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Consumers' attention to functional food labels: Insights from eye-tracking and change detection in a case study with probiotic milk

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ABSTRACT

Labels can largely influence functional foods consumers' purchase decisions. The aim of the work was to study consumers' attention to functional food labels and to evaluate differences between regular and functional products probiotic milk as case study. Four labels were designed considering two types of product (regular milk vs. probiotic milk) and two label backgrounds. Sixty consumers were asked to look at the labels while their eye movements were recorded using an eye-tracker and to complete a word association task. Then, they had to complete eight flicker change detection tasks, involving four different changes on key aspects of the labels (brand, type of product, type of microorganism and health claim) for each label background. Visual processing of the labels was not largely affected by the type of product and label design. Health claims were not comprehensively processed, probably due to the high information density of this area. Besides, consumers' health-related associations were generated by graphic design and not by the functional aspect of the products, suggesting that graphic design plays a key role in shaping health-related associations. Recommendations for the design of functional food labels are discussed.

1. Introduction

Functional foods are one of the most dynamic and innovative categories in the food industry, with an estimated global value over 40 billion US dollars and steady annual increases in sales (Bigliardi & Galati, 2013; Valls et al., 2013). These products can be defined as foods with health benefits beyond their basic nutritional value (Galland, 2013). In particular, probiotics are one of the most profitable categories within the functional foods market (Cruz et al., 2010). The number of probiotic products available in the marketplace continuously increases, being fermented milk the most popular vehicle (Al-Sheraji et al., 2013).

Although food companies invest substantial resources in the development of new functional foods, the large majority of the products fail in the marketplace (Khan, Grigor, Winger, & Win, 2013; Mellentin, 2014). This suggests that a deeper understanding of motives underlying consumers' willingness to purchase functional foods is necessary.

Research has shown that consumers do not perceive functional foods as a specific food category, different from their conventional counterparts. Instead, functional foods are perceived as an additional alternative within the wide range of products available within the food category to which they belong (Siró, Kápolna, Kápolna, & Lugasi, 2008; Urala & Lähteenmäki, 2003). Thus, when shopping for a product within a certain food category, consumers have to choose between functional and conventional foods. In this context, labels can largely influence purchase decisions by attracting consumers' attention and providing key information about the products (Moskowitz, Reisner, Lawlor, & Deliza, 2009; Rettie & Brewer, 2000; Silayoi & Speece, 2007). In the case of functional foods, health claims on labels are particularly important to communicate their potential health benefits (Lähteenmäki, 2013).

The information included on food labels has been reported to generate sensory and hedonic expectations which modulate future

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experiences with the products (Ares & Deliza, 2010; Becker, van Rompay, Schifferstein, & Galetzka, 2011; Deliza & MacFie, 1996; Schifferstein, Kole, & Mojet, 1999). Previous research has shown that label design can have a higher impact on consumers' willingness to purchase than the functional aspect of products (Ares, Besio, Gimenez, & Deliza, 2010).

In the few seconds that consumers spend selecting products they do not attend to all information available on food labels (Milosavljevic & Cerf, 2008). Therefore, a subset of the information is usually selected for further processing, whereas the rest is not processed and consumers do not even become aware of its presence on the label (Wedel & Pieters, 2008). For this reason, studying consumers' attention to food labels becomes a key aspect for the design of food labels which successfully attract consumers' attention.

Consumers' perception of food labels has been traditionally based on self-reported measures (Mackison, Wrieden, & Anderson, 2010; Napolitano, Caporale, Carlucci, & Monteleone, 2007; Poelman, Mojet, Lyon, & Sefa-Dedeh, 2008; Verbeke & Ward, 2006). However, these measures have been reported to be subjected to different biases and to be poor indicators of what consumers actually do in real-life situations (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003; Rosbergen, Pieters, & Wedel, 1997). For this reason, several alternative methodologies have been recently proposed to study consumers' processing and perception of food labels, including eye-tracking and change detection tasks (Ares et al., 2013; Gaschler, Mata, Störmer, Kühnel, & Bilalic, 2010; Varela, Antúnez, Cadena, Giménez, & Ares, 2014).

