Rapid Evidence Accumulation During Brand Choice: an Eye-Tracking Analysis

Rik Pieters, Tilburg University, The Netherlands
Tulin Erdem, New York University, USA
Ana Martinovici, Tilburg University, The Netherlands

We show that eye movements reflect fundamental, fast preference formation processes and predict choice well before it is implemented. Specifically, eye fixations and brand saccades rather than other types of saccades predict choice. Ownership effects influence brand choice via increased brand saccades, not eye fixations or other saccade types.

[to cite]:

[url]:
http://www.acrwebsite.org/volumes/1024258/volumes/v45/NA-45

copyright notice]:
This work is copyrighted by The Association for Consumer Research. For permission to copy or use this work in whole or in part, please contact the Copyright Clearance Center at http://www.copyright.com/.
Nonconscious Attention and Imagery: Impact on Perception and Preference

Chairs: Zachary Estes, Bocconi University, Italy
Aradhna Krishna, University of Michigan, USA

Paper #1: Rapid Evidence Accumulation during Brand Choice: An Eye-tracking Analysis
Rik Pieters, Tilburg University, The Netherlands
Tulin Erdem, New York University, USA
Ana Martinovic, Tilburg University, The Netherlands

Mathias Streicher, University of Innsbruck, Austria
Oliver Büttner, University of Duisburg-Essen, Germany
Zachary Estes, Bocconi University, Italy

Paper #3: Communicating a Promise of Change: Visual Steps Enhance Process Imagery
Luca Cian, University of Virginia, USA
Aradhna Krishna, University of Michigan, USA
Chiara Longoni, Boston University, USA

Paper #4: The Effect of Visual Cues on the Sense of Completeness
Miaolei (Liam) Jia, National University of Singapore, Singapore
Aradhna Krishna, University of Michigan, USA
Xuping Li, National University of Singapore, Singapore

SESSION OVERVIEW

Much work has revealed how visual images affect consumers’ conscious attitudes. But how do visual images affect consumers nonconsciously, and do their visual patterns affect their choices? This session brings together four papers that address these under-researched questions in different, but synergistic ways. The first two papers explore eye movements and choice, whereas the second two examine nonconscious visual imagery.

Pieters, Erdem and Martinovic report a large-scale eye-tracking experiment with 342 U.S. consumers. They test what kinds of eye movements best predict choice and the extent to which they mediate brand ownership effects on choice. The model accommodates eye-fixations (overall attention) and brand-, attribute-, and other-saccades (jumps between attributes, brands, and brand-attribute combinations) as choice predictors. They find that brand-saccades, which reflect processing by brand, are best at predicting choice. Moreover, brand preferences build up remarkably rapidly, so that eye movements predict brand choice well before it is implemented. Thus, eye movements reflect fundamental, fast preference formation processes.

Streicher, Büttner and Estes focus on the magnitude of the field of attention. They theorize that activating broad (vs. narrow) attention increases visual exploration of product assortments. In one lab study and two field experiments they manipulate broad (vs. narrow) attention by asking participants to name objects that randomly appear in the center or the periphery of a computer screen. Mouse-clicks and eye movements show that inducing broad attention increases visual exploration of product displays, increasing choice of peripherally-located products and ultimately increasing unplanned purchasing. This effect of attentional focus on unplanned purchasing is accentuated among impulsive buyers.

Cian, Krishna, and Longoni investigate ads that visualize a desired transformation either via before/after visuals (i.e., the starting and ending points of a weight loss program) or through progression visuals (i.e., also including intermediate steps). Across five studies, they show that the less frequently used format, the progression ad, is actually more credible and improves attitudes towards the ad and product. They theorize that, to be effective, ads promising transformation should facilitate mental imagery of the trajectory of the change. Indeed, progression ads demystify the promised transformation, making it more credible and leading to more positive attitudes.

Jia, Krishna and Li examine how shapes affect perceptions. Many marketing problems relate to whether a given set of products or procedures is a “complete set,” so that missing one element might create a psychological void. For example, social marketing campaigns promoting healthy eating should ensure that every element of information reaches the audience. They study the effect of shape on the sense of completeness. In three studies, they show that circular shapes increase the sense of completeness amongst constituent elements, and consequently increase the perceived importance of each component. Distinctive visual cues (e.g., colors) of components attenuate this effect.

