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Consumer preferences for nutritional claims: An exploration of attention and choice based on an eye-tracking choice experiment

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Abstract

Nutritional claim (NC) requirements on food packages are among the most important and influential EU policy measures related to diet and have the capacity to promote healthy eating. This study combines a discrete choice experiment (DCE) method with eye-tracking (ET) technology to assess consumer preferences for multiple NCs in yogurt selection and explores the relationships between the NC preferences and the visual attention paid to these claims and the visual attention and choice decisions. The results indicate that the low-sugar NC was the least-preferred claim in all the models. Overall, the presence of NCs generally increases visual attention in terms of fixation count, which may be linked to an increased likelihood of affecting the final decision to purchase yogurts with NCs.

Keywords: Nutritional claim, eye tracking, choice, yogurt, consumer

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Abbreviations: NC, nutritional claim; DCE, discrete choice experiment; ET, eye tracking; EU, European Union; NCD, non-communicable disease; FOP, front of pack; AOI, area of interest.

1. Introduction

Poor dietary patterns, high-energy intake, and malnutrition are some of the major triggers of non-communicable diseases (NCDs), such as obesity, diabetes, cardiovascular disease, and some types of cancer. According to the World Health Organization (WHO, 2018), NCDs cause 70 percent of deaths every year worldwide. Of the six WHO regions, Europe is the most affected by NCDs, and they are increasing. The impact of NCDs in Europe has accounted for an estimated 86 percent of the deaths and 77 percent of the disease burden in the last decade (WHO/Europe, 2018). Given the current situation, policy makers, such as the European Union (EU) and the United States Department of Agriculture (USDA), have called for transitions toward healthier diets and more informed food choices (Burlingame & Dernini, 2010; Dötsch-Klerk, Mela, & Kearney, 2015; UNEP, 2010). Healthiness, though, typically needs to be encouraged in consumers through trustworthy information that is based on scientific evidence.

In this regard, the EU has introduced European Council (EC) Regulation No. 1924/2006 (Smith, 2015), which requires NCs[1] in food products to be based only on scientific evidence. The positive impact of this regulation is that it identifies lawful claims and thereby makes it possible for authorities to take action if other NCs are used in the marketplace. Partly due to this EU labeling requirement, on average 85 percent of all packaged food products in Europe have NCs (Prieto-Castillo, Royo-Bordonada, & Moya-Geromini, 2015). In Spain, the availability of NCs reached 95 percent, making Spain one of the top countries in terms of nutritional labeling (Prieto-Castillo et al., 2015). In particular, a recent study that explored the presence of nutritional and health claims in five EU countries (the UK, Slovenia, the Netherlands, Germany, and Spain) ranked Spain second, after the UK, regarding the presence of NCs (Hieke et al., 2016). Studies of consumers' understanding and use of nutritional information have shown considerable interest in NCs, but, in the case of Spain, of the 52 percent who reported a full understanding, only 21 percent reported using them (Prieto-Castillo et al., 2015). Hence, there is a need to investigate and identify the attributes that motivate the use of NCs and their influence on the decision to purchase.

[1] This regulation defines an NC as "any statement that suggests or implies that a food has specific beneficial nutritional properties." This definition distinguishes two types of NCs. The first group refers to the content of nutrients or substances (e.g., a source of vitamin B_6), while the second group compares the product with its conventional version in terms of the content (high or low) of a nutrient or substance (e.g., high in calcium).

Previous literature has indicated that NCs help consumers to compare the healthfulness of food products (Grunert, Wills, & Fernández-Celemín, 2010) and that generally they are willing to pay premium prices for food products bearing NCs (Ballco & de-Magistris, 2018; Barreiro-Hurlé, Gracia, & de-Magistris, 2010; de-Magistris, López-Galán, & Caputo, 2016; Jurado & Gracia, 2017; Van Wezemael, Caputo, Nayga, Chryssochoidis, & Verbeke, 2014). However, despite these findings, there is increasing evidence that what consumers say about their preferences regarding NCs is not actually reflected in what they purchase in the marketplace. To illustrate, in the last few decades, the consumer demand for healthier functional food (FF) products offering NCs has grown rapidly (Santeramo et al., 2018). Attracted by such market growth, companies have invested in and developed new FF products (Khan, Grigor, Win, & Boland, 2014). Nevertheless, 70 to 90 percent of these new FF products exited the market within the first two years from their launch (Bimbo et al., 2017). This high failure rate suggests that a deeper understanding of the main motives underlying consumer preferences and the heterogeneity in the demand for NCs is needed. For this reason, understanding how consumers make trade-offs among multiple front-of-pack (FOP) NCs is an important issue for marketing and public policy purposes.

Recent studies have focused on exploring new approaches to investigating consumer food choice behavior based on consumers' visual attention.[2] These approaches use eye-tracking (ET) technology to analyze consumers' purchase decisions by tracking the visual attention paid to areas of interest (AOIs). ET technology is considered to be one of the most powerful means to determine individual choices (Balcombe, Fraser, & McSorley, 2015), especially when combined with discrete choice experiments (DCEs) (Scarpa, Zanoli, Bruschi, & Naspetti, 2013).

This study investigates consumers' preferences for alternative NCs (fat free, low sugar, high fiber, source of vitamin B_6, and source of calcium) and explores the impact of consumers' visual attention on their final choice. To elicit consumers' preferences for alternative NCs, we conducted a DCE, because its ability to evaluate multiple attributes simultaneously is consistent with random utility theory (RUM) and very similar to the purchase decision process (Lusk,

[2] By definition, "attention" is the "degree to which consumers focus on a stimulus within their range of exposure" (Solomon, Bamossy, Askegaard, & Hogg, 2006).

2003). Visual attention was measured in terms of fixation time (milliseconds) and fixation count[3] using ET. The fixation time was used due to its frequency of use in the extended literature analyzing visual attention to food products (Antúnez et al., 2013; Ares, Mawad, Giménez, & Maiche, 2014; Ares et al., 2013; Bialkova & Trijp, 2011; Bialkova et al., 2014; Fenko, Nicolaas, & Galetzka, 2018; Gere et al., 2016; Grebitus & Davis, 2017; Hummel, Zerweck, Ehret, Winter, & Stroebele-Benschop, 2017; Samant & HanSeok, 2016; Spinks & Mortimer, 2016; Torrico et al., 2018; Uggeldahl, Jacobsen, Lundhede, & Olsen, 2016; Van Loo et al., 2015; Vu, Tu, & Duerrschmid, 2016). However, the recent research by Orquin and Holmqvist (2018) suggested that the total fixation duration is not recommended because it often involves inappropriate aggregation data. Therefore, in our research, we also included the fixation count to compare results across ET measures. This study focuses on NCs because they are a simpler way to present information than nutritional tables. NCs do not list the amount of a nutrient but rather summarize the information concerning a specific nutrient and communicate it to consumers in simple, easy-to-process language (e.g., fat free). We chose to study yogurt claims because yogurt is recommended as part of a healthy diet in many countries (Eržen, Kač, & Pravst, 2014). Most notably, in a market study that we conducted on food products with NCs in Spain, yogurt was found to be a product that commonly contained NCs.

This study contributes to the existing literature on consumer food choice behavior in several ways. First, while most previous literature has focused on consumer preferences for fewer than three NCs, this study analyzes consumer preferences and choice behavior for multiple NCs. Second, this is the first study to combine ET and a DCE to investigate whether consumers pay attention to alternative NCs when making food choice decisions and how their attention affects their final food choices. Most researchers utilizing DCE and ET methods have explored consumer preferences for different formats of nutritional labels (e.g., choice logos, monochrome guidelines, daily amount nutritional labels, color coded nutritional labels, the traffic light system, and information tables showing nutritional facts) displayed on the FOP (Bialkova & Trijp, 2011; Bialkova et al., 2014; Graham & Jeffery, 2011; Mawad, Trías, Giménez, Maiche, & Ares, 2015) and the effect of sustainability-related labels on consumers' purchase behavior (Samant & HanSeok, 2016; Van Loo et al., 2015). Hence, this research contributes to the food choice

[3] The fixation time is respondents' fixation duration within an AOI, and the fixation count measures participants' fixation frequency within an AOI (Duchowski, 2017).

literature by exploring the importance of visual attention to a selection of NCs. Finally, this study offers new insights into the combination of DCEs and ET, a novel methodological approach that has not yet been applied to food products in a European country such as Spain.

The findings from this research can be informative for producers, processors, and retailers. In addition, the results can provide new insights for policy makers, assisting them in designing strategies to promote healthy food choices.

2. Consumer attention and food choices: Background

During a purchase decision, consumers are exposed to multiple food attributes, such as symbols, health-related label messages, health claims, nutritional claims, and others (Carrillo, Fiszman, Lähteenmäki, & Varela, 2014; Miraballes, Fiszman, Gámbaro, & Varela, 2014). As documented by Milosavljevic and Cerf (2008), consumers typically make choice decisions within a few seconds; thus, they may not attend to all the information available on the food package. Generally, some information is selected to be processed further while the rest is lost, and, in most cases, consumers are not even aware of its presence on the label (Oliveira et al., 2016). For this reason, studying consumers' attention to food labels is becoming a key aspect of the design of food labels that successfully attract attention.

In this regard, a rapidly growing body of literature has examined the relationship between visual attention and stated preference in the food sector. Table 1 contains a review of previous studies using ET and discrete choice experiments and their key findings. We focus on these particular studies because they combine DCEs with ET and center on consumer valuation for food-labeling programs.[4] The results of these studies are mixed regarding the extent to which the degree of visual attention paid to specific attributes correlates with the actual choices.

[4] Although we limited our literature review to food choice studies, we acknowledge that eye-tracking technology is widely used in other fields, such as psychology (Orquin & Lagerkvist, 2015; Orquin & Mueller Loose, 2013; Peschel & Orquin, 2013), marketing (Meißner, Musalem, & Huber, 2016; Pieters, 2008; Pieters & Warlop, 1999), and health economics (Ryan, Krucien, & Hermens, 2017), among others. Recently, ET has also increasingly been used to explore methodological issues related to survey design, organizational research (Meißner & Oll, 2017; Meißner, Pfeiffer, Pfeiffer, & Oppewal, 2017), visual biases, and threats (Orquin, Ashby, & Clarke, 2016; Orquin, Bagger, & Mueller Loose, 2013; Orquin, Chrobot, & Grunert, 2018; Orquin, Perkovic, & Grunert, 2018).

