THE ALLIANCE
INSEAD Wharton University of Pennsylvania

Alliance Center
for Global Research
and Development

Faculty & Research Working Paper

Does In-Store Marketing Work? Effects of the Number and Position of Shelf Facings on Brand Attention and Evaluation at the Point of Purchase

Pierre CHANDON
J. Wesley HUTCHINSON
Eric T. BRADLOW
Scott H. YOUNG
2009/24/MKT/ACGRD
(revised version of 2008/51/MKT/ACGRD)

Does In-Store Marketing Work? Effects of the Number and Position of Shelf Facings on Brand Attention and Evaluation at the Point of Purchase

by

Pierre Chandon*

J. Wesley Hutchinson**

Eric T. Bradlow***

and

Scott H. Young****

15 May 2009

Revised version of 2008/51/MKT/ACGRD

The authors gratefully acknowledge the financial support of the Wharton-INSEAD Center for Global Research and Education, which covered the cost of data collection, and Perception Research Services, Inc. who provided sites and personnel to conduct the experiment. Professor Bradlow was funded by the Wharton Interactive Media Initiative.

forthcoming, *Journal of Marketing*

* Associate Professor of Marketing at INSEAD, Boulevard de Constance, 77300 Fontainebleau, France, Tel: +33 (0)1 60 72 49 87, Fax: +33 (0)1 60 74 61 84, email: pierre.chandon@insead.edu

** Stephen J. Heyman Professor and Professor of Marketing at The Wharton School, University of Pennsylvania, 700 Jon M. Huntsman Hall, 3730 Walnut Street, Philadelphia, PA 19104, Tel: (215) 898-6450, email: jwhutch@wharton.upenn.edu

*** K.P. Chao Professor, Professor of Marketing, Statistics, and Education and Co-Director of the Wharton Interactive Media Initiative at The Wharton School, University of Pennsylvania, 700 Jon M. Huntsman Hall, 3730 Walnut Street, Philadelphia, PA 19104, Tel: (215) 898-8255, email: ebradlow@wharton.upenn.edu

**** Vice President, Perception Research Services, Inc. One Executive Drive, Fort Lee NJ 07024, Tel: (201) 346-1600, email: syoung@prsresearch.com

Does In-Store Marketing Work? Effects of the Number and Position of Shelf Facings on Brand Attention and Evaluation at the Point of Purchase

Recent trends in marketing have demonstrated an increased focus on in-store expenditures with the hope of "grabbing consumers" at the point of purchase: but does it make sense? To help answer this question, the authors examine the interplay between in-store and out-of-store factors on consumer attention to and evaluation of brands displayed on supermarket shelves. Using an eye-tracking experiment, they find that the number of facings obtained has a strong impact on evaluation that is entirely mediated by its effect on visual attention and works particularly well for frequent users of the brand, for low market-share brands, and for young, highly educated consumers who are willing to trade off brand and price. They also find that gaining in-store attention is not always sufficient to drive sales. For example, top and middle shelf positions gain more attention than low shelf positions; however, only top shelf positions carry through to brand evaluation. Our results underscore the importance of combining eye-tracking and purchase data to obtain a full picture of the effects of in-store and out-of-store marketing at the point of purchase.

Marketers are diverting a growing proportion of their promotional budgets from traditional out-of-store media advertising to in-store marketing, and retailers are responding by adopting increasingly sophisticated shelf management and audience measurement tools (Egol and Vollmer 2008). It is well known that large increases in total shelf space (e.g., end-of-aisle displays) have strong effects on brand sales (e.g., Bemmaor and Mouchoux 1991); however, the evidence is less conclusive for in-store marketing changes that keep total category shelf space constant (e.g., more shelf facings or different shelf position). On the one hand, some studies have shown that the position of a brand in a vertical or horizontal retail display influences quality expectations and hence choices (e.g., Raghubir and Valenzuela 2008). On the other hand, the field experiments conducted by Drèze, Hoch, and Purk (1994) led them to conclude that shelf position only has a limited influence on brand sales and that additional facings have a limited impact once the minimum level necessary to avoid stock outs has been reached.

More importantly, prior research has not examined the effects of in-store marketing on visual attention and brand consideration (pre-cursors of choice). It cannot therefore determine whether the effects of in-store marketing on choice are mediated by enhanced attention and consideration or influence choice directly (e.g., because of quality inferences). Examining multiple measures of attention and evaluation is made more important by the trend toward using the point of purchase as an advertising medium aimed at building brand awareness and image over the long term and not just as a distribution channel (Egol and Vollmer 2008). In this context, attention and consideration may provide more sensitive and reliable metrics of in-store marketing's effectiveness than choice. Finally, prior research has not manipulated in-store factors independently of brand and consumer-specific out-of-store factors, and is therefore unable to compare the relative impact of in-store and out-of-store factors and

whether in-store factors may be more effective for low or high market-share brands or for regular or non-users.

Therefore, the objective of this paper is to examine the interplay between in-store and out-of-store factors on consumer attention to and evaluation of brands displayed on supermarket shelves. Drawing on research on shelf management effects and on eye movements in scene perception, we develop a framework to assess the effects of important in-store factors – such as the number and position of shelf facings – and out-of-store factors – such as past brand usage, the brand's market share, and the individual's demographics and shopping goals – on attention and evaluation. We then test the predictions derived from this framework in an eye-tracking experiment in which we manipulate or measure these factors for established as well as for new brands with no out-of-store history in the US in two product categories (soaps and pain-relievers). Then, we estimate the effects of these factors on visual attention, visual reexamination, recall of visual attention, brand consideration, and brand choice for a large sample of representative US shoppers looking at life-size pictures of supermarket shelves. Finally, we use path analysis to decompose the total effects on evaluation into the direct effects (after controlling for attention) and the indirect effects (mediated by attention).

This research provides new insights into four of the five issues deserving future research identified in Wedel and Pieters' (2008) review of the eye-tracking literature: (1) studying the interplay between bottom-up salience and top-down expectations in guiding attention, (2) examining eye movements using other marketing stimuli besides print ads, (3) testing different attention metrics, and (4) investigating the relationship between attention and downstream marketing effects such as purchases. In particular, we show that out-of-store factors directly influence evaluation and are not mediated by attention, whereas in-store factors primarily influence attention, and through that route evaluation, but do not always carry through to evaluation because of conflicting direct effects on post-attention evaluation.

This research also contributes to the effort to develop better marketing metrics that include attention (Pechmann and Stewart 1990). First, we find that self-reported recall of visual attention is not a valid proxy for actual visual attention to brands in a supermarket shelf display. This raises doubts about the validity of audience measurement tools and academic studies using memory to infer exposure. More generally, we find that marketers would misunderstand the effects of in-store and out-of-store marketing if they only relied on self-reported attention or evaluation measures, and that they need to combine a rich set of indicators of these two stages of the decision-making process. For example, our finding that brands influence both attention and evaluation given attention suggests that a complete measure of a brand's equity should combine eye-tracking and purchase decision data.