Eye-movements have been extensively considered good indicators of information acquisition (Holmqvist, Nyström, Andersson, & van de Weijer, 2011). In order to acquire information from a specific part of a stimulus consumers have to fixate their eyes so that the light from that part falls into the fovea, the most sensitive are of the retina (Wedel & Pieters, 2008). For this reason, eye-tracking techniques are being increasingly used in sensory and consumer science to assess how consumers acquire information from labels (Ares et al., 2013; Piqueras-Fiszman, Velasco, Salgado-Montejo, & Spence, 2013; Rebollar, Lidón, Martín, & Puebla, 2015; Varela et al., 2014).

Change detection tasks, which are based on the idea that attention is needed to detect changes in a visual stimulus (Rensink, O'Regan, & Clark, 1997), has also been used to study attentional capture of food labels (Bix, Kosugi, Bello, Sundar, & Becker, 2010; Gaschler et al., 2010). In this task, participants are repeatedly exposed to a stimulus and a modified stimulus. Their task is to detect the change between the original and the modified stimulus, as quickly as possible (Simons & Rensink, 2005). The time needed by participants to detect the change is a good indicator of the attentional capture of the area of the stimulus, which was subjected to change (Rensink et al., 1997).

The aim of the present work was to study consumers' attention to functional food labels, and to evaluate differences between regular and functional products using probiotic milk as case study.

2. Materials and methods

In the present study consumers' attention to functional foods labels was evaluated using eye-tracking and change detection. In a first task, consumers were asked to look at food labels, while their eye movements were recorded, and to complete a word association task. The word association task was used to evaluate consumers' spontaneous perception of the labels, without making them focus on specific aspects. Finally, they had to complete eight flicker change detection tasks, involving different changes on key aspects of the labels.

2.1. Participants

Sixty participants (18–45 years old; 67% women) participated in the study. They were recruited among students and workers of the Psychology Faculty (Universidad de la República, Uruguay), according to their milk consumption (at least once a week), interest and availability to participate in the study. All participants self-reported normal or corrected-to-normal vision and full color vision. They signed an informed consent form and received a gift for their participation in the study.

2.2. Design of the study and data collection

Data collection was carried out using a Tobii T60 eye tracker (Tobii Technology, Stockholm, Sweden). Participants were asked to sit at a distance of 65 cm from the monitor and to move as little as possible. Before starting the task participants followed a 5-point calibration procedure of Tobii Studio Professional version 2.3 (Tobii Technology, Stockholm, Sweden). Participants completed a word association task, followed by a change detection task.

2.2.1. Word association task

Four labels were designed following a factorial design with two 2-level variables: type of product (milk vs. probiotic milk) and label background (A and B). The two backgrounds were designed by a graphic designer with previous experience in label design, to communicate different messages to consumers. Background A was expected to elicit associations related to milk and nature, while Background B was designed to generate expectations of health and wellbeing. In order to avoid any influence of consumers' previous experience with the products, all the labels corresponded to new products, which were not available in the Uruguayan market.

Labels included all the information that is compulsory for food labels in Uruguay. The probiotic milk label included the following health claim "*Lactobacillus acidophilus contributes to the equilibrium of gut flora. Consumption of this product should be associated with a balanced diet and a healthy life style*", as well as the following recommendation "*Pregnant women, breast-feeding mothers and children should consume this product under the medical supervision*". The four labels used in the study are shown in Fig. 1.

The images were presented in the monitor of the eye-tracker for 20 s, following a design that was balanced for order and carry over effects (Williams' Latin square). Participants had to look at each of the four labels and to write down the first four words that came to their minds. A fixation cross appeared for 0.2 s prior to each label to make participants fixate their gaze at a pre-defined point before looking at the labels.

2.2.2. Change detection task

Each of the two probiotic labels designed for the word association task were modified in four different ways: type of product (probiotic milk vs. milk), brand (Probio vs. Lactobio), health claim (with vs. without) and type of microorganism (*L. acidophilus* vs. *Bifidobacterium bifidum*). The changes involved key information related to the functional aspect of the product. Examples of the stimuli used in the change detection test are shown in Fig. 2.

