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The interplay between health claims and sensory attributes in determining consumers' purchase intentions for extra virgin olive oil

Lara Bou Fakhreddine^{*}, Mercedes Sánchez

Department of Business and IS-FOOD Research Institute, Public University of Navarra, Edificio Madroños, Campus Arrosadía, 31006 Pamplona, Spain

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ABSTRACT

A large body of literature has supported the idea that both food-intrinsic sensory attributes (e.g., taste, aroma, etc.) and food-extrinsic attributes (e.g., origin, health claims etc.) play a crucial role in consumers' purchase intentions. However, it is still uncertain how the presence of health claims in the era of high prevalence of diseases and viruses (e.g., the COVID-19 pandemic) might impact sensory attributes, and therefore shape consumers' purchase intentions. Thus, the aim of the study is to (i) investigate the impact of health claims presented to the consumers along with the sensory attributes on their purchasing intentions, and (ii) examine to what extent sensory attributes mediate the relationship between the presence of health claims and consumers' purchasing intentions. For that purpose, sensory analysis of a healthy food product (extra virgin olive oil (EVOO)) was conducted to examine consumers' interest in health claims in two scenarios: an informed scenario without health claims ($n = 102$) and an informed scenario with health claims ($n = 105$). The findings from a Structural Equation Model using STATA software suggest that the presence of health claims positively affects purchase intentions for EVOO. The sensory attributes taste and aftertaste partially mediate the relationship between the presence of health claims and consumers' purchasing intentions. Furthermore, consumers rated the sensory attributes higher in the presence of health claims. Therefore, the food industry should focus on ways to improve consumers' sensory and health perspectives by producing not only healthier food products with health claims but also tastier products than the ones available in the market. Moreover, food companies and marketers can make health claims more effective by targeting consumers' preferences and developing marketing campaigns using claims that are essential for promoting extra-virgin olive oil.

1. Introduction

Food products are introduced in the market as a bundle of attributes to draw the attention of consumers. These attributes can be either intrinsic (related to food itself) or extrinsic (non-food cues) (Olson & Jacoby, 1972). A large body of literature now supports the idea that both food-intrinsic sensory attributes (e.g., taste, aroma, etc.) and food-extrinsic attributes (e.g., origin, health claims, etc.) play a crucial role in purchase intentions (Ballco et al., 2020; Enneking et al., 2007; Symmank, 2019; Tempesta & Vecchiato, 2019). For instance, the information presented on the product packaging is considered vital in directing consumers' purchase intentions (Delgado et al., 2013; Miraballes et al., 2014; Mueller & Szolnoki, 2010; Solja et al., 2018). However, the sensory aspects can determine repeat purchases (Pinto et al., 2017).

Studies have shown that consumers considered sensory

characteristics to be one of the most important purchasing factors (Ares et al., 2008; Beriain et al., 2009; Corallo et al., 2019). However, non-sensory characteristics are gaining more interest, especially information regarding the health-related benefits of food products which can be communicated in several ways (e.g., traffic light systems, logos etc.) (De Gennaro et al., 2021; Delgado et al., 2013; Vidigal et al., 2011). Various manufacturers have adopted health claims to help consumers make healthy food choices. Based on the EU Regulation No. 1924/2006 (European Parliament and Council, 2006), health claims indicate the relationship between food nutrients and health effects. Furthermore, this growing interest in health claims is mainly related to the context, while consumers' interest in nutrition information and healthy eating is habitual it is also contextual (Sheth, 2020). In other words, the contextual factors such as the emergence of new diseases and viruses increase consumers' risk perception which motivates them to adopt new habits to protect themselves (Slovic, 1987). For instance, the high

^{*} Corresponding author.

E-mail addresses: lara.boufakhreddine@unavarra.es (L. Bou Fakhreddine), mersan@unavarra.es (M. Sánchez).

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prevalence of noncommunicable diseases (i.e., 71 % of all deaths globally) and recently the emergence of the COVID-19 pandemic have changed consumer behaviors by increasing the consumption and purchase of healthy foods (Borsellino et al., 2020; Cummings et al., 2022; Laguna et al., 2020; Rodríguez-Pérez et al., 2020). Thus, the need for nutrition information (e.g., health claims) increases in order to easily differentiate the healthy food products (Dörnyei & Gyulavári, 2016). Hence, it is important to keep on investigating the relevance of health claims presented to consumers since several unpredictable disasters could emerge that shift their attitudes towards healthy eating. Furthermore, it is relevant for researchers and practitioners to recognize the interplay between food-intrinsic sensory attributes and food-extrinsic attributes as both factors must be enhanced for the success of the product in the market (Mueller & Szolnoki, 2010; Pinto et al., 2017).

Several studies have combined intrinsic and extrinsic attributes to investigate consumers' purchasing intentions. Sánchez et al. (2012) analysed the effect of personal characteristics on the purchasing intentions for beef, focusing on the role of both intrinsic and extrinsic product attributes. Furthermore, Hoque et al. (2018a) studied the influence of health claims and sensory attributes on consumers' purchasing intentions for milk. Pinto et al. (2017) evaluated the importance of packaging and health claims along with sensory attributes on the acceptability and purchase decision for snack bars. Recently, Ballico et al. (2020) examined the effect of taste on consumer preferences regarding health and nutritional claims and how visual attention to these claims can influence consumers' purchasing intentions toward the yogurt.

Hence, it is still uncertain how the presence of extrinsic attributes such as health claims might impact actual food purchases as the purchase process is affected by various factors among which are the sensory attributes (Ballico & Gracia, 2022; Grunert 2015). Furthermore, Boncinelli et al. (2017) proposed to combine sensory attributes with nutritional value to obtain a general perspective about food products.

Given the above and the high degree of interest in health information especially health claims, the main objectives of our study are first, to investigate the impact of health claims presented to consumers along with the sensory attributes on their purchasing intentions, furthermore, to examine whether the interplay between the presence of health claims and sensory attributes might increase the likelihood of the product being purchased. For that purpose, a sensory analysis of a healthy food product (Extra Virgin Olive Oil-EVOO) is conducted to examine consumers' interest in nutrition information in two scenarios. The first scenario is the informed scenario without health claims and the second one is the informed scenario with health claims.

Researchers have recently focused on consumer acceptance of health claims for EVOO, indicated as a promising credence attribute for the purchase intention of EVOO and allowing fair returns for producers' work (Roselli et al., 2017). Health claims have been shown to add value to dairy products (Bimbo et al., 2016), however, their ability to add value to EVOO has been examined only marginally and with conflicting results (Boncinelli et al., 2017; De Gennaro et al., 2021; Perito et al., 2019; Pichierri et al., 2020a, 2020b). To the best of our knowledge, only a limited number of studies have tested the importance of health claims for consumers purchasing EVOO products. Boncinelli et al. (2017) surveyed Italian consumers (n = 1000) and found that health claims play a marginal role in the purchase of EVOO products. By contrast, Perito et al. (2019) examining consumer preferences for a wider set of search and credence attributes, found that health claims were a fundamental attribute for EVOO consumers. Also, Pichierri et al. (2020a, 2020b) competitively tested the four health claims associated with EVOO in a sample of Italian consumers and found that clearer health claims may add value to the product and increase consumers' purchase intentions. Lastly, De Gennaro et al. (2021) assessed the importance of health claims in selecting EVOO products by taking into consideration consumer preferences for search, experience, and credence attributes potentially

available on EVOO, as well as by accounting for attitudinal and psychographic individual characteristics which affect consumer purchase intentions for EVOO with health claims. Tempesta & Vecchiato (2019) suggest combining the study of health claims with a sensory analysis, in order to have more realistic information on the importance of health claims for EVOO. Furthermore, studying the effect of health claims on the sensory perception of EVOO will allow for a deeper investigation into the consumer experience and purchase intentions (McSweeney, 2022).