For managers, our main result is that all shelf-space actions are not equal. We show that the number of facings has a consistent and positive effect on attention and, through attention, on evaluation, and that its influence on choice is particularly strong for regular users, for low market-share brands, and among young, educated shoppers who value both brands and low prices. In contrast, the effects of shelf position are mixed. Positioning brands on the top shelf and near the center of a shelf improves both attention and evaluation, but positioning them on the middle shelves helps attention without improving evaluation. Positioning them on the left or right-hand side of the shelf makes no difference to either attention or evaluation.

ATTENTION AND EVALUATION AT THE POINT OF PURCHASE

We organize the review of the literature and the hypothesis development according to the framework shown in Figure 1. In this framework, we distinguish between visual attention and higher-order stages of the decision-making process (summarized as "evaluation"). The framework also summarizes the in-store and out-of-store factors that influence attention and evaluation. We examine these two characteristics of the framework in two separate sections. In the first section, we review the eye-movement literature in psychology and marketing to

support the distinction between attention and evaluation and their measurement. In the second section, we review the marketing literature to derive hypotheses about the main and interaction effects of the key in-store and out-of-store factors shown in Figure 1 on attention and evaluation.

--- Insert Figure 1 here ---

Attention vs. Evaluation: Insights from Eye-Movement Studies

The distinction between recall, consideration, and choice is well established in the information processing and decision making literatures (e.g., Alba, Hutchinson, and Lynch 1991). In comparison, few studies have looked at visual attention and some studies actually use recall as a proxy for attention (e.g., Barlow and Wogalter 1993; Raghubir and Valenzuela 2006; Shaw et al. 2000). In this section, we review the key findings of the literature on visual attention in scene perception and its applications in marketing. These studies show how people visually process complex commercial scenes, how visual attention can be measured with eye-movement data, and why it is important to distinguish between attention and the more evaluative measures of recall, consideration, and choice.

Eye movements in scene perceptions. There is a broad consensus on the following aspects of how people visually process scenes (Henderson and Hollingworth 1999; Pieters and Wedel 2007; Rayner 1998; Wedel and Pieters 2008). First, what appears as smooth and conscious eye movements actually consist of eye fixations (during which the eye remains relatively still for about 200-500 milliseconds) separated by rapid jumps, called saccades, which average 3°—5° in distance (measured in degrees of visual angle), last 20 to 40 milliseconds, and during which no information useful for scene perception can be acquired. Fixations serve to project a small area of the visual field onto the fovea, an area of the eye with superior visual acuity (which corresponds to roughly twice the width of one's thumb at arm's length). In

natural complex scenes such as supermarket shelves, eye fixations are necessary for object identification and their location is therefore a good indication of visual attention.

Eye-movement studies have also shown that the "gist of the information" about a scene can be extracted pre-attentively and from peripheral vision during the initial fixation (Henderson and Hollingworth 1999). People can identify the semantic category of the scene (e.g., a supermarket shelf), its spatial layout (e.g., there are four shelves) and the level of clutter during the first eye fixation. Greater levels of detail for a given object (e.g., brand name) require a fixation centered on that object. In applied eye-movement studies, the first fixation on an object is known as "noting" and the second as "reexamination". Noting is therefore based on a combination of prior ("out-of-store") knowledge and of the ("in-store") low-level visual characteristics of the objects in the scene gathered from prior fixations on other objects. In contrast, reexamination is more influenced by the informativeness of the object for the task at hand (e.g., brand preferences, if the goal is consideration or choice).

Finally, eye-tracking studies have shown that eye fixations, but not peripheral vision, increase memory for the fixated object (Loftus, Hoffman, and Loftus 1999; Pieters, Warlop, and Wedel 2002). On the other hand, Pieters and Wedel's (2007) extensive review of the eye movement literature concludes that people are mostly experiencing smooth, uninterrupted vision and that they are not aware of their own eye fixations. This suggests that recall of attention is essentially the same as recall of brand names in terms of the underlying cognitive process (Hutchinson, Raman, and Mantrala 1994). This is why in our framework we placed recall with consideration and choice among the measures of brand evaluation and not among the measures of visual attention.

Eye-movement studies in marketing. Most eye-tracking research in marketing has been done in an advertising context (for a review, see Wedel and Pieters 2008), and only a few have examined visual attention to supermarket shelves. Among these, Russo and Leclerc (1994)

used sequences of consecutive eye fixations to identify three different stages of in-store decision making: orientation, evaluation, and verification. Pieters and Warlop (1999) showed that time pressure and task motivation influenced visual attention to the pictorial and textual areas of unfamiliar brands displayed on supermarket shelves. Chandon et al. (2007) empirically decomposed a brand's observed consideration level into its memory-based baseline and the "visual lift" caused by in-store visual attention. They also found that noting and reexamination are only weakly correlated with brand consideration, confirming that the two constructs are empirically distinct. Finally, van der Lans, Pieters, and Wedel (2008) found that bottom-up factors (package brightness and color) are twice as important in determining the speed of brand search than the top-down factor of being the target of the search task or not.

Overall, marketing eye-tracking studies have demonstrated the value of measuring attention, and not just evaluation, to better understand how people visually process commercial scenes and to measure the effectiveness of visual marketing stimuli. On the other hand, these studies did not specifically study the effects of the number of facings or examine the effects of alternative shelf placements on both attention and evaluation, nor did they use multiple measures of these constructs. With one exception (Chandon et al. 2007), they looked at relatively small, simple displays with few brands and only one facing per brand. More importantly, their experimental designs did not allow them to disentangle in-store effects from out-of-store effects such as past brand usage. Our main contribution, therefore, is to provide a more thorough and methodologically rigorous analysis, especially in assessing the extent to which various effects on attention carry through to consideration and choice. In addition, the use of multiple measures of both attention and evaluation will allow us to examine whether recall of brand attention is a good proxy for attention and hence a substitute for eye-tracking

data; a finding of significant importance for the future design of in-store experiments and managerial practice.

In-Store and Out-of-Store Effects at the Point of Purchase

We define in-store factors as factors which cannot influence consumers without in-store visual attention. The in-store visual factors reviewed in Figure 1 correspond to the basic shelf management decisions that retailers can make for any given brand, while keeping the total space devoted to the category constant. They include the number of facings of the brand, its vertical position in the display, its horizontal position on the shelf, and its price. Out-of-store factors are factors that cannot influence consumers without memory activation. As shown in Figure 1, these factors are consumer specific (shopping goal, purchase criteria, and demographics), brand specific (market share), or vary across both brand and consumers (past brand usage). In this section, we draw on existing research to develop hypotheses about the effects of each set of factors on attention and evaluation.

