Eye Buy: Visual Exploration Affects Product Choice

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Spatial Effects
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Paper #1: Does Random Placement to Central Positions Improve Performance? Centre Effects in the Classroom and the Olympics
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Paper #2: Which Side is Right? Visual Price Dominance Under Low and High Engagement
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Does Random Placement to Central Positions Improve Performance? Centre Effects in the Classroom and the Olympics

EXTENDED ABSTRACT
A laboratory experiment and two field experiments, in two different contexts, provide evidence that central positions, assigned at random, improve performance. Study 1 identifies students’ schemas about classroom positions. Study 2 examines performance in seven MBA courses and finds that students randomly pre-assigned to seats in the centre performed better on their examinations and overall. Study 3 shows that athletes assigned at random to center lanes in 2000-2012 Olympics 100-meter race ranked better, had higher likelihood of progression to the next round, and raced more rounds. Implications for the routes through which central position affects performance, including self-signaling, are discussed.

Central positions may confer an advantage as people almost unanimously believe that the centre is better. A person in the centre of a group is perceived to be more causal than others for a group outcome (Taylor & Fiske, 1975). A product placed in the centre of a shelf space array is perceived to be more popular (Valenzuela & Raghbir, 2009) and showcases a choice advantage (Shaw, Bergen, Brown & Gallagher 2000, Chandon, et al. 2007). In the domain of sports, athletes prefer to be placed in central lanes (Green et al., 2001). In a choice of location context, Christenfeld (1995) found that people believe the right answer on a multiple-item quiz is the central option.

In the domain of people, using data from the TV show, The Weakest Link, where players play for a possible pot of $1 million, Raghubir and Valenzuela (2006) showed that players who were assigned at random to central positions did better in the game: they were less likely to be voted out as “weakest links” and, therefore, played more rounds of the game, were more likely to get to the final round, and were more likely to win. In fact, later experimental studies showed that those who believed more strongly in the “important people sit in the middle” schema were, in fact, more prone to inferences based on central position: a “centre-stage” effect. Changing the rules of the end-game to a cooperative context eliminated the effect. Rodway, Schepman, and Lambert (2012, see also Rodway, Schepman & Thoma 2016) use the “centre-stage” reasoning to explain preferences for pictures and judgments of facial attractiveness.

Bar-Hillel (2011, 2015) proposed an integrative model of when central positions enjoy an advantage as a function of whether or not the domain is interactive or not, and whether it is cooperative or competitive. In an “interactive [context]… the payoff … is affected by … at least one other [person]” (Bar-Hillel, 2015, pg. 422). A classroom context, where grades are on a curve, and a sports context, such as the Olympics, are both interactive, as one person’s performance is contingent on the performance of others in the group. Bar-Hillel (2011, 2015) proposed that when the domain was interactive, whether or not the interaction was competitive would determine whether there would be a centre advantage. We examine Bar-Hillel’s model in two competitive contexts: an MBA classroom (Studies 1 and 2) and the 100-meter race (Study 3).

Overall, results of Study 1 (n = 207) demonstrate, in a seat choice task, that MBA students would prefer occupying a more central position significantly more when being less confident in their performance. A two-level (Confidence: well prepared, not confident) within-subject ANOVA on the Center-Stage preference variable revealed a significant main effect (F (1, 171) = 30.84; p < .001; η2 = .15), reflecting that students chose to sit more center-stage when they were not as confident (Ms = 3.09 more central vs. 3.77 less central). This pattern suggests that students use the position in the classroom as a mechanism to buffer themselves from performance uncertainty. Supporting this prediction, the pattern of central (vs. frontal) position preference was stronger for those who believed there were motivational benefits to being in the center (F (1, 169) = 3.14; p < .07; η2 = .019).

Study 2 (n = 7,209 observations) investigated whether seating position had an effect on performance when not selected strategically by the student himself/ herself. Random assignment of student to position rules out any self-selection bias. Objective assessments rule out measurement bias. Data was provided blind to the authors by the academic office of a graduate school with a one-year MBA degree. Data consisted of seating position and grades for 7 courses encompassing 3 cohorts (three consecutive years: ns = 418, 422, and 438 enrolled students by year). The classrooms used were designed as a semi-circular amphitheater. Results of the regression analysis on the entire data set with each observation treated as an independent vari-
able, show that the more center-stage students are, the higher their examination performance, $B = -.02$, $t(6717) = -3.18$, $p = .001$, $R^2_a = .001$, assignment performance, $B = -.01$, $t(5609) = -2.04$, $p < .05$, $R^2_a = .001$, and overall performance, $B = -.02$, $t(7135) = -3.03$, $p = .002$, $R^2_a = .001$, though not their CP performance, $B = -0.1$, $t(3189) = -.66$, $p = .51$, $R^2_a = .000$ (similar findings when examining only data for the core courses in Term 1 taken by all students).

