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Impact of claims about protein content of different origins on consumers perception

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Acknowledgments

First, I want to thank Professor Marília Prada and Professor Magda Saraiva for accepting this challenge and guiding me along the way.

To my parents and my sister, with whom I could do nothing without, I'm thankful for everything you taught me and grateful for everything you did for me, this is for you.

To Jasmine, you were part of this work from day one. We did it, thank you for your support!

To my friends from Estremoz and Sousel, I'm thankful that we got to meet, I wouldn't change a thing about our friendship, thank you for everything guys!

To my friends from Évora, thank you for helping me along the way, I cannot stress enough how much you meant to me for those three years. Especially you Filipa and Inês, however much distance separates us, our bond can never be broken.

To Diogo, Laura, Carolina, and Joana, thank you for never letting me feel alone in Lisbon, thank you for being there for me.

To Francisco, Eliana, Carolina, and Francisca, I hope I was able to meet your expectations. I'm forever grateful for your confidence, as promised, I will never let you guys down.

To my friends from discord, we watched each other grow, we learned so much together... Thank you for everything! Gonçalo, I couldn't do this without you, I will never forget the nights we spent trying to understand statistics, so this one's for you! Also, the farm plan can now be put to rest.

To my friends from El Corte Inglés, thank you for giving me so much in so little time, your support meant a lot to me! Yes, this includes you, Daniela.

To the professors who guided me through my academic journey, Professor Teresa, Professor Sofia, Professor Nuno, and Professor Carla, thank you for guiding me toward this achievement.

To those who inspired me to be a better person, Sebastian Vettel and Keanu Reeves, I'm grateful to have lived in the same lifetime you did, thank you for making the world a better place, I will always follow your example.

Finally, to my grandmother, when you passed away, I promised I would make you proud, hope you are watching because I'm just starting!

Resumo

O consumo adequado de proteína apresenta diversos benefícios para a saúde e bem-estar. A procura por proteína resultou na emergência de novos produtos e informação que podem nem sempre ser os mais adequados. O presente estudo procurou compreender o impacto de alegações acerca do teor proteico de diferentes origens nas expectativas do consumidor. Este estudo experimental consistiu num questionário online (Qualtrics). Participaram neste estudo 191 voluntários (61% homens, $M = 39.5$, $DP = 15.5$) distribuídos aleatoriamente pelas condições resultados do delineamento entre-participantes: 2 (*teor proteico: controlo; elevada proteína*) X 2 (*origem: controlo; vegan*). O estudo tinha como principal objetivo avaliar o impacto destas alegações na perceção de um produto alimentar em diferentes dimensões (teor de proteína, teor de gordura, teor de açúcar, teor calórico, salubridade, saciação, densidade calórica e sabor). Os participantes apresentaram uma avaliação mais positiva para o produto com o rótulo “*elevada proteína*” em comparação com o produto com rótulo “*proteína controlo*”. No rótulo “*origem vegan*”, a avaliação foi mais saudável (menor teor de açúcar e gordura, menor densidade calórica e maior salubridade), porém mais negativa no que toca ao sabor em relação à condição “*origem controlo*”. É importante considerar que os participantes afirmaram possuir um nível de conhecimento baixo acerca de produtos enriquecidos com proteína. Estes resultados contribuem para o estudo de atitudes e comportamentos dos consumidores, visto que apresentam implicações acerca do efeito dos rótulos sobre expectativas e decisão de compra do consumidor.

Palavras-Chave: Proteína, Vegana, Rótulos, Perceção do consumidor

Códigos de Classificação APA PsycINFO:

3900 (Psicologia do Consumidor)

3920 (Atitudes e Comportamentos do Consumidor)

Abstract

Adequate protein consumption has several benefits for health and well-being. The demand for protein has resulted in the emergence of new products and information that may not always be the most suitable for everyone. The present study sought to understand the impact of claims about protein content from different sources on consumer expectations. This experimental study consisted of an online questionnaire (Qualtrics) with 191 participants (61% men, $M = 39.5$, $SD = 15.5$) randomly distributed resulting from the between-participants design: 2 (*protein content: control; high protein*) X 2 (*origin: control; vegan*). The main objective of the study was to evaluate the impact of these claims on the perception of a food product in different dimensions (protein content, fat content, sugar content, caloric content, healthiness, satiation, caloric density, and flavour). Participants showed an overall more positive evaluation of the "*high protein*" claim in comparison to the product with the "*protein control*" claim. Regarding the product with the "*origin vegan*" claim, there was an overall healthier evaluation (lower sugar and fat content, lower caloric density, and higher healthfulness), but a more negative evaluation in terms of taste in comparison to the product with the "*origin control*" claim. It is important to consider that participants claimed to have a low level of knowledge about protein-enriched products. These results contribute to the study of consumer attitudes and behaviour, as they have implications regarding the effect of food claims on consumer expectations and purchase decisions.

Keywords: Protein, Vegan, Food Labelling, Food Claims, Consumer Perception

Classification Codes APA PsycINFO:

3900 (Consumer Psychology)

3920 (Consumer Attitudes & Behavior)

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Introduction

In today's context of increasing concerns regarding health, animal welfare, and the environment, food claims play a crucial role in informing consumers about the nutritional or health benefits of a product (de Boer, 2021). These claims, presented on food packaging or in advertising, serve to verify important attributes such as production methods, product origin, and certifications related to animal welfare (Fernqvist & Ekelund, 2014). By providing this information, food claims address the growing consumer interest in these aspects, providing an additional dimension of importance to their decision-making process.

Considering the rising concerns highlighted previously, high protein diets, vegetarianism, and veganism rose in popularity (Cargill, 2019; Michel et al., 2021), food claims became an important feature to analyse before buying a product. It must be noted that food claims are a tool proven to help consumers make better decisions regarding their food choices. Food claims are shown to help consumers make rational decisions by interpreting them and due to familiarity accept functional healthier foods (Lähteenmäki, 2013). However, certain food claims have the potential to misguide consumers and influence their decisions in unexpected ways (Pereira et al., 2019). Moreover, this misguide can create a false perception of healthiness in products (Stremmel et al., 2022), leading to overconsumption and the potential for weight gain (Oostenbach et al., 2019).

To better understand how food claims (regarding the protein content and protein origin) influence consumers' perceptions and expectations regarding food products, the purpose of this study is to investigate the impact of "High-Protein" and "Vegan" claims on consumers' expectations and perceptions of a food product (e.g., protein content, fat content, sugar content, healthiness, satiation, caloric density, and taste). By examining these specific claims and their effects, we seek to contribute valuable insights to the field and enhance our understanding of consumer behavior about food choices and perceptions. By examining these specific claims and their effects, we seek to contribute valuable insights to the field and enhance our understanding of consumer behavior concerning food choices and perceptions.

The dissertation is organized into different sections:

1 - For the first chapter, we dive into a theoretical framework to better understand diet trends and the influence of labels and claims on consumers. We started by researching literature about the rise of healthy eating trends and the connections between diet, food choices, and overall health. Then, we look at food claims as tools, particularly health claims, to understand how they work. The subsequent section focuses on the impact of health information and health

claims on various aspects of food products, drawing upon previous studies to elucidate their effects. In the following section, we redirect our focus to better understand the details around high protein and plant-based diets. We follow up by exploring the related health implications and the growing prevalence of individuals opting for these dietary approaches. Furthermore, we make a comprehensive analysis of the previous empirical studies conducted on the impact of “High-Protein” claims and “Vegan” claims on food perception. This review included a global perspective as well as specific insights within the Portuguese context. We finish the chapter by highlighting the main goals and hypotheses suggested.

2 - In the second chapter, we outline the methodology used for this research. We provide an overview of the sample characteristics and study design. Additionally, we describe the instruments, materials, and procedure used in detail.

3 - In the third chapter, we focus on the analysis of the results. We performed all statistical analyses using SPSS Statistics software.

4 - The last chapter will be dedicated to discussing the findings to understand if the study’s goals were achieved and potential theoretical and practical contributions. Moreover, limitations will also be considered along with the implications of this study and directions for future research.

Chapter I - Theoretical Framework

1.1) The influence of consumer attitudes on the purchase phenomenon

The purchase phenomenon in the context of food involves a multitude of stimuli strategically created to capture consumers' attention, such as visual attributes and convenience. Furthermore, the decision to purchase food includes various dimensions, such as rational, cognitive, and moral considerations, so, the significance a product holds for a consumer can be a determining factor in the purchasing decision, adding a symbolic dimension that intertwines with the previously mentioned aspects, as well as cultural and social influences (Van der Merwe et al., 2022). We should be mindful that hedonic information also plays an important role in shaping consumer behavior, as individuals search for pleasurable experiences (Kemp et al., 2013).

One of the main factors influencing the purchase phenomenon is consumers' perception of product features. Product quality, functionality, design, and durability are nuclear features influencing consumers' attraction to a product and later satisfaction (Kotler et al., 2021). Price also plays a significant role, with consumers evaluating a product's perceived value and affordability when deciding to purchase (Hur et al., 2012).

Social influences strongly impact the purchase phenomenon. Consumers are influenced by reference groups, such as family, friends, and online groups, and rely on word-of-mouth recommendations and online reviews when considering products (Chuang et al., 2012). Cultural and societal norms, values, and trends also s consumer preferences and buying behavior (Shim et al., 2011).

Consumer attitudes and emotions are powerful drivers of the purchase phenomenon. Positive attitudes toward a product or brand can motivate consumers to make a purchase, while negative attitudes can deter them (Fernqvist & Ekelund, 2014). Consumers' emotions, such as emotional turmoil or fear of missing out, represent a factor that should be considered since these can bias the buying decisions during the purchase process (Bagozzi et al., 2016).

Although consumer attention seems to have a main effect influencing their decision-making, the availability of information also has repercussions for consumers' choices and therefore, should be considered (Bialkova et al., 2016).