In-store factors. All eye-movement studies of advertising or catalogue displays show that visual area strongly increases attention (Janiszewski 1998; Lohse 1997). A number of shopper surveys (Inman, Winer, and Ferraro 2009) and field experiments (Chevalier 1975; Curhan 1974; Inman and McAlister 1993; Wilkinson, Mason, and Paksoy 1982) have shown that large increases in shelf space increase brand sales even when the price and location of the products remain unchanged (for a review, see Campo and Gijsbrechts 2005). Drèze, Hoch, and Purk (1994) studied the brand sales impact of an increased number of facings, while holding the *total space* allocated to the category constant. They found significant effects of increasing the display area between 3 and 15 square inches but not beyond.[1] We therefore expect that increasing the number of facings has a positive but marginally diminishing effect on both brand attention and evaluation, but a stronger effect on attention than on evaluation.

[1] Because most brands in the categories that they studied had display sizes of about 15 square inches, Drèze, Hoch, and Purk (1994) concluded was that there was virtually no additional sales potential of increasing the number of facings beyond their current level. We return to this issue in the general discussion.

For this reason, we expect most of the effect on evaluation to be mediated by attention. Still, because consumers believe that important brands are given precedence in retail displays (Buchanan, Simmons, and Bickart 1999), a high number of facings should also have a positive direct effect on evaluation via inference (controlling for attention).

Eye-movement studies also suggest that not all shelf locations attract equal attention. Chandon et al. (2007) found that that the brands located near the center of two shelf displays were noted more often but were not considered more often. They speculate that this occurs because the first fixations tend to be in the center of a scene and because people fixate on the center to orient their attention when transitioning between different locations of a scene. However, because they did not manipulate shelf location independently of brand, their results may be driven by brand effects rather than by location effects. All the other studies of brand location effects looked at consumer choice or brand sales. Drèze, Hoch, and Purk (1994) found strong effects for vertical position, the best level being near the eye or hand levels (i.e., near the top shelves) and the worst level being the lowest shelf. In contrast, the same authors found weak effects for the horizontal position on the shelf, and these effects did not hold across all the categories. A related stream of research has examined the effects of the position of products in horizontal or vertical arrays (i.e., one single row or column of products. Christenfeld (1995) found that when multiple packages of identical products are available side-by-side on a supermarket shelf, people tend to choose the middle product. Shaw et al. (2000) replicated these results and argued that they occur because center positions receive more attention (although this claim is based on recall data and not on direct measures of attention). In contrast, Raghubir and Valenzuela (2006) argue that position effects are not mediated by attention but by quality inferences and provide support for their hypothesis in the context of the evaluation of the performance of students or game show contestants depending on where they are seated. The same authors (Raghubir and Valenzuela 2008) found that

consumers believe that retailers place expensive, high-quality brands on the top shelves and cheaper brands on the bottom shelves but are uncertain as to what criteria retailers use to order brands from left to right. They found that, when choosing among unfamiliar wines, people tend to choose the brands located at the top or in the middle of vertical displays and the brands located in the center of horizontal displays.

We therefore expect that brands positioned near the center of the shelf will receive more attention than brands located either in the vertical or horizontal extremities of the display. Because of the vertical position inferences, we expect a positive direct effect on evaluation of a position on the top shelves. Hence, we expect that a middle vertical position helps attention and, through attention, evaluation but has a negative direct effect (relative to the top as baseline) on evaluation because people believe the best products are placed on the top shelves. Based on the literature, we make no specific prediction about the effects of being on the left or right of the shelf on attention or evaluation. Finally, because of the strong evidence for position-based inferences (especially regarding vertical position), we expect that the position of facings (unlike their number) has a direct effect on evaluation and that their effect on evaluation is not entirely mediated by attention

The price of the brand posted on the shelf is a combination of the brand's regular price and of temporary price reductions. Predicting the effect of shelf price on attention is difficult because all price information is potentially relevant. For evaluation, price should have a negative impact on choice but a positive impact on recall and consideration because it is a signal of quality.

Out-of-store factors: Main effects and interaction with in-store factors. Recent research on in-store decision making has shown that most of the variance can be accounted for by out-of-store factors rather than in-store factors, particularly by individual shopping traits and strategies (Bell, Corsten, and Knox 2009; Inman, Winer, and Ferraro 2009). In a large-scale

study, Bell, Corsten and Knox (2009) found higher levels of self-reported, unplanned category purchasing among consumers who were not focused on fast and efficient buying, supporting prior findings that consumers who enjoy shopping and browsing are more likely to make buying decisions in the store (Beatty and Ferrell 1998). They also found higher levels of unplanned category purchasing among higher-income and younger consumers, which is consistent with prior findings of higher unplanned buying among educated consumers (Wood 1998). These results lead us to expect that younger and more educated consumers, consumers who are not focused on fast and efficient buying, and consumers who are willing to trade off multiple purchase criteria (rather than follow a single price or brand-based rule), will show higher levels of attention and evaluation and will be more influenced by in-store marketing.

We now turn to out-of-store factors which vary across brands (market share) or across brands and consumers (past brand usage). Bemmaor and Mouchoux (1991) found that promotional end-of-aisle displays are more effective for low market-share brands than for high-market share brands. This is because, regardless of consumers' individual brand preferences, high market-share brands advertise more, are more accessible in memory and as a result, gain less from added in-store visual salience (Fazio, Powell, and Williams 1989; Nedungadi 1990). In fact, Pechmann and Stewart found that people spend more time looking at magazine ads for high market share brands than for low market share brands (Pechmann and Stewart 1990). We therefore expect that attention and evaluation will be higher for high market-share brands, and that in-store factors will have a stronger impact on low market-share brands. Once differences in brand awareness and accessibility are accounted for (through the market share measure), past brand usage is really an indicator of consumer preferences. We expect that preferences, like other top-down factors, will increase attention and, of course, evaluation. We also expect that past usage will increase the effects of in-store factors because consumers are unlikely to choose a brand that they have never used before, even if in-store marketing draws their

attention to this brand, because such brands are likely to have been "permanently" eliminated from consideration. New products are a possible exception because absence of past usage does not necessarily indicate rejection.

Finally, we expect that, unlike in-store factors which primarily influence attention, out-of-store factors influence evaluation and have only a marginal effect on attention. We therefore expect that most of the effects of out-of-store factors on evaluation are direct and are not mediated by attention. For the same reason, we expect to find stronger interactions between in-store and out-of-store factors for evaluation than for attention. We tested all of these hypotheses in an eye-tracking experiment in which we manipulated, for each brand in two categories, the in-store factors (shown in Figure 1) manipulated or measured the out-of-store factors, and measured participants' attention to and evaluation of all displayed brands.