Table 1 – Summary of studies that have combined ET with stated preferences and DCEs

No.	Authors	Country	Products	Methodology	Key findings
1	Balcombe et al. (2015)	UK	A basket of goods containing a mix of foods	DCE and ET	No compelling evidence that higher- or lower-value attributes receive more or less attention.
2	Balcombe, Fraser, Williams, and McSorley (2017)	UK	A basket of goods containing a mix of foods	DCE and ET	Although respondents with higher levels of visual attendance valued specific attributes more, the results reveal weak relationships between ET and stated preference data.
3	Bialkova et al. (2014)	Netherlands	Yogurt	A combination of an experimental choice task with ET	Results suggest that attention mediates the effect of nutrition labels on choice. The longer the fixation, the higher the likelihood of being chosen.
4	Bialkova and van Trijp (2011)	Netherlands	Yogurt	Integration of the visual search paradigm (ET) with a CE	ET was found to be a promising tool for consumer research on attention to nutrition labeling information and its effect on informed healthy choices.
5	Graham and Jeffery (2011)	USA	Pizza, soup, yogurt, snacks, fruits, and vegetables	Self-reported online grocery shopping CE and ET	Participants spent longer looking at labels for foods they decided to purchase compared with foods they decided not to purchase.
6	Samant and HanSeok (2016)	USA	Chicken products	Stated preference and ET	Findings suggest that enhanced label knowledge increases consumers' visual attention to labels with a possibility of positive purchase behavior.

No.	Authors	Country	Products	Methodology	Key findings
7	Uggeldahl et al. (2016)	Denmark	Ground beef minced meat	DCE and ET	Eye movements are related to stated choice certainty.
8	Van Herpen and van Trijp (2011)	Turkey and Netherlands	Breakfast cereals	Self-reported use, recognition, ET, and CE	Although a nutrition table was evaluated most positively, it received little attention and did not stimulate healthy choices. Other types of labels enhanced healthy product choices.
9	Van der Laan, Hooge, Ridder, Viergever, and Smeets (2015)	Netherlands	Different food images	Choice screens and ET	Results show that for both the most-wanted and the least-wanted decision types, the total fixation duration was longest for the product of choice.
10	Van Loo et al. (2015)	USA	Coffee	DCE and ET	Results suggest that consumers who spend more time attending to and fixate more on sustainability attributes value them more.
11	Vu et al. (2016)	Austria	Different food images	Stated preference under time pressure, test design complexity, and ET	Highlights the importance of understanding the factors influencing gazing behavior in an ET test for better future application.

For example, Balcombe et al. (2015) examined visual attention in a multi-attribute DCE using ET and found little evidence that visual attention in terms of fixation duration on the attributes indicates the level of importance. In other words, looking longer or more often at an attribute does not necessarily mean that it is of higher value to the consumer. A more recent study by Balcombe et al. (2017) again examined the combination of visual attention and stated preferences and found weak relationships between them. These results differ significantly from those reported by Uggeldahl et al. (2016), who, through a DCE combined with ET on the selection of ground beef minced meat, found that visual attention paid to the alternatives in a choice task does reflect participants' stated choices. Similarly, Bialkova and Trijp (2011) indicated that the combination of ET with a DCE is a promising tool for consumer research on attention to nutrition labeling information and its effect on informed healthy food choices. Other explanatory studies that have combined visual attention with actual choices have found a positive association. More specifically, in the US, Graham and Jeffery (2011) examined visual attention to nutritional labels (e.g., a nutritional fact table) for sixty-four different food products in an online shopping scenario. Consumers were found to spend more time looking at the nutrients in food products that they ultimately chose to purchase. Another study using an online shopping purchase scenario, by Van der Laan et al. (2015), tested the effect of healthy food choices and changes in visual attention on purchases. This study showed that health goals increase the attention to goal-congruent items and increase the likelihood of the consumer choosing them.

Van Herpen and van Trijp (2011) examined consumer attention and the use of three different types of nutrition labeling (a logo, a traffic-light label, and a nutritional table) in Turkey and the Netherlands to investigate whether the type of label influences consumers to make healthier food choices. The results in both countries suggested that, although consumers evaluated the nutritional table positively, it received little visual attention and did not stimulate healthy choices. However, the traffic light and especially the logo labels enhanced healthy product choices. Bialkova et al. (2014) used yogurt selection in a DCE to explore whether and how attention to nutritional information (a health logo, a monochrome Guideline Daily Amount (GDA) label, or a color-coded GDA label) affects consumer choice. The results suggested that products with long fixation times have the highest likelihood of being chosen.

Regarding sustainability-related label claims, Samant and HanSeok (2016) determined the effect of label education on consumers' purchase behavior by combining visual attention and sustainability label claims on chicken products. The findings provided empirical evidence that enhanced label knowledge increases consumers' visual attention to labels, with the possibility of positive purchase behavior. Lastly, Van Loo et al. (2015) analyzed the importance of sustainability labels on coffee (e.g., Fairtrade, Rainforest Alliance, USDA Organic, and carbon footprint) by combining the visual attention paid to these labels with a DCE. Their results indicated that greater importance associated with sustainability labels results in increased visual attention and willingness to pay (WTP) for coffee with these labels.

Based on the findings of earlier studies, we hypothesize the following:

(H1). Providing NCs on yogurt packages may provide a signal detection assumption that an increase in participants' visual attention may result in an increased probability of the product being purchased.

Because consumers have raised concerns about their health and are shifting toward food products that are low in calories (Carrillo, Varela, & Fiszman, 2012; de-Magistris & Gracia, 2016; Jurado & Gracia, 2017), we also hypothesize that:

(H2). Low-calorie[5] yogurts (e.g., fat free and low sugar) will generate greater utility in participants than other nutritional claims.

3. Materials and methods

3.1 Choice experiment: Product and attribute selection

The product for the experiment was selected based on market research on food products bearing NCs sold in local supermarkets between July and September 2015. The foods were included in the database according to their importance in the shopping basket of Spanish families.[6] An examination of the products showed that yogurt carried the most NCs. In total, 251 yogurts that contained 1 NC on the FOP that corresponded to the official EU definitions

[5] According to the previous literature, low-calorie yogurts are mostly low fat, fat free (i.e., skimmed or semi-skimmed), and low in sugar (Peres, Esmerino, da Silva, Racowski, & Bolini, 2018; Pinheiro, Oliveira, Penna, & Tamime, 2005).

[6] According to the Ministry of Agriculture and Fisheries, Food and Environment's (MAPAMA, 2014) consumer survey in Spain, 89 percent of the per capita consumption of packaged food was liquid milk, processed meat, yogurt, cheese, industrial bread, and biscuits.

(Regulation (EC) No. 1924/2006) were considered for further analysis as well as a full-fat unlabeled yogurt. We used the 500 g package (4 containers, each with 125 g), because it is the size with the greatest presence in the market. All the products used were natural yogurts (no added flavor), with no fruits, except the one with fiber, which contained several types of cereal (oats, barley, wheat, and wheat bran). We included the high-in-fiber yogurt because of the high demand and the large variety of cereal-fiber-source yogurt in the local market (Cuevas, 2012; Fontecha, Recio, & Pilosof, 2009; Sah, Vasiljevic, McKechnie, & Donkor, 2016). The NCs included in the study are shown in Table 2.

Table 2 – Nutritional claims used in the study

Nº	Natural yogurts with NCs	Frequency of NC
1º	Fat free	42.78%
2º	Source of calcium	21.25%
3º	Full-fat unlabeled (reference)[a]	12.26%
4º	Low sugar	11.99%
5º	Source of vitamin B_6	10.63%
6º	High fiber	1.09%

Note: [a] The unlabeled product is a full-fat natural yogurt with no added flavor and no NC on the FOP.

Following Bialkova and vanTrijp (2011), Bialkova et al. (2014), and Carlsson, Kataria, and Lampi (2010), we excluded the price attribute by asking consumers to assume that the price was the same as the yogurt that they regularly consume, since yogurt is regularly consumed in Spanish households (Ministry of Agriculture and Fisheries, Food and Environment (MAPAMA), 2014) and individuals are aware of the price variations (which are not large except for the reference full-fat, no-NC yogurt) among different types of yogurt. Following the experimental design of Bialkova and van Trijp (2011) and Bialkova et al. (2014), a full factorial design (i.e., nutritional claims in our case) resulted in a combination of 15 choice questions (or choice tasks), each with 2 alternatives. To each choice task, we also added a non-buy option. The product location (either left or right in the two-alternative choice set) of the two products was systematically varied. A computer program (Tobii X2-30 ET) randomized the sequence of appearance of the 15 choice tasks. The participants had 15 seconds[7] to observe the 2 products in each task and then

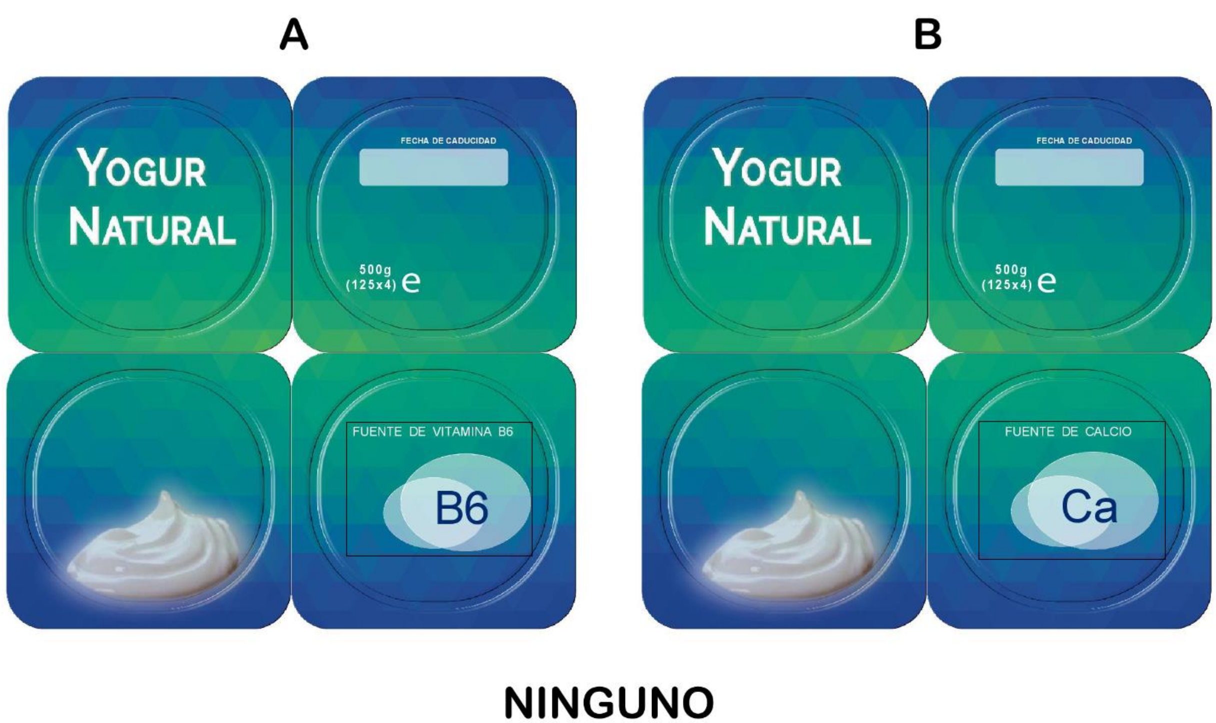
[7] We used a fixed exposure time to measure the fatigue effect from the 15 choice tasks and to examine the fixation process through the 15-second exposure time. However, due to the main focus of this paper, the results from this analysis are not included here. As for the set-up time, we considered studies in which the times varied from short periods of 2.5 seconds (Piqueras-Fiszman, Velasco, Salgado-Montejo, & Spence, 2013) to 10 seconds (Orquin & Scholderer, 2011) and up to 30 seconds (Strasser, Tang, Romer, Jepson, & Cappella, 2012). In addition, from a pretest of 20 participants, we observed that participants needed an average exposure time of 13 seconds to choose