Thus, this study contributes to the literature on the role of health claims and sensory attributes in directing consumers' purchasing intentions for EVOO in various ways. First, the combination of health claims and sensory attributes may constitute a holistic approach to gain more insights into consumer behaviour during the purchase process (Asioli et al., 2017; Pinto et al., 2017). Furthermore, the consideration of a wide range of sensory attributes (e.g., taste, aroma, aftertaste and colour) allows us to examine the interplay between the health claims and these attributes in shaping purchase intentions for EVOO. In this way, we may be able to draw conclusions on the impact of health claims on sensory attributes which in turn influence the purchase intentions for EVOO. The second contribution is to assess the mediating role of sensory attributes between the presence of health claims and purchase intentions for EVOO, thus explaining the mechanism (i.e., presence or absence of health claims) through which health claims can influence purchase intentions in a hedonic evaluation context. Combining health claims with sensory attributes is important in order to have an in-depth understanding of the factors triggering consumers' interest in nutrition information and how that might affect their purchasing intentions. Finally, findings from this study give additional insights for policymakers and marketers in the agro-food sector to promote their healthy products through health claims and also to focus on their sensory attributes to position their products well in the marketplace.

2. Theoretical background

2.1. Health claims and purchase intention

Extrinsic attributes such as health claims (i.e., statements on the product presenting the benefits of some nutrients on the individual's health) (European Commission, 2006), known also as credence attributes, are those characteristics the quality of which cannot be inspected either before or after purchase (Darby & Karni, 1973). Health claims on products attempt to address consumers' interest in health by transmitting messages about specific benefits that are likely to add value to products (Lähteenmäki, 2013). Health claims are, therefore, one piece of information that consumers may use to evaluate the possible benefits of a product for them (Ballico & Gracia, 2022). For instance, health claims can positively shape consumers' purchasing intentions for EVOO (Pichierri et al., 2021). Several studies have investigated the importance of health claims for consumers purchasing EVOO products (Perito et al., 2019; Pichierri et al., 2020 a,b). Boncinelli et al. (2017) found in a study of Italian consumers that health claims played a marginal role in the selection of EVOO products compared to the origin and organic attributes. However, Casini et al. (2014) found that consumers were willing to buy more EVOO bearing a health claim. Additionally, Perito et al. (2019) examined Italian consumers' preferences for a varied set of product attributes and found that health claims were a crucial attribute for EVOO consumers. Moreover, Pichierri et al. (2020b) examined consumer responses to different health claims in an experimental study with Italian participants and found that they may increase product attractiveness and consumers' purchase intention. De Gennaro et al. (2021) found that Italian consumers are interested in and value health claims on EVOO. Additionally, a study conducted in Germany and the United Kingdom revealed that consumers who valued the health properties of EVOO had higher purchasing intentions (Peršurić, 2020). Thus, we aim to test the following research hypothesis:

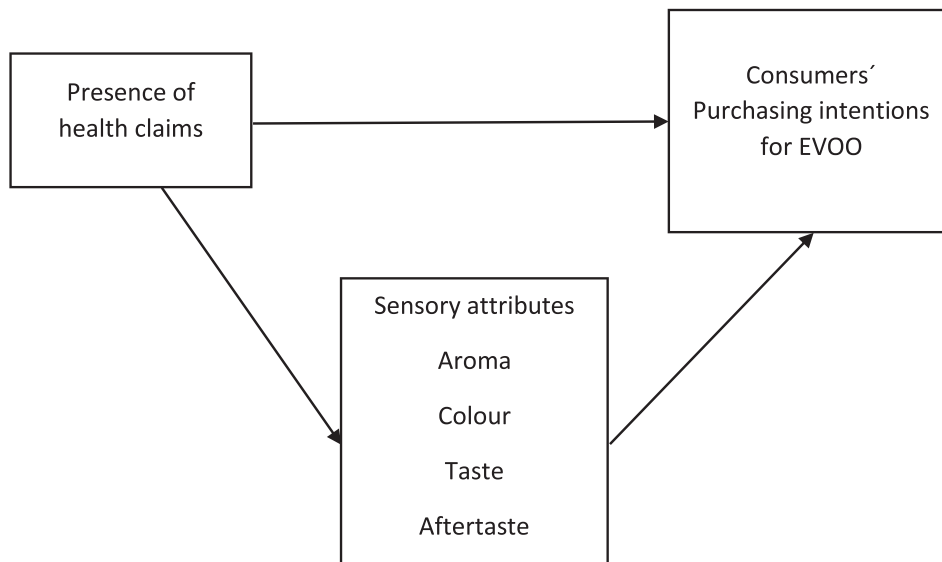


Fig. 1. Conceptual model representing the mediation effect of the sensory attributes.

H1. The presence of health claims positively influences consumers' purchasing intentions for EVOO.

2.2. Health claims and sensory attributes

The European Food Safety Authority (EFSA) Register of Nutrition and Health Claims records all authorised and non-authorised health claims and permits food companies to use these health claims on food products in the European Union (European Commission, 2012). Hence, consumers are actively looking for health claims to address their health needs and this has led to more manufacturers adopting health claims on their labels (Lähteenmäki, 2013). However, some previous findings have shown that health information could serve as a signal for sensory attributes (Kiesel & Villas-Boas, 2013; Werle et al., 2013). Thus, health information not only triggers consumers' health perceptions but also influences other perceptions, such as sensory attributes which are the main drivers of their purchase intentions (Turnwald & Crum, 2019). During the purchasing process for food products, consumers rely on the attributes presented on the product to direct their decisions to buy it or not (Fernqvist & Ekelund, 2014). These attributes include intrinsic characteristics such as taste, colour, etc., that can be evaluated by the consumers only after purchase or consumption (Nelson, 1970). For instance, taste is one of the most important attributes for purchasing EVOO (Dekhili et al., 2011). Furthermore, Santosa & Guinard (2011) have pointed out the importance of sensory attributes, especially that flavour positively affected the purchase and consumption motivations for EVOO.