Participants completed eight change detection tasks, corresponding to the four changes of each of the two label backgrounds. During each task, the standard label appeared for 240 ms and was continuously alternated with the modified label for another 240 ms. The two images were separated by a brief white screen with a cross in the center for 80 ms. The sequence of images looped continuously until the participant made a click with the mouse on the area in which the two labels differed. The task is represented in Fig. 3. The trial ended if participants were not able to detect the change in 40 s.

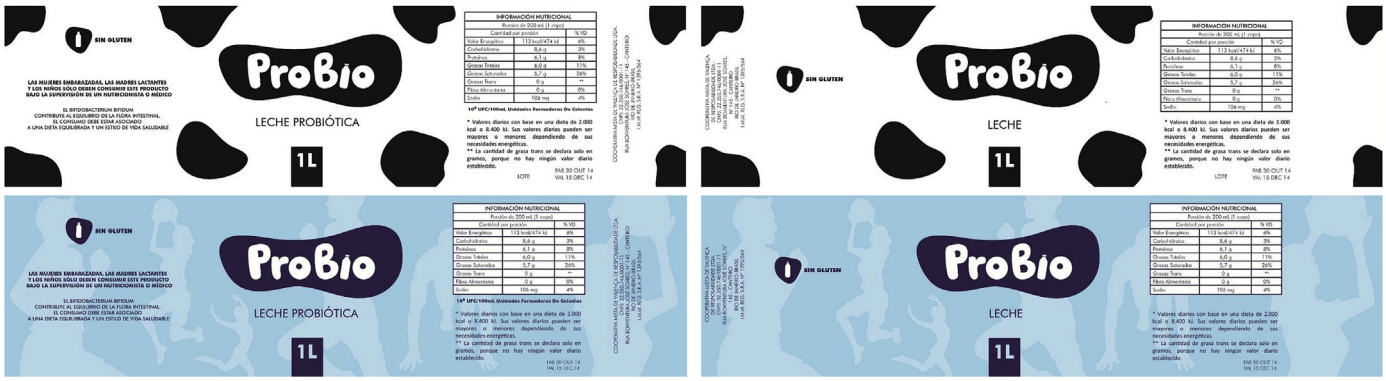

Fig. 1. Labels of probiotic (left) and regular milk (right), designed with two different backgrounds: A (above) and B (below).

Fig. 2. Stimuli used in the flicker change detection task for probiotic milk labels with background B: (a) standard label, (b) label without health claim, (c) label with a different microorganism, (d) label with different brand name, (e) label for a different product (milk).

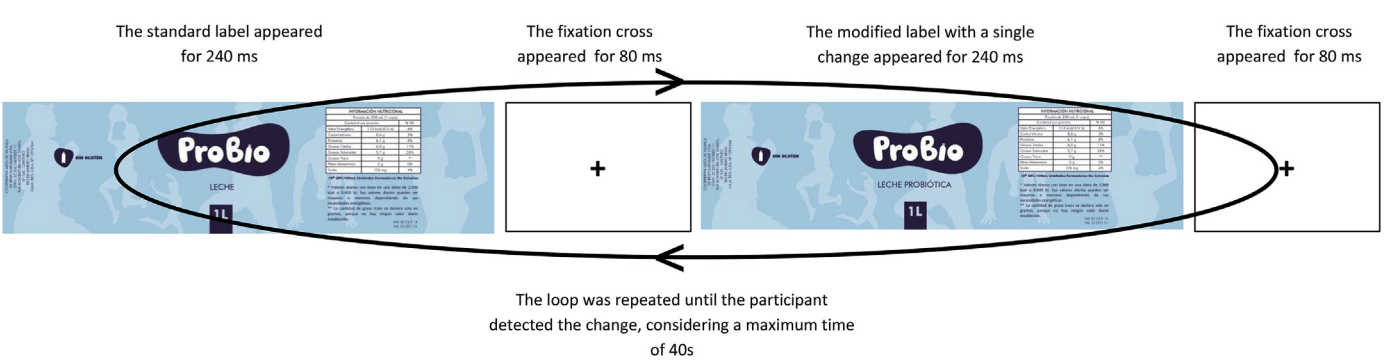

Fig. 3. Schematic representation of the flicker change detection task.