were asked to choose their preferred yogurt. Oral answers were recorded through an evaluation form that appeared on the screen after 15 seconds. Then, the moderator, using a parallel screen, selected the preferred alternative defined by the participant (A, B, or no buy). See the evaluation form in Appendix A (Figure A1).

3.2 Eye-tracking procedure and measures

To capture the visual attention during the DCE, we replicated the work of Van Loo et al. (2015) using a totally different product, yogurt, and measured preferences without considering the price attribute. For the analysis of the eye movement data, we defined a set of AOIs to capture the eye fixations, in terms of fixation time and fixation count, on the NCs (see Figure 1).

Figure 1 – An example of the areas of interest



Note: Option A refers to the Spanish version of a yogurt with a *source of vitamin* B_6, and option B refers to the yogurt with *a source of calcium*. AOIs were not marked in black in the original evaluation choice task. “Ninguno” is the “non-buy” option.

The FOPs were consistent in terms of AOI size (width and height). For each of these AOIs, we calculated the mean of the fixation time spent and the fixation count. The combination

between alternatives. Therefore, based on the previous research and the results from the pretest, we decided to use an exposure time of 15 seconds.

of images was presented in full color on a 24” computer screen with 1920×1080 pixel resolution. Eye positions were sampled at 50 Hz with a remote ET device (Tobii X2-30 ET) positioned under the computer screen on which the stimuli were displayed. Before recording the eye movements, we ran a 9-point calibration procedure and familiarized the participants with the process using an example of a 2-alternative choice task in which they were asked to choose “out loud” [8] A, B, or no buy. Then, we ran another calibration procedure before recording their eye movement for the experiment. The distance between the ET device and the participants’ eyes was 58–60 cm.

3.3 The experiment

The experiment consisted of three stages: (i) recruiting and sampling, (ii) ET in combination with the DCE, and (iii) a follow-up questionnaire aimed at capturing yogurt purchase behavior, consumption habits, attribute importance, general attitudes toward yogurts with NCs and HCs, general health interest, and socio-demographic consumer characteristics. The experiment was carried out in different periods of time (morning and afternoon) and on different days (from Monday to Saturday). The sessions consisted of 1 participant at a time. Upon their arrival at the lab, the respondents received information about the main purpose of the experiment (stage 1). A 9-point calibration procedure was used to calibrate participants’ eye vision with the eye-tracking device before the example warm-up task and after starting the data collection. The respondents faced 15 choice tasks (stage 2). For each task, they were asked to choose their most-preferred option (A, B, or neither). They were reminded each time to imagine that they were in a supermarket to buy yogurt and that the price reference was the price of the yogurt that they habitually purchase. Finally, the participants completed a follow-up questionnaire capturing their yogurt purchase behavior, consumption habits, attribute importance, general attitudes toward yogurts with NCs and HCs, general health interest, and socio-demographic consumer characteristics (stage 3).

[8] The choice of the product was indicated orally based on the applied methodology from two previous studies (Bialkova & van Trijp, 2011; Bialkova et al., 2014). In addition, since we followed a stratified sample approach, we used the oral choice to avoid any possible choice mistake due to a lack of computer skills (almost 10 percent of the sample was older than 70 years).

3.3.1 Recruitment and sample characteristics

The experiment was conducted from September to November 2016 in a medium-sized town in Spain that is widely used by food marketers and consulting companies because the socio-demographic characteristics are representative of the Spanish Census of Population (see Appendix B (Table B1)). The participants were recruited via email by a recruiting agency and were selected by random stratification with proportional allocation for age, gender, and education to avoid under/overrepresentation of consumer profiles. To discover distinctive groups with similar preferences, we performed a cluster analysis (Section 4.1). Table 3 shows the characteristics of the final sample of respondents and the segments from the cluster analysis.

Table 3 – Descriptive analysis of the sample and socio-demographic characteristics (percentages)

	Reference population, Spain[a]	Sample	Segment1	Segment 2
Sample size	-	n = 100	n = 39	N = 61
Gender				
Female	51.00	52.00	46.15	55.74
Male	49.00	48.00	53.85	44.26
Age groups				
18–34**	22.24	18.00	15.38	26.23
35–44**	19.55	23.00	10.26	21.13
45–54	18.28	19.00	17.95	16.39
More than 54	39.93	40.00	56.41	36.07
Educational level[b]				
Primary	24.88	27.00	33.33	22.95
Secondary*	47.64	42.00	51.28	39.34
University**	27.48	31.00	15.38	37.70
Household income				
Less than €900–€1500*	-	9.00	51.28	26.23
€1501–€3500**	-	55.00	43.59	62.30
€3501–more than €4500	-	36.00	5.13	11.48

Note: [a] Data obtained from the Register (INE, 2017) on January 1, 2017 (www.ine.es). [b] OECD (2014). * The correlation is significant at the 0.05 level based on the χ^2 test between segments. ** The correlation is significant at the 0.01 level based on the χ^2 test between segments.

The final sample consisted of 100[9] adults out of 113[10] in total, who were older than 18 years and without eye problems. Compared with previous ET studies, this sample is rather large.

[9] For an eye-tracking study, this is a rather large sample, taking into account that past ET studies employed far fewer subjects (e.g., 53 in Ares et al., 2013; 71 in Ares et al., 2014; 40 in Balcombe et al., 2015; 99 in Balcombe et al., 2017; 10 in Bialkova & van Trijp, 2011; 24 in Bialkova et al., 2014; 48 in Fenko, et al., 2018; 59 in Gere et al.,

Most respondents were female (51 percent). With respect to age and education, our sample is similar to the population in Spain, with approximately one-quarter of the respondents being between 35 and 44 years old and 40 percent being more than 55 years old. Around half of the sample had completed secondary studies.

3.3.2 Measurement of the importance of yogurt attributes and nutritional claims to the participants

After completing the DCE and ET study, the respondents answered a set of questions aimed at capturing the importance that they attach to the following eight yogurt attributes: price, taste, brand, healthiness, convenience, health claims, nutritional claims, and natural ingredients. Food choice motives and the related importance that consumers attach to product attributes are valuable bases for segmentation (Haley, 1968; Jadczaková, 2013), because they determine to a large extent the food choices that consumers make and the arguments and information to which they are sensitive (Bellows & Hallman, 2010). Therefore, the insights gained by segmenting consumers based on these importance ratings can help to identify effective marketing strategies aimed at promoting healthy food consumption (Verain, Sijtsema, & Antonides, 2016).

The eight yogurt attributes were included based on previous studies on different food categories (Grunert, Hieke, & Wills, 2014; Van Loo et al., 2015). The importance of yogurt attributes was scored on a 5-point scale ranging from “not at all important” (1) to “extremely important” (5), and the attributes were merged into one construct (Cronbach’s $\alpha = 0.70$). In addition to measuring the importance of yogurt attributes, we asked the participants to rate how important it is to them that the yogurt that they usually purchase contains one of the following NCs: low sugar, fat free, source of calcium, source of vitamin B_6, and high in fiber. The importance of each NC was scored on a 5-point scale ranging from “not at all important” (1) to “extremely important” (5), and the NCs were merged into 1 construct (Cronbach’s $\alpha = 0.69$).

2016; 29 in Samant & HanSeok, 2016; 32 in Spinks & Mortimer, 2016; 22 in Van der Laan et al., 2015; 81 in Van Loo et al., 2015; 81 in Van Loo, Nayga, Campbell, Seo, & Verbeke, 2017; 50 in Varela, Antúnez, Cadena, Giménez, & Ares, 2014; and 39 in Zhang & Seo, 2015).

[10] It should be noted that 13 participants were not able to complete the entire experiment due to problems with their vision.

3.4 Data analysis

3.4.1 Statistical analysis of yogurt attributes and eye-tracking variables

The yogurt attributes and ET variables were analyzed using STATA 12 (StataCorp., Texas, TX). The scale construct reliability was tested with Cronbach's α, while the correlations between the attributes and the ET variables were tested with Spearman's correlation coefficients. The yogurt attributes were used as segmentation variables in cluster analysis. Cluster analysis allows the grouping of observations into segments in which the preferences within the same segment are similar while the preferences between segments are dissimilar (Wedel & Kamakura, 2000). As suggested by Van Loo et al. (2015) and Verain et al. (2016), we applied a two-step procedure. First, a hierarchical agglomerative clustering procedure defined the number of clusters and the cluster centroid (Ketchen & Shook, 1996). Second, a non-hierarchical (k-means) approach was used to group the respondents into the optimal number of clusters using the centroids of the sub-clusters found in the first step as initial starting points (Ketchen & Shook, 1996). Two distinct segments with relatively homogeneous importance ratings were identified as the optimal solution. Cross-tabulations with student t-test statistics were used to determine the associations between the categorical variables, while an Anova F-test and Bonferroni post hoc test were used for the comparison of mean scores.