Audience members should gain a more nuanced understanding of how eye movements can predict brand choices, and how manipulating those eye movements can affect actual purchases. Additionally, audience members should gain insight into how visual imagery can nonconsciously influence perceptions such as credibility and importance.

Rapid Evidence Accumulation during Brand Choice: An Eye-tracking Analysis
EXTENDED ABSTRACT

Consumers frequently make rapid choices between complex products on websites that display detailed information on multiple brands and attributes side-by-side. Remarkably little is known about the processes driving such choices, which occur in less than a few minutes only. We develop and test an evidence accumulation model that is calibrated on eye-movements to address the issue. The model is rooted in recent developments in cognitive science and economics (Krajbich and Rangel 2011; Reutskaja et al. 2011), and relies on the idea that over and above their role in information search, eye-movements reflect fundamental preference formation processes. This builds on seminal research about the implications of task complexity for information processing (Jacoby, Speller, and Kohn 1974; Payne 1976; Russo and Rosen 1975) and the visual perception and information processing literature (Wedel and Pieters 2008). The model is calibrated on data collected in a large scale field experiment (N = 342) among regular consumers. The findings have implications for search and choice theories, and for the brand management and information design.

Under normal conditions, visual attention, information processing and comprehension processes are strongly connected to the eye-movements that people make during task performance (Just and Carpenter 1980; Wedel and Pieters 2008). Prior research on attention and choice (Krajbich, Armel, and Rangel 2010; Pieters and Warlop 1999; Shi, Wedel, and Pieters 2013; Yang, Toubia, and de Jong 2015) has often focused on one type of eye-movements: eye-fixations, which are brief moments (200-400 milliseconds) when the point of regard is relatively still and which indicate attention intensity. The very fast jumps (20-40 milliseconds for typical stimuli) between successive fixations are defined as eye-saccades.
While eye-fixations, eye-saccades provide information about the specific attentional processes that people are engaged in (Rayner 1978). Specifically, for consumers making a choice from an attributes-by-brands matrix, eye-saccades reflect specific processing styles that are central to brand choice. We hypothesize that consumers engage in rapid brand comparison and information integration processes, which are reflected in, respectively, attribute-saccades and brand-saccades (jumps between brands within an attribute and jumps between attributes within a brand, respectively), and that in particular brand-saccades predict choice, over and above the effect of mere eye-fixations. In addition, we hypothesize that prior ownership predicts choice and this is mediated by attention. Task complexity is expected to influence attention measures as consumers need to adapt their processing style to the amount of product information available on the display.

We develop a multivariate latent growth and choice model, estimated using MCMC techniques, to examine the extent to which attention predicts brand choice, the effect of ownership on choice, and the extent to which attention mediates it. The model is calibrated on data collected from consumers who had expressed to be in the market for a smartphone, randomly drawn from large, locally representative participant pools, from three locations in the continental US: Washington DC, Cincinnati, and San Diego. Stratification led to representation of three user segments: owners of one of the smartphone brands on display (N = 246), owners of a different brand (N = 25), and current non-smartphone owners (N = 71). User segment information combined with choice data, allows testing differences between loyal consumers, brand switchers, and consumers new to the market.

The results not only show that attention predicts choice, but more importantly that it does so from the very start of the choice task (39% correct brand choice predictions after only one quarter of the decision time, p < .01 when compared to random choice). We find support for a positive feedback loop over time between attention and choice meaning that (1) consumers focus more on the brand they eventually choose, and (2) this brand focus also increases the probability of choice. The influence of brand ownership on choice is mediated by specific attention types: brand-saccades and overall attention. Task complexity influences the total time spent in the task, but not how the specific attention types evolve during the choice task, which counters common ideas in the decision-making literature. Both brand-loyal and brand-switching consumers are found to focus on the owned brand and to compare its attributes to the other brands during the first half of the decision. In the second half these groups differ in attention towards the owned brand, but have similar attention patterns towards the chosen brand.