2.3. Data analyses

2.3.1. Eye-tracking data

The following areas of interest (AOI) were defined on the labels: brand, type of product, manufacturer, best before date, net content, nutritional label, recommendation and health claim, as exemplified in Fig. 4. The last two areas were only defined in probiotic milk labels.

For each AOI several measures were calculated using the eye-tracker's software: *percentage of consumers who their gaze on the AOI*, *total fixation duration* (duration of all fixations within an AOI), *fixation count* (number of times that a participant fixated on an AOI), and *time to first fixation* (time from the start of the label display until the participant fixated on the AOI for the first time).

A logistic regression analysis was used to analyze and interpret data from the percentage of fixations on an AOI. This analysis enables evaluating the influence of many different independent variables on dependent variables that are binary (discrete) (Freeman, 1987). In this case logistic regression was used to study the influence of the experimental variables (type of product and label background) on the probability of consumers' fixating their gaze on a specific AOI on the label. The statistical significance of the independent variables was confirmed using chi-square statistical test. A significance level of 5% was used as criterion for statistical significance.

A mixed linear model was used to analyze time to first fixation, fixation count and total fixation duration. For each area of interest, type of product, label background and their interaction were considered as fixed effects, while consumer was considered as random effect.

2.3.2. Word association

All the words mentioned by participants were considered for data analysis. Frequency of mention of each word was calculated. Then, data were analyzed by grouping the responses into exclusive and exhaustive categories using inductive coding (Krippendorff, 2004). Two coders, who had more than 2 years of experience in content analysis, performed the task. Final categories were established by consensus. The frequency of mention of each category was determined and differences among labels were evaluated using chi-square test. Furthermore, a chi-square per cell test was used to identify the source of variation of the global chi-square (Symoneaux, Galmarini, & Mehinagic, 2012).

2.3.3. Change detection task

In each trial, the location of the change was selected as area of interest. Time to first mouse click on the area of interest was calculated as indicator of time to change detection. Fixation count on the labels during the change detection task was calculated as a measure of consumers' attentional effort during the task. Data from participants who had not clicked inside the area of interest were discarded.

Time to change detection and fixation count data were analyzed using a mixed linear model considering change, type of product, label background and their interaction as fixed effects, while consumer was considered as random effect. A logistic regression analysis was used to study the influence of the experimental variables (type of product and label background) on the probability of consumers' fixating their gaze on a specific AOI on the label.

All statistical analyses were performed using R language (R Core Team, 2013).

3. Results

3.1. Eye-tracking

3.1.1. Percentage of consumers who fixated their gaze

The percentage of consumers who fixate their gaze on an area of interest (AOI) is an indicator of its attentional capture, due to bottom–up and/or top–down processes (Holmqvist et al., 2011). During the word association task, brand information was the AOI with the highest attentional capture, regardless of the type of label. As shown in Table 1, this AOI was fixated by the great majority of the participants. At the aggregate level the AOIs nutritional label, recommendation and type of product were also fixated by the majority of the consumers (Table 1). On the contrary, less than half of the participants fixated their gaze on the health claim included on probiotic milk labels, which indicates that they did not extract information from this AOI to complete the word association task. Best before date was fixated by few consumers, which could be probably related to its non-central location and small relative size (Fig. 4).

Type of product and label background did not significantly affect the percentage of consumers who fixated their gaze on the areas of interest ($p > 0.098$). The only exception was the percentage of consumers who fixated their gaze at brand information, which was significantly affected by label background ($p = 0.017$). The percentage of consumers who fixated their gaze on brand information was significantly higher for Background A (expected to elicit associations related to milk and nature) than for Background B (designed to generate expectations of health and wellbeing) (86.5% vs.78.5%).