EYE-TRACKING EXPERIMENT

Design and Stimuli

As shown in Figures 2 and 3, and described in detail in the Web Appendix, we created a fractional factorial design which allowed us to test the effects of the number and location of shelf facings independently of any brand-specific effects using 12 planograms.[2] To test for diminishing sensitivity, we used three levels for the number of a facings manipulation (4, 8, or 12 facings, corresponding to about 45, 90, and 135 square inches in the picture). We used four levels for the vertical position of the brands (first, second, third, and bottom shelf), and four levels for their horizontal position (far left, center left, center right, and far right shelf). In order to create between-subject variation in prices, the brand's shelf price was either the regular price at the time of the study or was discounted by about 23%. Additional analyses reported in the Web Appendix show that the fractional factorial design allows us to uniquely

[2] Planogram is the retailing term for a diagram that specifies, usually for a particular product category, the location and number of facings for each SKU (stock-keeping unit).

identify the main effects of in-store factors and their interaction with out-of-store factors, and show that these effects are not confounded with brands.

--- Insert Figures 2 and 3 about here ---

Participants randomly saw one of the 12 planograms for each of two categories (soap and pain relievers), and category presentation order was counterbalanced across participants. As reported in the Web appendix, category order only influenced average recall because of a recency effect, and is not discussed further. We also manipulated the shopping goal of the participants (between subjects) by either giving them a brand choice or a consideration task before they started looking at the displays. This manipulation allowed us to determine whether the measurement of consideration (online *vs*. retrospective) would create any biases. It also provided us with an opportunity to test the robustness of prior findings on the effects of in-store marketing when consumers are either focused on buying a single brand or are simply browsing. There were a total of 48 experimental cells (12 planograms by two shopping goals by two category order conditions).

The stimuli were shelf displays of bar soaps and pain relievers. We chose these categories because of their high penetration level and because the packages of all the brands in these categories use the same "brick" design. This minimizes the possibility that people may recognize the brands without eye fixation and increases the effectiveness of our manipulation of in-store factors. It also ensures that brand is not confounded with package shape or size. We selected the top 11 brands in each category based on their US market share and added a 12^{th} brand (intentionally) that was unknown to participants. For this, we used two European brands: Simple soap and Nurofen pain relievers, which were not available in the US. As shown in Figure 2, we used only the best-selling stock-keeping unit per brand (i.e., size and form) so that simple verbalized names would unambiguously identify the brands chosen and considered in our task.

The prices of the other brands were the average regular prices of these products in two major food store chains at the time of the experiment. The prices of the two new brands were determined during pre-tests to position them as regional or store brands. Prices in the sale condition were discounted by an average of 23% (consistent with practice) but were not marked in any special way (i.e., no "shelf talkers"). This was done to avoid confounding the effects of the price discount with the effects of in-store signage. As shown in Figure 3, and explained in details in the Web appendix, price was manipulated between subjects following a Latin-square design. In each planogram, and hence for each participant, half the brands were on sale and half were priced at their regular level. In order to increase the face validity of the stimuli, prices were rounded to the nearest nine-ending number.

Procedure

The data used in our analyses were collected in collaboration with Perception Research Services, Inc. (PRS) using the procedure and stimuli typically used in commercial tests of package designs. We recruited 384 adult shoppers (eight per experimental design cell) in shopping centers in eight US cities and offered them $10 for their participation. They were heads of household responsible for the majority of their household's grocery shopping. Their ages ranged from 24 to 69, they had at least a high-school education, and earned a minimum annual income of $25,000. Twenty participants were eliminated because of a technical problem, sixteen others were eliminated because they did not fill out the questionnaires completely, and four only provided eye-tracking data for one category, leaving a total of 8,304 observations (24 brands for 344 participants and 12 brands for four participants).

Each person was seated and told that he/she would see a series of products like those found in stores. Their eye movements were tracked using infrared corneal reflection, which does not require headgear. The eye-tracking equipment recorded the coordinate of the fovea with a frequency of 60 readings per second and, based on this information, identified when the eyes

were still (which identifies a fixation) and measured the duration of these fixations and the coordinates of the fovea during these fixations. It then mapped the coordinates of the fovea to the position of each area of interest on the picture (e.g., individual brands).

Participants first went through a calibration procedure requiring them to look twice at a blank picture with five circles projected on a 4 x 5 feet screen placed approximately 80 inches in front of them. After the calibration procedure was finished, the participants were told that they would look at two pictures of supermarket shelves. In the choice goal condition, the research assistant asked the participants: “Tell me the name of the one brand that you would buy.” In the consideration goal condition, she asked the participants: “Tell me the names of the brands that you would consider buying.” In both conditions, participants were told to press a button immediately after they had finished the task. Pressing this button blanked the screen and allowed us to record the total time spent making the decision.

Attention measures. The eye-tracking measures available for each participant and category are the total time spent looking at the picture and the position and duration of each eye fixation. Following the standard procedure in eye-tracking research, we eliminated fixations lasting less than the 50 milliseconds required for information acquisition in complex visual scenes perception (van Diepen, De Graef, and d'Ydewalle 1995). The position of the eye fixation enables us to know whether the participant fixated on the package or the price tag area of the brand. However, because the price tag area is very close to the bottom of the packages, it is difficult to attribute with confidence those eye fixations that land between the price and package areas to either one of them. We therefore aggregated fixations to the brand level (i.e., packages and price together) for the two attention variables: “noting” (whether the brand was fixated on at least once) and “reexamination” (whether the brand was fixated on at least twice). These two measures are typically used in commercial eye-tracking package tests as the primary measures of interest. Out of the 8,304 observations, only six indicated recall without

noting and only one suggested consideration without noting. This shows that peripheral vision is not an issue in our setting, and reinforces prior results that eye fixations are valid measure of visual attention (Wedel and Pieters 2008). Note also that these six anomalous results could also have been caused by error in the recording of recall and consideration. On the other hand, among the 6,013 cases of noting, 3,949 were not recalled. This already suggests that recall is an evaluation measure, not an attention measure.

Evaluation measures. In the consideration goal condition, a research assistant recorded the names of the brands *considered* as participants verbalized them during the eye-tracking task. After the screen was blanked, the research assistant asked participants: "If you had to choose only one brand, which one would it be?" In the choice goal condition, the research assistant recorded the name of the one brand *chosen* for purchase as participants verbalized it during the eye-tracking task. After the screen was blanked, the research assistant asked participants: "Now, please tell me the names of the other brands that you considered buying, if any, when I asked you to choose one." This procedure allowed us to measure brand consideration and brand choice in both shopping goal conditions. After providing the consideration and choice information for the first category, participants followed the same procedure for the second category. Participants were therefore in the same shopping goal condition for both products.

After the second eye-tracking task was completed, the research assistant measured recall of visual attention, first for the second category (which had just been seen), then for the first category, by asking: "Thinking of the [soap or pain relievers] that you just saw, please tell me the names of the brands that you remember seeing." She then asked the same question for the first product category. After the recall measure, participants went to a separate room where they provided information about their past brand usage for each of the 24 brands and were asked general questions about their individual characteristics. In total, each interview lasted about ten minutes.