1.2) Food claims

Food claims are a form of information shown on food packaging or in advertising with the main goal of informing consumers about the nutritional or health benefits of a product (Kaur

et al., 2017). These claims may include various aspects, such as the method of production, origin, and composition (Fernqvist & Ekelund, 2014). Nutritional claims can take different materializations, including "free-from" claims (e.g., sugar-free) and "added" claims (e.g., high in protein, enriched with omega 3; Prada et al., 2021).

Nutritional claims usage has a significant influence on consumers' food purchases and their perception of product quality. Past literature has shown this phenomenon specifically in dimensions such as healthfulness, taste, and value (Grunert et al., 2011; Lando & Labiner-Wolfe, 2007; Prada et al., 2021). For example, a study by Bialkova et al. (2016) found that taste is a significant predictor of buying intentions, explaining a substantial portion of the variation in regression models. When considering purchasing an item labelled as healthy, consumers weigh the health benefits on one side against potential reductions in taste caused by lower levels of fat, salt, or sugar on the other side. As a result, consumers may anticipate a decrease in perceived tastefulness and loss of hedonic pleasure, which can discourage consumers from buying the product. This phenomenon is referred to as a health-pleasure trade-off (Bialkova et al., 2016).

Food claims and nutritional claims, despite their potential value, can be susceptible to misuse and misleading practices. This can manifest through the provision of incomplete or even false information, thereby influencing consumers to make purchasing decisions they would otherwise refrain from (Pereira et al., 2019). Furthermore, nutritional claims may even influence consumers eating behaviour (e.g., serving size). For example, a study by Oostenbach et al. (2019) suggested that the presence of a health claim on a snack product led to consumers eating larger portions, resulting in overconsumption.

We should also consider the different approaches used in food claims (design and labelling) to communicate information about the nutritional content and health attributes of food products. One notable design is the nutritional traffic light system, which utilizes color-coded labels to indicate the levels of specific nutrients such as fat, sugar, and salt in a product. This system offers a simple visual cue, with green denoting low content, amber representing moderate content, and red signifying high content. However, it is important to note that no single food claim design can be deemed universally superior. The effectiveness of a design depends on factors such as consumer preferences, cultural context, and information needs (Temple, 2020). Nutritional labels are one of the most common types of food claims. These claims have an informative purpose regarding the nutrient content and composition of the products. Some of the information provided includes serving size, calories, macronutrients (e.g., proteins content), micronutrients (e.g., minerals), allergens, and the recommended daily

intake (NIȚU et al., 2022). These labels are typically present in product packaging, in order to aid consumers to make more knowledgeable decisions regarding their food choices. Studies have also explored the presence of claims and marketing techniques on food labels, shedding light on their impact on consumer perceptions and decision-making. For example, Pereira et al. (2019) examined claims and marketing techniques used in Brazilian food labels, highlighting the various strategies employed by manufacturers to attract consumers' attention and influence their purchasing behavior.

When examining the effectiveness of nutritional labels, it becomes evident that there may exist a discrepancy between consumers' expected use of nutrition labels and their actual usage. While some consumers exhibit comprehension of specific terms presented on labels and can apply the information to straightforward tasks, others may encounter difficulties and confusion when confronted with more intricate information or tasks. This insight underscores the complexities and challenges that consumers face in their utilization and comprehension of nutrition labels. It further emphasizes the importance of conducting additional research to establish a definitive relationship between label usage and the ability to make healthier decisions (Grunert & Wills, 2007).

To better understand the Portuguese context, it is essential to examine the regulatory framework governing the provision of nutritional information through labelling in Portugal. The Portuguese Regulation (Decreto-Lei nº 26/2016) establishes specific requirements for food labelling, including the mandatory inclusion of nutritional information (i.e., the nutritional value per 100g or 100 ml of product), ingredients, and allergens. This legislation aligns with European Union regulations, aiming to provide consistent and accurate information to consumers across member states (Martini et al., 2019).

1.3) What is protein and why is it so popular?

In recent years, high protein diets have emerged in popularity amongst people interested in fitness and healthier lifestyles. Protein is a crucial macronutrient responsible for building and repairing tissues. Protein also aids immune function and hormone production (Cargill, 2019). The recommended daily protein intake for adults is 0.8 grams per kilogram of body weight. However, it should be noted that protein intake should be based on dimensions besides degree of activity, sex, and other factors (Wolfe et al., 2008). Protein has also been linked to aiding weight management, since it provides a feeling of satiation to individuals, reducing their appetite after consumption (Westerterp-Plantenga, 2020). Along with protein's role in building and maintaining muscle mass, high-protein diets have been shown to promote muscle protein

synthesis, which is important specifically for individuals engaging in resistance exercise (Jäger et al., 2017). This could be specifically important for older adults since recent research has shown a positive association between health and muscle mass at an older age (Baum et al., 2016).

High-protein diets' rising popularity is linked to a growing availability of enriched protein products (e.g., protein bars) and supplements, marketed towards athletes and sportsmen. The increased availability of these products generates interest and contributes to their popularity. Additionally, some trends have emerged regarding the incorporation of protein-rich foods, such as lean meats, and plant-based protein sources, into meals and snacks (Shang et al., 2018). For example, in a study conducted by Li and Dando (2019), participants were asked to rate their liking of vanilla yogurts based on various labels, including "High-Protein." Results provided us with the conclusion that amongst the labels, participants preferred "High-Protein" and "Low Fat" labels, over labels such as "All Natural". Another study by Fernan et al. (2017), showed that "High-Protein" claims increase people's perception of protein content, specifically in protein bars.

1.3.1) Protein intake in Portugal

Regarding the Portuguese data, it is concerning to observe that a considerable portion of the Portuguese population has inadequate protein intake. About 39.3% of adult women and 22.6% of adult men under consume protein (i.e., intake of under 0.8g per kilo of bodyweight; IAN-AF, 2017). Low protein consumption should be addressed as a serious matter. Protein is a nuclear element to muscle mass maintenance and considering muscle health serves as an indicator of quality of life and lower risks of mortality, low protein intake could represent risks for overall health and well-being. Individuals (particularly adults and the elderly) should ensure they meet the recommended protein intake to support muscle health and optimize their overall health outcomes (Hengeveld et al., 2020).

However, 9.5% of adult women and 15.7% of adult men, as well as 83.2% of children and 35.2% of teenagers, were shown to overconsume protein (i.e., intake of over 2g per kilo of bodyweight; IAN-AF, 2017). Overconsumption of protein, particularly when it exceeds the recommended levels can have some significant health implications such as kidney strain due to the kidney function to filter and eliminate the waste generated from protein (Eguchi et al., 2019) and even weight management challenges, since overconsuming calories will always result in weight gain, whatever the nutrient is (Magkos & Astrup 2021).

1.4) Protein sources

Protein can be found in both animal and plant-based products, making it important to analyse their respective benefits and drawbacks.

Some examples of animal protein sources are meats, fish, and eggs, these are labeled as complete protein sources since they provide a complete profile of the essential amino acids required by the body (Wolfe et al., 2018). Amino acids are important for muscle growth, repair, and maintenance. However, over-ingestion of animal protein sources usually results in ingesting high levels of saturated fat which contribute to health problems such as cardiovascular diseases (Hoffman & Falvo, 2004). Moreover, we must consider the environmental footprint linked to animal protein consumption. Gas emissions, deforestation, water pollution, and high demand for the use of water are all consequences of livestock production which is the main source of animal protein (Detzel et al., 2021).

On the other hand, plant-based protein sources offer several options (e.g., legumes and soy products) as an alternative to animal protein ones. Regarding plant-based protein sources' benefits, these are mainly related to their composition since most plant-based products present lower levels of saturated fats (which is linked to heart disease) and higher levels of fiber and antioxidants when compared to their animal counterpart. Finally, when we consider the sustainability dimension, plant-based sources present a smaller environmental footprint since they require fewer natural resources and contribute to a more sustainable food system (Shaw et al., 2022).

However, plant-based protein sources have some limitations, like an incomplete profile of amino acids. To address this, vegan and vegetarian consumers must have some knowledge to ensure a complete amino acid profile (Shaw et al., 2022). Another drawback of the plant-based sources is their composition being less protein dense (when compared to their animal counterpart). To consume the necessary amount of protein with a complete profile of amino acids, individuals may need to consume a wide range of plant-based sources (Tso et al., 2021).

1.4.1) Attitudes and expectations towards protein sources of different origins

Considering the advantages and disadvantages of both protein sources, we must now discuss consumers' attitudes toward each of them.

In terms of animal protein sources, consumers often expect meat products to possess desirable sensory attributes such as juiciness, tenderness, and distinctive flavours that have been deeply ingrained in culinary traditions and cultural preferences. These animal-based

products are viewed as significant sources of high-quality protein and essential nutrients (Cook & Ancarno, 2019).

Still, consumers are increasingly drawn to plant-based proteins due to perceived health benefits, sustainability considerations, and compatibility with vegetarian or vegan lifestyles. This shift reflects a growing demand for diverse and sustainable protein choices following personal values and dietary preferences (Michel et al., 2021). However, consumer perceptions of plant-based alternatives were shown to be influenced by stereotypes about their taste, texture, and overall sensory experience. Some consumers may perceive plant-based alternatives as less flavourful, less satisfying, or less nutritionally complete compared to traditional meat products (He et al., 2020).

For instance, Michel et al. (2021) measured the participants' expectations of three burgers (beef, pea, and algae-based) in different variables. The study found that consumers' attitudes varied depending on the protein source. While traditional animal-based proteins like beef were generally favoured for their taste and sensory attributes, plant-based proteins such as peas and algae were perceived as healthier and more sustainable. However, some consumers expressed concerns about the taste and texture of plant-based proteins. These findings highlight the complex interplay of sensory, health, and sustainability considerations that influence consumers' attitudes toward the different protein sources.

