,1950309	1,05393518	39
	Total	-,0303051	,99646357	73
PEA	TASTE	-,2218739	1,08781872	37
	HEALTH	,3158063	,84276461	33
	Total	,0316039	1,00988868	70
Total	TASTE	-,0396536	1,01542404	71
	HEALTH	,0391028	,99010776	72
	Total	,0000000	1,00000000	143

Tests of Between-Subjects Effects

Dependent Variable: REGR factor score 1 for analysis 1_item 1 and item 3

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	7,452[a]	3	2,484	2,566	,057	,052
Intercept	,029	1	,029	,030	,862	,000
PROTEIN_COND_SOY_PEA	,151	1	,151	,156	,693	,001
BRANDING_COND_TASTE_HEALTH	,301	1	,301	,311	,578	,002
PROTEIN_COND_SOY_PEA * BRANDING_COND_TASTE_HEALTH	7,070	1	7,070	7,304	,008	,050
Error	134,548	139	,968			
Total	142,000	143				
Corrected Total	142,000	142				

a. R Squared = ,052 (Adjusted R Squared = ,032)

Chi-Square:

Product Positioning as perceived by respondents (manipulation check 2) * Positioning

Crosstab

Count

		Positioning		
		TASTE	HEALTH	Total
Product Positioning as perceived by respondents (manipulation check 2)	Health	5	48	53
	Taste	54	10	64
	Sustainability	12	14	26
Total		71	72	143

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	65,287[a]	2	<,001
Likelihood Ratio	73,747	2	<,001
Linear-by-Linear Association	22,381	1	<,001
N of Valid Cases	143		

a. 0 cells (,0%) have expected count less than 5. The minimum expected count is 12,91.

Product Positioning as perceived by respondents (manipulation check 2) * Protein

Crosstab

Count

		Protein		
		SOY	PEA	Total
Product Positioning as perceived by respondents (manipulation check 2)	Health	28	25	53
	Taste	28	36	64
	Sustainability	17	9	26
Total		73	70	143

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	3,570[a]	2	,168
Likelihood Ratio	3,612	2	,164
Linear-by-Linear Association	,417	1	,519
N of Valid Cases	143		

a. 0 cells (,0%) have expected count less than 5. The minimum expected count is 12,73.