3.4.2 Econometric analysis of the choice experiment and eye tracking

The DCE method is consistent with the random utility theory and the theory of consumer demand (Lancaster, 1966). A random utility function may be defined as follows:

$$\mathrm{U}_{\mathrm{njt}} = V_{\mathrm{njt}} + \varepsilon_{\mathrm{njt}} \qquad (1)$$

where U_{nj} is the n^{th} utility from the consumer's choice of alternative j; V_{nj} is the systematic or representative portion of the utility function, which depends on the product attributes and their values for alternative j; and ε_{nj} is the stochastic Gumbel distributed error term (unobserved and treated as random). To estimate the consumer preferences for the multiple NCs, we used a random parameter logit (RPL) model (Train, 2003). More specifically, we estimated an RPL model, named RPL1, which accounts for both random taste variation and correlation patterns across random parameters. Given our choice experiment, the utility function that individual *n* derives from alternative *j* in choice situation *t* is defined as follows:

$$U_{njt} = OptOut + \beta_1 Ffat_{njt} + \beta_2 \mathrm{Lsugar}_{njt} + \beta_3 Hfiber_{njt} + \beta_4 SvitB6_{njt} + \beta_5 Scalcium_{njt} + \varepsilon_{njt} \quad (2)$$

where *n* is the number of respondents, *j* represents the available choices in the choice tasks (two experimentally designed yogurt profiles and the opt-out option), and *t* is the number of choice situations. $OptOut$ is the alternative-specific constant representing the opt-out option. The variables related to the five NCs (fat free, *Ffat*; low sugar, *Lsugar*; high fiber, *Hfiber*; source of vitamin B_6, $SvitB_6$; and source of calcium, *Scalcium*) enter the model as dummy variables, and "full fat – unlabeled" yogurt represents the product of reference.

To investigate the effects of visual attention on consumer choice behavior and preferences, we estimated two additional RPL models that incorporate the visual attention data into the utility function. In particular, RPL2 adds to RPL1 by including visual attention in terms of fixation time expressed in milliseconds, and RPL3 adds to RPL1 by including visual attention in terms of fixation count. In line with Grebitus, Roosen, and Seitz Carolin (2015) and Van Loo et al. (2015), we rescaled the fixation time spent and fixation count to have a zero mean. For RPL2 and RPL3, the utility function specified for individual *n*, alternative *j*, in choice situation *t*, is defined as follows:

$$U_{njt} = OptOut + \beta_1 Ffat_{njt} + \beta_2 \mathrm{Lsugar}_{njt} + \beta_3 Hfiber_{njt} + \beta_4 SvitB6_{njt} + \beta_5 Scalcium_{njt} + \gamma_{\mathrm{Ffat}}(FtFfat * Ffat_{njt}) + \gamma_{\mathrm{Lsugar}}(FtLsugar * Lsugar_{njt}) + \gamma_{\mathrm{Hfiber}}(FtHfiber * Hfiber_{njt}) + \gamma_{\mathrm{SvitB6}}(FtSvitB6 * SvitB6_{njt}) + \gamma_{\mathrm{Scalcium}}(FtScalcium * Scalcium_{njt}) + \varepsilon_{njt} \quad (3)$$

where γ_{Ffat} is the coefficient of the interaction term between the fat-free attribute and the fixation time *FtFfat* for the fat-free attribute and so on for the other attributes. Thus, in RPL2, the $FtFfat$ variable is the mean-centered fixation time spent on the fat-free nutritional claim, whereas, in RPL3, $FcFfat$ is the mean-centered fixation count. Similarly, the other γs are the coefficients of the interaction terms between the attribute and the visual attention mean-centered variables. The remaining variables are as specified in (2).

In all the models, it is assumed that the coefficients of the five NCs (*Ffat*, *Lsugar*, *Hfiber*, *SvitB6*, and *Scalcium*) are random and follow a normal distribution. In the RPL2 and RPL3 models, the interaction terms are also assumed to be random and to follow a normal distribution.

4. Results

4.1 Consumer segmentation and stated importance of yogurt attributes

The results from the questionnaire reveal that, when evaluating yogurt attributes, participants attach the highest level of importance to the health aspect of the product, followed by taste and nutritional and health claim labels (Table 4).

Table 4 – Importance of yogurt attributes

No.		Mean	Standard deviation
1	Health[a]	4.16	0.81
2	Taste	4.12	0.91
3	NC labels	4.11	0.91
4	HC labels	3.95	1.11
5	Natural ingredients	3.85	0.99
6	Price	3.66	1.01
7	Brand	3.09	1.04
8	Convenience[b]	2.72	1.16

Note: Measured on a 5-point scale from 1 (not at all important) to 5 (extremely important). [a] Health means that consumers might choose the product because of the health properties that it holds. [b] Convenience means that it can be found easily, there is a large variety, and it can be combined easily with other food.

This result suggests that NCs are perceived as being less important than health and taste and more important than health claims, natural ingredients, price, brand, and convenience. From the cluster analysis using the importance of yogurt attributes, we obtained two distinct consumer segments. The segment sizes and scores are reported in Table 5.

Segment 1 (39 percent of the sample) attaches the greatest importance to the *fat-free* type of nutritional claim followed by the *source of calcium* and *source of vitamin* B_6 types of nutritional claims when purchasing yogurt. Segment 2 (61 percent of the sample), on the other hand, attaches the greatest importance to the *source of calcium* NC followed by the *fat-free* and *source of vitamin* B_6 types of claims. The *high in fiber* type of claim is the least valued claim by both segments. With respect to the importance attached to yogurt attributes, both segments do not attach importance to any of the yogurt attributes mentioned in Table 5. The χ^2 test revealed no significant differences across the segments in terms of the socio-demographic variables gender, age group (45–54 and older than 54), education (primary), and income (from €3501 and above €4500) (Table 3). To describe the segments further, the importance of NCs on the yogurt packaging (Table 5) was compared with the visual attention data (Sections 4.2, 4.3, and 4.4).

Table 5 – Two-cluster solution and profiling of consumer segments (n = 100)

	Segment 1		Segment 2
Segment size (n)	39 (39.00%)		61 (61.00%)
Importance of yogurt attributes[b]			
Taste	4.23 (0.78) [a]	Health	4.23 (0.76)
Health claims	4.10 (0.99)	Nutritional claims	4.11 (0.95)
Nutritional claims	4.10 (0.85)	Taste	4.05 (0.99)
Health	4.05 (0.89)	Health claims	3.85 (1.18)
Natural ingredients	3.85 (1.01)	Natural ingredients	3.85 (0.98)
Price	3.72 (0.94)	Price	3.62 (1.05)
Brand	3.00 (1.10)	Brand	3.15 (1.00)
Convenience	2.64 (1.20)	Convenience	2.77 (1.13)
Importance of NCs' attributes[b]			
Fat free*	3.69 (1.30)	Source of calcium*	3. 64 (1.20)
Low sugar	3.54 (1.39)	Low sugar	3.57 (1.16)
Source of calcium*	3.31 (1.16)	Fat free*	3.33 (1.22)
Source of vitamin B_6**	3.15 (1.16)	Source of vitamin B_6**	2.72 (1.29)
High fiber	2.92 (1.35)	High fiber	2.64 (1.08)

Note: * The correlation is significant at the 0.05 level based on the student t-test between segments. ** The correlation is significant at the 0.01 level based on the student t-test between segments. [a] Mean (standard deviation). [b] Measured on a 5-point scale from 1 (not at all important) to 5 (extremely important).

4.2 Visual attention to NCs based on eye-tracking measures

The participants had the highest fixation count on the *low-sugar* NC with an average of 9 fixations and 2146 milliseconds of fixation time, suggesting that *low sugar* is the most important attribute when customers make their choices. On average, *source of calcium* and *high fiber* received fewer fixations than the other NCs. The fixation time and fixation count are reported in Table 6.

Table 6 – Average eye-tracking measures for the total of 5 stimuli (n = 100)

	Fixation time (ms)[1]				Fixation count			
AOIs	Mean	Std Dev.	Min.	Max.	Mean	Std Dev.	Min.	Max.
Fat free	2057.15	1630.92	118	8544	8.30	5.20	1	26
High fiber	1314.83	1046.70	113	4665	5.37	3.63	1	18
Low sugar	2145.85	1555.14	101	7826	8.96	5.29	1	25
Source of calcium	1787.37	1245.8	129	4978	7.85	4.68	1	18
Source of vitamin B_6	1957.87	1257.26	116	5405	8.75	4.58	1	21

[1] Milliseconds.

4.3 Relationship between visual attention and nutritional claims' importance

The results show several relationships between the total fixation count and fixation time within an AOI and the stated importance of the NCs (Table 7).

Table 7 – Pearson correlation coefficients between stated importance and visual attention to yogurts with NCs

	Fixation time (ms)[1]					Fixation count				
Stated importance[2]	Fat free	High fiber	Low sugar	Source of calcium	Source of vitamin B_6	Fat free	High fiber	Low sugar	Source of calcium	Source of vitamin B_6
Fat free	0.141	0.178	0.176	0.239	0.182	0.153	0.145	0.165	0.218	0.171
(p-values)	(0.161)	(0.076)	(0.079)	(0.017)	(0.070)	(0.130)	(0.151)	(0.101)	(0.029)	(0.089)
High fiber	0.086	0.138	0.195	0.201	0.186	0.061	0.139	0.170	0.218	0.140
(p-values)	(0.393)	(0.172)	(0.053)	(0.045)	(0.064)	(0.546)	(0.167)	(0.091)	(0.030)	(0.165)
Low sugar	-0.002	0.075	0.057	0.090	0.074	0.021	0.101	0.066	0.010	0.060
(p-values)	(0.984)	(0.461)	(0.573)	(0.373)	(0.467)	(0.839)	(0.317)	(0.514)	(0.339)	(0.554)
Source of calcium	0.172	0.159	0.240	0.202	0.215	0.164	0.157	0.269	0.211	0.209
(p-values)	(0.087)	(0.114)	(0.016)	(0.044)	(0.032)	(0.103)	(0.120)	(0.007)	(0.035)	(0.037)
Source of vitamin B_6	0.138	0.162	0.279	0.231	0.199	0.168	0.195	0.310	0.292	0.211
(p-values)	(0.171)	(0.107)	(0.005)	(0.021)	(0.048)	(0.094)	(0.052)	(0.002)	(0.003)	(0.035)

Note: [1] Milliseconds. [2] The stated importance attributes are measured on a 5-point scale from 1 (not at all important) to 5 (extremely important).

There is a positive significant relationship between the stated importance and the fixation count or fixation time for two NCs: *source of calcium* and *source of vitamin B_6*. This finding suggests that those stating that they attach a high degree of importance to these two NCs when purchasing yogurt truly do pay more attention to these attributes when making choices. With respect to the rest of the visual attention and NC attributes, we observe a small positive correlation (e.g., low sugar fixation time and high fiber (0.053), high fiber fixation count and source of vitamin B_6 (0.052)); however, this correlation is weak and is not significant at the 5 percent level. This suggests that the relationship suggested by the correlation between these variables could have happened by chance. Therefore, we accept the null hypothesis and conclude that there is no correlation between these and the rest of the variables above the 5 percent significance level.