Likewise, Possidónio et al. (2021) showed that consumers hold various expectations regarding plant-based alternatives. While some perceive plant-based proteins as healthier and more sustainable options, others express concerns about taste, texture, and overall sensory experience. These preconceived notions can significantly influence consumers' perceptions of plant-based alternatives and lead to variations in their attitudes toward these products. Recent research by Martinelli and de Canio (2021) suggests that consumers are willing to pay a premium price for vegan products due to ethical and sustainable concerns, which aligns with the conclusions drawn by Possidónio et al. (2021) regarding consumers' perception of plant-based products.

A study conducted by Stremmel et al. (2022) examined the impact of labelling expected vegan products (e.g., juice) as vegan versus unexpected-vegan products (e.g., products that include chocolate) as vegan. The findings revealed that consumers did not anticipate these products to be vegan by default, and the vegan label disconfirmed their expectations, leading to perceptual biases. Consequently, taste expectations were lowered, resulting in decreased consumption intentions across utilitarian and hedonic food categories, indicating that consumers value the taste of animal ingredients regardless of the type of food or consumption

goal. Therefore, labelling unexpected-vegan products (e.g., products that include chocolate) as vegan will negatively affect consumers' taste expectations and subsequent consumption intentions. However, the study also showed that the vegan label increased overall consumption intentions for unexpected-vegan products compared to expected-vegan products. This increase was partially mediated by perceived healthiness and sustainability, indicating how vegan labels influenced consumers' perceptions in terms of healthiness and sustainability. Moreover, this perception often includes the belief that vegan products have lower calories compared to animal protein products. However, there is a risk of misleading consumers into unhealthy overconsumption due to biased healthiness perceptions caused by the vegan label.

Finally, we address the presence of health halo effects in food claims. This effect occurs when consumers create a more positive impression of a product based on a single health claim. For instance, in the presence of a "low fat" claim, consumers may perceive the product as healthier, having fewer calories, and even expect a better taste (Wansink & Chandon, 2006).

1.5) Goal and hypothesis

Literature suggests that, despite having the main purpose of informing and educating consumers to make healthier choices (NITU et al., 2022), food claims are a tool that can be subject to misuse and misleading practices, whether through the dissemination of false or incomplete information or due to consumers' limited understanding of these claims (Pereira et al., 2019). Such misuse may be attributed to health halo effects caused by health claims (Fernan et al., 2017).

This experimental study was conducted to better understand people's perceptions of food products by manipulating food claims. Participants will be asked to rate a product (cereal bar) in several evaluative dimensions, with the package manipulated to highlight (or not) a high-protein content and its origin (vegan vs. control). Specifically, we predict that:

H1: The "High-protein" claim will create an expectation of higher protein content, satiation, caloric density and taste and lower expectations of healthiness, fat content, and sugar content compared to the control condition.

H2: The "Vegan" claim will create an expectation of worse taste, protein content and satiation and better expectations of healthiness, fat content, sugar content, and caloric density.

Chapter II - Method

2.1) Participants and design

The study included a total of 191 participants, with 39% being women. The age of the participants ranged from 18 to 66 years ($M = 39.5$, $SD = 15.5$). Most participants (76%) had at least a bachelor's degree. In terms of occupation, most participants were workers (45%) or students (36%). To better understand participants' profiles, they were asked about their involvement in sports or physical activities. Results revealed that most (55%) reported engaging in some form of physical activity, including activities such as gym classes or walking. Height and weight were also collected from the participants (as optional responses) and later used to calculate the Body Mass Index (BMI). According to the World Health Organization (2023), out of the 170 participants who provided this information, the majority (60%) fell within the normal BMI range (between 18.5 and 25), while 26% were classified as overweight (BMI over 25).

Participants were randomly assigned to one of the four conditions resulting from the design: 2 (Protein content claim: protein control; high protein) x 2 (Origin: origin control; origin vegan). Both factors were manipulated between-participants.

2.2) Instrument

This research was conducted in the Portuguese context with only Portuguese-speaking respondents. Therefore, the instruments described below were originally presented in Portuguese in the survey. The full survey can be found in Appendix 1.

2.2.1) Food perception

In this study, the participant's perception of various food products was assessed using a subset of evaluative dimensions (Prada et al., 2017). Specifically, the participants were requested to provide their ratings on three dimensions: healthiness, caloric content, and taste. These dimensions were measured using 7-point scales, ranging from 1 (indicating "*Not healthy at all/Not caloric at all/Not tasty at all*") to 7 (indicating "*Very healthy/Very caloric/Very tasty*"). Moreover, we also examined perceived nutritional characteristics by including four dimensions, namely fat, sugar, and protein content, as well as satiation, ranging from 1 (indicating "*Low fat content/Low sugar content/Low protein content/Not satiating at all*") to 7 (indicating "*High fat content/High sugar content/High protein content/Very satiating*").

2.2.2) Willingness to pay

Since price has a significant role when it comes to purchasing decisions (Hur et al., 2012), we decided to include a question adapted from Sörqvist et al. (2016) asking the participants how much they thought the product was worth starting from 0€ to 3€ (open-ended answer).

2.2.3) Control question and manipulation check

As this research adopts an experimental design, to assess participants' attentiveness and understanding of the survey content, some responses were flagged as potential indications of inattentiveness or lack of comprehension. We included a question in the questionnaire about the type of product presented (i.e., “What product did you just evaluate?”) including four possible answers (“A bar”; “Breakfast Cereal”; “A Pudding” and “A Chocolate”).

To assess if the manipulation between conditions had been successful (i.e., in this case, if the participant had noticed the claim in the packaging), we introduced the following questions “*The product you just evaluated:*” and gave the participant four possible answers: “*Had no information about the protein content*”; “*Had high protein content*”; “*Had information about protein content but I cannot recall it*”; and “*I cannot recall if it had information about the protein content*”. By including this question, we ensure the validity of the manipulation and its impact on participants' perceptions and responses.

2.2.4) Attitudes towards protein-enhanced products and perceived knowledge and frequency of consumption of protein-enhanced products

To gain insight into participants' attitudes and knowledge regarding protein-enhanced products, two open-ended questions were included in the survey. The first question “*To what kind of consumers do you associate protein-enhanced products?*” aimed to explore the associations participants made concerning the type of consumers who typically use protein-enhanced products. This allowed us to examine the perceived target audience for such products. The second question “*If you consume protein-enhanced products, please indicate the reasons and situations in which you do so (If you do not consume this type of product, please explain the reason as well)*” delved into participants' personal experiences and motivations related to consuming protein-enhanced products. By addressing these questions, we aimed to gain a comprehensive understanding of participants' attitudes, behaviours, and knowledge regarding protein-enhanced products.

Participants were then asked to rate their subjective knowledge of protein-enhanced products on a seven-point scale (i.e., “*How would you evaluate your knowledge of enriched*

protein products"; 1 = *Little knowledge*; 7 = *Very knowledgeable*) and to the frequency of their consumption of protein-enhanced products using a 7-point scale ("*How often do you consume enriched protein products?*"; 1 = *Rarely*; 7 = *Frequently*).

2.2.5) Perception of well-being and body signs

Participants were asked to indicate how much they think about their health and well-being (1 = *I don't think about my health and well-being*; 7 = *I think about my health and well-being a lot*) as well as their attention to body sign (1 = *I am not attentive to my body signs*; 7 = *I am attentive to my body signs a lot*) using 7-point scales.

2.2.6) Sports practice

To characterize participants' sports practice, we adopted the categorization proposed by Santos (2021): federated athletes actively involved in sports, non-federated athletes participating in sports, individuals engaged in regular physical activities, and individuals who neither participate in sports nor engage in physical activities.

In the questionnaire, participants were asked to choose one of the five options (including an option to not answer) that best described their status, along with providing details about the sports they practice or the physical activities they engage in and the frequency. Based on Santos's (2021) proposal, participants were later divided into two groups: athletes (those who selected the first or second option and reported a frequency of at least four times a week) and non-athletes (those who selected the third or fourth option or participants who selected the second option and reported a frequency of fewer than four times a week).

2.3) Material

A set of labels was developed in order to address the protein content (i.e., protein control or high protein) and the origin of the source (i.e., origin control or origin vegan; see Table 2.1).

Table 2.1.

Set of labels used for all conditions.

		Protein Content Information	
		<i>Protein control condition</i>	<i>High protein condition</i>
Product origin information	<i>Origin control condition</i>		
	<i>Origin vegan condition</i>		

We chose an image of a protein bar from an international retailer's website. This brand was selected due to its uncommonness in the Portuguese market. The product (cereal bar) was chosen since it typically offers both animal-based and plant-based options. To ensure uniformity throughout the study, all experimental conditions were based on the same image and edited in Photoshop CS6 64-bit to display the intended claim. The original brand was kept.

This approach was implemented to minimize the presence of extraneous variables that could potentially influence participants' evaluations of the products. The four images were standardized to a resolution of 1200 x 630 pixels.

2.4) Procedure

All procedures were conducted following the ethical guidelines set forth by Iscte-Instituto Universitário and the project was approved by the OPP (Portuguese Psychologists Order). The survey used in the current study was developed using the online survey platform Qualtrics. Individuals were invited to participate in a survey about the perception, and evaluation of food products. Invitations were extended through various channels, such as institutional emails and social networking websites, to encourage participation. Each participant was only presented with one of the conditions – which were assigned automatically by the software evenly.

The first part of the survey included a brief description of the study including estimated time duration, informed consent information, and the voluntary nature of their participation. Participants were also informed that they could give up the survey at any time by closing their

browser. After consenting, participants were asked for some demographic data (e.g., age, nationality, gender).