Our research provides strong evidence that over and above the mere intensity of attention (eye-fixations), the type of attentional processes (brand-saccades) predicts choice. It reveals that preference formation during brand choices proceeds very early and our research is the first to document this “early saccade preference effect”. It also is the first to show the attentional processes that account for ownership effects on choice.

**Eye Buy: Attentional Scope Affects Product Choice via Visual Exploration**

**EXTENDED ABSTRACT**

Marketing studies suggest that with increasing exploration of shopping environments unplanned purchasing also increases (e.g., Hui et al. 2013; Inman, Winer, and Ferraro 2009; Stilley, Inman, and Wakefield 2010). Recent eye-tracking studies, in turn, show that chronic impulse buying, a trait which links to unplanned purchasing, correlates with increased exploration of non-focal products in shoppers’ visual periphery (Böttner et al. 2014). The present research therefore tests, for the first time, whether the scope of attention influences unplanned purchasing by visual exploration of shopping environments. Measuring mouse-clicks, eye movements, and actual purchases, we show that activating broad (vs. narrow) attention increases visual exploration of product displays, ultimately increasing unplanned purchasing.

Prior marketing studies have described visual exploration of product assortments as relatively stable and unmalleable gaze patterns with a bias towards the horizontal center of shelves (Atalay, Bodur, and Rasolofoarison 2012). In contrast, we theorize that activating broad (vs. narrow) attention increases visual exploration of the periphery of product assortments, because attentional scope may affect spatial dispersion of gaze patterns in subsequent situations (Friedman et al. 2003). We further predict that this increased attention to the visual periphery should increase choice of peripheral products, because viewing those peripheral products may remind shoppers of forgotten needs (Inman and Winer 1998), increase product preferences (Orquin and Mueller Loose 2013) or trigger an impulsive desire to possess that product (Hoch and Loewenstein 1991). Hence, broad attentional scope should increase purchasing products from the periphery by increasing visual exploration (i.e., mediation). And given that more choice options fall into the visual consideration set as visual exploration of the shopping environment increases, a broad (vs. narrow) scope of attention should ultimately increase unplanned purchasing.

The results of Böttner et al. (2014) also suggest that chronic buying impulsiveness may moderate the effect because non-impulsive shoppers are effective in shielding and filtering irrelevant stimuli from the visual periphery. And conversely, highly impulsive individuals are more susceptible to irrelevant stimuli and more affected by their direct surroundings (Kasof 1997). Hence, impulsive shoppers should be more susceptible to the influence of attention on unplanned purchasing.

Using a visual manipulation of attention, Study 1 establishes that broad (vs. narrow) attention increases hypothetical choice (mouse-clicks) of peripheral products presented onscreen. Study 2 shows via eye-tracking in a field setting that both choice quantity (i.e., total number of chosen products) and choice variety (i.e., number of different brands chosen) increase as a function of broad (vs. narrow) attention by increasing visual exploration of products on shelves. Using real shoppers in a supermarket, Study 3 finally shows that activating broad (vs. narrow) attention increases unplanned purchasing, and that high buying impulsiveness accentuates this effect.

In all studies, attentional scope was manipulated by showing participants 20 object pairs on a computer display, one pair at a time (2 sec). Critically, each pair included one object in the center and one in a random corner (periphery) of the display. Participants in the narrow attention group were instructed to name the object appearing in the center of each display, whereas participants in the broad attention group named all objects appearing in the periphery. All participants saw and named the same objects. In study 1, participants (N = 129) then viewed a horizontal arrangement of nine refrigerators containing frozen food and they were instructed to click on any products they would be interested in purchasing. We calculated the horizontal distance of each click from the center of the display, and then we averaged those distances per participant. Participants in the broad attention group chose products further from the center of the display (M = 10.55 cm) than those in the narrow attention group (M = 8.39 cm), t(127) = 2.97, p < .01.
Study 2 was conducted in a small retail shop (400 m²) with shoppers \( (N = 79) \) who wore eye-tracking glasses. After the attentional manipulation, participants were asked to make hypothetical purchases from a specific shelf area containing candy and snack food. The broad attention group hypothetically spent more money \( (M = 6.57) \), chose more products \( (M = 3.16) \), and chose more brands \( (M = 3.16) \) than the narrow attention group \( (\text{spending} \ M = 5.51, t(77) = 2.20, p < .05) \); chosen products \( M = 2.48, t(77) = 1.97, p = .05 \); chosen brands \( M = 2.40, t(77) = 2.20, p < .05 \). Participants in the broad attention group visually examined 62% of all shelf compartments, whereas the narrow attention group examined only 50% of the shelf compartments, \( t(77) = 2.72, p < .01 \). This visual exploration also mediated all three variables of hypothetical purchasing (Hayes 2013, model 4; all CIs excluding zero; all direct effects \( p > .05 \).

