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## **The effect of bottom-up factors on consumers' visual attention and choices**

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### **Abstract**

Eco-labels play a key role in allowing consumers interested in environmental issues to recognize sustainable products easily. However, due to time restrictions, consumers do not fully process all the information (Ballco et al., 2019). In this sense, visual attention becomes a scarce resource that consumers selectively allocate among all the labels on the product packaging. Different studies demonstrated that gazing behaviour has downstream effects on decision-making, limiting the choice to fixated objects (Orquin & Mueller Loose, 2013). In particular, bottom-up factors (e.g. visual saliency, size, position, etc.) are among the most prominent factors to drive consumers' attention automatically and involuntarily (Janiszewski, 1998). Despite the large body of literature in this area, few of these studies (e.g., Van Loo et al., 2015, Peschel et al. 2019) have investigated whether increasing the visibility of food labels through bottom-up factors can affect the choice of this product. Since size and visual saliency have been recognized as the most prominent bottom-up factors by vision research (Itti & Koch, 2001), in this study, we focus solely on size and saliency (colour, shapes and contrast) to determine the effect on product choice. A combined approach was applied to investigate consumers' choices via eye-tracking technology and a discrete choice experiment (DCE).

Two studies were developed to evaluate the role of bottom-up factors on consumers' attention and choices. Both studies included a discrete choice experiment, although the Study A combined it with an eye tracking study. Study A was conducted at the Consumer Research and Neuromarketing Laboratory in Ancona (Italy) where consumers' gaze were tracked through a Tobii X2-60 Hz eye tracker.

To validate the study in different socio-economice and cultural contexts, study B was conducted online. In this last case, no eye-tracking data were recorded.

The discrete choice experiment (DCE) is a survey-based methodology widely used for modelling consumers' preferences. Based on the Lancasterian consumer theory (Lancaster, 1966) and the random utility model framework (RUM) (McFadden, 1973), the method simulates a trading market in which the respondents choose several alternatives with different attributes. Each participant was exposed to 15 choice sets with three alternatives and a no-choice option. The alternatives varied in terms of product type (smoked salmon or smoked seabass), label (four eco-labels), eco-label size (big/small), eco-label saliency (high/low) and price (three different levels according to the market offer). The selection of eco-labels was based on the results of a previous study using a Tobii X2-60 Hz eye tracker. The position of the eco-label was the same for each alternative and their saliency was calculated with a visual saliency model called GBVS (Graph-Based Visual Saliency) algorithm. The design was generated through a fractional D-efficient design using the Ngene software ( $D\text{-error} = 0.22$ ). The survey was developed on the Qualtrics platform. The data was collected in two steps.

In the study A, 61 students and workers from the Marche Polytechnic University (UNIVPM) were invited to the Consumer Research and Neuromarketing Laboratory in Ancona (Italy) to participate in the study in presence on October 2020. Of them, 54% were female. Participants also presented a variety of education levels, ranging from high school diploma (30%) to Postgraduate with a doctoral degree (34%).

In study B, 279 participants were recruited across different countries through Amazon Mechanical Turk (MTurk). Most respondents had higher degree education, including Postgraduate with master's (37%), Bachelor's (27%) and Postgraduate with a doctoral degree (25%).

In both studies, all subjects were between 18 and 64 years old, partially or fully responsible for household food shopping and declared to purchase smoked salmon or smoked sea bass at least once a year. They also had normal or corrected to normal vision and

were tested for colour blindness using the highly reliable Ishihara test. A multinomial logit model (MLN) was used to estimate the effects of eco-labels, size, saliency, product type and price on consumers. The data was analyzed using the APOLLO package in R.

Results from the DCE laboratory study confirm consumers' interest in eco-labels (Grunert, 2011). Indeed, participants focused their visual attention mainly on the eco-labels before making their choice. Moreover, consumers preferred eco-labelled products over alternatives not carrying any eco-label.

The price had a significant and negative coefficient. The salmon was preferred to the seabass. These results were fully confirmed by the online DCE as well. Nevertheless, the attention data collected in the laboratory study using eye-tracking provide some interesting results. Consumers tend to fixate faster, longer and more often eco-labels presented with a larger size and a higher saliency. However, even though consumers' fixations were influenced by size and saliency, no effect was found on consumers' choices.

Our findings contribute to the ongoing research on the role of visual attention decision-making in food marketing. In line with previous literature (e.g., Gidlöf et al., 2017), eye-tracking measures showed that 'manipulating size and saliency significantly influences consumers' attention. However, despite the previous literature (e.g. Peschel et al., 2019), no correlation was found among visual attention and decision making. Despite consumers significantly fixated for a longer time on more salient and bigger eco-labels, they do not choose products carrying this kind of label. This means that a downstream effect of visual attention on decision making was not found in the case of eco-labels. Thus, visual attention does not play a part in constructing decisions. This issue needs to be further explored to understand the role of visual attention in 'consumers' choices in the case of food labels.

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