In Study 3 ($n = 237$), we examine objective performance measures from the Olympics 100-meter race over four consecutive Olympics (2000-2012). We test whether athletes placed at random in central starting positions in an initial heat perform better in terms of rank, progression, and number of rounds in which the athlete participated before being eliminated. Analysis showed a contingent pattern: male athletes assigned at random to the central position in the first heat consistently performed better on all measures than those in the lane next to them. They ranked better (interaction gender and distance from the centre ($F(1, 233) = 3.34$, $p = .069$, $η^2 = .014$, Figure 1), were more likely to progress to the next round ($M_{centre} = 1.84$, $SD=.99$ vs. $M_{next-to-centre} = 1.54$, $SD=.85$; $F(1, 234) = 5.85$, $p = .016$, $η^2 = .024$) compared with those assigned to the lanes adjacent to centre. Thus, across the three measures, the centre-effect was more prevalent for men versus women.

Given the random assignment to classroom seat and lane, one of the routes through which performance was higher may be self-signaling: where the person assigned to a given position uses their position as a source of information about their ability leading to their improving their performance. Thus, it may be possible that position may also be informative to the person placed in the position. This information could potentially impact their motivation to perform better. This “centrality-produces-efficacy” route would need to be further researched at the individual motivation and aspirational goal level, especially in the context of gender differences.

**Which Side is Right? Visual Price Dominance Under Low and High Engagement**

**EXTENDED ABSTRACT**

Building on research in visual field effects and brain hemispheres, the authors predict that under low engagement, prices positioned to left will be visually dominant, whereas under high engagement, prices positioned to the right will dominate. Four studies support this assertion. Study 1 demonstrates that in a retail field setting, customers purchase more of a product when the price is not dominant. Study 2 uses a response time study to demonstrate visual dominance, and Study 3 offers evidence of activation associated with visual dominance in a neuroimaging study. Finally, Study 4 examines the impact of visual price dominance on value perceptions.

Imagine you want a new television. As you consider the options you like in the store, you realize that all the models you are considering feature the price on their right side. Why is that? This research examines whether and how the location of the price might affect consumers’ price perceptions and product evaluations, moderated by engagement. Specifically, this study predicts an engagement by visual field interaction that influences attention. This interaction leads to greater attention to the left-side visual field when engagement is low. When engagement is high though, it prompts greater attention to the right-side visual field. When information receives more attention, it also gets weighted more heavily (Bagchi and Davis 2012). When price information appears in the visual field and dominates attention, it causes the product to be perceived as lower in value.

Consistent with these predictions, participants in a pretest indicate greater purchase intentions for a product for which the price is in the right-side visual field rather than the left ($p < .05$). Then the first main study uses a single, three-level factor (visual field location: left, right, control). A promotion for a product (Arizona iced tea) featured a large sign, on the front of a product cooler in an actual store, highlighting a discounted price (i.e., $8.99$; regular price $9.99$). During the first promotional week, the price appeared on the right side of the sign; in the second promotional week, it was shown on the left side. The measure of the effect of visual field location on consumer response reflected the number of units of the target product sold on average in two-hour intervals. The results show that a price in the left visual field prompted a non-significant increase in sales ($p > .22$), whereas a price featured in the right visual field led to significantly more sales ($p < .05$, see Figure 3).

Then in Study 2, 66 right-handed students participated in a study (engagement: low, high) 2 (visual field location: left, right) between-subjects study. Their levels of engagement were manipulated, using scenarios adapted from Howard and Kerin (2006) and Suri et al. (2012). Half of the participants saw a description of a television and its price in their left visual field; the other half saw the same...
information in their right visual field. Participants then had to recall the price of the television and recognize its slogan. Their response times were measured using DirectRT software. With an analysis of variance to test the effect of visual field location and engagement on participant response times, this study reveals, as expected, that under low engagement, participants responded faster if the price was located in the left visual field (p < .01). Under high engagement, they instead responded faster when the price was located in the right visual field (p < .05).

In Study 3, 10 right-handed people participated in a 2 (engagement: low, high) × 2 (visual field location: left, right) mixed design study. They were told that as part of a marketing study, they would see six prices in a row on the screen in front of them and be asked to remember the location of one of those prices. To assess the relative level of activation in the left versus right hemisphere during the task, the authors measured blood flow in each participants prefrontal cortex, at 16 different points across his or her forehead. To examine asymmetric activation in the prefrontal cortex, they used functional near-infrared spectroscopy (fNIR; Ayaz et al., 2012). As the participants grow more engaged in the task, activation of the left prefrontal cortex should increase. In support of this prediction, greater oxygenated-hemoglobin concentration changes were observed in the anterior left dorsolateral prefrontal cortex of more involved participants (p < .01).