Additionally, several studies have emerged to analyse to what extent the presence of health claims on food products affects consumers' sensory profiling (McSweeney, 2022; Plasek & Temesi, 2019). Grasso et al. (2017) revealed that the inclusion of plant sterol health claim information significantly influenced consumer sensory profiling before and after health claim information disclosure. Moreover, for soy muffins with health claims, Padhi et al. (2015) argue that the flavour, aroma and taste of the product with health claims are perceived as higher when compared to the wheat muffins without claims. Regarding sensory profiling, in comparisons of blind tasting vs informed tasting conducted with food products, results have shown that when consumers taste the product in blind conditions (i.e., absence of health claims), those factors are not available for the consumer to create any expectation, and if an EVOO is very bitter or pungent, it may be rejected for not meeting the

expectations of consumers (Delgado et al., 2013). Health claims can also make a food item more appealing to consumers, especially if they are interested in that particular health claim (Klopčič et al., 2020). However, McSweeney (2022) in his systematic review showed that there is a negative relationship between the perceived healthiness of the food product and its flavour. On the other hand, Jo et al. (2016) found the opposite result with French consumers, healthier items were perceived to be tastier. In the same line, Jo & Lusk (2018) found a positive relationship between perceived health and taste by studying how taste and health beliefs for sixty food items in different countries changed in response to exogenous health information. Hence, we hypothesized that:

H2. The presence of health claims positively affects the sensory characterisation of the EVOO.

2.3. The mediation effect of sensory attributes

Health extrinsic attributes and sensory attributes can positively impact consumers' purchasing intentions (Balco et al., 2020; Pichierri et al., 2020a) and they may be a fundamental tool for the consumer's judgement of the product's quality (Pinto et al., 2017). In food products, informed liking (consumers' blind liking, evaluation of packaging, brand, region, etc.) may mediate the relationship between cues and purchase intention (Mueller & Szolnoki, 2010). Furthermore, Apaolaza et al. (2017) found that the sensory attributes mediate the relationship between the organic label on wine and consumers' purchase intentions. Additionally, Hoque et al. (2018b) found that sensory attributes mediate the association between the presence of labelling information and purchasing intentions for a functional food such as milk. This idea is also consistent with widely established evidence in the literature regarding consumers' purchasing intentions toward healthy products (Gorski Findling et al., 2018), suggesting that their interest in the health claims of the product is positively related to their intention to purchase it (Pichierri et al., 2021) as mentioned previously. Given this, it is predictable that the sensory attributes mediate the effect of the presence of health claims on consumers' purchasing intentions for EVOO.

Lay beliefs might be a useful concept to explain further the latter relationship (Jo & Lusk, 2018). Lay beliefs refer to the individual's subjective, informal, and common-sense explanation for the world around them (Furnham, 1988). The literature has demonstrated that consumers intuitively believe that the less healthy a food product is, the better it will taste (Balco & Gracia, 2022; Hamblin, 2018; Mai &

Hoffmann, 2015; Raghunathan et al., 2006; Suzuki & Park, 2018). Raghunathan et al. (2006) found that consumers consider less healthy items to be better tasting and preferred them when the hedonic goal is more salient. Lima et al. (2019) indicate that a product's sensory attributes overrode the effect of health claims and suggest that this public policy is unlikely to have a real effect on consumers' purchase intentions if there are no healthy alternatives that meet their sensory expectations. The remaining sensory attributes such as aftertaste, aroma and colour, can negatively or positively affect consumers' purchase intentions depending on each individual's preferences (Peršurić, 2020). For instance, some consumers disliked bitter oils, and liked ones that were somewhat rancid (Delgado et al., 2013). Additionally, some consumers attributed higher quality to the EVOOs that were greener in colour, whereas other consumers assumed that greener olive oils were of poorer quality (Gámbaro et al., 2014). Thus, we hypothesized that:

H3. The sensory attributes mediate the relationship between the presence of health claims and purchasing intentions for EVOO.

Our conceptual model is depicted in Fig. 1.

3. Methodology

3.1. Participant recruitment

The study was conducted in Pamplona, Navarra, a region in Northern Spain. Spanish participants were recruited by sharing all relevant information about the EVOO sensory analysis (e.g., location, date, time

Table 1
Descriptive analysis by information scenario.

	Total	Information scenario		Statistical tests	
		Without health claims	With health claims	Statistical value	Sig.
Sociodemographic characteristics					
Gender				3.5119	0.061
Female	50.72 %	44.12 %	57.14 %		
Male	49.28 %	55.88 %	42.86 %		
Age				0.1208	0.941
18–30 years	33.33 %	32.35 %	34.29 %		
31–50 years	45.89 %	46.08 %	45.71 %		
51–80 years	20.77 %	21.57 %	20.00 %		
Education				3.6496	0.302
Elementary	4.35 %	3.92 %	4.76 %		
Secondary	20.29 %	18.63 %	21.90 %		
High	75.36 %	77.45 %	73.33 %		
Economic level				3.6883	0.158
Low	5.80 %	5.88 %	5.71 %		
Medium	83.09 %	87.25 %	79.05 %		
High	11.11 %	6.86 %	15.24 %		
Consumption frequency				6.6439	0.084
Everyday	86.96 %	83.33 %	90.48 %		
At least once per week	11.11 %	14.71 %	7.62 %		
Two or three times per month	0.97 %	1.96 %			
Rarely	0.97 %		1.90 %		
Never					

etc.) through the Public University of Navarra website and Diario de Navarra which is a local newspaper on the 10th of June 2021,¹ in

¹ <https://www.unavarra.es/sites/actualidad/contents/noticias/2021/06/10/la-upna-busca-personas-voluntari.html><https://www.diariodenavarra.es/noticias/navarra/2021/06/10/se-buscan-voluntarios-para-catar-aceite-oliva-hamburguesas-pamplona-729859-300.html>.

Pamplona, Navarra, Spain. People that were interested in participating sent an email to a specific email address or made contact by telephone (indicating name and surname, age, day, and time chosen, and contact telephone or email) to confirm their participation. Inclusion criteria included being an EVOO consumer and aged 18 years or older. Spain is the main producer and consumer country of extra virgin olive oil in the world, accounting for 63 % of EU production and 40 % of worldwide production (European Commission, 2020). Between 2020 and 2021 Spanish extra virgin olive oil increased by 23.6 % (MAPA - Ministry of Agriculture, 2020). Spaniards consumed more than 138 million liters of extra virgin olive oil in 2021 and the Navarra region registered 3.99 L per person/year (MAPA - Ministry of Agriculture, 2020). Thus, a total of 207 consumers of EVOO were recruited. The sensory experiment was conducted in a dedicated tasting room² at the Public University of Navarra over three days on the 15th, 17th and 21st of June 2021.

3.2. Sample characteristics

A descriptive analysis of the socio-demographic profiles for the two sub-samples based on the information scenario (i.e., without health claims vs with health claims) is presented in Table 1. No statistically significant differences were found, apart from gender and consumption frequency. The total sample of 207 consumers was randomly divided between the information scenarios (Without health claims = 102 and with health claims = 105). The p-values of the chi-squared tests show that the null hypothesis of similarity between information scenarios cannot be rejected for all the characteristics; age (0.941), education level (0.302), economic level (0.158), apart from gender (0.061) and consumption frequency (0.084), meaning that there were no differences between treatments. Half of the respondents were female (50.72 %). Regarding age groups, the age ranges from 31 to 50 years old were the most common (45.89 %). Concerning the education level, people with higher studies were overrepresented (75.36 %) in the sample. The medium income level was also overrepresented (83.09 %).