The demographic data was followed by a short debrief on how there were no right or wrong answers for product evaluation as we seek for authentic answers. Following this debrief, participants were shown one of the conditions and had to evaluate the product on seven dimensions (protein content, fat content, sugar content, healthiness, satiation, caloric density, and taste) as well as how much they thought the product was worth and how they would feel if they consumed the product they were presented (for a trial example, see Figure 2.1).

Then, they were presented with the manipulation check questions, followed by a question about their subjective knowledge about enriched protein products, their frequency of consumption, and finally, questions regarding their attitudes towards enriched protein products where participants were asked to associate the products to a population and provide their reasoning to consume or not consume those products. After that, participants were asked to rank their perception of well-being and attention to body-signs.

Finally, participants were requested to provide their height and weight (given there was an option to not answer) and indicate their level of physical activity/sports practice, according to the provided options. The last question regarded participants' level of knowledge about nutrition.

Once the survey was completed, participants were thanked for their participation and provided with a short debrief that included contact information for the research team. Participants were also given a box to fill in their email addresses in order to participate in the gift card prize draw and a box to ask the research team any questions regarding the study or its outcome.

Figure 2.1.

Example of a condition present in the questionnaire



ON[®]
VEGAN HIGH PROTEIN BAR
CHOCOLATE CARAMEL

Na sua opinião esta **barra**, é:

	1	2	3	4	5	6	7	
Nada calórico	☐	☐	☐	☐	☐	☐	☐	Muito calórico
Baixo teor proteico	☐	☐	☐	☐	☐	☐	☐	Elevado teor proteico
Nada saboroso	☐	☐	☐	☐	☐	☐	☐	Muito saboroso
Baixo teor de gordura	☐	☐	☐	☐	☐	☐	☐	Elevado teor de gordura
Baixo teor de açúcar	☐	☐	☐	☐	☐	☐	☐	Elevado teor de açúcar
Nada saudável	☐	☐	☐	☐	☐	☐	☐	Muito saudável
Nada saciante	☐	☐	☐	☐	☐	☐	☐	Muito saciante

Em que medida estaria interessado em comprar esta **barra**?

	1	2	3	4	5	6	7	
Nada interessado	☐	☐	☐	☐	☐	☐	☐	Muito interessado

Note. This trial corresponds to the “High Protein Vegan” condition.

Chapter III - Results

3.1) Manipulation checks

3.1.1) Manipulation check regarding product type

Considering this research was conducted with an experimental design, a manipulation check regarding the product was placed in the questionnaire. In this question, participants were asked to recall what food products they were shown.

As shown in Table 3.1, most of the participants were able to remember correctly the product evaluated, with the lowest correct answer being 93.48% for the “high protein vegan” condition.

Table 3.1.

Conditions: Manipulation check according to product (% of Hits)

	"Bar"	"Breakfast Cereal"	"Chocolate"	"Pudding"
Origin Control	93.75%	-	6.25%	-
Origin Vegan	94%	-	6%	-
High-Protein Control	100%	-	-	-
High-Protein Vegan	93.48%	-	6.52%	-

3.1.2) Manipulation check regarding claim

We asked the participant to recall if the packaging of the food product shown had any information on protein content (see Table 3.2).

In general, we can state most of the participants noticed and could recall the correct information of the claim presented in their condition. It was in the case of the origin vegan condition that most participants correctly recalled the information in the packaging (83.68%); followed by the high-protein vegan claim (78.26%); the high-protein control claim followed (77.08%) and lastly, the protein control condition (72.92%).

In the origin vegan and high protein vegan claims, more than 12% of the participants stated that they could not recall the information about the protein content. This was more noticeable for the control condition (25%).

Table 3.2.*Conditions: Manipulation check according to condition (% of Hits)*

	<i>"Had no information about the protein content"</i>	<i>"Had high protein content"</i>	<i>"Had information about the protein content but I cannot recall it"</i>	<i>"I cannot recall if it had information about the protein content"</i>
Origin Control	72.92%	-	2.08%	25%
Origin Vegan	83.68%	4.08%	-	12.24%
High-Protein Control	12.50%	77.08%	6.25%	4.17%
High-Protein Vegan	4.35%	78.26%	2.17%	15.22%

3.2) Impact of claim about protein content of different origins on the evaluation of protein content, fat content, sugar content, healthiness, satiation, caloric density, and taste

Participants were requested to rate the product image presented along with the claim about protein and origin of the condition they were associated with. A 2 (origin control, origin vegan) X 2 (protein control, high protein) design was used, and univariate ANOVAs per evaluative dimension. Descriptive results are summarized in Table 3.3.

Table 3.3.*Means and standard deviations for each variable according to claim about protein and origin.*

	Origin: Control		Origin: Vegan		Total	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Protein content						
Protein Control	3.53	1.82	2.66	1.46	3.10 ^c	1.70
High Protein	6.23	1.33	6.30	.812	6.26 ^d	1.11
<i>Total</i>	4.77 ^a	2.10	4.26 ^b	2.18	4.52	2.15
Sugar Content						
Protein Control	5.49	1.25	3.72	1.80	4.61 ^c	1.78
High Protein	4.40	1.68	3.35	2.00	3.90 ^d	1.90
<i>Total</i>	4.99 ^a	1.55	3.56 ^b	1.89	4.29	1.86
Fat Content						
Protein Control	4.96	1.60	3.49	2.00	4.22 ^c	1.95
High Protein	3.68	1.90	3.38	1.92	3.53 ^d	1.90
<i>Total</i>	4.37 ^a	1.85	3.44 ^b	1.95	3.91	1.95
Taste						
Protein Control	5.72	1.28	3.62	1.80	4.67 ^c	1.88
High Protein	5.57	1.55	3.78	1.80	4.71 ^d	1.89
<i>Total</i>	5.66 ^a	1.41	3.69 ^b	1.79	4.69	1.88
Caloric Density						
Protein Control	5.55	1.18	4.23	2.20	4.89 ^c	1.87
High Protein	4.70	1.56	3.81	1.93	4.27 ^d	1.79
<i>Total</i>	5.16 ^a	1.42	4.05 ^b	2.08	4.61	1.86
Satiation						
Protein Control	3.43	1.77	3.47	1.41	3.45 ^c	1.59
High Protein	3.67	1.82	4.24	1.53	3.95 ^d	1.70
<i>Total</i>	3.54 ^a	1.78	3.81 ^b	1.51	3.67	1.65
Healthfulness						
Protein Control	2.83	1.59	4.68	2.12	3.76 ^c	2.08
High Protein	4.52	1.84	5.27	1.88	4.88 ^d	1.88
<i>Total</i>	3.61 ^a	1.90	4.94 ^b	2.03	4.26	2.07
WTP ¹						
Protein Control	1.49	0.53	1.61	.59	1.55 ^c	0.56
High Protein	1.60	0.57	1.66	.58	1.63 ^d	0.57
<i>Total</i>	1.54 ^a	0.55	1.63 ^b	.58	1.58	0.56

Note: Ratings for all items varied between 1 and 7 except for ¹WTP (Willingness to pay) ranging from 0 to 3. Sample was reduced to by 20 participants ($n=171$), considering the results of the manipulation check measures. Different superscripts indicate different mean scores according to origin claim (^{a, b}) and claim about protein (^{c, d}).

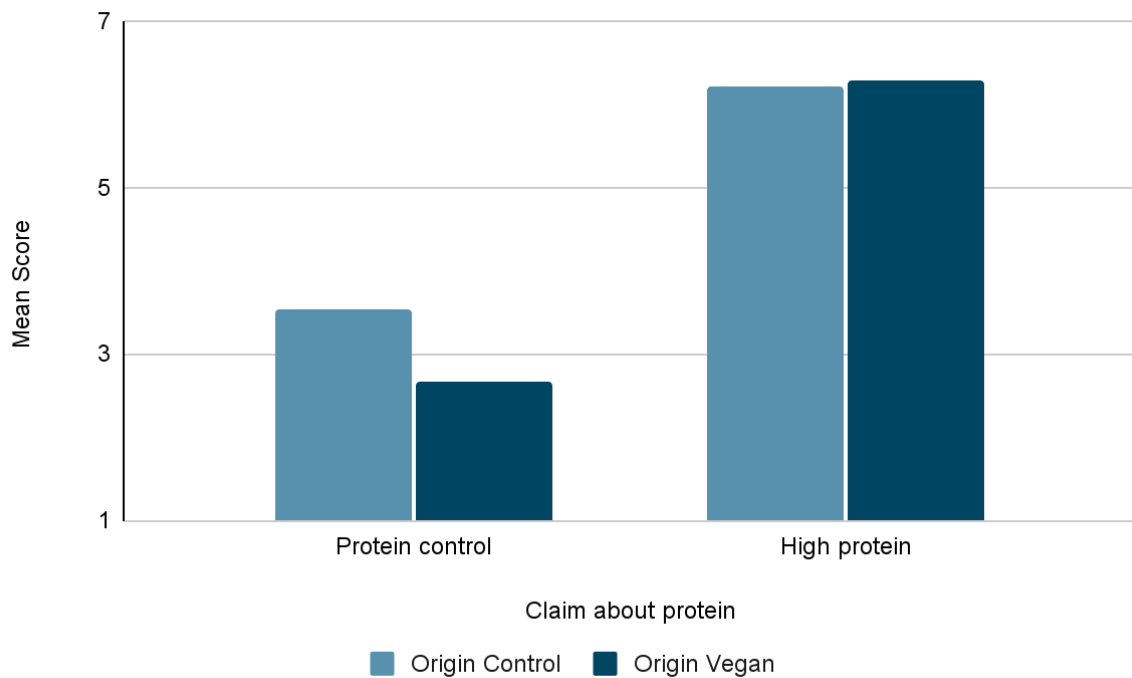
3.2.1) Protein content

As expected, the high protein claim significantly influenced the evaluation of protein content, $F(1,167) = 206.344$, $MSE = 2.054$, $p < .001$, $\eta_p^2 = .553$, such that the high protein bars ($M =$

6.26, $SD = 1.11$) were rated as having higher protein content than the bars in the control condition ($M = 3.10$, $SD = 1.70$). We did not observe a significant main effect of food origin in protein ratings, $F(1,167) = 3.295$, $MSE = 2.054$, $p = .071$, $\eta_p^2 = .019$. However, the interaction between the claim about protein and origin was significant, $F(1,167) = 4.594$, $MSE = 2.054$, $p = .034$, $\eta_p^2 = .027$. As we can see in Figure 3.1, when the product did not display a high protein label (i.e., control), the vegan option was rated as having less protein than the control origin condition, $t(169) = -14.085$, $p < .001$. In contrast, origin did not influence perceived protein content for the high protein conditions, $t(169) = 1.553$, $p = .422$.