Finally, in Study 4, 105 right-handed students participated in a 2 (engagement: low, high) × 2 (visual field location: left, right) between-subjects design. Half of the participants saw information with the products price on the left; the other half saw the products price on the right. As predicted, when they were less engaged, consumers believed the product offered greater value when its price was located in the right visual field (p < .05) (Grewal, Monroe, & Krishnan 1998). If they were more engaged, consumers perceived that the product offered higher value if its price was located in their left visual field (p < .05; see Figure 4). Also as expected, in the high engagement condition, participants perceived lower monetary sacrifice if the price appeared in their left visual field (p < .01). An analysis with PROCESS Model 8 reveals moderated mediation; that is, the effects of price location are mediated by sacrifice perceptions in the high (95% confidence interval excludes 0: -1.29 to -1.7) but not in the low (95% confidence interval includes 0: -.28 to .58) engagement condition.

These findings represent an exciting opportunity for retailers and advertisers. The vast majority of retail contexts induce relatively low engagement among shoppers. This research suggests that placing product prices in the right visual field will increase consumers’ perceptions of quality and value and thus lead to greater demand for those products.

**Eye Buy: Visual Exploration Affects Product Choice**

**EXTENDED ABSTRACT**

Shoppers prefer centrally-located products, but this can constrain shoppers’ choices and retailers’ sales. We show that attentional priming influences visual exploration of a product display, thereby influencing product consideration and choice. In two lab studies and one field experiment, priming attention to the periphery (vs. center) affected eye movements toward, mouse clicks on, choice of, and memory of peripherally-located products. This effect of visual exploration on peripheral product choice was accentuated among impulsive buyers.

Shoppers generally prefer centrally-located products (Christenfeld 1995; Shaw et al. 2000) because they infer that the most popular products are placed centrally (Valenzuela and Raghubir 2009) and they tend to fixate central products immediately prior to choice execution (Atalay et al. 2012). Consequently, placing a product at or near the center of a supermarket shelf can increase its sales (Chandon et al. 2009). Central locations on retail shelves and online shops thus are a highly valued asset (Drezé et al. 1995). Notably, however, this central bias can constrain shoppers’ choice by limiting views of more peripherally-located products, and it may constrain retailers’ sales because fewer views elicit fewer sales (cf. Orquin and Loose 2013; Pieters and Warlop 1999). So, how can shoppers’ fixation on central products be overcome, and what are the consequences for product choice?

We show that priming shoppers’ attention influences their visual exploration of a product display, thereby influencing their product consideration and choices, especially for impulsive shoppers. Our attentional priming task requires participants to view a series of objects, attending selectively to objects either in the center (narrow attention) or the periphery (broad attention). We predicted that attentional breadth would affect visual exploration (i.e., viewing relatively more or fewer of the products distributed across a display; Büttner, Wieber et al. 2014) and peripheral choice (i.e., the number of peripheral, non-central products chosen). We further predicted that this effect is accentuated among impulsive shoppers (Rook and Fisher 1995), who may be especially susceptible to visual exploration (cf. Büttner, Florack et al. 2014).

Study 1 (N = 150) tested whether attentional breadth affects visual exploration of product displays. First, we showed participants 20 object pairs, with one object in the center and the other in the periphery (Figure 5A), and they named aloud either the central object (narrow attention group) or the peripheral object (broad attention group) of all 20 pairs. Then, in a product memory task, participants viewed an array of 15 products (Figure 5B) and subsequently reported all the products they could recall. Finally, in an oddball detection task, participants viewed a series of 18 product shelves from...
a retail shop, two of which included a peripherally-located oddball product that did not belong in the shown array (Figure 5C and 5D). As predicted, the broad attention group recalled more peripherally-located products ($t = 3.22, p < .01, d = .53$) and detected more oddball products in the periphery ($t = 2.84, p < .01, d = .47$) than the narrow attention group. Thus, activating broad attention increased visual exploration of peripherally-located products.