Study 3 was conducted in a large supermarket (3000 m²). First, shoppers \( (N = 99) \) indicated their planned purchases and then were released for shopping after the attentional manipulation. After their shopping, the experimenters recorded their unplanned purchases and chronic buying impulsiveness (Rook and Fisher 1995). The broad attention group purchased more product categories unplanned \( (M = 2.00) \) than the narrow attention group \( (M = 2.96), t(97) = 3.18, p < .01 \), and also spent more money unplanned \( (M_{\text{broad}} = €5.59, M_{\text{narrow}} = €3.22, t(97) = 2.01, p < .05) \). As predicted, this effect interacted (Hayes 2013, Model 1) with chronic buying impulsiveness \( (B = .55, t(95) = 2.06, p < .05) \), with 63% of shoppers showing a significant effect of the attentional manipulation on unplanned category purchases as a function of increasing buying impulsiveness.

Thus, attentional scope seems to be an important mechanism that explains how many different products shoppers attend to and discover during shopping, ultimately affecting unplanned purchasing. Practically, in-store communications (e.g., screens) could be optimized by displaying product offers in the periphery, thus inducing broad attention.

### Communicating a Promise of Change: Visual Steps Enhance Process Imagery

#### EXTENDED ABSTRACT

Humans often desire change: we want to be thinner, look younger, have more hair. Marketers respond to such desires by offering products promising to deliver the corresponding changes: weight-loss programs, wrinkle removers, hair regrowth solutions. The visuals in the advertisements (ads) for these products typically focus on the desired final outcome by featuring a before and an after visual (e.g., a person at the beginning and at the end of a weight loss program; before-after ads). Very few change-ads include visuals of the intermediate steps between the before and the highly desirable after (e.g., a person gradually slimming down throughout the weight loss program; progression ads).

Although neglected in the marketplace and by future marketers, across seven studies we show that progression ads are superior to before-after ads across multiple consumer domains. We theorize that, to be effective, ads promising transformation should facilitate mental imagery of the trajectory of the change, i.e., the consumer should be able to imagine herself going through the transformation from “before” to “after.” Progression ads (but not before-after ads) evoke this kind of spontaneous process imagery -- thoughts and images about the means and ways leading to a change. In turn, spontaneous process imagery increases the credibility of the ad and leads to more favorable attitudes toward the product (serial mediation).

Through a content analysis of 250 ads of the top five weight-loss programs in the US (source: Consumer Affairs) we show that before-after ads are more common than progression ads: 36% were “before-after” whereas only 0.8% were “progression.” Another a pilot study asked participants \( (N = 122) \) to draw the ad for a weight loss program. While 22.95% of participants drew before-after ads, only 1.64% drew progression ads \( (z = 5.07, p < .001; \text{remaining ads coded as “others”}) \). Overall, these pilot studies show that progression ads are neglected by both current and future marketers.

In studies 1a \( (N = 116) \) and 1b \( (N = 139) \), we show that adding intermediate steps to a before-after ad increases the credibility of the ad. In both studies and using different stimuli (stylized figures and actual photographs), the progression ad was more credible than the before-after ad. One pretest ensured that the stimuli used did not differ on visual appearance, informativeness, complexity, familiarity, and novelty (all \( p’s > .1 \)).