3.3. Selection of EVOO and health claims

Regarding the sensory experiment, four different types of EVOO were presented to the consumers. Two of them were traditional EVOO but with different origins and varieties of olives: the first one is from Navarra and the olive variety is Arroniz, the second one is from Jaen and is the Picual olive variety. The other two types were one innovative EVOO with truffle and the other an organic EVOO. The number of samples was limited to four as recommended by the Olive Oil Council (COI/T20/Doc15) that when tasting a virgin olive oil, four samples at the most should be assessed in each session to avoid the contrast effect that could be caused by immediately tasting other samples. Furthermore, excessive tastings may produce fatigue or loss of sensitivity (Meilgraad et al., 1999). For instance, Predieri et al. (2013) presented four samples of Italian EVOO to study consumers' attitudes towards local virgin olive oil production. Moreover, the selection of four types of EVOO was a strategy to cover a wide range consumed by Spanish consumers, also, as a proxy for different kinds of EVOO that consumers encounter during the purchasing process and finally to focus the objective of our study and not cause a distraction for consumers by providing too much information. Thus, we selected one local type from Navarra because the experiment is conducted in Pamplona which is located in this province. The second one (Jaen, Andalucía and Picual olive variety) was chosen because

² We followed the global sensory standards managed by the International Standards Organisation (ISO) Committee ISO/TC34/SC12 on Sensory Analysis, whose scope is 'standardisation in the field of food sensory analysis that includes vocabulary, general directives, selection and training of sensory analysis assessors and the methodology to carry out the different tests, including materials and apparatus specification used in the laboratory': <https://www.iso.org/ics/67.240/x/>.

Andalucía is the largest olive oil producer worldwide and Picual is the most abundant variety in Spain, additionally, Andalusian EVOO was ranked the World's Best Olive Oil by the International Oleic Council (Mario solinas, 2022). Furthermore, the inclusion of an innovative and ecological EVOO was to keep up with consumers as they become more interested in innovative products and concerned about environmental issues (Banovic et al., 2019; Pindado & Barrera, 2020). The selection of EVOO as the product of interest in this study was based on various reasons: (1) Europe is the largest producer of olive oil globally and Spain accounts for 63 % of this, more than a half of the whole of Europe's production, and 40 % of the worldwide production (European Commission, 2020; MECS -Ministry of Education, Culture & Sports, 2017), (2) The world's consumption of olive oil has risen over the last three years reaching approximately 3,215,000 tonnes in 2022 (IOC - International Olive Council, 2022). This rise in the consumption is because of the increase in consumers' awareness of the health benefits of the Mediterranean diet (Salas-Salvadó et al., 2018), which is regarded as the best healthy diet for 2022 and olive oil is the main source of healthy fat in this diet (US News & World Report, 2022), and (3) specifically, in the Mediterranean countries such as Spain, where the consumption is quite high, consumers tend to shift their consumption to higher quality olive oils, such as EVOO (Ballco & Gracia, 2020). EVOO can offer a series of health benefits such as its anti-inflammatory properties (Kohatsu & Karpowicz, 2018), and a reduction of the risk of developing hypertension or diabetes (Gavahian et al., 2019).

Therefore, promoting the consumption of EVOO through health messages could improve public health (Pichierra et al., 2021). Food companies may adopt the health claims as a tool to convey the healthy features of the EVOO (European Commission, 2006). Currently the European Food Safety Authority (EFSA) authorised four types of health claims for EVOO, as seen in Appendix A. Three of the four claims are considered to be functional health claims (Art.13 (1) of Regulation (EC) No. 1924/2006), while the other is considered to be a disease risk reduction claim (Art.14 of Regulation (EC) No. 1924/2006). In our study, the health claim selected is the following: "Olive oil polyphenols contribute to the protection of blood lipids from oxidative stress". To elaborate more the choice of this health claim, first the EVOO is rich in polyphenols which are antioxidant compounds (i.e., they protect from the oxidative stress caused by free radicals) (Silenzi et al., 2020). Furthermore, the beneficial effect of EVOO polyphenols has been recognized by the American Food and Drug Administration (FDA) (Vilaplana-Pérez et al., 2014) and the EFSA, that recommends the consumption of 20 g of EVOO daily, to prevent cardiovascular disease and oxidative stress. More specifically, the EFSA has stated that, "The claim may be used only for olive oil, containing at least 5 mg of hydroxytyrosol and its derivatives (e.g., oleuropein complex and tyrosyl) per 20 g of olive oil. In order to bear the claim information shall be given to the consumer that the beneficial effect is obtained with a daily intake of 20 g of olive oil". Second, the claim for polyphenol is only applicable for virgin oils because it is extracted directly from the fruit by mechanical processes: crushing, malaxation and extraction (Roselli et al., 2017). Consequently, EVOO is not treated by heat or chemical processes as other types of olive oils, thus the polyphenols are preserved (Jimenez-Lopez et al., 2020).

3.4. Experimental design

The majority of hedonic evaluation studies have evaluated the food item in blinded conditions (the food item), expected conditions (the extrinsic cues) and the informed conditions (food item with extrinsic cues) (Lima et al., 2019). However, in this study, our main objective was not to only analyze the sensory profile and evaluation of EVOO but rather to analyse the impact of health information on consumers' hedonic evaluations of EVOO. For this purpose, we conducted a sensory analysis with two experimental groups: an informed scenario without health claims and an informed scenario with health claims. The sessions involved between 12 and 15 participants at a time and were conducted

for three days, five sessions each day. The first day was for the informed scenario without health claims, the second day was for two informed scenario sessions without health claims and three informed scenarios with health claims sessions. For the last day, all five sessions were of the informed scenario with health claims. In total, we were supposed to have 225 participants but not all the sessions were at full capacity (e.g., 15 participants) so the total sample size was 207 participants that were divided randomly into 102 consumers for the informed scenario without health claims and 105 consumers for the informed scenario with health claims. The choice of this sample size mainly is because we conducted a hedonic test, which is subjective in character and for this reason must be performed on a large number of panelists (Meilgraad et al., 1999). In other words we use a large numbers of consumers to achieve a statistically valid sample as per Stone et al. (2021). Furthermore, this sample size is in line with previous sensory studies where it was between 100 and 300 participants (Ballco et al., 2020; Predieri et al., 2013).

Upon arrival, a questionnaire was displayed on the screen in front of each participant. The first page presented the consent form for participation. To ensure ecological validity, we tested our hypotheses using a real food product and in a laboratory context which leads to a more positive hedonic evaluation compared with a home use test (Schmuckler, 2001). Hence, one of the research assistants explained the general objectives of the sensory experiment, while the other research assistants distributed the materials: one sample of each type of EVOO, bread, labels as shown in Appendices D, E and F. More specifically, 30 ml of each EVOO was served in a plastic cup. The cups were randomised and coded with three digits corresponding to each of the four different types of EVOO to be tasted. This three-digit code was adopted to keep the samples anonymous and prevent bias. Furthermore, two types of labels were given to the consumers depending on the scenario (i.e., an informed scenario without health claims, only the origin, olive variety, table of nutrition information, and other symbols such as Protected Designation of Origin (PDO) and organic label, whereas for the informed scenario with health claims in addition to the symbols mentioned above, health claims were added on the labels). The health claim used was, "Olive oil polyphenols contribute to the protection of blood lipids from oxidative stress" as previously explained. In terms of sensory experimental details, consumers 1) hedonically tested the four types of EVOO along with the labels as per the scenario, without or with health claims; 2) stated their purchasing intentions on a 10-point Likert scale (1 = definitely not at all to 10 = definitely yes) for each type (Achón et al., 2017). Before tasting the next EVOO participants were instructed to drink some water and eat bread to cleanse their palate. Finally, the respondents filled out a questionnaire detailed below. At the end of the experiment, the participants received chocolate and a small bottle of EVOO as a gift.