4.4 Differences in visual attention across segments

The differences in visual attention across segments that attach different degrees of importance to NC attributes for yogurt are reported in Table 8.

Table 8 – Visual attention degree of importance to NC attributes for yogurt

	Segment 1		Segment 2
Segment size (n)	39 (39.00%)		61 (61.00%)
Fixation count			
Low sugar***	13.97 (4.16)	Source of vitamin B_6***	6.15 (2.87)
Fat free***	12.90 (4.72)	Low sugar***	5.75 (2.90)
Source of vitamin B_6***	12.82 (3.72)	Fat free***	5.36 (2.83)
Source of calcium***	12.28 (3.55)	High fiber***	3.46 (1.75)
High fiber***	8.36 (3.81)	Source of calcium***	4.97 (2.66)
Fixation time (ms)[1]			
Low sugar***	3671.33 (1305.22)	Source of vitamin B_6***	1204.89 (649.66)
Fat free***	3500.28 (1620.93)	Low sugar***	1170.54 (657.13)
Source of vitamin B_6***	3135.62 (1057.34)	Fat free***	1134.49 (711.06)
Source of calcium***	3004.97 (974.11)	Source of calcium***	995.95 (608.50)
High fiber***	2255.28 (1031.71)	High fiber***	713.55 (437.16)

Note: * The correlation is significant at the 0.05 level based on the student t-test. ** The correlation is significant at the 0.01 level based on the student t-test. [1] Milliseconds.

The fixation time and count for the various attributes are indicators of their relevance to participants' purchase decisions. Therefore, we expect the segments that attach greater importance to various attributes also to have stronger visual attention in terms of fixation time and count. We find significant differences in the fixation time and count for the various NCs between S1 and S2 (Table 8). Although there are differences in the visual attention between the two segments, S1, albeit smaller, has greater visual attention in terms of fixation time and count for all the NCs than S2. The participants in this segment showed the strongest visual attention in terms of fixation time to the *fat-free* and *low-sugar* NCs followed by the *source of vitamin* B_6 claim. On the other hand, in terms of the fixation count, the participants paid the most attention to the *low-sugar* and *fat-free* NCs, followed by the *source of vitamin* B_6 claim. The visual preferences in S2 seem to be slightly different from those in S1; however, they are consistent in terms of fixation time and count visual attention. More specifically, regarding both fixation time and fixation count, the participants paid the most attention to the *source of vitamin* B_6 and *low-sugar* NCs followed by the *fat-free* claim. Overall, the *high-fiber* NC is the least-valued NC for both eye-tracking measures.

4.5 Effect of visual attention to nutritional claims on choice behavior for yogurt

RPL1, the baseline model, assumes random taste heterogeneity and correlation patterns across random parameters, while RPL2 and RPL3 add the interaction terms between the NCs and the visual attention measures fixation time and count[11] to RPL1. Hence, RPL2 and RPL3 allowed us to determine whether consumers who pay more attention to an attribute value it more. As expected, the results show that the coefficient of the opt-out option is negative and statistically significant in all the models, indicating that consumers gain more utility from choosing one of the experimentally designed yogurt profiles rather than the opt-out choice. The coefficients of the five NCs (i.e., *fat free*, *low sugar*, *high fiber*, *source of vitamin* B_6, and *source of calcium*) are also all positive and statistically significant at the 1 percent and 5 percent significance levels in all the models, indicating that consumer utility increases when these claims are reported on yogurt packages.

The corresponding standard deviations are also statistically significant, suggesting that consumers' preferences for these five attributes are heterogeneous. According to the results from RPL1, consumer utility is greater when a yogurt bears the *fat-free* NC, followed by the *high-fiber* and *source of calcium* claims, in comparison with the unlabeled yogurt. On the other hand, yogurt that bears the *source of vitamin* B_6 or the *low-sugar* claim is the least preferred. Participants' utility changes when we look at the visual attention results. In both models (RPL2 and RPL3), four of the five interaction terms are statistically significant: those related to *calcium*, *fat*, *fiber*, and *vitamin* B_6 contents. This result indicates that a longer fixation time or higher fixation count is related to greater utility for these attributes. In other words, people who visually attend more to these types of NCs are more likely to choose yogurt that carries them. Table 9 reports the coefficient estimates from the three RPL models.[12]

A model fit comparison of the information criteria shows that RPL1 and RPL3 improve the model performance. This result suggests that the incorporation of visual attention in terms of fixation count information as covariates improves the model fit (see the model fit comparison in Appendix C (Table C1)).

[11] The fixation time and fixation count are in the utility model as dummy variables. They take the value of 1 when the individuals' fixation time (milliseconds) or fixation count is equal to or higher than the centered mean of each attribute and 0 otherwise (e.g. the fat-free yogurt takes the value of 1 if the time fixation is equal to or higher than 2057 ms or 0 otherwise).

[12] The results from the Cholesky matrix are available on request.

Table 9 – Results of three random-parameter logit model specifications

	RPL 1	RPL 2	RPL 3
	-	Fixation time	Fixation count
Parameters	β (z)	β (z)	β (z)
Opt-out	-1.34 (-8.06)***	-1.38 (-7.98)***	-1.37 (-7.93)***
Fat free	**3.13 (8.57)*** **	**3.30 (8.46)*** **	**3.44 (7.93)*** **
Standard deviation	4.01 (9.56)***	4.20 (8.17)***	4.26 (8.08)***
Low sugar	**0.76 (2.08)** **	**1.07 (2.49)** **	**1.15 (2.24)** **
Standard deviation	2.71 (8.37)***	4.14 (5.54)***	3.84 (4.65)***
High fiber	**2.39 (7.08)*** **	**2.42 (6.84)*** **	**2.76 (6.77)*** **
Standard deviation	2.99 (8.38)***	3.68 (7.42)***	3.57 (7.85)***
Source of vitamin B_6	**1.22 (3.94)*** **	**1.12 (3.50)*** **	**0.77 (2.14)** **
Standard deviation	3.04 (8.8)***	3.46 (5.08)***	1.96 (4.79)***
Source of calcium	**2.09 (4.82)*** **	**0.93 (2.75)*** **	**1.00 (2.77)*** **
Standard deviation	2.12 (6.15)***	1.56 (4.36)***	2.02 (4.53)***
Int. 1 – Fat	**-**	**2.55 (2.81)*** **	**2.66 (4.23)*** **
Standard deviation		1.56 (4.36)***	2.02 (4.53)***
Int. 2 – Sugar	**-**	**-0.41 (-0.77)**	**-0.25 (-0.42)**
Standard deviation		1.22 (2.41)**	0.17 (0.39)
Int. 3 – Fiber	**-**	**2.35 (3.76)*** **	**1.43 (2.46)** **
Standard deviation		1.15 (2.11)**	0.91 (1.89)*
Int. 4 – Vitamin B6	**-**	**0.64 (1.70)* **	**1.33 (2.96)*** **
Standard deviation		1.23 (2.43)**	1.12 (3.09)***
Int. 5 – Calcium	**-**	**2.61 (5.22)*** **	**3.36 (6.83)*** **
Standard deviation		1.53 (3.40)***	1.23 (3.09)***
N	4500	4500	4500
Log likelihood	-934.08	-895.10	-868.14
AIC	1.274	1.282	1.246

Note: Significance levels at *** 1%, ** 5%, and * 10%.

5. Discussion and final remarks

This study combined a DCE and ET regarding yogurt selection to assess consumers' valuation of multiple NCs and to investigate whether attention is related to food choice decisions in one European country (Spain). Consumer heterogeneity was taken into account through consumer segmentation, which entailed the classification of the participants into two segments by consumer characteristics. Those in segment 1, compared with those in segment 2, are more likely to be male, to be between 18 and 34 years old, to have completed secondary studies, and to have a low income. This segment attached a high level of importance to the *fat-free* NC followed by a *source of calcium and a source of vitamin* B_6. Segment 2 is characterized by females aged between 18 and 34 years with a higher income than segment 1 who had completed secondary education. For this segment, the most important NCs considered when purchasing yogurts were the *source of calcium* type of claim followed by the *fat-free* and *source of vitamin* B_6 claims. The preferences of segment 2 are consistent with the interaction terms (i.e., fixation count visual attention and choice) of the RPL 3 model, which also had the best model fit.

In terms of the importance attached to yogurt attributes, we did not find any statistically significant differences between segments. This result suggests that there is homogeneity in the importance given to these attributes between our two segments. The first four most important attributes to the participants of both segments when purchasing yogurt were taste, nutritional claims, health claims, and health. These findings are consistent with the results of previous studies that defined taste as one of the most important attributes in the decision to purchase food products (Carrillo et al., 2012; Insch & Jackson, 2014; Markovina et al., 2015; Sautron et al., 2015). Moreover, the results are consistent with a previous study by Rebollar, Lidón, Guzmán, Gil, and Martín (2017), who found healthfulness to be one of the most important attributes in yogurt for Spanish consumers.

Taking the aforementioned into consideration, food companies should be willing to differentiate their products according to these preferences. These results can be informative and challenging to producers and processors: informative in terms of promoting the *source of calcium*, *fat-free*, and *source of vitamin* B_6 types of NCs as a differentiation strategy and challenging in terms of combining taste and health (i.e., two intrinsic attributes) to reduce the "halo" effect of the common belief that "healthy" in most cases equals less tasty food products. Since taste has been found to be one of the most important determinants of repeated purchases (Elbel, Gyamfi, & Kersh, 2011; Holmquist, McCluskey, & Ross, 2012), a strategy that would allow consumers to taste the food product before purchasing it may generate repurchases in the case of satisfaction and may be seen as a form of differentiation. This strategy is common in some stores in the US (e.g., Costco) and has proven to be effective in increasing sales (Pinsker, 2014).

In terms of the extent to which providing NCs on yogurt packages may provide a signal detection assumption that increasing participants' visual attention may result in increasing the probability of the product being purchased (H1), we showed that visual attention in terms of fixation count may increase the likelihood of a product being purchased. This finding is in line with the overall results of previous studies that suggest that visual attention plays a role in explaining choice behavior (Bialkova & van Trijp, 2011; Bialkova et al., 2014; Graham & Jeffery, 2011; Samant & HanSeok, 2016; Uggeldahl et al., 2016; Van der Laan et al., 2015; Van Loo et al., 2015, 2017; Vu et al., 2016). This finding is consistent with Orquin and Holmqvist (2018), who suggested that the total dwell time may threaten the external validity of the study. Our results partially confirm that greater utility is generated when the *fat-free* and *low-sugar* claims (H2) are present on the yogurt package compared with the other claims. Overall, the results from the interactions of the DCE and ET suggest that the *fat-free* claim received the second-strongest visual attention, after *source of calcium*, and was the most chosen among the claims. This result is consistent with the attribute preferences from the cluster analysis (segment 2) and is in line with the previous studies by Krystallis and Chrysochou (2012) and Van Wezemael et al. (2014), who found that consumers have positive perceptions of and attach higher values to NCs related to fat content and saturated fat.