In study 2 \( (N = 134) \), we test the downstream consequences of credibility on attitudes toward the product. Participants rated credibility and reported their attitudes toward one of two versions of an ad for a fictitious hair growth product. The before-after ad featured a drawing of a person before using a hair growth treatment and a drawing of the same person at the end of the treatment. The progression ad contained an identical drawing with the addition of drawings of four intermediate outcomes. As predicted, the progression ad was associated with higher credibility \( (M_{\text{before-after}} = 2.91, M_{\text{progression}} = 3.79; F(1, 132) = 5.99, p < .05) \) and more positive attitudes \( (M_{\text{before-after}} = 3.71, M_{\text{progression}} = 4.73; F(1, 132) = 7.35, p < .05) \) than the before-after ad. In a mediation model, credibility fully accounted for the effect of ad type on attitudes \( (95\% \text{CI: } .16, 1.43) \).

Studies 3a \( (N = 143) \) and 3b \( (N = 80) \) use open-ended and close-ended responses to show that progression ads evoke greater process imagery than before-after ads, even though both ads only have visuals of outcomes. In study 3a we coded the content of the spontaneous thoughts and images that either a before-after or a progression ad evoked in participants. Indeed, the progression ad generated more spontaneous process imagery than the before-after ad \( (z = 5.11, p < .01) \). The two ads did not differ on outcome imagery \( (p > .5) \) or amount of imagery (i.e., response length, \( p > .5 \)). In study 3b participants rated the extent to which a before-after ad or a progression ad evoked process and outcome imagery (through six randomly presented statements, three reflecting process imagery \( \alpha = .89 \) and three reflecting outcome imagery \( \alpha = .70 \) adapted from Taylor et al. 1998; Escalas and Luce 2004; Zhao et al. 2007; 2011). Again, the progression ad led to higher process imagery than the before-after ad \( (M_{\text{before-after}} = 4.11, M_{\text{progression}} = 6.92; F(1, 78) = 41.53, p < .01) \) and to the same outcome imagery \( (p > .5) \).

Study 4 \( (N = 142) \) tests the links between the constructs investigated in the previous studies. Results show how the progression ad leads to greater process imagery than the before-after ad, which then results in higher credibility and consequently more positive attitudes toward the product (full serial mediation, \( 95\% \text{CI: } .18 \) and \( .89 \)).

Study 5 tests a boundary condition and shows that ambiguity (operationalized through size of change) moderates the effect of ad type on attitudes. We expected to replicate study 4 in the large change condition (high ambiguity because the transformation is large), with a full serial mediation whereby the progression ad leads to greater process imagery, credibility, and ultimately better attitudes than the before-after ad. However, when the change is small (low ambiguity because the transformation is trivial), the progression ad should no longer be more persuasive than the before-after ad. Indeed, within the large change condition, there was a full serial mediation \( (95\% \text{CI: } .45 \) and \( 1.86) \). However, and as predicted, within the small change condition, the serial mediation was not significant \( (95\% \text{CI: } -1.00 \) and \( .20) \). Importantly, the full mediations in studies 2, 4, and
5 via process imagery indicated that the process mechanism driving the observed effect is not the amount of information contained in the ad (or these mediations would be partial).

Theoretically, and differently from prior research on mental simulation, we bring attention to an understudied yet important typology of mental imagery: spontaneous mental simulation of process (process imagery), and highlight its critical role in the persuasiveness of advertised change. Second, we add to the literature on process versus outcome focus by showing how process imagery can be spontaneously generated through outcome visuals. Substantively, we show that before-after ads, currently prevalent in the market place, may be an ineffective way to credibly promise positive change.

**The Effect of Visual Cues on the Sense of Completeness**

**EXTENDED ABSTRACT**

When brand managers introduce a new product category to their existing portfolio (e.g., when Colgate introduced mouthwash), they are frequently concerned with how to leverage on the popularity of their existing products (e.g., Colgate toothpaste). When a city tourism board wants to promote some lesser-known attractions, a solution might be to link these attractions to better-known ones. Similarly, when social marketing campaigns aim to promote disease prevention or healthy eating, an important issue is to ensure that every element of information gets across to the audience. The marketing problems discussed above can all relate to “a sense of completeness” — whether consumers perceive a given set of products or procedures as being a complete set, so that missing one element might create a psychological void.