3.5. Measurement of the variables

To achieve the aim of our study, consumers filled out a questionnaire

Table 2
ANOVA test for comparison of the mean values for different variables by information scenario.

	Informed scenario without health claims		Informed scenario with health claims		ANOVA p-values
	Mean	SD	Mean	SD	
Taste	6.36	1.64	6.59	1.51	0.0382**
Aroma	6.52	1.61	6.69	1.39	0.1075
Aftertaste	5.81	1.70	6.22	1.72	0.0007**
Colour	6.93	1.17	7.16	1.04	0.0027**
Acceptability	6.29	1.56	6.55	1.52	0.0172**
Purchase intention	6.64	2.60	7.08	2.32	0.0004**

*** p < 0.01, ** p < 0.05, * p < 0.1. SD (standard deviation error).

SE: Standard Error. CI: Confidence Interval. UL: Upper Level. LL: Lower Level.

*** p < 0.01, ** p < 0.05, * p < 0.1.

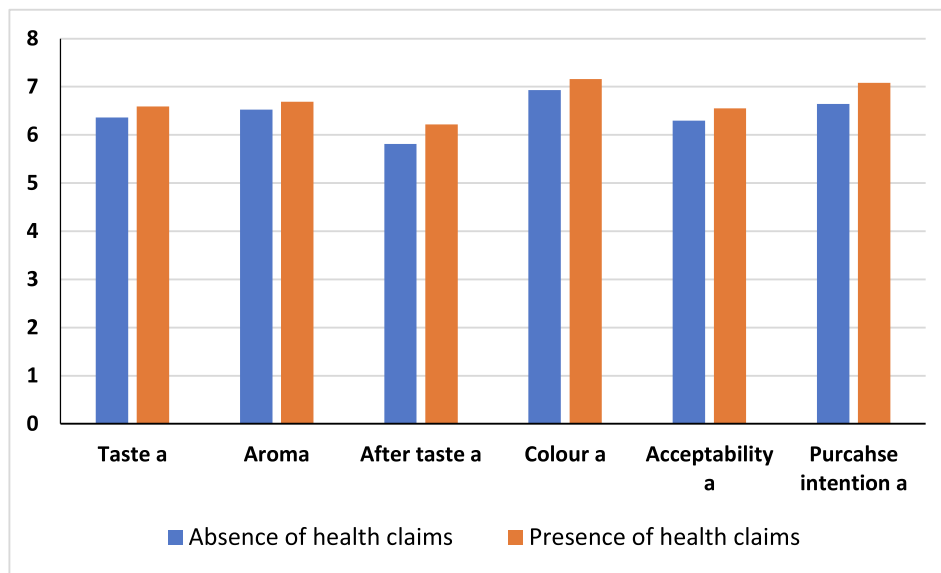


Fig. 2. Mean scores of the attitudinal determinants, sensory attributes, and consumers' purchasing intentions per information scenario. a: indicates a significant difference between the means of the two information scenarios of each of the variables considered revealed by the one-way Anova test.

along with the sensory experiment that embodies several questions related to their socio-economic profile, their consumption frequency of EVOO, and the key attributes (e.g., origin, brand, organic label, health claims, etc.) that guide their purchase decisions for EVOO. For instance, the presence of health claims variable was created as a dummy variable: zero for the absence of health claims, and one for its presence. The sensory intrinsic attributes (i.e., Colour, Aroma, Taste and aftertaste) were measured by a nine-point hedonic scale (Peryam & Pilgrim 1957; Jones & Thurstone, 1955), these scales are used as a fundamental tool to predict consumers' food decisions and have received a great deal of attention from researchers (Ballco et al., 2020; Hein et al., 2008; Lim, 2011).

And finally, Achón et al. (2017) served as the source to measure our dependent variable "consumers' purchasing intentions" by a 10-point Likert scale (1 = definitely not at all to 10 = definitely yes).

3.6. Data analysis

The data from the two different information scenarios were merged. Furthermore, since we conducted the sensory analysis for four types of EVOO, we have created new variables to group the values from the four samples for each sensory attribute, importance given for health claims and nutrition information, purchase intention and each item considered for interest in healthy eating and the need for health-related information. Thus, the data analyzed was $n = 207 \times 4 = 828$ samples. We tested our hypotheses by employing a Structural Equation Model in Stata and the Sobel's test to estimate the significance of mediation models (Sobel, 1982). Sobel's test has been used in various studies to assess mediation

models (Grunert et al., 2010; Hoque et al., 2018a).

Additionally, a one-way Anova test was performed with two levels of information scenario: with and without health claims, to test the difference between the means of the sensory attributes and the purchase intention.

4. Results

4.1. One-way ANOVA test

Table 2 presents the results from a one-way Anova test with two levels of information scenario: with and without health claims, to test the difference between the means of each variable considered in our study. Additionally, the mean scores of the different constructs are shown in Fig. 2: the sensory attributes, acceptability and purchasing intentions. The mean scores of the sensory attributes: Taste ($M_{\text{without health claims}} = 6.36 < M_{\text{with health claims}} = 6.59$), Aroma ($M_{\text{without health claims}} = 6.52 < M_{\text{with health claims}} = 6.69$) aftertaste ($M_{\text{without health claims}} = 5.81 < M_{\text{with health claims}} = 6.22$), Colour ($M_{\text{without health claims}} = 6.93 < M_{\text{with health claims}} = 7.16$) acceptability ($M_{\text{without health claims}} = 6.29 < M_{\text{without health claims}} = 6.55$) and consumers' purchasing intentions ($M_{\text{without health claims}} = 6.64 < M_{\text{with health claims}} = 7.08$) are higher for the full information scenario. There is a significant difference in the means for all the constructs considered except aroma.

Additionally, a pairwise correlation was performed for each of the information scenarios with and without health claims. The findings shown in Appendices B and C revealed that the values of the different sensory attributes, the importance given to health claims and the

Table 3
Test of the mediation effect (Colour).

	Colour			Purchase intention		
	β	SE	95 % CI (LL; UL)	β	SE	95 % CI (LL; UL)
Presence of health claims	0.19**	0.08	0.04; 0.35	0.77***	0.20	0.38; 1.17
Colour				0.06	0.09	-0.12; 0.24
Income	0.21*	0.12	-0.04; 0.45	-0.02	0.32	-0.64; 0.61
Gender	-0.18**	0.08	-0.33; -0.03	0.70***	0.20	0.30; 1.10
Education	0.09	0.10	-0.09; 0.28	0.26	0.25	-0.22; 0.75
Sobel's test Mediation effect				0.01	0.02	-0.02; 0.05

SE: Standard Error. CI: Confidence Interval. UL: Upper Level. LL: Lower Level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 4
Test of the mediation effect (Aroma).