Figure 3.1.

Participants perceived protein content means by claim about protein and origin.



Note: Mean scores varied between 1 and 7

3.2.2) Sugar content

For sugar content, the claim about protein content also influenced the evaluation, $F(1, 167) = 7.936$, $MSE = 2.845$, $p = .005$, $\eta_p^2 = .045$. This result shows that high protein condition bars ($M = 3.90$, $SD = 1.90$) were rated as having less sugar than the control condition bars ($M = 4.61$, $SD = 1.78$). The origin also influenced perceived sugar content, $F(1, 167) = 29.437$, $MSE = 2.845$, $p < .001$, $\eta_p^2 = .150$. As expected, the origin control conditions ($M = 4.99$, $SD = 1.55$) were evaluated as having more sugar than the origin vegan conditions ($M = 3.56$, $SD = 1.89$).

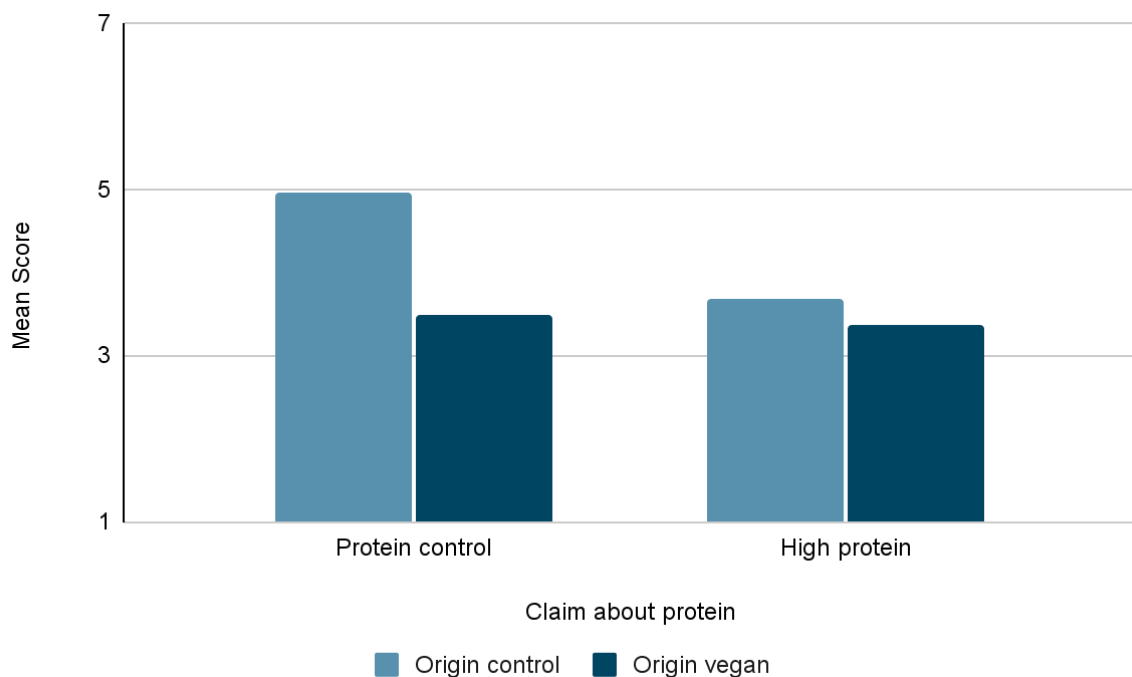
Moreover, the interaction effect between the claim about protein and origin was not significant, $F(1, 167) = 1.912$, $MSE = 2.845$, $p = .169$, $\eta_p^2 = .011$.

3.2.3) Fat content

Similarly, fat content evaluation was influenced by the claim about protein content, $F(1, 167) = 5.961$, $MSE = 3.444$, $p = .016$, $\eta_p^2 = .034$, so high protein condition bars ($M = 3.53$, $SD = 1.90$) were evaluated as having less fat than the protein control condition bars ($M = 4.22$, $SD = 1.95$). As expected, origin also played a role, $F(1, 167) = 9.561$, $MSE = 3.444$, $p = .002$, $\eta_p^2 = .054$, with origin control condition bars ($M = 4.37$, $SD = 1.85$) being evaluated as having more fat content than origin vegan bars ($M = 3.44$, $SD = 1.95$). Results also pointed to an interaction between the claim about protein and origin, $F(1, 167) = 4.213$, $MSE = 3.444$, $p = .042$, $\eta_p^2 = .025$ as shown in Figure 3.2. However, two independent sample t-tests showed the interaction to be non-significant for both claim about protein $t(169) = 2.333$, $p = .023$ and origin $t(169) = 3.189$, $p = .002$.

Figure 3.2.

Participants perceived fat content means by claim about protein and origin.



Note: Mean score varied between 1 and 7

3.2.4) Caloric density

The claim about protein also influenced perceived calories, $F(1, 167) = 5.596$, $MSE = 3.079$, $p = .019$, $\eta_p^2 = .032$, as the high protein condition bars ($M = 3.44$, $SD = 1.95$) were perceived as being less caloric than the protein control condition ($M = 4.89$, $SD = 1.88$). As expected, we also found a significant effect of origin, $F(1, 167) = 16.749$, $MSE = 3.079$, $p < .001$, $\eta_p^2 = .091$, with origin control condition bars ($M = 5.16$, $SD = 1.42$) being rated has more calorie than the origin vegan condition bars ($M = 4.05$, $SD = 2.08$). We did observe a significant interaction between both factors, $F(1, 167) = 0.635$, $MSE = 3.079$, $p = .427$, $\eta_p^2 = .004$.

3.2.5) Healthfulness

As expected, both the claim about protein, $F(1, 167) = 15.832$, $MSE = 3.486$, $p < .001$, $\eta_p^2 = .087$, and origin, $F(1, 167) = 20.447$, $MSE = 3.486$, $p < .001$, $\eta_p^2 = .109$, showed an effect on consumers perceived healthfulness. Specifically, high protein condition bars ($M = 4.88$, $SD = 1.89$) were perceived as healthier than the protein control condition ($M = 3.76$, $SD = 2.08$); and origin control condition bars ($M = 3.61$, $SD = 1.90$) were rated as less healthy alternative in comparison to origin vegan condition bars ($M = 4.94$, $SD = 2.03$). However, no interaction effect was found between the claim about protein and the origin, $F(1, 167) = 3.709$, $MSE = 3.486$, $p = .056$, $\eta_p^2 = .022$.

3.2.6) Satiation

In the satiation variable, the claim about protein influenced expected satiation, $F(1, 167) = 4.131$, $MSE = 2.687$, $p = .044$, $\eta_p^2 = .024$ with high protein condition bars ($M = 3.95$, $SD = 1.70$) being rated as more satiating than the protein control condition ($M = 3.95$, $SD = 1.59$). On the other hand, origin did not influence rating in this dimension, $F(1, 167) = 1.468$, $MSE = 2.687$, $p = .227$, $\eta_p^2 = .009$, nor there was an interaction between the factors, $F(1, 167) = 1.087$, $MSE = 2.687$, $p = .299$, $\eta_p^2 = .006$.

3.2.7) Taste

Finally, as expected, taste showed no effect of the claim about protein, $F(1, 167) = .001$, $MSE = 2.602$, $p = .971$, $\eta_p^2 = .000$. However, as expected, the origin claim had a main effect, $F(1, 167) = 61.726$, $MSE = 2.602$, $p < .001$, $\eta_p^2 = .270$, with origin control condition bars ($M = 5.66$, $SD = 1.40$) being rated has tastier than origin vegan condition bars ($M = 3.69$, $SD = 1.79$). Moreover, we found no interaction effect between the factors, $F(1, 167) = 0.404$, $MSE = 2.602$, $p = .526$, $\eta_p^2 = .002$.

3.3) Willingness to pay

When it comes to consumers' willingness to pay for the products, in contrast to our prediction, we did not observe significant main effects of the claim about protein content, $F(1, 167) = 0.760$, $MSE = .322$, $p = .384$, $\eta_p^2 = .005$ nor origin $F(1, 167) = 0.404$, $MSE = 1.065$, $p = .304$, $\eta_p^2 = .006$. The interaction between these factors was also non-significant, $F(1, 167) = 0.093$, $MSE = .322$, $p = .761$, $\eta_p^2 = .001$.

3.4) Subjective knowledge and frequency of consumption of enriched protein products

In general, the participants' subjective knowledge about enriched protein products was found to be low ($M = 3.61$, $SD = 2.02$), $t(168) = 23.251$, $p < .001$ (one sample t-test against scale midpoint). Moreover, results show no differences in subjective knowledge about enriched protein products according to the claims about protein or origin, $F < 1$ for all conditions.

Similarly, when it comes to the frequency of consumption of enriched protein products, participants showed a low frequency ($M = 3.50$, $SD = 2.07$), $t(168) = 21.963$, $p < .001$ (one sample t-test against scale midpoint). Moreover, results show no differences in the frequency of consumption of enriched protein products according to the claims about protein or origin, $F < 1$ for all conditions.