RESULTS

Breadth and Depth of in-Store Attention and Evaluation

The descriptive statistics were essentially identical for soaps and pain relievers, so we provide average results for both categories. Participants spent less time in the choice goal condition (M = 15.5 seconds) than in the consideration goal condition (M = 19.2 seconds, $F(1, 347) = 7.3$, $p < .01$). This shows that the shopping goal manipulation successfully encouraged people to either focus on fast and efficient purchasing (choice goal condition) or to be more open-minded and browse the shelf without needing to make an immediate decision. Both purchase decision times are consistent with the measures recorded by in-store observation studies (Hoyer 1984; Leong 1993). The noting and reexamination probabilities (respectively, 72% and 51%) were similar to what is typical in commercial package tests and highly correlated (r = .63). Recall was significantly lower (31%), weakly correlated with attention, and strongly correlated with consideration (see Table 1). This shows that recall is biased toward preferred brands (see also Hutchinson, Raman, and Mantrala 1994) and provides additional evidence that it may not be a good proxy for visual attention (we return to this issue in the model results section).

--- Insert Table 1 here ---

Only 24% of the brands (2.8 out of 12) were included in the consideration set. Participants therefore considered only a third of the brands noted and just under half the brands reexamined. These consideration sets are slightly smaller than those obtained in the ASSESSOR studies, perhaps because we did not have multiple product variants per brand (Hauser and Wernerfelt 1990). As shown in Table 1, consideration was weakly correlated with noting and reexamination and strongly correlated with recall and choice. This shows that noting is not a direct proxy for brand consideration and that one needs to separately model attention and evaluation. In addition, the positive correlation between attention and evaluation

does not show whether in-store factors caused consideration or whether people looked at brands already in their long-term consideration sets.

Results for the two brands that no participant had seen before (Simple soap and Nurofen pain reliever) provide a simple empirical test of the effects of attention on evaluation. As expected, we found that recall, consideration, and choice increased with the number of in-store fixations on these brands. For example, brand choice increased from zero among people who never fixated these brands to 3.6% among people who fixated them more than ten times ($\chi^2(1) = 7.1$, $p < .01$). Because participants had never seen these brands before the study, we can safely maintain that in-store eye fixations caused these increases in recall, consideration, and choice and were not themselves caused by memory-based out-of-store factors such as prior usage.

Overall, these descriptive results show that in-store attention is limited and that higher attention can increase consideration and choice for new brands. However, the low number of observations and the low purchase scores for the two new brands prevent us from obtaining reliable results about which specific in-store marketing activity was most responsible for the in-store attention that led to the improved purchase probabilities. Even if we had more observations regarding these two brands, it would be important to study the effects of in-store factors for the other, established brands. In the next section, we examine this issue for all brands by estimating five categorical (logistic or multinomial) regressions, one for each dependent variable. As described in the Web Appendix, these regressions take into account the mixed (within and between-subject) nature of the data and deal with individual heterogeneity with a random intercept model. The direct and indirect effects of in-store and out-of-store factors will be examined later using path analysis.

Regression Analyses

To take into account the repeated-measures structure of the data, we estimated separate random-effects binary logistic regressions for noting, reexamination, recall, and consideration

with in-store and out-of-store independent variables and with random brand and individual intercepts. For the choice data, we estimated a conditional logistic regression (i.e., McFadden's multinomial logit) because participants were constrained to choose only one brand per category, whereas they could, of course, note, reexamine, recall, and consider multiple brands. The conditional logistic regression examines how differences across brands explain which of the 12 brands was chosen. As a result, it cannot estimate the effects of consumer-specific out-of-store factors that are constant across brands for a given respondent and category (shopping goal, shopper trait, demographics, and category order).

The variable names and definitions are provided in Table 2 and the model specification is provided in the Web Appendix. Because the effects were similar for soaps and pain relievers, we aggregated the data across both categories. Very few of the interactions between in-store position and out-of-store factors were significant and no significant increase in fit was obtained from including these interactions. Table 3, therefore, reports only the parameter estimates of the models that included the interactions of the out-of-store variables with the number of facings. To facilitate the interpretation of the effect sizes, Figure 4 shows the mean noting, reexamination, recall, consideration, and choice across the different levels of the key in-store and out-of-store variables. Unobserved brand and individual effects are discussed in the Web Appendix.

--- Insert Tables 2 and 3 and Figure 4 here ---

In-Store effects. Except for left *vs*. right position and price (which had no effect), all in-store factors had large effects on attention but these effects carried through weakly (and not uniformly) to evaluation. The number of facings had strong and positive effects on both noting and reexamination that were marginally diminishing (as indicated by significant quadratic effects). Going from four to eight facings increased the probability of noting the brand by 28% (from 60% to 76%) and the probability of reexamining it by 40% (from 38% to

53%) but adding another four facings only added an extra 7% to noting (from 76% to 82%) and an extra 19% to reexamination (from 53% to 63%). The effects of facings on the three evaluation measures were also positive and statistically significant but were linear and of a smaller magnitude. Going from four to twelve facings improved recall by 17% (from 28% to 33%), consideration by 18% (from 21% to 25%), and choice by 15% (from 7.7% to 8.8%).

The effects of shelf location were assessed using separate variables for horizontal and vertical positions (see Table 2). We coded the horizontal position on the shelf with two binary variables: LEFT indicated whether the brand was on the left or right side of the shelf and HCENTER indicated whether it was in the center or at the extreme ends of the shelf. In order to illustrate the combined effects of LEFT and HCENTER in an intuitive way, we report in Figure 4 the mean attention and evaluation for three areas of the shelf: left, center (which combines both center left and center right), and right. As Table 3 and Figure 4 show, being located on the right or left side of the shelf made no difference to either attention or evaluation. However, brands were more likely to be noted and reexamined when they were near the center of the shelf than when they were located at its extremities (M_{Center} = 80% *vs*. $M_{Extreme}$ = 65%), and the same pattern was evident for reexamination (M_{Center} = 59% *vs*. $M_{Extreme}$ = 43%), but not for recall. Importantly, this effect carried through to consideration (M_{Center} = 24.1% *vs*. $M_{Extreme}$ = 22.9%) and choice (M_{Center} = 9.0% *vs*. $M_{Extreme}$ = 7.7%), although it was only statistically significant for choice.

For vertical position, we used a similar coding as for horizontal position. In the regressions, TOP indicated whether the brand was on the top two or the bottom two shelves and VCENTER indicated whether it was on the middle two shelves (shelves 2 and 3) or on one of the two extreme shelves (shelves 1 or 4, see Figure 4). To show the combined effects of these two variables, Figure 4 reports the means for the top shelf, for the middle two shelves, and for the bottom shelf. Compared to positioning the brand on the bottom shelves, positioning it on

the top shelves had a positive influence on all the dependent variables, increasing noting (M_{Top} = 74% *vs*. M_{Bottom} = 70%), reexamination (M_{Top} = 54% *vs*. M_{Bottom} = 48%), recall (M_{Top} = 32% *vs*. M_{Bottom} = 30%), consideration (M_{Top} = 24.4% *vs*. M_{Bottom} = 22.6%), and choice (M_{Top} = 8.8% *vs*. M_{Bottom} = 7.9%, although this last difference was not statistically significant). In contrast, positioning the brand on one of the middle two shelves helped attention (for noting: M_{Middle} = 80% *vs*. $M_{Extreme}$ = 64%; for reexamination: M_{Middle} = 62% *vs*. $M_{Extreme}$ = 40%) but these gains did not extend to evaluation, which was actually slightly lower for the middle two shelves than for the extreme shelves (although these differences were not statistically significant).

