



Looking is buying. How visual attention and choice are affected by consumer preferences and properties of the supermarket shelf



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ABSTRACT

There is a battle in the supermarket aisle, a battle between what the consumer wants and what the retailer and others want her to see, and subsequently to buy. Product packages and displays contain a number of features and attributes tailored to catch consumers' attention. These are what we call *external factors* comprising the visual saliency, the number of facings, and the placement of each product. But a consumer also brings with her a number of goals and interests related to the products and their attributes. These are important *internal factors*, including brand preferences, price sensitivity, and dietary inclinations. We fit mobile eye trackers to consumers visiting real-life supermarkets in order to investigate to what extent external and internal factors affect consumers' visual attention and purchases. Both external and internal factors influenced what products consumers looked at, with a strong positive interaction between visual saliency and consumer preferences. Consumers appear to take advantage of visual saliency in their decision making, using their knowledge about products' appearance to guide their visual attention towards those that fit their preferences. When it comes to actual purchases, however, visual attention was by far the most important predictor, even after controlling for all other internal and external factors. In other words, the very act of looking longer or repeatedly at a package, for any reason, makes it more likely that this product will be bought. Visual attention is thus crucial for understanding consumer behaviour, even in the cluttered supermarket environment, but it cannot be captured by measurements of visual saliency alone.

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In-store decisions on what to buy are – like most other decisions – to a large degree based on visual attention. Consumers in grocery stores use their visual attention to find out what products are available and their properties. But visual attention does not stop at this information-providing role: it also supports decision-making processes and significantly influences the choices made. A person making a decision will increasingly shift his or her attention towards the option eventually chosen. This is the so-called gaze-cascade effect indicating that visual attention plays an active role in the decision making process (e.g. Glaholt & Reingold, 2009; Shimojo, Simion, Shimojo, & Scheier, 2003). There are even recent studies indicating that merely looking at an object may make us value it more. Looking at an option can also increase the probability that we choose it, and it is therefore argued that visual attention is involved in preference formation (Armel, Beaumel, &

Rangel, 2008; Milosavljevic, Navalpakkam, Koch, & Rangel, 2012; Pärnamets, Johansson, Hall, Balkenius, Spivey & Richardson, 2015b) but evidence is mixed (see Orquin & Mueller Loose, 2013). In sum, it is not surprising that marketers, product designers, retailers, and others all strive to capture consumers' visual attention in the supermarket.

What captures our visual attention, then? Visual attention is, of course, affected by *external factors*, which we define as something outside of consumer control and part of the supermarket environment, e.g., visual prominence and shelf layout. This is why we see product packages with contrasts and vibrant colours, often including attention-grabbing human faces. It also explains why we see shelves which contain many facings for certain products, since covering a larger area of the visual field makes it more likely that consumers look at it (Peschel & Orquin, 2013). In addition, certain parts of the shelves (such as the center) are considered more beneficial for attracting consumer attention (e.g. Atalay, Bodur, & Rasolofoarison, 2012; Chandon, Hutchinson, Bradlow, & Young, 2009), and these are often given to popular products (Dreze,

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Hoch, & Purk, 1995). Consumers also hold beliefs about how the shelf is organized. For instance, consumers believe that popular products are placed on middle shelves, expensive products on top shelves, and promoted products on the extremes of a display (Valenzuela, Raghuram, & Mitakakis, 2013). It is highly likely that these beliefs will also affect the visual attention.

Of course, not only external factors steer our visual attention. Consumers enter the supermarket with expectations, experiences, goals and preferences: for certain brands, for certain price segments, and for certain qualities. These *internal factors*, which we define as endogenous factors based solely on the consumer's goals, will also influence consumers' visual attention. While such factors represent the goal-directed aspect of consumer behaviour, external factors can be used by the retailer as a tool to influence consumer decisions. We can thus envision the supermarket aisle as a battle between these two influences: what the consumer wants to discover and what the retailer and others want her to see. But which side will win, and under what circumstances?