3.5) Attitudes towards enriched protein products

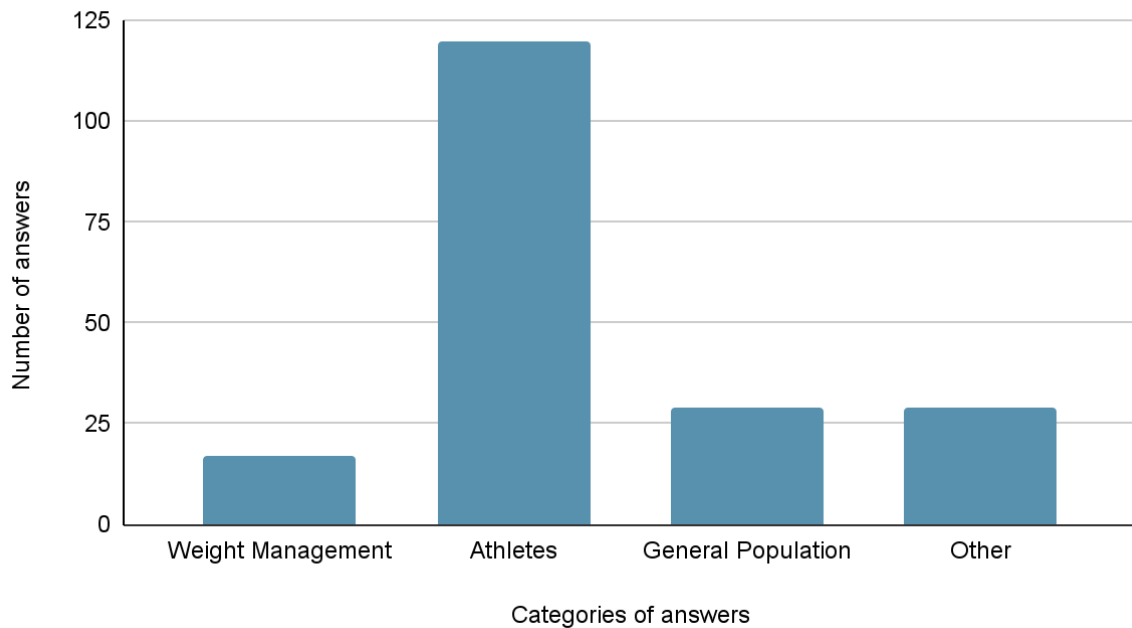
3.5.1) Participants associations

With the goal of exploring participants' views of enhanced-protein products, we asked them to indicate to what population they associated these products. A total of 176 participants (92%) answered this open-ended question, being coded 210 responses (the number of associations is greater than the number of answers since one answer could include more than one category). The responses were coded into four categories: weight management, athletes, general population, and other answers (see Figure 3.3).

The main category was athletes with 120 answers (57%, e.g., “*People who attend the gymnasium and athletes*”, [“*Pessoas que frequentam ginásio e atletas*”]), followed by the general population with 29 answers (14%, e.g., “*All population*”, [“*Toda a população*”]) and other answers also with 29 answers (14%, e.g., “*I don't know*”, [“*Não sei*”]) and finally weight management with 17 answers (8%, e.g., “*People trying to lose weight*”, [“*Pessoas a tentar perder peso*”]). However, 15 participants chose not to answer (7%).

Figure 3.3.

Participants association of enriched protein products (n = 210)



3.5.2) Participants reasons for consuming enriched-protein products

With the goal to unveil participants' purposes for consumption of enriched protein products, we asked their reasoning for consuming (or not) these products. Out of the 191 participants, 97 stated they consumed enhanced protein products (51%), while 73 said they did not consume enhanced protein products (38%) and finally 21 participants chose not to answer (11%) being coded 178 responses (this value is higher than the number of participants since multiple categories could be present in the same answer). The answers were then coded in a total of 8 categories: price, taste, health, weight management, sports and exercise, lack of knowledge, preference for other alternatives, and other answers (see Figure 3.4).

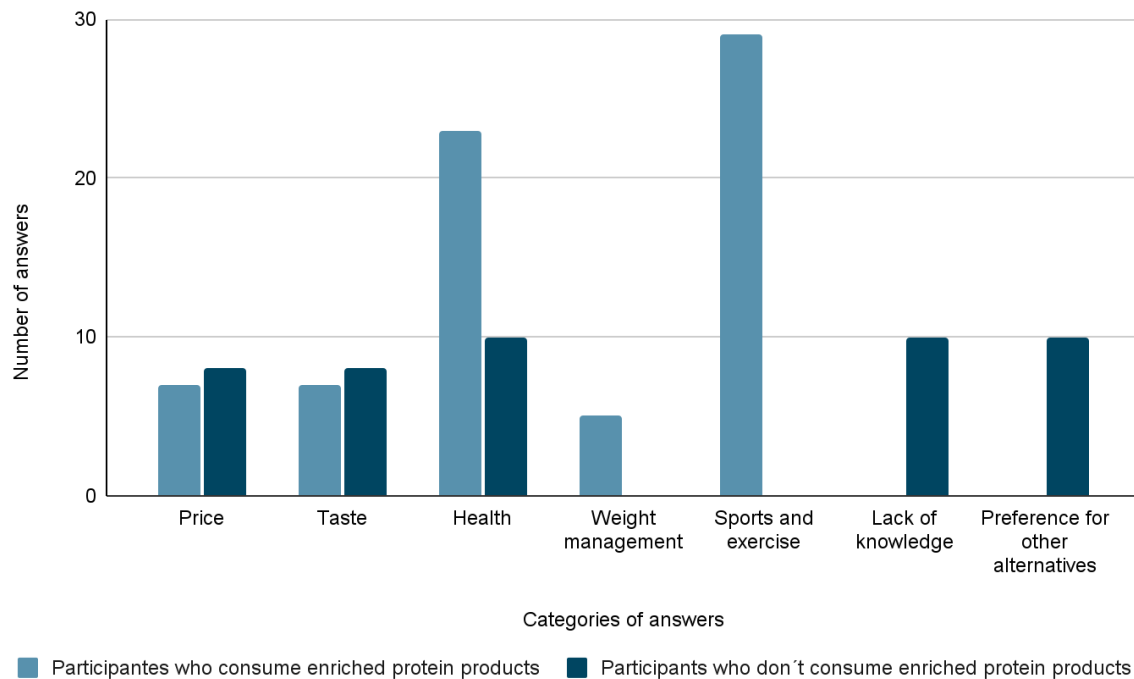
The most prevalent answers from participants who consumed enriched protein products were sports and exercise (28%, e.g., “*When I exercise*”, [*Quando pratico exercício físico*]) and health reasons (23%, e.g., “*I according to the need to reach my daily protein amount*”, [*Consumo mediante necessidade de atingir a quantidade diária de proteína*]), along with other answers (28%, e.g., “*My son says they are good for me*”, [*O meu filho diz-me que são bons para mim*]).

The most prevalent answers from participants who did not consume enriched protein products were health reasons (13%, e.g., “*I think they have too much sugar*”, [*Acho que tem muitos açúcares*]), lack of knowledge about enhanced protein products (13%, e.g., “*I am not informed on the matter*”, [*Não estou informado sobre o assunto*]) and preference for

alternatives (13%, e.g., “I would rather opt for unprocessed products” , [“*Prefiro optar por produtos não processados*”]), as well as other answers (28% e.g., “I never happened to buy them”, [“*Nunca calhou comprar*”]).

Figure 3.4.

Participants reasons for consuming/not consuming enriched protein products (n = 178).



3.6) Sports practice and perception of well-being and body signs

Considering the criteria, most participants were not considered athletes (94.2%) with only 10 (5.8%) being considered athletes.

Participants' mean score for perceptions of well-being ($M = 5.43$, $SD = 1.27$), $t(168) = 55.575$, $p < .001$ (one sample t-test against scale midpoint), and body signs ($M = 5.06$, $SD = 1.71$), $t(168) = 38.377$, $p < .001$ (one sample t-test against scale midpoint), were both high. The high means imply that participants were concerned with their health and attentive to their body signs.

3.7) Correlations

To better understand the variables frequency of consumption of enriched protein products and subjective knowledge about enriched protein products, we explored how individuals' characteristics were related to both these variables and participants' perception of the products. Results are shown in Table 3.4.

Frequency of consumption showed a moderate positive correlation with both knowledge, $r = .505$, $p < .001$, and health, $r = .415$, $p < .001$. This suggests that participants who consume enriched protein products more often are prone to be more knowledgeable about them and have better health attitudes.

Subjective knowledge about enriched protein products showed a strong positive correlation with health attitudes, $r = .604$, $p < .001$, and a weak positive correlation with BMI, $r = .260$, $p = .001$. This result tells us that participants with higher subjective knowledge about enriched protein products show more concern for their health. Moreover, the correlation between subjective knowledge about enriched protein products and BMI implies that the more knowledgeable an individual is about enriched protein products, the higher their BMI is.