The *low-sugar* NC, on the other hand, was the least-preferred claim in all the models. This result also confirms the increasing evidence that what consumers say about their preferences regarding NCs is not actually reflected in what they finally purchase in the marketplace. One reason for rejecting the *low-sugar* NC may be that consumers reject sugar-reduced products that do not meet their sensory preferences, even if they are more healthful than regular products (Civille & Oftedal, 2012). Therefore, emphasizing sugar reduction may create negative sensory effects and decrease the value of a product (e.g., yogurt) (Brunner, Horst, & Siegrist, 2010; Lähteenmäki et al., 2010; Raghunathan, Naylor, & Hoyer, 2006). Although the *fat-free* NC was the most valued by both clusters and produced the greatest utility in terms of visual attention and final choice in yogurt, producers, processors, and retailers should carefully consider the type of food product and modify the sensory characteristics related to the NCs accordingly (e.g., fat reduction in meat products, in general, reduces the sensory quality, the texture, and the acceptance of the final product; Méndez-Zamora et al., 2015).

This study has some limitations that constitute areas for further research. The first limitation is that, even though we found that the presence of NCs on yogurts' FOP increases attention, we cannot prove this with certainty but can only assume that attention might be linked to an increased likelihood of affecting the final decision to purchase yogurts with NCs. As defined by Orquin and Holmqvist (2018), it is difficult to support an eye–mind assumption, because researchers cannot know whether the presence of fixation implies that the object has been processed or not and vice versa. Therefore, whilst we maintain that eye tracking is useful, we argue that more research is needed to understand the extent to which ET data can be used to improve stated preference research. The second limitation is that this research was carried out in only one European country due to the limitation in funding; hence, it should be replicated in other countries to provide more evidence. Future research using eye tracking should be developed not only in lab conditions but also in a real supermarket context using eye-tracking glasses to test the consumers' attention in terms of preferences and decision making in different contexts.

Finally, since each NC has its own effect on people's health, it would also be interesting to explore groups of consumers with similar shopping goals (e.g., fat-free products for consumers who are concerned about reducing their cholesterol level) and discover whether their taste preference is more important than their health goals.

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Conflict of interest

The authors declare no conflict of interest.

Highlights:

- Two clusters profile consumer segments for Spanish yogurts with nutritional claims.
- The presence of NCs on yogurts' front of pack increases the attention of consumers.
- The *low-sugar* claim was the least valued of the claims.
- Visual attention (fixation count) increases the likelihood of purchase decisions.

References

Antúnez, L., Vidal, L., Sapolinski, A., Giménez, A., Maiche, A., & Ares, G. (2013). How do design features influence consumer attention when looking for nutritional information on food labels? Results from an eye-tracking study on pan bread labels. *International Journal of Food Sciences and Nutrition*, *64*(5), 515–527. https://doi.org/10.3109/09637486.2012.759187

Ares, G., Giménez, A., Bruzzone, F., Vidal, L., Antúnez, L., & Maiche, A. (2013). Consumer visual processing of food labels: Results from an eye-tracking study. *Journal of Sensory Studies*, *28*(2), 138–153. https://doi.org/10.1111/joss.12031

Ares, G., Mawad, F., Giménez, A., & Maiche, A. (2014). Influence of rational and intuitive thinking styles on food choice: Preliminary evidence from an eye-tracking study with yogurt labels. *Food Quality and Preference*, *31*, 28–37. https://doi.org/10.1016/j.foodqual.2013.07.005

Balcombe, K., Fraser, I., & McSorley, E. (2015). Visual attention and attribute attendance in multi-attribute choice experiments. *Journal of Applied Econometrics*, *30*(3), 447–467. https://doi.org/10.1002/jae.2383

Balcombe, K., Fraser, I., Williams, L., & McSorley, E. (2017). Examining the relationship between visual attention and stated preferences: A discrete choice experiment using eye-tracking. *Journal of Economic Behavior & Organization*, *144*, 238–257. https://doi.org/10.1016/j.jebo.2017.09.023

Ballco, P., & de-Magistris, T. (2018). Valuation of nutritional and health claims for yoghurts in Spain: A hedonic price approach. *Spanish Journal of Agricultural Research*, *16*(2), 0108. https://doi.org/10.5424/sjar/2018162-12130

Barreiro-Hurlé, J., Gracia, A., & de-Magistris, T. (2010a). Does nutrition information on food products lead to healthier food choices? *Food Policy*, *35*(3), 221–229. https://doi.org/10.1016/j.foodpol.2009.12.006

Bellows, A. C., Alcaraz, V, G., & Hallman, W. K. (2010). Gender and food, a study of attitudes in the USA towards organic, local, U.S. grown, and GM-free foods. *Appetite*, *55*(3), 540–550. https://doi.org/10.1016/j.appet.2010.09.002

Bialkova, S., & Trijp, H. C. M. van. (2011). An efficient methodology for assessing attention to and effect of nutrition information displayed front-of-pack. *Food Quality and Preference*, *22*(6), 592–601. https://doi.org/10.1016/j.foodqual.2011.03.010

Bialkova, S., Grunert, K. G., Juhl, H. J., Wasowicz-Kirylo, G., Stysko-Kunkowska, M., & Trijp, H. C. M. van. (2014). Attention mediates the effect of nutrition label information on consumers' choice. Evidence from a choice experiment involving eye-tracking. *Appetite*, *76*, 66–75. https://doi.org/10.1016/j.appet.2013.11.021

Bimbo, F., Bonanno, A., Nocella, G., Viscecchia, R., Nardone, G., De Devitiis, B., & Carlucci, D. (2017). Consumers' acceptance and preferences for nutrition-modified and functional dairy products: A systematic review. *Appetite*, *113*, 141–154. https://doi.org/10.1016/j.appet.2017.02.031

Brunner, T. A., Horst, K. van der, & Siegrist, M. (2010). Convenience food products. Drivers for consumption. *Appetite*, *55*(3), 498–506. https://doi.org/10.1016/j.appet.2010.08.017

Burlingame, B., & Dernini, S. (2010). Sustainable diets and biodiversity – Directions and solutions for policy, research and action. *International Scientific Symposium*, 309.

Caputo, V., Nayga, R. M., & Scarpa, R. (2013). Food miles or carbon emissions? Exploring labelling preference for food transport footprint with a stated choice study. *Australian Journal of Agricultural and Resource Economics*, 57(4), 465–482. https://doi.org/10.1111/1467-8489.12014

Carlsson, F., Kataria, M., & Lampi, E. (2010). Dealing with ignored attributes in choice experiments on valuation of Sweden's environmental quality objectives. *Environmental and Resource Economics*, *47*(1), 65–89. https://doi.org/10.1007/s10640-010-9365-6

Carrillo, E., Fiszman, S., Lähteenmäki, L., & Varela, P. (2014). Consumers' perception of symbols and health claims as health-related label messages. A cross-cultural study. *Food Research International*, *62*, 653–661. https://doi.org/10.1016/j.foodres.2014.04.028

Carrillo, E., Varela, P., & Fiszman, S. (2012). Effects of food package information and sensory characteristics on the perception of healthiness and the acceptability of enriched biscuits. *Food Research International*, *48*(1), 209–216. https://doi.org/10.1016/j.foodres.2012.03.016

Civille, G. V., & Oftedal, K. N. (2012). Sensory evaluation techniques – Make "good for you" taste "good." *ResearchGate*, *107*(4), 598–605. https://doi.org/10.1016/j.physbeh.2012.04.015

Cuevas, R. (2012). Investigacíon "A fondo": *Eroski Consumer*, *4*(164), 27.

De-Magistris, T., & Gracia, A. (2016). Consumers' willingness to pay for light, organic and PDO cheese: An experimental auction approach. *British Food Journal*, *118*(3), 560–571. https://doi.org/10.1108/BFJ-09-2015-0322

De-Magistris, T., López-Galán, B., & Caputo, V. (2016). The impact of body image on the WTP values for reduced-fat and low-salt content potato chips among obese and non-obese consumers. *Nutrients*, *8*(12), 830. https://doi.org/10.3390/nu8120830

Dias, J. G. (2006). Latent Class Analysis and Model Selection. *In From Data and Information Analysis to Knowledge Engineering* (pp. 95–102). Springer, Berlin, Heidelberg. https://doi.org/10.1007/3-540-31314-1_10

Dötsch-Klerk, M., Mela, D., & Kearney, M. (2015). Sustainable diets. *Food Science and Technology*. http://www.fstjournal.org/features/29-1/sustainable-diets Accessed June 1, 2018.