3.1.2. Time to first fixation

Time to first fixation is indicative of the attentional capture of the AOI and the order in which participants process them for completing the task (Holmqvist et al., 2011). In the present work time to first fixation on an AOI provided similar results than the percentage of consumers who fixated their gaze. Regardless of the type of label, participants first looked at brand information, followed by type of product (Table 1). This result can be explained by the fact that these areas of interest were located in the center of the label (Fig. 4). Meanwhile, time to first fixation on manufacturer and shelf-life date were markedly longer, as shown in Table 1.

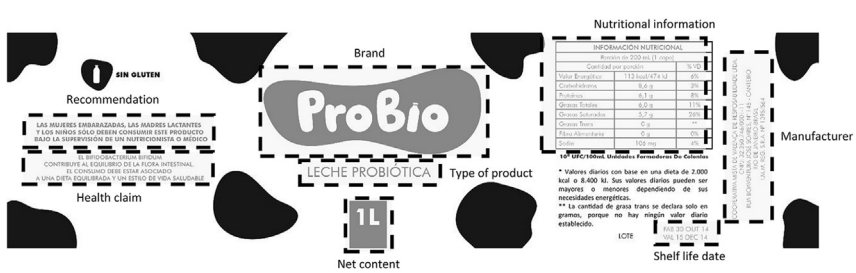

Fig. 4. Example of how areas of interest were defined in one of the labels.

Table 1
Average percentage of consumers who fixated their gaze, average time to first fixation, fixation count, and total fixation duration on specific areas of interest on the labels during the word-association task for milk and probiotic milk labels.

Area of interest	Percentage of consumers who fixated their gaze (%)	Time to first fixation (s)	Fixation count	Total fixation duration (s)
Brand	82.5	1.6	5.0	0.9
Nutritional label	70.8	3.6	4.6	1.0
Recommendation[a]	70.8	3.2	6.4	1.7
Type of product	63.3	2.3	2.5	0.5
Net content	42.9	4.1	1.8	0.3
Health claim[a]	42.5	4.4	4.9	1.1
Manufacturer	35.4	5.1	1.8	0.4
Shel life date	16.7	5.9	1.9	0.5

[a] This area of interest was only defined in probiotic milk labels.

Time to first fixation on the areas of interest was not significantly affected by label background ($p > 0.068$). Type of product significantly affected time to first fixation on nutritional information, manufacturer and product name. Time to first fixation on the first two areas of interest was significantly shorter for milk than for probiotic milk labels (3.1 s vs. 4.1 s and 4.5 s vs. 5.7 s, respectively). The opposite trend was found for product name. Consumers looked at this information earlier for probiotic milk labels than for regular milk labels (1.8 s vs. 2.8 s).

3.1.3. Fixation count

Fixation count is related to processing of information and indicates its information for consumers and/or difficulty for visual processing (Holmqvist et al., 2011). Brand, recommendation, nutritional label and health claim received more fixations than the rest of the information. In the case of the last three areas of interest the highest number of fixations can be related to the high information density of the areas of interest. The high fixation count on brand can be attributed to its central position on the label, as well as to its large relative size (Fig. 4).

Fixation count on the areas of interest was not significantly affected by label background ($p > 0.068$). However, product type significantly affected fixation count on brand, nutritional information and product name ($p < 0.020$). Consumers made more fixations on brand, nutritional information on milk labels than on probiotic labels (3.0 s. 2.5 and 5.4 vs. 3.8, respectively). Regarding product name, consumers made more fixations on probiotic milk labels than on regular milk labels (2.8 vs. 1.8). The interaction between label background and type of product was not significant ($p > 0.075$).

3.1.4. Total fixation duration

As shown in Table 3, the largest total fixation duration values were found for the areas of interest recommendation, health claim, nutritional label and brand, suggesting that consumers invested more time extracting information from them than from any other AOI. However, consumers did not perform a comprehensive evaluation of these areas of interest as they only read part of the information, as exemplified in Fig. 5.

Fig. 5 shows an exemplar heatmap for one of the probiotic milk labels. In the figure the relative duration of the fixations in each point of the label is represented using a heat scale (from cold/green, for shorter duration, to hot/red, longer duration). As shown, consumers did not fixate some parts of the health claim and nutritional information, suggesting that did not comprehensively assess the information.