The PRICE variable, the actual shelf price of the brand as seen by the participants (i.e., regular or discounted) was transformed to have zero mean and unit variance within each category (as shown in Table 2). Like HIGHMS (the market share variable), PRICE had no effect on attention but high-priced brands were more likely to be recalled and considered.[3]

Out-of-store effects and interactions. As expected, out-of-store factors primarily influenced evaluation, although some also had statistically significant effects on attention. Past usage increased noting ($M_{Regular\ user}$ = 76% *vs*. $M_{Non\ user}$ = 71%) and reexamination ($M_{Regular\ user}$ = 59% *vs*. $M_{Non\ user}$ = 48%) and both effects were statistically significant. Still, Figure 4 shows that these effects on attention are small and marginally diminishing, whereas the effects of past usage on evaluation are massive (for recall: $M_{Regular\ user}$ = 80% *vs*. $M_{Non\ user}$ = 15%, for consideration: $M_{Regular\ user}$ = 80% *vs*. $M_{Non\ user}$ = 6%, and for choice: $M_{Regular\ user}$ = 49% vs. $M_{Non\ user}$ = 1%).

[3] The same results were obtained using regular price (instead of final price) and a binary variable for promotion (which was never statistically significant). More detailed analyses of eye-fixations on the price tags themselves (*vs*. the packages) showed that this happened because the price discount manipulation did not draw attention to prices. This is consistent with the finding of previous research regarding the low level of price search and the need to advertise price reductions (Dickson and Sawyer 1990; Woodside and Waddle 1975), which we did not do here.

The expected interaction between usage and facings was supported by the data. Increasing the number of facings had a lower effect among non-users than among past users of the brand. For example, increasing the number of facings from four to twelve improved consideration by 26% (from 38% to 48%) among regular users but increased it by only 8% (from 6.2% to 6.7%) among non-users.

We also found the expected main and interaction effects of market share (captured by the HIGHMS variable) on evaluation but not on attention. Noting and reexamination were not statistically different between high and low market-share brands, and increasing facings improved attention equally, regardless of market share. For evaluation, however, high market-share brands were more likely to be recalled ($M_{High\ share}$ = 47% *vs*. $M_{Low\ share}$ = 14%), considered ($M_{High\ share}$ = 39% *vs*. $M_{Low\ share}$ = 9%) and chosen ($M_{High\ share}$ = 14% *vs*. $M_{Low\ share}$ = 2%). In addition, a higher number of facings increased consideration and choice more for low market-share brands than for high market-share brands. For example, increasing the number of facings from four to twelve increased choice by 60% (from 1.9% to 3%) for low market-share brands but increased choice by only 9% (from 13.4% to 14.7%) for high market-share brands.

We now turn to the consumer-specific variables. In general, these factors had a stronger impact on evaluation than on attention (note that these factors could not influence choice likelihood because all participants had to choose only one brand). As expected, participants in the consideration shopping goal condition paid attention to more brands and had larger consideration sets than participants who were asked to choose only one brand (but only the latter was statistically significant). The interactions of CSDGOAL with FACING were never statistically significant. Overall, we could not replicate prior results on the difference between "browsers" and "fast and efficient" shoppers. On the positive side, this shows that the key

results hold, regardless of whether consideration and choice were measured during or after the eye-tracking task.

To measure each individual's shopping trait, we asked them to rate their agreement with the item "When buying [soap or pain relievers], price is more important than brand" on a scale anchored with 1 = "completely disagree" and 7 = "completely agree"). Individuals who answered 1 or 2 were categorized as "brand shoppers," those who answered 6 or 7 were categorized as "price shoppers," and those who answered 3, 4, or 5 were categorized as "value shoppers" because their response indicated that they were willing to trade off brand and price. As expected, value shoppers noted, recalled and considered more brands (although only the latter was statistically significant) and their choices were more influenced by facings than the choices of either brand or price shoppers, who had the same attention and evaluation patterns.

Turning to demographics, we found that participants with a higher education paid attention to fewer brands but recalled more brands than participants with lower levels of education. Consistent with prior research on the effects of education and income on impulse buying, the number of facings influenced choice more among highly educated consumers. Finally, age had no impact on attention but older participants tended to consider fewer brands and were less responsive to changes in the number of facings, which is also consistent with the prior results on unplanned purchasing reviewed earlier.

Mediation Analyses

The separate analyses of noting, reexamination, recall, consideration, and choice enabled us to examine the effects of in-store and out-of-store factors on a detailed set of behaviors of important theoretical and practical interest. However, the separate analyses provided estimates of the *total effects* of each factor on, say, choice but did not allow us to estimate how much of this total effect was mediated by attention and how much was a direct effect on choice. Drawing on the results of Zhang, Wedel, and Pieters (2009) that the effects of feature

advertisements on sales are mediated by attention, it would be interesting to examine whether the effects of in-store effects on evaluation are also entirely mediated by attention, and may therefore be effective even if they have no direct effect on consideration or choice. Finally, the similarities between the patterns of responses of the two attention measures and between the three evaluation measures suggest that it may be useful to construct summary measures of attention and evaluation in order to provide single estimates of the effects of these factors on these two constructs. To address these questions, we estimate simultaneously all the causal relationships shown in Figure 1 using a structural equation model with observed variables (i.e., a path analysis).

Variables and Method. For the path analysis, we estimated the structural equation model shown in Figure 5 (including the brand dummies not shown in Figure 5). All the variables were observed except the two error terms z1 and z2. Instead of the five separate dependent variables, we used two causally related ordered dependent variables: attention and evaluation. To compute the summary measure of attention, we leveraged the nested nature of noting and reexamination (since all the brands reexamined were also noted) to compute a three-level ordered categorical variable, ATTENTION_{ij}, which indicates, for each brand *j* and person *i*, whether the brand was (a) never fixated, (b) fixated exactly once, or (c) whether it was fixated at least twice. We also used the nested nature of the consideration and choice data (since all the brands chosen were also considered) to construct a three-level ordered categorical variable, EVALUATION_{ij}, which indicates whether the brand was (a) neither chosen nor considered, (b) considered but not chosen, or (c) considered and chosen . We did not use recall data because it was not perfectly nested (i.e., 16% of considered brands were not recalled). However, the results are very similar if we incorporate recall data and compute a four-level ordered measure of evaluation by assuming that all the brands considered were also recalled.