	Aroma			Purchase intention		
	β	SE	95 % CI (LL; UL)	β	SE	95 % CI (LL; UL)
Presence of health claims	0.19*	0.11	-0.01; 0.41	0.73***	0.20	0.33;1.12
Aroma				0.31***	0.07	0.18;0.44
Income	0.02	0.17	-0.32;0.35	-0.01	0.31	-0.63; 0.60
Gender	0.15	0.11	-0.06;0.36	0.64***	0.20	0.25; 1.03
Education	0.10	0.13	-0.15;0.36	0.24	0.26	-0.24; 0.72
Sobel's test Mediation effect				0.061	0.04	-0.01;0.13

SE: Standard Error. CI: Confidence Interval. UL: Upper Level. LL: Lower Level.*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 5
Test of mediation effect (Taste).

	Taste			Purchase intention		
	β	SE	95 % CI (LL; UL)	β	SE	95 % CI (LL; UL)
Presence of health claims	0.23**	0.11	0.02; 0.46	0.68***	0.20	0.30;1.07
Taste				0.43***	0.06	0.31;0.55
Income	0.16	0.18	-0.19;0.50	-0.07	0.31	-0.68;0.53
Gender	0.13	0.11	-0.09;0.35	0.63***	0.20	0.24; 1.01
Education	0.18	0.14	-0.09;0.45	0.19	0.24	-0.28;0.67
Sobel's test Mediation effect				0.10 **	0.05	0.01;0.20

SE: Standard Error. CI: Confidence Interval. UL: Upper Level. LL: Lower Level.*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 6
Test of the mediation effect (AfterTaste).

	Aftertaste			Purchase intention		
	β	SE	95 % CI (LL; UL)	β	SE	95 % CI (LL; UL)
Presence of health claims	0.39***	0.12	0.15; 0.63	0.64 ***	0.20	0.25;1.03
Aftertaste				0.38***	0.06	0.27; 0.49
Income	0.23	0.19	-0.14;0.61	-0.09	0.31	-0.70;0.52
Gender	0.05	0.44	-0.18; 0.29	0.66***	0.20	0.28;1.05
Education	0.34**	0.15	0.04;0.63	0.14	0.24	-0.33;0.62
Sobel's test Mediation effect				0.148 ***	0.05	0.05;0.25

SE: Standard Error. CI: Confidence Interval. UL: Upper Level. LL: Lower Level.*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

acceptability of EVOO are higher in the presence of health claims than in their absence. Thus, given the above findings, H2 is supported.

4.2. Direct and indirect effects

To test the H1 hypothesis that the presence of health claims has a positive influence on consumers' purchasing intentions for the EVOO, and the H3 hypothesis that the sensory attributes mediate the relationship between the presence of health claims and consumers' purchasing intentions for the EVOO, we conducted four simple mediation analysis through STATA 16.0 using structural equation modelling considering each of the sensory attributes as a mediator separately: Colour, Aroma, Taste and Aftertaste. In the first step we considered the sensory attributes as a dependent variable and in the second the consumers' purchasing intention as the dependent variable. Furthermore, we adopted Baron and Kenny (1986) approach along with the Sobel's test (Sobel, 1982) to test the mediation effect.

To assume the presence of a mediation effect the following steps should be significant along with the Sobel's test: (a)The presence of health claims is a significant positive predictor of purchase intention, (b) the presence of health claims is a significant positive predictor of the sensory attributes (the proposed mediators), and (c) sensory attributes are significant positive predictors of purchase intention when the presence of health claims is included in the model.

After controlling for education, income, and gender, we found a significant direct effect for the presence of health claims on consumers' purchasing intentions, hence H1 is supported. The presence of health claims has a significant relationship with taste, aftertaste and colour,

and a non-significant relationship with aroma.

Moreover, a significant indirect effect was found for the presence of health claims on consumers' purchasing intention through the sensory attributes taste and aftertaste, whereas no mediation effect was found for colour and aroma. Furthermore, Sobel's test was significant for taste and aftertaste, hence H3 is supported for the following sensory attributes: Taste and Aftertaste. The results of the mediation analyses for the different sensory attributes: Colour, Aroma, Taste and Aftertaste are shown in Table 3, 4, 5 and 6 respectively.

5. Discussion

As a way to gain a holistic perspective of consumers' purchasing intentions for EVOO in this study, we examined the interplay between health claims and sensory attributes in determining consumers' purchase intentions, specifically how the sensory attributes mediate the relationship between the presence of health claims and consumers' purchase intentions for EVOO. This study adds to the literature on the inferences people draw from health claims by demonstrating that these claims positively affect the hedonic evaluation of a product, which in turn influences consumers' purchase intention.

Our findings indicated that the presence of health claims is related positively to consumers' purchasing intentions for EVOO. This finding is in line with previous studies that emphasised the importance of health claims (Ares et al., 2010; Gineikiene et al., 2017; Hirogaki, 2013; Hung & Verbeke, 2019; Pichierrri et al., 2020a) in increasing consumers' purchasing intention (Ballco et al., 2020; Peršurić, 2020; Pichierrri et al., 2021; Pichierrri et al., 2020b). This could be explained by the fact that

consumers are more interested in healthy eating and rely on a mode of thinking that is based on simple decision rules that guide their judgment when they have limited resources or motivation to process available information (Gigerenzer & Todd, 1999). Accordingly, consumers tend to adopt health claims as a tool to quickly evaluate food products and purchase them (Verrill et al., 2019). Additionally, the results showed a difference in the consumers' purchasing intentions between the two information scenarios. Their purchasing intentions were higher in the full information scenario. One explanation of this could be that the presence of health claims motivates consumers to purchase the product since it is reflecting the health benefits of the product (Lähteenmäki, 2013). This finding is in line with previous studies that reported the presence of health claims had a positive and significant effect on consumers' purchasing intentions (Johansen et al., 2010; Mueller & Szolnoki, 2010).

Moreover, the findings revealed that the different sensory attributes (i.e., taste, aroma, aftertaste and colour) are rated higher in the full information scenario, even the acceptability of the EVOO. This result is in line with one study that showed the health information presented to consumers may reduce dissatisfaction with taste and enhance sensory acceptability (Pinto et al., 2017). However, other studies showed contradictory results that the presence of health claims may negatively influence product evaluation, especially when consumers can taste the product (Fenko et al., 2016). Thus, in our study we argue that the higher rate of sensory attributes in the presence of health claims is due to the fact that the EVOO is perceived as a healthy food. In other words, health claims increase taste perception for healthy food and food without salient health connotations, but not for unhealthy food items (Jo & Lusk, 2018; Nadricka et al., 2020). Thus, the role of taste and healthiness expectations in the presence of health claims and the suggestion that healthy products are less tasty is both product and claim specific (Tønnesen et al., 2022). Furthermore, Li & Dando (2019) suggest that consumers' acceptability increases in the presence of health claims. This acceptability is driven by the food product's sensory attributes but can be affected by extrinsic cues (Choi & Lee, 2019), specifically health claims (Crucean et al., 2019; Marino et al., 2017).