Duchowski, A. T. (2017). *Eye tracking methodology*. Cham: Springer International Publishing. https://doi.org/10.1007/978-3-319-57883-5

Elbel, B., Gyamfi, J., & Kersh, R. (2011). Child and adolescent fast-food choice and the influence of calorie labeling: A natural experiment. *International Journal of Obesity*, *35*(4), 493–500. https://doi.org/10.1038/ijo.2011.4

Eržen, N., Kač, M., & Pravst, I. (2014). Perceived healthfulness of dairy products and their imitations: Nutrition experts' perspective. *Agro Food Industry Hi Tech*, *25*, 24–27. https://doi.org/10.13140/2.1.1329.3126

Fenko, A., Nicolaas, I., & Galetzka, M. (2018). Does attention to health labels predict a healthy food choice? An eye-tracking study. *Food Quality and Preference*, *69*, 57–65. https://doi.org/10.1016/j.foodqual.2018.05.012

Fontecha, J., Recio, I., & Pilosof, A. M. R. (2009). *Funcionalidad de Componentes Lácteos* (Vol. 1). Spain: CSIC. https://www.researchgate.net/profile/Wilman_Carrillo/publication/301282613_Funcional idad_de_Componentes_Lacteos/links/570ecea308aed4bec6fdeca1/Funcionalidad-de-Componentes-Lacteos.pdf#page=147

Gere, A., Danner, L., Antoni, N. de, Kovács, S., Dürrschmid, K., & Sipos, L. (2016). Visual attention accompanying food decision process: An alternative approach to choose the best models. *Food Quality and Preference*, *51*, 1–7. https://doi.org/10.1016/j.foodqual.2016.01.009

Graham, D. J., & Jeffery, R. W. (2011). Location, location, location: Eye-tracking evidence that consumers preferentially view prominently positioned nutrition information. *Journal of the American Dietetic Association*, *111*(11), 1704–1711. https://doi.org/10.1016/j.jada.2011.08.005

Grebitus, C., & Davis, G. C. (2017). Change is good!? Analyzing the relationship between attention and nutrition facts panel modifications. *Food Policy*, *73*, 119–130. https://doi.org/10.1016/j.foodpol.2017.10.002

Grebitus, C., Roosen, J., & Seitz Carolin, C. (2015). Visual attention and choice: A behavioral economics perspective on food decisions. *Journal of Agricultural & Food Industrial Organization*, *13*(1), 73. https://doi.org/10.1515/jafio-2015-0017

Grunert, K. G., Hieke, S., & Wills, J. (2014). Sustainability labels on food products: Consumer motivation, understanding and use. *Food Policy*, *44*, 177–189. https://doi.org/10.1016/j.foodpol.2013.12.001

Grunert, K. G., Wills, J. M., & Fernández-Celemín, L. (2010). Nutrition knowledge, and use and understanding of nutrition information on food labels among consumers in the UK. *Appetite*, *55*(2), 177–189. https://doi.org/10.1016/j.appet.2010.05.045

Haley, R. I. (1968). Benefit segmentation: A decision-oriented research tool. *Journal of Marketing*, *32*(3), 30–35. https://doi.org/10.2307/1249759

Hieke, S., Kuljanic, N., Pravst, I., Miklavec, K., Kaur, A., Brown, K. A., … Rayner, M. (2016). Prevalence of nutrition and health-related claims on pre-packaged foods: A five-country study in Europe. *Nutrients*, *8*(3), 137. https://doi.org/10.3390/nu8030137

Holmquist, C., McCluskey, J., & Ross, C. (2012). Consumer preferences and willingness to pay for oak attributes in Washington chardonnays. *American Journal of Agricultural Economics*, *94*(2), 556–561. https://doi.org/10.1093/ajae/aar071

Hummel, G., Zerweck, I., Ehret, J., Winter, S. S., & Stroebele-Benschop, N. (2017). The influence of the arrangement of different food images on participants' attention: An experimental eye-tracking study. *Food Quality and Preference*, *62*, 111–119. https://doi.org/10.1016/j.foodqual.2017.07.003

INE. (2017). INEbase / Demografía y población /Cifras de población y Censos demográficos /Cifras de población / Últimos datos. http://www.ine.es/dyngs/INEbase/es/operacion.htm?c=Estadistica_C&cid=1254736176951&menu=ultiDatos&idp=1254735572981 Accessed May 21, 2018.

Insch, A., & Jackson, E. (2014). Consumer understanding and use of country-of-origin in food choice. *British Food Journal*, *116*(1), 62–79. https://doi.org/10.1108/BFJ-10-2011-0275

Jadczaková, V. (2013). Review of segmentation process in consumer markets. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, *61*(4), 1215–1224. https://doi.org/10.11118/actaun201361041215

Jurado, F., & Gracia, A. (2017). Does the valuation of nutritional claims differ among consumers? Insights from Spain. *Nutrients*, *9*(2). https://doi.org/10.3390/nu9020132

Ketchen, D. J., & Shook, C. L. (1996). The application of cluster analysis in strategic management research: An analysis and critique. *Strategic Management Journal*, *17*(6), 441–458.
Khan, R. S., Grigor, J. V., Win, A. G., & Boland, M. (2014). Differentiating aspects of product innovation processes in the food industry: An exploratory study on New Zealand. *British Food Journal*, *116*(8), 1346–1368. https://doi.org/10.1108/BFJ-04-2013-0094
Krystallis, A., & Chrysochou, P. (2012). Do health claims and prior awareness influence consumers' preferences for unhealthy foods? The case of functional children's snacks. *Agribusiness*, *28*(1), 86–102. https://doi.org/10.1002/agr.20285
Lähteenmäki, L., Lampila, P., Grunert, K., Boztug, Y., Ueland, Ø., Åström, A., & Martinsdóttir, E. (2010). Impact of health-related claims on the perception of other product attributes. *Food Policy*, *35*(3), 230–239. https://doi.org/10.1016/j.foodpol.2009.12.007
Lancaster, K. J. (1966). A new approach to consumer theory. *Journal of Political Economy*, *74*(2), 132–157.
Lusk, J. L. (2003). Effects of cheap talk on consumer willingness-to-pay for golden rice. *American Journal of Agricultural Economics*, *85*(4), 840–856. https://doi.org/10.1111/1467-8276.00492
Markovina, J., Stewart-Knox, B. J., Rankin, A., Gibney, M., Almeida, M. D. V. de, Fischer, A., … Frewer, L. J. (2015). Food4Me study: Validity and reliability of Food Choice Questionnaire in 9 European countries. *Food Quality and Preference*, *45*, 26–32. https://doi.org/10.1016/j.foodqual.2015.05.002
Mawad, F., Trías, M., Giménez, A., Maiche, A., & Ares, G. (2015). Influence of cognitive style on information processing and selection of yogurt labels: Insights from an eye-tracking study. *Food Research International*, *74*, 1–9. https://doi.org/10.1016/j.foodres.2015.04.023
Meißner, M., & Oll, J. (2017) The promise of eye-tracking methodology in organizational research. *Organizational Research Methods*, *8*, 109442811774488.
Meißner, M., Musalem, A., & Huber, J. (2016). Eye tracking reveals processes that enable conjoint choices to become increasingly efficient with practice. *Journal of Marketing Research*, *53*(1), 1–17.
Meißner, M., Pfeiffer, J., Pfeiffer, T., & Oppewal, H. (2017). Combining virtual reality and mobile eye tracking to provide a naturalistic experimental environment for shopper research. *Journal of Business Research*. 10.1016/j.jbusres.2017.09.028
Méndez-Zamora, G., García-Macías, J. A., Santellano-Estrada, E., Chávez-Martínez, A., Durán-Meléndez, L. A., Silva-Vázquez, R., … Quintero-Ramos, A. (2015). Fat reduction in the formulation of frankfurter sausages using inulin and pectin. *Food Science and Technology*, *35*(1), 25–31. https://doi.org/10.1590/1678-457X.6417
Milosavljevic, M., & Cerf, M. (2008). First attention then intention: Insights from computational neuroscience of vision. *International Journal of Advertising*, *27*(3), 381–398. https://doi.org/10.2501/S0265048708080037
Ministry of Agriculture and Fisheries, Food and Environment (MAPAMA). (2014). *Informe del Consumo Alimentario en España 2014*. http://www.mapama.gob.es/es/alimentacion/temas/consumo-y-comercializacion-y-distribucion-alimentaria/panel-de-consumo-alimentario/ultimos-datos/ Accessed May 21, 2018.

Miraballes, M., Fiszman, S., Gámbaro, A., & Varela, P. (2014). Consumer perceptions of satiating and meal replacement bars, built up from cues in packaging information, health claims and nutritional claims. *Food Research International*, *64*, 456–464. https://doi.org/10.1016/j.foodres.2014.07.028

OECD. (2014). Compare your country – Education at a glance. http://www.oecd.org/education/Education-at-a-Glance-2014.pdf Accessed May 21, 2018.

Oliveira, D., Machín, L., Deliza, R., Rosenthal, A., Walter, E. H., Giménez, A., & Ares, G. (2016). Consumers' attention to functional food labels: Insights from eye-tracking and change detection in a case study with probiotic milk. *LWT – Food Science and Technology*, (68), 160–167. https://doi.org/10.1016/j.lwt.2015.11.066

Orquin, J. L., & Holmqvist, K. (2018). Threats to the validity of eye-movement research in psychology. *Behavior Research Methods*, *50*(4), 1645–1656. https://doi.org/10.3758/s13428-017-0998-z

Orquin, J. L., & Lagerkvist, C. J. (2015). Effects of salience are both short- and long-lived. *Acta Psychologica*, *160*, 69–76.

Orquin, J. L., & Mueller Loose, S. (2013). Attention and choice: A review on eye movements in decision making. *Acta Psychologica*, *144*(1), 190–206. DOI: 10.1016/j.actpsy.2013.06.003.

Orquin, J. L., & Scholderer, J. (2011). Attention to health cues on product packages. *Journal of Eyetracking, Visual Cognition and Emotion*, *1*(1), 6.

Orquin, J. L., Ashby, N. J. S., & Clarke, A. D. F. (2016). Areas of interest as a signal detection problem in behavioral eye-tracking research. *Journal of Behavioral Decision Making*, *29*(2–3), 103–115. DOI: 10.1002/bdm.1867

Orquin, J. L., Bagger, M. P., & Mueller Loose, S. (2013). Learning affects top down and bottom up modulation of eye movements in decision making. *Judgment and Decision Making*, *8*(6), 700–716.

Orquin, J. L., Chrobot, N., & Grunert, K. G. (2018). Guiding decision makers' eye movements with (un) predictable object locations. *Journal of Behavioral Decision Making*, *31*(3), 341–354.

Orquin, J. L., Perkovic, S., & Grunert, K. G. (2018). Visual biases in decision making. *Applied Economic Perspectives and Policy*, 118.

Peres, J., Esmerino, E., da Silva, A. L., Racowski, I., & Bolini, H. (2018). Sensory profile, drivers of liking, and influence of information on the acceptance of low-calorie synbiotic and probiotic chocolate ice cream. *Journal of Food Science*, *83*(5), 1350–1359. https://doi.org/10.1111/1750-3841.14120

Peschel, A. O., & Orquin, J. L. (2013). A review of the findings and theories on surface size effects on visual attention. *Frontiers in Psychology*, *4*, 21–30.

Pieters, R. (2008). A review of eye-tracking research in marketing. In N. K. Malhotra (Ed.), *Review of marketing research* (Volume 4, pp. 123–147). Emerald Group Publishing Limited.

Pieters, R., & Warlop, L. (1999). Visual attention during brand choice: The impact of time pressure and task motivation. *International Journal of Research in Marketing*, *16*(1), 1–16.

Pinheiro, M. V. S., Oliveira, M. N., Penna, A. L. B., & Tamime, A. Y. (2005). The effect of different sweeteners in low-calorie yogurts – A review. *International Journal of Dairy Technology*, *58*(4), 193–199. https://doi.org/10.1111/j.1471-0307.2005.00228.x

Pinsker, J. (2014, October 1). The psychology behind Costco’s free samples. https://www.theatlantic.com/business/archive/2014/10/the-psychology-behind-costcos-free-samples/380969/ Accessed July 12, 2018.