To estimate the parameters of the path analysis, we used the Bayesian estimation procedure of AMOS 16.0 (Arbuckle 2007) and generated 18,000 samples using the MCMC algorithm. The Bayesian estimation allows us to study ordered-categorical data and hence to relax the assumption that all the levels of the ATTENTION and EVALUATION variables are equally spaced. It also allows us to obtain the 95% credible interval of the posterior distribution of direct, indirect, and total effects, which is problematic with other estimation procedures. Regression parameters were estimated for each single arrow and covariances were estimated for double arrows. There are no correlations between variables that were orthogonally manipulated (e.g., FACING and LEFT).

--- Insert Figures 5 and 5 about here ---

Path Analysis Results. Figure 6 shows three unstandardized regression coefficients for the key in-store and out-of-store variables: (1) the coefficient of the direct effect measures the impact of each factor on evaluation after controlling for the effects of attention, (2) the coefficient of the indirect effect measures the impact on evaluation that is mediated by attention, and (3) the coefficient of the total effect (i.e., the sum of the direct and indirect effects). Because the range of all the independent variables was normalized to 1, comparing the value of these coefficients gives us an indication of the size of their effects.

The path analysis shows that evaluation is primarily driven by out-of-store effects, so we discuss these effects first. As Figure 6 shows, indirect effects were small and often not statistically significant, showing that only a small fraction of the total effects of out-of-store factors on evaluation were mediated by attention. For example, although the indirect effects of high past usage and high market share were statistically significant, they both accounted for only 3% of the total effects of these factors on evaluation.

Among in-store variables, the role of attention as mediator is much greater than for out-of-store variables. This was especially true for the effect of facings, which was large and

completely mediated by its effect on attention. As in the regression analyses, positioning the brand on the left or right had no impact on either attention or evaluation. Interestingly, the direct and indirect effects of being on the top two shelves (*vs*. the bottom two shelves) were both positive and statistically significant, with the indirect effect accounting for 36% of the total effect. In contrast, and as predicted in the separate regression analyses, the positive indirect effects of a central, vertical, and horizontal position were offset by negative direct effects not mediated by attention; only partially for horizontal center (whose total effect on evaluation was still positive and statistically significant), but entirely in the case of vertical center (whose total effect was negative but not statistically significant). Thus, the key result from this analysis is that the number of facings has a clear causal impact on evaluation that is mediated by attention, but the effects of location are mixed and attention-mediated effects are apparently offset by direct effects.

GENERAL DISCUSSION

The objective of this research was to examine whether in-store shelf management works: (a) does it draw attention to the brand, (b) does it influence brand consideration and choice over and above the contribution of out-of-store factors, (c) do these effects depend on brand and consumer-specific out-of-store factors, and (d) how much are the observed effects on brand evaluation mediated by attention? To answer these questions, we manipulated the number of facings and the vertical and horizontal position of 12 brands of bar soap and pain relievers, while keeping total shelf space constant, and measured consumers' past usage, shopping traits and demographics.

Effects of the Number and Position of Shelf Facings

Our main result is that the number of shelf facings strongly influences visual attention and, through attention, brand evaluation. In the best brand scenario, for occasional users of a low market-share brand, doubling the number of facings improved noting by 26% (from 63% to

80%), reexamination by 33% (from 43% to 58%), consideration by 22% (from 24% to 29%), and choice by 67% (from 3% to 5%). For the average brand and consumer, doubling the number of facings increased noting by 28%, reexamination by 35%, and choice and consideration by 10%.

Our results stand, therefore, in sharp contrast with the conclusion of Drèze, Hoch, and Purk (1994, p. 324) that most brands would not benefit from additional facings over and above the current levels in actual markets. Rather, our results support the conclusions from earlier experimental studies which found an average 0.2 elasticity of brand sales to shelf space increases (Campo and Gijsbrechts 2005), and with the eye-tracking studies that found that display size is one of the most reliable drivers of attention (Wedel and Pieters 2008). Aside from the methodological differences (e.g., Drèze et al. (1994) examined larger categories and their quasi-experimental field study did not manipulate the number and position of facings independently of brand), the discrepancy with their results can be best explained by the fact that we studied brand consideration and choice given category purchase and did not examine purchase quantity. In contrast, Drèze et al. (1994) studied unit brand sales, which are influenced by brand choice but also by category incidence and purchase quantity. Empirical generalizations have shown that two thirds of the variance in unit brand sales comes from category incidence and purchase quantity decisions and that marketing actions have a lower impact on these two decisions than on brand choice (Van Heerde, Gupta, and Wittink 2004).

Our findings on the relative effectiveness of different shelf positions for brand evaluation are broadly consistent with those of prior studies. However, our mediation analyses reveal important differences between attention and evaluation that had not been anticipated in the literature, which has so far focused on inferential (*vs.* attentional) effects. We find that the position of facings strongly influences attention (similar to our results for number of facings), but that attention gains from shelf position do not always improve evaluation (unlike our

results for number of facings). This is because shelf position, especially on the vertical dimension, also directly influences evaluation (after controlling for attention), and in a way that can either strengthen (when the brand is on the top shelf) or weaken (when the brand is on the middle shelves) the positive impact of higher attention. For example, positioning the brand on the top shelf (*vs*. the bottom one) increased noting by 17% and choice by 20%, and 36% of the gains in terms of brand evaluation came from attention. In contrast, placing a brand near the horizontal center of a shelf (rather than on either of its ends) increased noting by 22% and choice by 17%, but all the evaluation gains came from attention because the direct effects on evaluation were actually negative. This shows that not all position-based improvement in attention is equal in its ability to improve evaluation. It also reinforces the findings of Raghubir and Valenzuela (2008) that the effects of vertical position (and particularly the positive inferences associated with a high location) are stronger than the effects of being on the left *vs*. the right side of a shelf.

Implications for Managers

The traditional justification for in-store marketing and attention studies is that "unseen is unsold". According to various studies, a majority of brand choice decisions are made inside the store, yet consumers only evaluate a fraction of the products available (Inman, Winer, and Ferraro 2009). In this context, one would expect that improved attention through in-store marketing activity would strongly influence consumer behavior at the point of purchase, and our results show that it does, but only to a certain extent. In addition, our results show that improving attention is not a sufficient condition, since not all in-store attention drives choice.

We found that out-of-store factors do influence visual attention but much less than in-store factors. This is consistent with the results of van der Lans, Pieters, and Wedel, (2008) on the primacy of bottom-up factors in guiding visual attention and search among brands in supermarket displays. On the other hand, out-of-store factors have a much stronger impact

than in-store factors on evaluation and only a small fraction of this impact is mediated by attention. Thus, the overall picture that emerges from our analyses is that in-store factors have powerful effects on attention that translate into small, but reliable effects on brand evaluation. These small effects build up over time and contribute to individual-specific out-of-store factors. This picture is consistent with the "trench warfare" metaphor often used for packaged goods sold in supermarkets. Large battles for attention are waged every day, but the battle lines of market share change very slowly.