Table 3.4

Correlations between main variables and sociodemographic variables

	1.Age	2.BMI	3.Frequency of consumption	4.Subjective knowledge	5.Health	6.Taste	7.Satiation	8.Healthfulness	9.Caloric density	10.Protein content	11.Fat content	12.Sugar content	13.Purchase interest
1	-	.170*	-.191*	.026	.016	.055	-.096	.039	.004	-.050	.170*	.122	.028
2	.170*	-	.019	.260**	.025	.128	-.109	-.098	.071	-.048	.209**	-.023	.078
3	-.191*	.019	-	.505**	.415**	.092	.036	-.108	.181*	.036	.436**	.156*	.031
4	.026	.260**	.505**	-	.604**	.097	-.182*	-.336**	.465**	-.139	.259**	.381**	.471**
5	.016	.025	.415**	.604**	-	.094	-.052	-.395**	.375**	.088	.334**	.320**	.275**
6	.055	.128	.092	.097	.094	-	-.046	-.395**	.375**	.088	.334**	.320**	.275**
7	-.096	-.109	.036	-.182*	-.052	-.046	-	.376**	-.233**	.334**	.320**	.320**	.275**
8	.039	-.098	-.108	-.336**	-.229**	-.395**	.376**	-	-.667**	.320**	.320**	.320**	.275**
9	.004	.071	.181*	.465**	.294**	.375**	-.233**	-.667**	-	.320**	.320**	.320**	.275**
10	-.050	-.048	.036	-.139	-.012	.088	.334**	.320**	-.210**	-	.320**	.320**	.275**
11	.170*	.209**	.157*	.436**	.259**	.381**	-.317**	-.628**	.625**	-.141	-	.584**	-.175*
12	.122	-.023	.156*	.216**	.174*	.417**	-.309**	-.721**	.598**	-.220**	.584**	-	-.218**
13	.028	.078	.031	-.046	-.094	.244**	.471**	.275**	-.115	.412**	-.175*	-.218**	-

Note: * Correlation is significant at the 0.05 level (2-tailed).
 ** Correlation is significant at the 0.01 level (2-tailed).

Chapter IV - Discussion

Considering the emerging preoccupation with human health, animal welfare, and environmental concerns, the need for information became a nuclear variable for consumers to make the best choices according to their beliefs and well-being (Van der Merwe et al., 2022). Food claims became an important source of information for consumers regarding the nutritional or health benefits of a product, production methods, origin, and certifications related to animal welfare (de Boer, 2021; Fernqvist & Ekelund, 2014).

Previous research has found that health claims can significantly impact consumers' perception of a product (Oostenbach et al., 2019). Nutritional claims specifically have been shown to influence consumers' perception of product attributes (Grunert et al., 2011; Lando & Labiner-Wolfe, 2007; Prada et al., 2021). Additionally, the appeal of “*high protein*” claims has been highlighted, as they were found to enhance consumers' perception of protein content and were favoured over other nutritional claims (Fernan et al., 2017; Li & Dando, 2019).

In the current work, our main goal was to understand how food claims would shape consumer expectations regarding different product characteristics such as healthfulness, macronutrient profile, and participants' willingness to pay, by exposing participants to the same product with different claims, specifically “*high protein*” and “*vegan*” claims. We also considered the possibility of sports practice moderating consumers' approach to food claims and evaluation of enriched protein products.

In our first hypothesis, we theorized how the presence of a “*high protein*” claim would lead to an overall better evaluation of the product. The results support our hypothesis, apart from the expected taste dimension. It is also important to note that, the presence of the “*high protein*” claim influenced consumers to the extent of expecting the product to be healthier in non-claimed dimensions, such as caloric density and sugar content, leading to an overall expectation of a healthier product. This could be attributed to a health halo effect since consumers assume the “*high protein*” labelled products to be overall healthier (Wansink & Chandon, 2006). Even though there were no claims regarding the protein source or ingredients, the health halo effect still took place, this goes in accordance with Katz et al. (2019). These results also corroborate the findings of Li and Dando (2019), meaning consumers show a general preference for products labelled as “*high protein*”.

In our second hypothesis, we suggest that the presence of a “*vegan*” claim would lead to a more negative evaluation of the product considering sensory information. Even though results showed no effect of the “*vegan*” claim in both the protein content and satiation variables, our

hypothesis was partially supported. It is important to consider that the presence of the “vegan” claim, influenced consumers since these showed expectations of a healthier product in non-claimed dimensions such as healthfulness, sugar content, fat content, and caloric density. Looking at the dimensions of taste and healthfulness, we can observe a health-pleasure trade-off since participants anticipate a decrease in perceived tastefulness and loss of hedonic pleasure in exchange for a more healthful product (Bialkova et al., 2016; Prada et al., 2021).

Moreover, these findings regarding the “vegan” claim, follow the conclusions provided by Michel et al. (2021), where the author states that even though plant-based products were overall favoured in the moral dimension, healthier and more sustainable, the taste was deemed a concern for consumers, who expected plant-based products to have an unpleasant taste.

Although recent research showed consumers were willing to pay a premium price for plant-based products regarding their moral, sustainable, and healthfulness dimensions (e.g., Martinelli and de Canio, 2021; Possidónio et al., 2021), our results showed no significant effect in either claim about protein or origin.

Results regarding attitudes towards enriched protein products showed participants mainly associate such products with athletes, showing a direct connection to healthier lifestyles, which is reinforced by consumers' main reason to consume enriched protein products being linked to sports practice and health reasons. Once again, this association supports the emergence of a halo effect (Wansink & Chandon, 2006) due to the claim about protein content, making consumers believe protein is linked to health and better lifestyles. To an extent, this is not wrong, since protein is needed for developing muscle mass, which, has health benefits, including being linked to a better elder life quality at elder age (Hengeveld et al., 2020). However, due to the implications overconsumption of protein could have for an individual, the daily recommended dose should be respected considering the individual's profile and lifestyle (Eguchi et al., 2019; Jäger et al., 2017).

Interestingly, some participants who admitted not consuming enriched protein products showed a preference for alternative options (e.g., unprocessed products), which goes against the results of Li and Dando, 2019, who showed an “*all natural*” label to be the least liked by consumers when compared to “*high protein*” and “*low fat*” labels. On the other hand, natural choices and organic choices were shown to influence consumers' perceived healthfulness and overall interest in purchase (Berry et al., 2017) since they perceive these products as healthier whereas processed products are perceived as unhealthier (Dubé et al., 2016) which could be linked to the health reasons not to consume enriched protein products.

4.1) Limitations and Future Studies

Even though the design used in this study was able to meet the main goal and provide answers to the hypothesis, it is important to understand its limitation. First, we should point out that although the questionnaire was carefully made, the pictures used were not validated for the Portuguese population.

After the questionnaire was shared online, an error was found in the first manipulation check question “*What product did you just evaluate?*”, whereas one of the options given to participants was “*pudding*”, the option presented was supposed to be “*cookies*”. The option “*pudding*” would feel out of touch with the rest of the options since it’s a completely different product, however, the manipulation checks seemed to be successful, so we proceeded.

Some limitations worth pointing out are extraneous variables. One example of this could be the influence of someone’s diet (e.g., someone vegan would be biased towards a better evaluation of a vegan product). To address this limitation, control questions could have been introduced (e.g., asking what diet the participant follows). Consumers' values, such as the importance of animal welfare, environmental awareness, and health concerns (Fernqvist & Ekelund, 2014), could be considered potential moderators in future studies.

Moreover, due to the design used, participants' responses were self-reported which considering the focus of the study could be susceptible to response bias, besides. Additionally, the design did not consider participants' contextual factors when completing the questionnaire which could bias their evaluation. For instance, a participant answering the questionnaire while feeling hungry could influence their response.

Due to the restricting nature of the definition of an athlete we decided to follow (i.e., any participant who was a federated athlete or practiced a sport with a frequency of at least 4 times a week), it was not possible to analyse the impact of this variable due to the low percentage of participants defined as athletes (i.e., 5.8% of the sample).

Finally, the sample size could be considered a limitation. Even though the research had 191 participants, this design required the use of four conditions. Moreover, some participants were excluded from this research since the manipulation check was an exclusion criterion.

Some possible directions for future studies, include studying how “*high protein*” and “*vegan*” claims may affect consumers' perceptions of other products. In addition, the claims used in our study followed the front of package design which has a direct implication on consumers' behaviour. Future research may try to examine this effect design and compare the outcomes with other designs (e.g., a claim present in the back of the package). A less restrictive

definition of an athlete should also be adopted to better understand if being an athlete could be a mediator.

As for practical implications, this study showed the presence of a health halo effect regarding the “*high protein*” and “*vegan*” claims, if consumers consider these products healthier by default, they are more likely to purchase products with these labels and even overconsume them, which may not be appropriate, meaning it could be harmful to the consumer.

As for theoretical contributions, this study shed some light on the consumer behaviour field. Specifically, how claims about protein content and product origin impact consumers' expectations regarding food products. This study showed how “*high protein*” and “*vegan*” claims influence consumers, making them expect products to be healthier and overall, better when compared to products with no claim (Michel et al., 2021; Wansink & Chandon, 2006). We saw the presence of a health halo effect (Wansink & Chandon, 2006) for both claims, since these were expected to be healthier in dimensions that were not presented to the participants, and a health pleasure trade-off (Bialkova et al., 2016) for the “*vegan*” claim since the products were expected to be healthier at the cost of a better taste. Our results go according to the literature, showing the influence food claims present over consumers' expectations and food choices.

Overall, there is a need to increase information and awareness about the effects of protein and origin claims on consumers' perceptions of healthfulness. This is a matter that involves consumers' health, therefore, any diet should be adapted to an individual's needs, promoting sustainable consumption of protein.

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Appendix 1

Questionnaire

ISCTE-Instituto Universitário de Lisboa

Caro/a participante,

O presente estudo surge no âmbito de uma tese de mestrado a decorrer no Iscte – Instituto Universitário de Lisboa. Objetiva-se entender como as pessoas percecionam diferentes produtos alimentares.

O questionário terá a duração aproximada de **5 minutos**. A participação é de **carácter estritamente voluntário**, tendo a possibilidade de interromper a participação em qualquer momento sem ter de prestar qualquer justificação, bastando para isso fechar esta página de navegação.

Ao participar habilita-se a ganhar um **cartão presente de um valor de 50€** da Sonae.

Para além de voluntária, a participação é **anónima e confidencial**. Os dados obtidos destinam-se apenas a tratamento estatístico e nenhuma resposta será analisada ou reportada individualmente. De acordo com as normas da comissão de Proteção de Dados, a eventual publicação dos dados só poderá ter lugar em revistas da especialidade.