Study 2 ($N = 78$) is a field experiment that tested whether attentional breadth affects product choice, and if so, whether that effect is mediated by visual exploration. We intercepted customers entering a grocery shop and we asked them to wear mobile eye-tracking glasses. After manipulating their attentional breadth (as in the prior study), we directed them to an aisle of candies and snacks, and we asked them to place in their basket any products they were interested in buying. As predicted, the broad attention group fixated significantly more products ($t = 2.72, p < .01, d = .65$; Figure 6) and chose more products ($t = 1.97, p = .05, d = .44$) than the narrow attention group. Moreover, visual exploration significantly mediated the effect of attentional focus on product choice ($B = .44, CI = .13$ to $.94$; Figure 7). Thus, activating broad attention increased visual exploration of shelves in a retail shop, which in turn increased product choices. While our measure of purchasing was hypothetical, it nonetheless involved shoppers choosing real products in an actual retail shop.

Study 3 ($N = 129$) tested whether the effect of attentional breadth on product choice is moderated by chronic buying impulsiveness. We again manipulated participants’ attentional breadth as

Figure 5. Example stimulus from the attentional manipulation task

(A), product array from the product memory task (B), and product arrays from the oddball detection task, Study 1. Oddball products were a can of beer (C) and a spray can of whipped cream (D)

Figure 6. Distribution of visual attention (fixations) across the 47 product compartments by the broad and narrow attention groups, Study 2 Narrow Attention

Figure 7. The effect of attentional breadth (narrow = 1, broad = 2) on product choice (number of products chosen) was fully mediated by visual exploration (number of product compartments fixated), Study 2

Study 3 ($N = 129$) tested whether the effect of attentional breadth on product choice is moderated by chronic buying impulsiveness. We again manipulated participants’ attentional breadth as
in Studies 1 and 2. Participants then viewed an arrangement of nine refrigerators of frozen food products (Figure 8), clicking on all the products they would like to purchase, and finally they reported their buying impulsiveness (Rook and Fisher 1995; α = .84). The broad attention group hypothetically chose more products from peripheral locations (t = 3.21, p < .01, d = .58), and more products overall (t = 2.12, p < .05, d = .38), than the narrow attention group. This effect was moderated by buying impulsiveness, B = .48, t = 2.56, p = .01, with the Johnson–Neyman point at a buying impulsiveness score of 3.55 on a 1-7 scale. 54% of participants were above this J-N point in buying impulsiveness (Figure 9). In other words, more controlled shoppers were unaffected by the attentional manipulation, whereas more impulsive shoppers were indeed affected: Directing impulsive shoppers’ attention to the center or periphery subsequently decreased or increased their choice of peripherally-located products.

Consumers generally prefer choice options from the center of a display, such as a shelf in a shop or a product line-up on a website (Atalay et al. 2012; Chandon et al. 2009). Yet, consumers do often choose products from the periphery of a display (Valenzuela and Raghubir 2009). So what leads those consumers to the periphery? The present research demonstrates that inducing broad attention expands shoppers’ exploration from centrally-located products toward peripherally-located ones, ultimately increasing the quantity and variety of products chosen. These results thus complement prior theorizing on location-based product choice: Central product choice may be the default, but it is easily and strongly counter-acted by broad attention. This research also provides novel insights on impulsive buying. We show that impulsive shoppers’ tendency to choose more products is accentuated at the peripheries of product displays, especially when stimulated to visually explore the display. Alternatively stated, the centrality bias in perception and choice seems to be particularly pronounced for non-impulsive shoppers.

### Figure 8. Product array, Study 3.
Participants hypothetically purchased products by clicking on them, which placed a red dot on each chosen product. Hypothetical purchases were analyzed according to their selection from the left, central, or right refrigerators.

### Figure 9. The effect of attentional breadth (broad v. narrow) on product choice (i.e., products chosen from peripheral locations) was moderated by buying impulsiveness, Study 3. The solid diagonal line is the slope of the moderation, dotted lines are 95% CIs, and the solid vertical line is the Johnson–Neyman point, above which the moderation was significant.

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Swiping Is the New Liking: How Product Orientation Shapes Product Evaluations Conveyed Through Swiping

**EXTENDED ABSTRACT**

Apps like Tinder or Styletect require consumers to evaluate people/products by swiping them, to the right or left. This work explores whether product orientation affects the product evaluations expressed by swiping movements. Building on stimulus–response compatibility theory, which indicates the facilitation of certain motor responses by task-irrelevant visual aspects of a stimulus, a horizontal product orientation, cueing a horizontal direction, is predicted to facilitate responses in a congruent direction. Four studies indicate that when people use swiping movements to evaluate objects, their evaluations are influenced by the object’s orientation, whereas evaluations conveyed through button presses reveal no orientation effect.