As for the rest of the eye-tracking variables, label background did not significantly affect total fixation duration on any of the areas of interest ($p > 0.077$). Type of product affected the total duration of the fixations on brand, nutritional information, net content and product name ($p < 0.020$). Consumers invested more time fixating their gaze on the first four areas of interest for regular milk labels than for probiotic milk ones. On the contrary, total duration of the fixations on product name was longer for probiotic milk than for milk labels (0.5 s vs. 0.4 s). The interaction between label background and type of product did not significantly affect total fixation duration ($p > 0.098$).

3.2. Word association task

The most frequent associations elicited by the labels were related to the categories *Nutritional characteristics*, followed by associations related to *Food*. Type of product and label design significantly affected the frequency of mention of the categories. As shown in Table 2, frequency of mention of the category *Health* was significantly higher for labels designed with background B than for labels with background A. However, it is interesting to note that probiotic milks were not associated with the category *Health* more frequently than milk labels. Besides, probiotic milks were frequently associated with the category *Childhood*, which included words such as baby, childhood and mother.

Labels with background A were frequently associated with the category *Cow*, which is clearly related to graphic design (Fig. 1). Probiotic milk labels designed with background A were more frequently associated with the categories *Probiotic* and *Positive associations* than the rest of the labels (Table 2). On the contrary, regular milk labels designed with background A were frequently associated with the categories *Usage* and *Safety*.

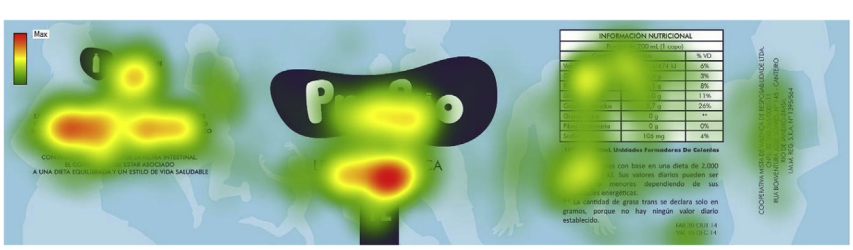

Fig. 5. Exemplar heatmap of one of the probiotic milk labels evaluated in the word association task.

Table 2
Results from the word association task. Percentage of consumers who mentioned words within each of the identified categories.

Category	Examples	Milk background A	Probiotic milk background A	Milk background B	Probiotic milk background B
Nutritional characteristics	Sodium, carbohydrates, proteins, fat	77	57 (−)*	83	72
Food	Food, eat, drink, hungry	65	80 (+)*	50	42
Health	Basketball, dance, exercise, vitality, gut flora	10 (−)***	18 (−)***	100 (+)***	77 (+)***
Sensory characteristics	Color, liquid, light, tasty	22	25	40	37
Information	Bottle, information, numbers	27	30	37	22
Childhood	Baby, childhood, mother	7 (−)***	52 (+)***	10 (−)**	38 (+)*
Cow	Cow, animal, spots	52 (+)***	45 (+)**	5 (−)***	3 (−)***
Positive associations	Calm, interesting, young, new	3 (−)*	25 (+)*	12	18
Brand	Brand, marketing	17	7	22	8
Usage	Daily, breakfast	23 (+)***	13	5	3 (−)*
Safety	Safe, warning, care, prohibited	17 (+)*	13	2 (−)*	7
Negative associations	Boring, not attractive	12	8	7	0 (−)*
Probiotic	Probiotic, bifidum, biology	0 (−)*	15 (+)***	0 (−)*	7
Neutral associations	Common, regular	8 (+)*	2	3	2
People	People	0	0	8 (+)**	2

Effect of the chi-square per cell test for comparing eating situations: (+) or (−) indicate that the observed value is higher or lower than the expected theoretical value, *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

3.3. Change detection task

Time to change detection and total fixation duration were significantly affected by the type of change, label background and the interaction between these two variables ($p < 0.010$). Table 3 shows average time needed for consumers to detect the changes on labels with different background design, as well as average fixation count on the labels.