In the following we set out to examine how the internal and external factors mentioned above affect visual attention and decision making in real-life grocery stores. We use a real-life setting because familiarity with the task and with the visual environment is very likely to substantially alter how consumers' visual attention is affected by its surroundings (e.g. Kingstone, Smilek, Ristic, Kellan-Friesen & Eastwood, 2003; Kingstone, Smilek, & Eastwood, 2008; Saarela, Lapveteläinen, Mykkänen, Kantanen, & Rissanen, 2013). We do this by fitting consumers with portable eye trackers while they visit stores that they are more or less familiar with. We vary familiarity, because it is well known to affect the relative impact that internal and external factors have on visual attention, as we will see below. The eye trackers record how consumers allocate their visual attention while they buy products from three different product categories, and we combine this with questionnaire-based information about consumers' preferences and goals. In particular, we examine how *external factors*, such as visual saliency, number of facings, and placement and *internal factors*, such as how well the product fits the consumers' preferences (what we will call option quality, see below), influence what participants *look* at during the decision process, what they *buy*, and the *quality* of their choice. In addition, we examine to what extent these effects are modulated by familiarity with the store and familiarity with the product category and the general popularity of the products (number of items sold per year).

1. How internal factors affect visual attention and decision-making

Consumers' goals and preferences will naturally have an impact on what they attend to. One of the earliest findings in eye-tracking research was that the way people view a scene is largely dependent on the instructions they are given (Yarbus, 1967, pp. 171–211). The effect has been reported repeatedly ever since, and it has also been found in marketing (Glaholt, Wu, & Reingold, 2010; Milosavljevic et al., 2012). As an example, Pieters and Warlop (1999) found that participants filtered information on product packages and changed scanning strategies depending on task conditions. When participants were under time pressure, they filtered textual elements more and pictorial elements less.

For consumers in a grocery store the most prominent task is to get food that meets their own criteria with respect to price, nutritional value, environmental impact, and so on. We should therefore expect consumers to deploy visual attention focusing on options or attributes that matter to them. Several studies have demonstrated that participants look longer and more frequently at information and options that are important for their choice and that are in

accordance with their preferences (e.g. Reisen, Hoffrage, & Mast, 2008; Glaholt, Wu & Reingold, 2010). For instance, Erica van Herpen and van Trijp (2011) report that consumers given a nutrition-related health goal increase their attention to nutrition labels. It has also been argued that this tendency to look more at important options and attributes challenges the causal effect of visual attention on choice. Orquin, Bagger, and Mueller Loose (2013) claim that it is difficult to discern if an alternative receives more attention because it is of greater utility or because of a gaze cascade effect.

In order to assess the impact of internal factors on consumer choice, we need access to their preferences. This is not an easy task, especially since there are often large discrepancies between what consumers say that they want and what they actually end up buying. In a study by Meyerding (2016), consumers ranked the price of tomatoes as their twelfth most important attribute when given a questionnaire with a Likert scale. However, when they were asked to choose between pictures of various packages of tomatoes, their actual choices were most heavily influenced by price. We are interested in the goal directedness of consumers' visual attention and choice, so the measure of interest for us is what consumers *say* that they want rather than what they *actually* buy. To put it differently, since we want to see to what extent externally driven visual attention affects consumers' actual purchases, we cannot use these purchases to estimate what it was consumers' were originally after when entering the store. Instead we use what consumers claim they want and compare this to what they actually buy, while at the same time trying to understand the role visual attention plays in this transition.

We use multi-attribute choice theory (Keeney & Raiffa, 1993) and combine questionnaires regarding preferences for various attributes with option attributes (see methods section) to measure how well each product fits the consumers' stated preferences. We will call this fit the products' option quality (see Gidlöf, Wallin, Holmqvist, & Møgelvang-Hansen, 2013).

2. How external factors affect visual attention and decision-making

Although consumers have goals and expectations, their decisions are made in an environment tailored to attract their visual attention. The supermarket and the products on the shelves contain a number of features and attributes that affect visual attention and – in the end – decisions. For instance, Milica Milosavljevic and colleagues (Milosavljevic et al., 2012) demonstrated that participants asked to choose between food items, such as chips and chocolate bars displayed on a computer monitor, were more influenced by the products' visual saliency than by their preferences when they were under time pressure.

In our environment, there are certain elements that attract our visual attention more than others. This attraction effect depends on low-level visual features such as colour, intensity, contrast and edge orientation. Thus, these features can describe the visual saliency of an object. In the study described below we assigned each product on the shelf a saliency factor from 0 to 1, computed through an algorithm based on these features (Itti, Koch, & Neibur, 1998). It thus describes to what extent the product stands out from its neighbouring products. There are, however, other external factors that may draw consumers' attention. A product with many facings, for instance, covers a larger area of consumers' visual field, and it is therefore more likely to be attended to (e.g. Chandon et al., 2009). In addition, the placement of products on the shelf also influences their potential for attracting the customers' visual attention. Previous research has shown that consumers tend to look more at products in the center of the display (Atalay, Bodur &

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