The conversion to touchscreen interfaces has introduced “swiping” as a movement to interact with products onscreen. The current study assesses a bias in product evaluations conveyed by swiping and consider product orientation as a source of bias. As such this work relates to a body of research showing that product display persuasively influences evaluations (e.g., Keller, Markert, and Bucher, 2015; Valenzuela and Raghubir, 2009). Our central proposition that people are more inclined to swipe in a direction congruent (vs. incongruent) with the direction primed by an object’s horizontal orientation builds on two arguments.
First, we draw on the vast experimental psychology literature on stimulus response compatibility effects dealing with the interference of irrelevant stimulus features with the proper response to it (Kornblum, Hashbroucq, and Osman, 1990) to explain the origin of this effect. The dominant explanation for SRC phenomena proposes that when responses and stimuli vary along the same dimension, dimensional overlap occurs, resulting in the automatic activation of responses congruent with the irrelevant feature (Kornblum et al., 1990). Similarly, a horizontal orientation can prime congruent swiping responses that also imply movement along the horizontal direction. Two studies indeed show that product orientation affects swiping responses but not key press responses (which lack a similar horizontal directional component). Moreover, study 2 demonstrates that the effect is attenuated in case dimensional overlap is reduced.

Second, the process via which response activation translates into response selection is different from that in SRC tasks, where errors occur due to speeded responses. Participants generally realize making mistakes. In evaluation tasks, participants are unlikely to realize that automatically activated responses conflict with their actual evaluations, as numerous studies illustrate the contextually constructed nature of evaluations (Schwarz, 2006). If orientation congruent responses affect people’s swiping responses unwittingly when conveying subjective evaluations, time pressure should not moderate the effect. It should moderate, though, when respondents make objective judgments. Allowing sufficient time, consumers can override the influence of product orientation on objective classification judgments but not on subjective evaluations (study 3). Study 4 shows that rightward oriented products are no longer preferentially swiped to the right once consumers become aware of this bias, if consumers are given sufficient time to render their evaluation.

Study 1 demonstrates the hypothesized effect: Rightward (vs. leftward) product orientations elicit more like responses when the positive evaluations are mapped at the right side and evaluations are conveyed through swiping. No orientation effect is expected for button pressing though. Fifty-eight participants were instructed to evaluate thirty pictures of toys, each with a clear, randomly determined leftward or rightward orientation, on their attractiveness as a gift for children. Half of the participants conveyed evaluations by pressing the green versus red onscreen presented button (respectively on the right and left side), and the other half conveyed evaluations by swiping the picture to the red or green button. The results point to a significant effect of orientation in the swipe condition, but not in the button press condition (Figure 10).

Study 2 introduces a second directional cue (i.e., implied motion) as a moderator. In this study, 185 participants evaluated the aesthetic appeal of 12 pictograms, with a randomly determined leftward or rightward orientation, either by pressing a red or green button or by swiping the pictograms to the left or right. The 12 pictograms fell into three categories: static images (no implied motion), congruent images (orientation and implied motion are in the same direction), and incongruent images (implied motion is opposite to orientation). As expected, we find that: (1) there is no effect of orientation on evaluations conveyed via button presses, (2) the effect of orientation on swiping responses replicates for the first two sets of stimuli, but (3) is attenuated for the third set of stimuli as dimensional overlap in not unequivocally established here (See Figure 11).

Study 3 focuses on objective vs. subjective judgments and shows that the effect is moderated by time pressure for the former, whereas time pressure does not affect the extent to which the latter type of evaluations are influenced. Ninety-six participants first evaluated 30 toys on their attractiveness. Next, they assessed whether the toys represented animals or not (objective judgment). Each time, responses were conveyed by swiping the toys, either presented with a leftward or rightward orientation, to the left or right. Half of the participants performed these tasks under time pressure (responses within 1000ms). The results (see Figure 12) indicate that response speed does not alter the impact of stimulus orientation for subjective judgments, while it is crucial for objective judgments. We attribute this difference to a lack of awareness of the influence of stimulus orientation in case of the subjective judgments.

Study 4 tests the role of awareness more explicitly. A sample of 122 participants evaluated 30 shoes, with randomly determined right- or leftward orientations, on their aesthetic appeal. Time pressure was manipulated as in study 3. Before the experiment started, half of the respondents was made aware that product orientations could bias evaluations. Results (see Figure 13) show that when participants were not informed about the possibility of shoe orientations influencing their evaluations, rightward oriented shoes have a higher chance of being liked than leftward oriented ones and this was not moderated by time pressure. When participants were warned, time pressure moderates the orientation effect. Participants not experiencing time pressure could override the influence of product orientations and even tended to prefer leftward oriented shoes. We observed no


REFERENCES

Paper 1

Paper 2


Paper 3
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Paper 4