For both backgrounds, time for detecting the change and fixation count were significantly longer when labels differed in type of microorganism than for the rest of the changes (Table 3), suggesting that this change was the most difficult to detect.

For labels designed with background A, time needed to detect changes in brand, product name and health claim did not significantly differ. However, total fixation duration during the task was significantly higher when labels differed in brand than for the rest of the changes (Table 3). Meanwhile, a change in health claim was the easiest to detect in labels designed with background B, both in terms of time needed to detect the change and fixation count.

Time for detecting a change in brand and product name, as well as total fixation count during the task, were significantly lower for labels with background A than for labels designed using background B, whereas the opposite trend was found for time needed to detect a change in the type of microorganism (Table 3).

4. Discussion

Information processing has been closely related to decision making. Several studies have shown that consumers have higher fixation likelihood on attributes that are more relevant for reaching a decision (Glöckner & Herbold, 2011; Orquin & Mueller Loose, 2013; Su, Rao, Li, Wang, & Li, 2012). Therefore, a deeper understanding of how consumers process functional food labels can contribute to increasing their interest and purchase intention of this food category. In this context, the present work studied consumers' attention to regular and probiotic milk labels using eye-tracking and change detection tasks.

Results from the eye-tracking task showed that the areas of the labels with the highest attentional capture during the word association task were brand, nutritional information, type of product and a recommendation on product consumption for specific consumer segments. The percentage of consumers who fixated their gaze on the areas of interest, as well as time to first fixation, fixation count, and total fixation duration were not significantly affected by the type of product and label design. These results indicate that visual processing of the labels was mainly determined by top–-down attentional capture, i.e. consumers looked at specific areas of the labels when completing the task. Previous work on visual processing of food labels showed that consumers intentionally scan them in order to find basic information: brand, image, nutritional information and ingredients (Ares et al., 2013).

However, label design influenced consumers' ease to identify changes in the labels (Table 3). This results indicates that graphic design affected the attentional capture of specific areas of interest of the labels. Label design can increase attentional capture of specific pieces of information by increasing saliency of the element from the background in which it is included (Koch, 2004). In the present work, background A increased the attentional capture of brand, type of product and health claim compared to background B. These results suggest the need to consider visual attention during the selection of the graphic design of food labels.

On average, specific information about the functional product did not show a high attentional capture. Information about type of product (milk vs. probiotic milk) and health claim were only fixated

Table 3
Average time (s) needed by consumers to detect different changes on labels with different background design detection task, and total number of fixations during the change detection task.

Change	Average time to change detection (s)		Average fixation count	
	Background A	Background B	Background A	Background B
Brand	$1.6^{a,A}$	$2.5^{b;B}$	$9.3^{b,A}$	$13.6^{b,B}$
Type of product	$1.1^{a,A}$	$2.8^{b,B}$	$5.1^{a,A}$	$16.6^{b,B}$
Health claim	$0.9^{a,A}$	$1.3^{a,A}$	$5.7^{a,A}$	$7.5^{a,B}$
Type of microorganism	$4.7^{b,B}$	$3.3^{c,A}$	$24.7^{c,A}$	$25.4^{c,A}$

Average values within a column (row) with different lowercase (uppercase) superscripts are significantly different according to Tukey's test, for a significance level of 5%.

by 63.3% and 42.5% of the consumers. This result suggests that many consumers did not even realize that labels corresponded to probiotic milks with potential health benefits to their health. Similarly, Varela et al. (2014) reported that consumers did not seem to visually process nutritional information and health claims when evaluating breakfast cereal packages. The low attentional capture of health claims suggests that many consumers who do not intentionally look for functional food products might not be aware of their existence when making their purchase at supermarkets. It is worth highlighting that in the present work labels were presented on a computer screen one by one, which could have increased the salience the information, particularly that usually presented on the sides and back of the packages. In this sense, consumers' attention to information about health claims and type of product in real-life settings is expected to be even lower than in the present work. Further research on consumers' attention to health claims when evaluating products and making their purchase decisions in more realistic environments (e.g. simulated supermarket shelves) seems necessary to provide recommendations to the industry about how to design functional food labels.

