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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.