Our results showed that the taste and aftertaste partially mediate the relationship between the presence of health claims and consumers' purchasing intentions for EVOO. This is consistent with previous studies, which indicated that taste might explain the relationship between the presence of health claims and purchasing intention (Hoque et al., 2018b). One explanation of this is that consumers rely on both factors while purchasing food products (Pinto et al., 2017). Furthermore, health claims evaluation is dependent on individual needs; for example, medical recommendations (Pinto et al., 2017). Thus, the health claims may change consumers' preferences, but sensory attributes dictate the hedonic response (McSweeney, 2022). Taste is considered as a crucial factor in the purchasing of extra virgin olive oil (Boncinelli et al., 2017; Santosa & Guinard, 2011), and consumers are also influenced by health information (Ballco et al., 2020). Thus, health information not only affects consumers' health perceptions, but also their taste perception (Teisl et al., 2001; Mai & Hoffmann, 2015). We argue that tasting the product can greatly influence the healthy value ascribed to health claims of a product while purchasing a product. This is in line with Jo & Lusk's (2018) results that found a positive relationship between perceived health and taste by studying how taste and health perception change in response to exogenous health information.

Consumers' purchasing intentions are driven by the interplay of key drivers such as the presence of health claims and sensory attributes, specifically, taste. This is consistent with the results of previous studies (Ballco et al., 2020; Delgado et al., 2013; Enneking et al., 2007), which confirmed that sensory and health claims are key drivers in directing consumers' preferences and shaping their purchasing intentions.

For the other sensory attributes aroma and colour no mediation effect existed. This could be explained by the fact that the aroma of EVOO depend on the consumers' preferences related to sensory characteristics

such as pungent, bitter, or fruity EVOO that may play a role in their perception of the product (Del Giudice et al., 2015; Predieri et al., 2013). Regarding colour, consumers sometimes value greener extra virgin olive oil and sometimes they refer to it as indicating a low quality, which in turn may slightly affect their purchase intentions (Gámbaro et al., 2014).

6. Conclusions and future studies

This paper provides insights into the impact of health claims on sensory attributes in shaping the purchase intentions for EVOO, by studying the mediation effect of sensory attributes between the presence of health claims and purchase intentions. It contributes to extending the literature on health claims by investigating the interplay between health claims and sensory attributes in order to acquire a holistic perspective about purchasing intentions for EVOO. Furthermore, the combination of sensory and non-sensory factors may generate more complete and realistic information about consumer behavior in purchasing situations (Asioli et al., 2017).

Our findings reveal generally that the presence of health claims in the product (EVOO) triggers consumers' purchasing intentions. Furthermore, the sensory attributes were rated higher in the presence of health claims, which means that health claims do not decrease the role of sensory attributes in shaping consumers' purchase intention. Thus, a good hedonic evaluation along with the presence of health claims is necessary to create a positive market response and increase consumers' intentions to purchase EVOO. This result should motivate the food industry to produce not only healthier food products with health claims but also tastier products than the ones available in the market. Moreover, food companies and marketers can make health claims more effective by targeting consumers' preferences and developing marketing campaigns using claims that are essential for promoting extra-virgin olive oil.

Additionally, food marketers and nutrition policies should concentrate on ways to improve consumers' sensory and health perspectives by adopting a double perspective; sensory attributes along with the presence of health claims to motivate consumers to buy the product. This is because our study revealed a mediation effect of taste and aftertaste on the relationship between the presence of health claims and consumers' purchasing intentions for EVOO. By focusing on these two factors, policymakers could implement new strategies to facilitate the process of searching for information.

There are some limitations in our study that should be clarified. First, we focus on one type of product (EVOO), however, to find more evidence and confirm our findings about the impact of health information and sensory attributes on the consumer's purchasing intentions, future research is encouraged to consider other types of healthy and unhealthy products. Second, our study focused on one geographical area (Spain), therefore, to expand our findings, future studies could replicate our study by considering different countries. Third, in the actual purchase process consumers are confronted by various product cues (e.g., brand, PDO, etc.), thus it is crucial to investigate the impact of the combination of these cues with health claims and with the sensory attributes on consumers' purchasing intentions. Finally, the textual form of health claims on paper could be a limiting factor as consumers usually relate health claims with the actual package, which may further have a different font or specific design to influence consumers. However, in our study, we intended to present the information in a simple way for consumers as a way to not distract them by the packaging of the product and focus their attention only on the health claims and sensory attributes.

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CRedit authorship contribution statement

Lara Bou Fakhreddine: Conceptualization, Methodology, Software, Writing – original draft. **Mercedes Sánchez:** Conceptualization, Writing – review & editing, Supervision.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. . Authorised health claims for olive oil

Nutrient/food category	Claim text
Olive oil polyphenols	<i>Olive oil polyphenols contribute to the protection of blood lipids from oxidative stress</i>
Oleic acid	<i>Replacing saturated fats in the diet with unsaturated fats contributes to the maintenance of normal blood cholesterol levels. Oleic acid is an unsaturated fat</i>
Vitamin E	<i>Vitamin E contributes to the protection of cells from oxidative stress</i>
Monounsaturated and/or polyunsaturated fatty acids	<i>Replacing saturated fats with unsaturated fats in the diet has been shown to lower/reduce blood cholesterol. High cholesterol is a risk factor in the development of coronary heart disease</i>

Source: European Commission (Available at: https://ec.europa.eu/food/safety/labelling_nutrition/claims/register/public/?event=search).

Appendix B. . Pairwise correlation between variables for the informed scenario without health claims

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Taste	1.000						
(2) Aroma	0.654***	1.000					
(3) Aftertaste	0.785***	0.558***	1.000				
(4) Colour	0.464***	0.535***	0.358***	1.000			
(5) Acceptability	0.892***	0.708***	0.857***	0.457***	1.000		
(6) Importance given for health claims	-0.068	-0.017	-0.012	-0.075	-0.035	1.000	
(7) Purchase intention	0.729***	0.547***	0.713***	0.263***	0.774***	0.038	1.000