The extent to which consumers processed different areas of the label depended on the size and information density, as expected (Loftus & Mackworth, 1978). As shown in Table 1, consumers tended to make more and longer fixations on the largest areas of the labels (e.g. brand, Fig. 1), as well as areas with high information density (e.g. nutritional label, recommendation and health claim). However, the former areas of interest were not comprehensively processed by consumers (Fig. 5). This result, added to the low percentage of consumers who fixated their gaze on health claim, suggests that the attentional capture of health claims on food labels should be considered in order to effectively communicate the health benefits of functional foods to consumers. In the present work health claim was included in the side of the label and with a small font (Fig. 4), which might have reduced consumers' attentional capture.

Consumers' lack of deep processing of health claims can explain the fact that probiotic milk labels did not elicit more health-related associations than regular milk labels (Table 2). As shown in Table 2, health associations were mainly generated by background B, which included people doing physical activities. Previous research has also shown the large impact of graphic design on consumers' associations of food labels (Ares, Piqueras-Fiszman, Varela, Morant Marco, Martín López & Fizman, 2011; Smith, Mogelvang-Hansen, & Hyldig, 2010), which suggests that graphic design of labels could be more effective than words in communicating specific characteristics of the products.

Consumers' visual processing of regular and probiotic milk labels was similar. However, results from the eye-tracking task showed that consumers reduced the depth with which they processed specific areas of the labels as the amount of information included on labels increased. Consumers reduced total duration fixation and fixation count on brand and nutritional information when information about the probiotic milks was included on the labels, compared to the regular milks. This can be probably attributed to the fact that consumers had the same time (20 s) to look at the labels, even if they differed in the amount of information they contained.

It is worth highlighting that several individual variables, such as gender, age, involvement with the product, health consciousness and product liking, are expected to have a large influence on consumers' visual processing of food labels. For example, health motivation has been reported to affect consumers' attention to nutrition information (Bialkova & van Trijp, 2011). In this sense, further research focused on the influence of individual variables on consumers' attention to functional food labels is necessary. In particular, it would be interesting to better understand how interest in functional foods affects attention to health claims.

From a methodological point of view, it is worth highlighting the advantages of combining methodologies for studying consumers' attention to food labels. Firstly, the combination of eye-tracking and word association enabled a better understanding of consumers' associations with the products. For example, although probiotic milks were more frequently associated with the category *Childhood* than regular milks (Table 2), it cannot be concluded that functional foods were regarded as appropriate for children. Results from the eye-tracking task showed that the recommendation related to the consumption of probiotic products by children and breast feeding mothers in probiotic products generated associations related to childhood. Therefore, the word association task seemed to have captured the most salient words or characteristics after consumers read the labels, as it has been previously reported by Piqueras-Fiszman et al. (2013).

Secondly, the consideration of the number of fixations needed to complete the change detection task provided additional information to that provided by time to change detection and showed higher discriminative ability. Furthermore, the information provided by change detection on the attentional capture of the different areas of the labels was not directly comparable to eye-tracking measures during the word association task. Change detection seems to be largely dependent on the size and location of the change, which suggests that care must be taken when using this type of task to conclude on how consumers visually processed food labels.

5. Conclusions

The information provided on functional food labels plays an important role for differentiating them from their conventional counterparts. Results from the present work showed that consumers may not perform an in-depth evaluation of key information related to the functional aspects of the products, particularly nutritional information and health claims. In this sense, it is important to stress that consumers' attention to health claims in real-life settings might be actually lower than that obtained in the present work.

Consumers' attention to specific areas of interest labels decreased as information density increased, suggesting that health claims should be written as concise as possible to assure that consumers fully process them. Besides, consumers' health-related associations were generated by graphic design and not by product description (i.e. probiotic milk) or health claim, suggesting that graphic design should be regarded as a key strategy to generate health-related associations in consumers.

In summary, results stress the need to further study the influence of consumers' processing of functional food labels. In particular, studying how label design can increase bottom–up attentional capture of key information about functional foods can contribute to increasing consumers' awareness of this food category at the point of sale.

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