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The Role of Visual Attention in Decision-Making: an Eye-Tracking Experiment

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We use eye-tracking to examine the factors that drive consumer attention and choice at the point-of-purchase. Consumers are biased towards choosing alternatives that are visually salient because they look earlier, more often, and longer at these items than at equally, or more, liked but less salient alternatives.

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EXTENDED ABSTRACT

Bettman suggested as early as 1979 that attention may be one of the key factors that influence choice. More recently, Janiszewski et al. (2013) reported that repeated allocation of attention to a product increases the likelihood that consumers will eventually select that product. But which factors determine what products successfully attract consumer attention? More importantly, how do these factors interact and influence one another? And, critically for marketing theory and practice, how exactly does the resulting attentional focus affect consumer choices among various, competing products?

The deployment and focus of consumer attention depend on two types of factors: endogenous and exogenous. Endogenous factors are "person factors" that are driven by consumer goals, such as taste, familiarity, and involvement (Chandon, Hutchinson, Bradlow and Young 2009; Pieters and Wedel 2004; 2007). Exogenous factors, on the other hand, are "stimulus factors", such as color or brightness of packaging. These exogenous factors automatically attract consumer attention irrespective of one's goals and intentions (Milosavljevic et al. 2012; Chandon et al. 2009; van der Lans, Pieters and Wedel 2008). The marketing literature has identified the interplay between endogenous and exogenous factors, their respective and joint effects on attention, and the effect of attention on the decision-making process as research topics of prime importance (Payne and Venkatraman 2011; Russo 2011; Chandon et al. 2009; Wedel and Pieters 2008; Bettmann 1979; Russo 1978). Addressing these questions is the focus of the current research.

We presented hungry participants with high-resolution photos of store shelves filled with a total of 28 typical snack food items (randomly chosen from a set of 41 food items, such as Doritos, Oreos, Reese's, M&Ms, etc.) and asked them to search for and choose the item that they want to eat. Seventeen participants (median age = 25 years, range = 18 – 55 years; 61% male) participated in an eye-tracking experiment but due to incomplete eye-recordings and failures to follow task instructions, the data from four participants had to be dropped from the analysis. Each participant made 150 choices in blocks of 25 based on the allowed decision-making time: 0.255 seconds, 0.455 seconds, 0.655 seconds, 1.155 seconds, 3.155 seconds and 25 trials in the free-response condition in which participants had as much time as they wanted to make a choice.

During the entire decision-making task, we record moment-to-moment measures of attention, at a rate of 1000 times per second. We use the neuro-model of visual saliency to measure the exogenous-factor strength of the images on store shelves (Koch and Itti 2012; WhiteMatter Labs GmbH; Itti, Koch and Niebur 1998), and liking ratings of 41 different snack food items, such as Doritos and Snickers, to measure participants' preferences for each item.

Our results indicate that the visual saliency of the items that participants chose was significantly higher than the saliency of equally or, sometimes, more liked but non-chosen alternatives (providing support for our H1). More specifically, when participants chose an item that was not rated as a "5=would like to eat very much", they chose an item rated "4=would like to eat" with the highest saliency ranking (5) as measured by the neuro-model of visual saliency in significantly more trials than they chose items that were less visually salient (saliency ranking of 1-4; $\chi^2(4)$, $p = 5.64 \times 10^{-06}$).

We next test three properties of visual attention that may give rise to this bias. During initial fixations, the items that participants look at have a higher visual saliency rank than preference rank (all $p < 0.012$, Wilcoxon sign-rank test; H2 supported). We next hypothesize that visual saliency will continue to bias eye movements throughout the entire decision-making process (H3), not only during the initial eye movements. To estimate the relative importance of visual saliency on refixations, we here consider two additional variables known to affect consumers' eye movements: preferences and centrality (i.e., how close to the center of the shelf an item is placed). We found that the three-parameter model significantly outperformed a model based on centrality alone for all fixations (all $p < 0.05$, $\chi^2(2)$ test of difference in deviance) indicating that both preference and visual saliency information are required to predict whether or not an item will be refixated on. Visual saliency contributes to the model not only at the beginning of the decision-making process (H2), but up through fixation 7 (H3 supported). Finally, we hypothesize that visual saliency will influence total gaze duration, i.e., consideration, during decision making (H4). We found that items that have a very high saliency rank are fixated on longer overall than items with lower saliency ranks across all decision-making times ($H = 64$, 4 d.f., $p = 3.75 \times 10^{-13}$, Kruskal-Wallis).

The current study improves our theoretical understanding of the effects of exogenous and endogenous factors on attention, as well as the effects of attention on decision making. Our results show that every-day choices are systematically biased by exogenous visual saliency so that consumers are likely to choose the alternatives that are visually salient among several liked alternatives. Using the eye-tracking method and insights from vision science we further show how this effect on choice is generated: participants look (1) earlier, (2) more repeatedly, and (3) overall longer on items with higher visual saliency allowing them more opportunity to consider, and eventually choose, these alternatives.

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