In this research, we study the effect of visual cues on the sense of completeness. Specifically, we examine the role of circular shapes. Prior research has documented that circular shapes activate a “softness” association (Jiang et al., 2016), are related to harmony and friendliness (Zhang, Feick, and Price, 2006), and are related to groups and belonging (Zhu and Argo, 2013). We contribute to this literature and demonstrate that circular shapes increase the sense of completeness amongst constituent elements.

We first conducted a pilot study to test whether the association strength between circles and completeness is indeed greater than that for the other shapes. Participants (n=118) were shown six shapes (i.e., triangle, square, rhombus, circle, rectangle, and trapezium), and were asked to indicate which shape gave them the greatest feeling of completeness. We found that 67.8% of the participants indicated that out of the six shapes, circle gave them the greatest feeling of completeness (16.1% chose square, the next popular shape; n(117) = 7.43, p < .0001).

Because circular shapes are associated with a high sense of completeness, grouping a set of components in a circular (vs. square, based on our pilot) shape should increase the perceived completeness of the set. Study 1 confirmed this. Participants (n=125) were asked to view a flyer on the prevention measures for the Zika virus. When study 1 was run, the Zika virus was widespread in the city where the study was conducted. Four prevention measures were listed in the flyer (e.g., “use insect repellents regularly,” “wear long-sleeved shirts and long pants”), and each was illustrated with a figure and verbal descriptions. Participants were randomly assigned to one of the two conditions. In the circle [square] condition, the four measures were grouped in a circular [square] shape. After participants viewed the flyer, they were asked to indicate the extent to which the four measures formed a complete prevention process for the Zika virus (1 = not at all, 7 = very much). An ANOVA revealed that participants perceived the set of prevention measures to be more complete when the four measures were grouped in a circular versus square shape (M_circle = 4.75, M_square = 4.26; F(1, 123) = 5.52, p = .02).

Study 2 was conducted to test whether circular shapes would increase the perceived importance of the components. Participants (n=123) were asked to view an ad for an oral care product collection. The collection included three products of a brand: toothpaste, mouthwash, and dental floss. Participants were randomly assigned to one of the two conditions. In the circle [square] condition, the product collection was grouped in a circular [square] shape. Two dependent variables were measured: (1) the completeness perception of the set; and (2) product importance rating. We asked participants to rate the importance of mouthwash — which was not in the oral care routine for most of the participants (as determined by a pre-test).

ANOVA analyses revealed that a circular (vs. square) shape made participants perceive the product collection to be more complete (M_circle = 4.67, M_square = 4.30; F(1, 121) = 3.99, p < .05), and made participants perceive the mouthwash to be more important (M_circle = 4.48, M_square = 3.97; F(1, 121) = 3.86, p < .05). A mediation analysis further revealed that the completeness perception fully mediated the effect of the circular (vs. square) shape on the importance rating.

Study 3 (n=293) was conducted to test the moderating role of distinctive visual cues. We predict that distinctive visual cues (e.g., colors) will reduce the sense of completeness, and thereby attenuate the effect of circular shapes. We employed a 2 (shape: circle vs. square) 2 (component color: same color vs. different color) between-subjects design. In the same color condition, we used the same design as we did in study 2. In the different color condition, we used different background colors for the three component products. After participants viewed the ad, they responded to the same importance measure as we used in study 2. A two-way ANOVA revealed a significant interaction effect between shape and component color (F(1, 289) = 4.13, p = .04). A contrast analysis revealed that when the background of the components had the same color, a circular (vs. square) shape made participants perceive the mouthwash to be more important (M_circle = 4.48, M_square = 3.91; F(1, 289) = 5.94, p = .02); when the conditions had different background colors, a circular versus square shape did not affect the perception of mouthwash importance (M_circle = 3.96, M_square = 4.07; F(1, 289) = .23, p = .63). The main effects of shape and component color were non-significant (ps > .10).

Our research demonstrates that a circular (vs. square) shape increases the perceived completeness of a set of products or items, which has rich implications for the design of product campaigns and marketing materials.

**REFERENCES**