Piqueras-Fiszman, B., Velasco, C., Salgado-Montejo, A., & Spence, C. (2013). Using combined eye tracking and word association in order to assess novel packaging solutions: A case study involving jam jars. *Food Quality and Preference*, *28*(1), 328–338. https://doi.org/10.1016/j.foodqual.2012.10.006

Prieto-Castillo, L., Royo-Bordonada, M. A., & Moya-Geromini, A. (2015). Information search behaviour, understanding and use of nutrition labeling by residents of Madrid, Spain. *Public Health*, *129*(3), 226–236. https://doi.org/10.1016/j.puhe.2014.12.003

Raghunathan, R., Naylor, R. W., & Hoyer, W. D. (2006). The unhealthy = tasty intuition and its effects on taste inferences, enjoyment, and choice of food products. *Journal of Marketing*, *70*(4), 170–184.

Ryan, M., Krucien, N., & Hermens, F. (2017). The eyes have it: Using eye tracking to inform information processing strategies in multi-attributes choices. Health Economics, 27(4), 709–721. https://doi.org/10.1002/hec.3626

Rebollar, R., Lidón, I., Guzmán, R., Gil, I., & Martín, J. (2017). The influence of illuminance level on perception and willingness to buy during the tasting of sweetened natural yoghurt. *Food Quality and Preference*, 62, 270–274. https://doi.org/10.1016/j.foodqual.2017.05.007

Regulation (EC) No. 1924/2006. (2006, December 20). EUR-Lex – 02006R1924-20121129 – EN – EUR-Lex. https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A02006R1924-20121129 Accessed June 20, 2018.

Sah, B. N. P., Vasiljevic, T., McKechnie, S., & Donkor, O. N. (2016). Physicochemical, textural and rheological properties of probiotic yogurt fortified with fibre-rich pineapple peel powder during refrigerated storage. *LWT – Food Science and Technology*, *65,* 978–986. https://doi.org/10.1016/j.lwt.2015.09.027

Samant, S. S., & HanSeok, S. (2016). Effects of label understanding level on consumers’ visual attention toward sustainability and process-related label claims found on chicken meat products. *Food Quality and Preference*, *50,* 48–56.

Santeramo, F. G., Carlucci, D., Devitiis, B. D., Seccia, A., Stasi, A., Viscecchia, R., & Nardone, G. (2018). Emerging trends in European food, diets and food industry. *Food Research International*, *104*, 39–47. https://doi.org/10.1016/j.foodres.2017.10.039

Sautron, V., Péneau, S., Camilleri, G. M., Muller, L., Ruffieux, B., Hercberg, S., & Méjean, C. (2015). Validity of a questionnaire measuring motives for choosing foods including sustainable concerns. *Appetite*, *87*, 90–97. https://doi.org/10.1016/j.appet.2014.12.205

Scarpa, R., Zanoli, R., Bruschi, V., & Naspetti, S. (2013). Inferred and stated attribute non-attendance in food choice experiments. *American Journal of Agricultural Economics*, *95*(1), 165–180. https://doi.org/10.1093/ajae/aas073

Smith, R. (2015). Regulation (EC) No 1924/2006 of the European Parliament and of the Council. In R. Smith, *Core EU legislation* (pp. 183–186). London: Macmillan Education UK. https://doi.org/10.1007/978-1-137-54482-7_19

Solomon, M. R., Bamossy, G., Askegaard, S., & Hogg, M. K. (Eds.). (2006). *Consumer behaviour: A European perspective* (3rd ed). New York: Prentice Hall.

Spinks, J., & Mortimer, D. (2016). Lost in the crowd? Using eye-tracking to investigate the effect of complexity on attribute non-attendance in discrete choice experiments. *BMC Medical Informatics and Decision Making*, *16*, 14. https://doi.org/10.1186/s12911-016-0251-1

Strasser, A. A., Tang, K. Z., Romer, D., Jepson, C., & Cappella, J. N. (2012). Graphic warning labels in cigarette advertisements: Recall and viewing patterns. *American Journal of Preventive Medicine*, *43*(1), 41–47. https://doi.org/10.1016/j.amepre.2012.02.026

Torrico, D. D., Fuentes, S., Viejo, C. G., Ashman, H., Gurr, P. A., & Dunshea, F. R. (2018). Analysis of thermochromic label elements and colour transitions using sensory acceptability and eye tracking techniques. *LWT*, *89*, 475–481. https://doi.org/10.1016/j.lwt.2017.10.048

Train, K. (2003). *Discrete choice methods with simulation*. SUNY-Oswego, Department of Economics. https://econpapers.repec.org/bookchap/oettbooks/emetr2.htm

Uggeldahl, K., Jacobsen, C., Lundhede, T. H., & Olsen, S. B. (2016). Choice certainty in discrete choice experiments: Will eye tracking provide useful measures? *Journal of Choice Modelling*, *20*, 35–48. https://doi.org/10.1016/j.jocm.2016.09.002

UNEP. (2010). Assessing the environmental impacts of consumption and production. *International Journal of Sustainability in Higher Education*, *11*(4). https://doi.org/10.1108/ijshe.2010.24911daf.001

Van der Laan, L., Hooge, I. T. C., Ridder, D. T. D. de, Viergever, M. A., & Smeets, P. A. M. (2015). Do you like what you see? The role of first fixation and total fixation duration in consumer choice. *Food Quality and Preference*, *39*, 46–55. https://doi.org/10.1016/j.foodqual.2014.06.015

Van Herpen, E., & Trijp, H. C. M. van. (2011). Front-of-pack nutrition labels. Their effect on attention and choices when consumers have varying goals and time constraints. *Appetite*, *57*(1), 148–160. https://doi.org/10.1016/j.appet.2011.04.011

Van Loo, E. J., Caputo, V., Nayga, R. M., Seo, H.-S., Zhang, B., & Verbeke, W. (2015). Sustainability labels on coffee: Consumer preferences, willingness-to-pay and visual attention to attributes. *Ecological Economics*, *118*, 215–225. https://doi.org/10.1016/j.ecolecon.2015.07.011

Van Loo, E. J., Nayga, R. M., Campbell, J. D., Seo, H.-S., & Verbeke, W. (2017). Using eye tracking to account for attribute non-attendance in choice experiments. *European Review of Agricultural Economics*. https://doi.org/10.1093/erae/jbx035

Van Wezemael, L., Caputo, V., Nayga, R. M., Chryssochoidis, G., & Verbeke, W. (2014). European consumer preferences for beef with nutrition and health claims: A multi-country investigation using discrete choice experiments. *Food Policy*, *44*, 167–176. https://doi.org/10.1016/j.foodpol.2013.11.006

Varela, P., Antúnez, L., Cadena, R. S., Giménez, A., & Ares, G. (2014). Attentional capture and importance of package attributes for consumers' perceived similarities and differences among products: A case study with breakfast cereal packages. *Food Research International*, *64*, 701–710. https://doi.org/10.1016/j.foodres.2014.08.015

Verain, M. C. D., Sijtsema, S. J., & Antonides, G. (2016). Consumer segmentation based on food-category attribute importance: The relation with healthiness and sustainability perceptions. *Food Quality and Preference*, *48*, 99–106. https://doi.org/10.1016/j.foodqual.2015.08.012

Vu, T. M. H., Tu, V. P., & Duerrschmid, K. (2016). Design factors influence consumers' gazing behaviour and decision time in an eye-tracking test: A study on food images. *Food Quality and Preference*, *47*, 130–138. https://doi.org/10.1016/j.foodqual.2015.05.008

Wedel, M., & Kamakura, W. A. (2000). *Market segmentation: Conceptual and methodological foundations* (2nd ed.). Springer US. Retrieved from //www.springer.com/us/book/9780792386353

WHO. (2018). *Non communicable diseases*. http://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases Accessed June 1, 2018.

WHO/Europe. (2018, June 20). *Noncommunicable diseases*. http://www.euro.who.int/en/health-topics/noncommunicable-diseases Accessed June 20, 2018.

Zhang, B., & Seo, H.-S. (2015). Visual attention toward food-item images can vary as a function of background saliency and culture: An eye-tracking study. *Food Quality and Preference*, *41*, 172–179. https://doi.org/10.1016/j.foodqual.2014.12.004

Appendixes

Appendix A

Figure A1 – An evaluation form of the most-preferred yogurt

Note: The question is translated from Spanish as follows: “Which of these two yogurts would you choose?” “Alternativa A” refers to option A, “Alternativa B” refers to option B, and “Ninguno” is the “no-buy” option.

Appendix B

Table B1 – Population in Spain and Zaragoza (%)

Total		Sex[a]		Age					
		Female	Male	0–14	15–34	35–54	55–64	65–84	85 and above
Spain	46,624,382	51	49	15.06	22.59	32.20	11.76	15.60	2.79
Zaragoza	1,317,847	50	50	14.06	21.13	31.53	12.24	17.24	3.80

Source: Spanish Census of Population, 2017, www.ine.es. [a] In percentages.

Appendix C

The model fit information criteria, such as the Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC), as well as the log-likelihood values, can be used to discuss the relative fit of the various models (Table C1). The lower the information criteria, the better the model fit. It is known that using the BIC (AIC) tends to under-fit (over-fit) models, while evidence presented in previous studies (Caputo, Nayga, & Scarpa, 2013; Dias, 2006) shows that AIC3 (with three instead of two weights for parameter penalization) outperforms the other two, correcting for the over-fitting.

Table C1 – Comparison of the information criteria

Model	Choices	Log-Lik.	Parameters	BIC/N	AIC/N	AIC3/N
MNL	1499	-1227.45	6	1.650	1.646	1.650
RPL1	1499	-934.08	21	1.261	1.274	1.288
RPL2	1499	-895.10	66	1.334	1.282	1.326
RPL3	1499	-868.14	66	1.298	1.246	1.290

Nevertheless, the BIC assumes that one of the models is the true one, which is unlikely to be the case here, while the AIC aims at finding the model that approximates the unknown data-generating process (by minimizing the expected estimated Kullback–Leibler divergence). All three, BIC, AIC, and AIC3, favor RPL1 and RPL3 over the competing models. The combined evidence from ruling out RPL2 and preferring RPL1 and RPL3 suggests that these two are indeed the best models. In addition, the log-likelihood is closer to zero and the information criteria are lower in RPL1 and RPL3 than in RPL2, implying that the incorporation of visual attention in terms of fixation count information as covariates improves the model fit.