Agradecemos antecipadamente pela sua colaboração!

Tendo tomado conhecimento sobre a informação disponível acerca do estudo, declaro aceitar participar:

☐ SIM

☐ NÃO



0%  100%

ISCTE-Instituto Universitário de Lisboa

Antes de iniciar por favor responda a algumas perguntas gerais.

Por favor indique a sua idade:

Indique, por favor, o seu género:

☐ Mulher

☐ Homem

☐ Não binário

☐ Prefiro não responder

Indique a sua nacionalidade:

☐ Portuguesa

☐ Outra. Qual?



Indique, por favor, a sua ocupação?

☐ Aluno/a

☐ Estudante-trabalhador/a

☐ Empregado/a

☐ Desempregado/a

☐ Reformado/a

☐ Outra

Indique o seu nível máximo de escolaridade (se for estudante, indique o grau que frequenta atualmente)?

☐ Ensino básico

☐ Ensino secundário

☐ Licenciatura

☐ Pós-graduação

☐ Mestrado

☐ Doutoramento

Neste estudo, pretendemos entender como é que as pessoas percecionam diferentes produtos alimentares.

No seu caso, iremos pedir-lhe que avalie uma nova **barra** indicando em que medida o alimento lhe parece:

- ... saboroso (1 = Nada saboroso a 7 = Muito saboroso)
- ... calórico (1 = Nada calórico a 7 = Muito calórico)
- ... saudável (1 = Nada saudável a 7 = Muito saudável)
- ... saciante (1 = Nada saciante a 7 = Muito saciante)
- ... teor proteico (1 = Baixo teor proteico a 7 = Elevado teor proteico)
- ... teor gordura (1 = Baixo teor gordura a 7 = Elevado teor gordura)
- ... teor açúcar (1 = Baixo teor açúcar a 7 = Elevado teor açúcar)

Estas avaliações devem ser **rápidas e espontâneas**. Estamos apenas interessados na sua opinião, logo não existem respostas certas nem erradas.



0%  100%

ISCTE-Instituto Universitário de Lisboa

Click to write the question text



Na sua opinião este **barra**, é:

	1	2	3	4	5	6	7	
Baixo teor de gordura	☐	☐	☐	☐	☐	☐	☐	Elevado teor de gordura
Baixo teor de açúcar	☐	☐	☐	☐	☐	☐	☐	Elevado teor de açúcar
Baixo teor proteico	☐	☐	☐	☐	☐	☐	☐	Elevado teor proteico
Nada saciante	☐	☐	☐	☐	☐	☐	☐	Muito saciante
Nada calórico	☐	☐	☐	☐	☐	☐	☐	Muito calórico
Nada saboroso	☐	☐	☐	☐	☐	☐	☐	Muito saboroso
Nada saudável	☐	☐	☐	☐	☐	☐	☐	Muito saudável

Em que medida estaria interessado em comprar esta **barra**?

	1	2	3	4	5	6	7	
Nada interessado	☐	☐	☐	☐	☐	☐	☐	Muito interessado



Na sua opinião esta **barra**, é:

	1	2	3	4	5	6	7	
Nada calórico	☐	☐	☐	☐	☐	☐	☐	Muito calórico
Baixo teor proteico	☐	☐	☐	☐	☐	☐	☐	Elevado teor proteico
Nada saboroso	☐	☐	☐	☐	☐	☐	☐	Muito saboroso
Baixo teor de gordura	☐	☐	☐	☐	☐	☐	☐	Elevado teor de gordura
Baixo teor de açúcar	☐	☐	☐	☐	☐	☐	☐	Elevado teor de açúcar
Nada saudável	☐	☐	☐	☐	☐	☐	☐	Muito saudável
Nada saciante	☐	☐	☐	☐	☐	☐	☐	Muito saciante

Em que medida estaria interessado em comprar esta **barra**?

	1	2	3	4	5	6	7	
Nada interessado	☐	☐	☐	☐	☐	☐	☐	Muito interessado

0% ————— 100%

ISCTE-Instituto Universitário de Lisboa

Click to write the question text



Na sua opinião esta **barra**, é:

	1	2	3	4	5	6	7	
Nada saciante	☐	☐	☐	☐	☐	☐	☐	Muito saciante
Baixa teor de gordura	☐	☐	☐	☐	☐	☐	☐	Elevado teor de gordura
Baixo teor de açúcar	☐	☐	☐	☐	☐	☐	☐	Elevado teor de açúcar
Baixo teor proteico	☐	☐	☐	☐	☐	☐	☐	Elevado teor proteico
Nada calórico	☐	☐	☐	☐	☐	☐	☐	Muito calórico
Nada saboroso	☐	☐	☐	☐	☐	☐	☐	Muito saboroso
Nada saudável	☐	☐	☐	☐	☐	☐	☐	Muito saudável

Em que medida estaria interessado em comprar esta **barra**?

	1	2	3	4	5	6	7	
Nada interessado	☐	☐	☐	☐	☐	☐	☐	Muito interessado

0%  100%

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Click to write the question text



Na sua opinião esta **barra**, é:

	1	2	3	4	5	6	7	
Baixo teor de açúcar	☐	☐	☐	☐	☐	☐	☐	Elevado teor de açúcar
Nada saciante	☐	☐	☐	☐	☐	☐	☐	Muito saciante
Nada calórico	☐	☐	☐	☐	☐	☐	☐	Muito calórico
Nada saudável	☐	☐	☐	☐	☐	☐	☐	Muito saudável
Baixo teor de gordura	☐	☐	☐	☐	☐	☐	☐	Elevado teor de gordura
Baixo teor proteico	☐	☐	☐	☐	☐	☐	☐	Elevado teor proteico
Nada saboroso	☐	☐	☐	☐	☐	☐	☐	Muito saboroso

Em que medida estaria interessado em comprar este **barra**?

	1	2	3	4	5	6	7	
Nada interessado	☐	☐	☐	☐	☐	☐	☐	Muito interessado

Por favor, indique quanto é que acha que esta **barra** vale (de 0 a 3€):

Imagine que consumia esta **barra**. Como se sentiria?

	1	2	3	4	5	6	7	
Nada orgulhoso/a	☐	☐	☐	☐	☐	☐	☐	Muito orgulhoso/a
Nada culpado/a	☐	☐	☐	☐	☐	☐	☐	Muito culpado/a



Pedimos-lhe agora que responda a um conjunto de questões de controlo face ao produto que avaliou.

Que produto alimentar avaliou?

☐ Chocolate

☐ Barra

☐ Pudim

☐ Cereais de Pequeno-Almoço

O alimento que avaliou neste questionário:

☐ Não continha informação acerca do teor proteico

☐ Não me recordo de ver informação sobre teor proteico

☐ Fornecia informação sobre o teor proteico, mas não me recordo

☐ Continha elevado teor proteico



0%  100%

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Como avalia o seu conhecimento em relação a **produtos alimentares enriquecidos com proteína**:

1 2 3 4 5 6 7

Baixo conhecimento ☐ ☐ ☐ ☐ ☐ ☐ ☐ Elevado conhecimento

Com que frequência consome **produtos alimentares enriquecidos com proteína**?

1 2 3 4 5 6 7

Raramente ☐ ☐ ☐ ☐ ☐ ☐ ☐ Frequentemente

A que tipo(s) de consumidores associa **produtos alimentares enriquecidos com proteína**?

Caso consuma produtos enriquecidos com proteína, indique-nos, por favor, quais as **razões** e em que **situações** o faz:

(Caso não consuma este tipo de produtos, explique-nos igualmente o porquê):



0%  100%

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Responda agora às seguintes afirmações, indicando a opção que melhor o/a caracteriza:

	1	2	3	4	5	6	7	
Não penso na minha saúde e bem-estar	☐	☐	☐	☐	☐	☐	☐	Penso muito na minha saúde e bem-estar
Não estou atento/a aos sinais do meu corpo	☐	☐	☐	☐	☐	☐	☐	Estou muito atento/a aos sinais do meu corpo



Para finalizar, por favor indique a sua **altura**...

☐ Cm

☐ Não sei / Prefiro não responder

Para finalizar, por favor indique o seu **peso**...

☐ Kg

☐ Não sei / Prefiro não responder

Selecione, por favor, apenas uma das seguintes opções:

☐ Atualmente estou inscrito/a como atleta federado/a. Por favor, indique que modalidade desportiva pratica (e.g., atletismo,futebol) e quanto tempo por semana se dedica a essa modalidade.

☐ Não estando inscrito/a como atleta federado/a, pratico uma modalidade desportiva (e.g., atletismo,futebol). Por favor, indique que modalidade desportiva pratica e quanto tempo por semana se dedica a essa modalidade.

☐ Não pratico qualquer modalidade desportiva (e.g., atletismo,futebol), mas costumo fazer exercício físico (e.g., caminhada, corrida, aula em ginásio). Por favor, indique que tipo de exercício físico pratica e quanto tempo por semana se dedica a essa modalidade.

☐ Não pratico qualquer modalidade desportiva (e.g., atletismo,futebol), nem faço exercício físico regularmente.

☐ Prefiro não responder

0% — 100%

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Tem formação superior na área da Nutrição?

☐ Sim. Por favor, indique qual:

☐ Não, mas interessou-me e leio muito sobre esta área.

☐ Não.



0% — 100%

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O estudo chegou ao fim.

Mais uma vez agradecemos a sua participação!

Se desejar fazer algum comentário ou pedir algum esclarecimento adicional, por favor use o espaço abaixo ou contacte-nos via e-mail: **marilia_prada@iscte-iul.pt** ou **gamds@iscte-iul.pt**.

Caso tenha interesse em participar no sorteio do cartão presente de 50€, indique-nos o seu e-mail:

(Note que o seu endereço de email não vai armazenado, nem divulgado ou emparelhado com as suas respostas, servindo apenas para o sorteio)