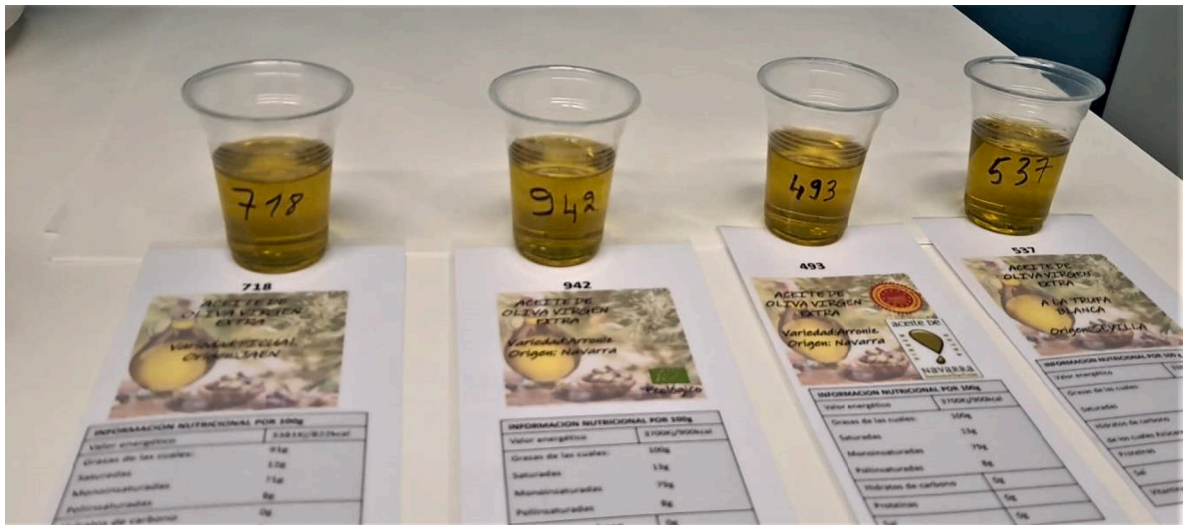
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Appendix C. . Pairwise correlation between variables for the informed scenario with health claims

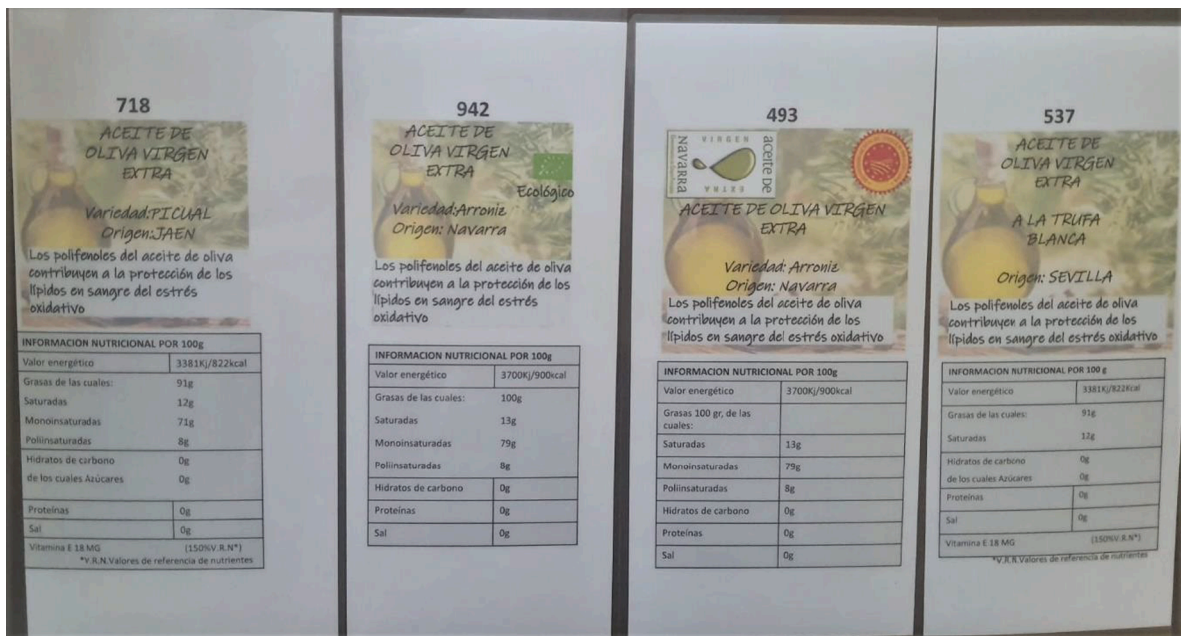
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Taste	1.000						
(2) Aroma	0.649***	1.000					
(3) Aftertaste	0.801***	0.523***	1.000				
(4) Colour	0.398***	0.382***	0.336***	1.000			
(5) Acceptability	0.903***	0.657***	0.860***	0.434***	1.000		
(6) Importance given for health claims	-0.061	-0.032	-0.037	-0.179***	-0.033	1.000	
(7) Purchase intention	0.760***	0.568***	0.736***	0.278***	0.820***	0.067	1.000

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

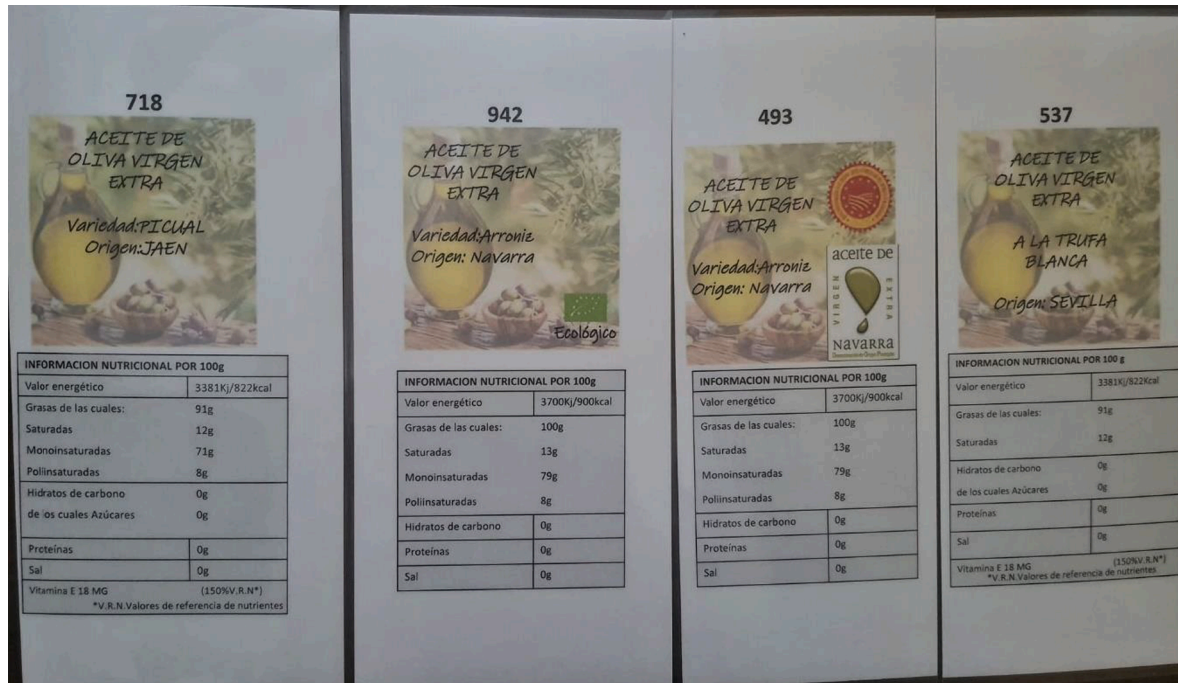
Appendix D. Samples with different labels were presented to the consumers during the sensory analysis



Appendix E. . Different labels with health claims were presented to the consumers during the sensory analysis (full information scenario).



Appendix F. . Different labels without health claims were presented to the consumers during the sensory analysis (informed scenario without health claims scenario).



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