Attention as brand equity. Among out-of-store factors, we found that past brand usage increases attention and not just consideration given attention or choice given consideration. The positive impact of past usage on attention is particularly valuable because, without attention, brand preference cannot affect consideration and choice. In addition, past brand usage improves the effectiveness of facings in driving consideration and choice. Importantly, our results suggest that brand usage does not just increase the expected utility of the brand. It also decreases search costs and increases the effectiveness of in-store marketing, which, in turn, interact with expected utility to drive consideration and choice in a multiplicative manner (i.e., positive double jeopardy; see Alba et al. 1991; Pechmann and Stewart 1990). This implies, for example, that a comprehensive measure of brand equity should use eye-tracking data to measure its attention-getting impact in addition to the typical measures of recall and preference given forced exposure.

We also found that, after controlling for individual differences in brand usage, low market-share brands were more responsive to facing increases than high market-share brands. This underscores the importance of distinguishing between liking and the overall higher brand accessibility of high market-share brands. Increasing the number of facings is therefore particularly useful for small-niche brands with a loyal customer base. Finally, we found that in-store marketing works particularly well for younger, more educated, "opportunistic"

consumers, not because of differences in attention (attention patterns and the influence of in-store marketing were similar across all consumers) but because these consumers were more willing to consider and choose brands that were brought to their attention because of in-store marketing (i.e., less stickiness).

Measures of point-of-purchase effectiveness. For managers interested in developing metrics of point-of-purchase behavior, our results show that these behaviors can be clearly categorized into two groups, depending on whether they are based on attention and measured by eye movements (noting and reexamination) or on higher-order evaluative processes and measured by verbal reports (recall of visual attention, consideration, and choice). Even though recall was nominally about attention, it should not be used as a proxy for visual attention. First, recall misses about two thirds of the brands that were actually fixated. Second, and more importantly, recall is biased to favor highly evaluated brands. This is consistent with research on brand recall tasks showing that a sufficient amount of elaboration is necessary for recall (Hutchinson, Raman, and Mantrala 1994; Lynch, Marmorstein, and Weigold 1988). Drawing inferences about visual attention from recall data would therefore lead to important errors. For example, shoppers with high education levels recalled more brand names but actually noted fewer brands on the shelves. We therefore validate the claims of Pieters and Wedel (2007; 2008) that marketers need to measure attention and not just evaluation, and that eye-tracking data are required to measure attention (but see also Burke et al. 1992; Pechmann and Stewart 1990 for alternative methods using computer simulated environments).

Implications for Future Research

The key issue for future research is to determine why some improvements in visual attention, such as those caused by a higher number of facings, reliably improve consideration and choice, whereas others, such as those gained by positioning the brand on one of the middle shelves, do not. One possible explanation is that some enhancements in visual attention are

driven by bottom-up visual characteristics, whereas others are goal-directed, and hence more likely to lead to consideration and choice. For example, a position in the center of the shelf may automatically improve noting and reexamination simply because of the limited visual angle of saccades (Rayner 1998). After having fixated a brand at one end of the shelf, consumers wishing to evaluate brands located at the other end of the shelf are likely to fixate brands located in the center while on their way to the other end. These "stepping-stone" fixations may mostly serve the "where" (orientation) component of attention rather than the "what" (identification) component of attention (Liechty, Pieters, and Wedel 2003). Supporting this speculation, we found that the mean and variance of the duration of eye fixations (gaze) were shorter for the 25% of fixations located nearest to the center the shelf than the 25% of fixations farther away from the center (M_{Center} = .249 ms *vs*. $M_{Extreme}$ = .270 ms, t = 3.0, p < .05; σ^2_{Center} = .09 *vs*. $\sigma^2_{Extreme}$ = .14, Levene statistic (1) = 3.9, p < .05). This is also consistent with prior results showing that gaze duration is shorter for less informative objects (Henderson and Hollingworth 1999).

Marketplace meta-cognitions provide another explanation for the dissociation between attention and evaluation. It may be that, as suggested by Buchanan, Simmons, and Bickart (1999), people homogeneously expect that a higher number of facings indicates an important brand. In contrast, there may be more heterogeneity in the inferences people make based on the shelf location of the brands. For example, Raghubir and Valenzuela (2008) found that people who were looking to buy premium brands tended to choose brands on the right-hand side of horizontal displays, whereas people looking to buy value brands preferred those in the center. In contrast, there is converging evidence from a variety of studies that a high vertical position is universally associated with positive evaluation and with power (Meier and Robinson 2004; Schubert 2005). One explanation of our results may therefore simply be that

the participants had a preference for premium soaps and pain relievers, and hence avoided those in the center of the shelf and favored those on the top shelf.

Our understanding of consumer decision making at the point of purchase would also benefit from better measurement of the dependent and independent variables. For example, it would be helpful to directly measure the effects of brand accessibility and liking and to examine how they interact with in-store factors. Another issue would be to examine whether there may be any additional mediators between attention and evaluation and whether some factors moderate the attention-to-evaluation path. More generally, it would be useful to study the extent to which attention, consideration, and choice may simply be indicators with different thresholds of the same latent construct, say the brand's utility, or whether they represent qualitatively different decisions. Our finding that attention is largely influenced by different factors than those that influence choice suggests that it may be a causal (formative) antecedent of choice and not simply another reflective indicator of the same construct. To address this issue, researchers would have to build an integrative model of attention, consideration, and choice that uses all the information collected here. Such a model would also show whether researchers need to measure attention and choice or whether they can infer these stages with the choice data alone, as is typically done in such multi-stage models.

TABLE 1

Correlation between Attention and Evaluation Measures

	Attention		Evaluation		
	Noting	Reexamination	Recall	Consideration	Choice
Noting	1.00				
Reexamination	.63	1.00			
Recall	.13	.14	1.00		
Consideration	.11	.13	.64	1.00	
Choice	.08	.10	.40	.54	1.00

TABLE 2

Variable Names and Definitions

	Attention variables
$NOTING_{ij}$	1 if participant *i* fixated on brand *j* at least once and 0 otherwise.
$REEXAM_{ij}$	1 if participant *i* fixated on brand *j* at least twice and 0 otherwise.
$ATTENTION_{ij}$	Ordered categorical variable which indicates, for each brand *j* and person *i*, whether the brand was (a) never fixated, (b) fixated exactly once, or (c) fixated at least twice.
	Evaluation variables
$RECALL_{ij}$	1 if participant *i* recalled having seen brand *j* and 0 otherwise.
$CONSID_{ij}$	1 if participant *i* considered buying brand *j* and 0 otherwise.
$CHOICE_{ij}$	1 if participant *i* stated a choice to buy brand *j* and 0 otherwise.
$EVALUATION_{ij}$	Ordered categorical variable which indicates, for each brand *j* and person *i*, whether the brand was (a) neither chosen nor considered, (b) considered but not chosen, or (c) considered and chosen.
	In-store factors
$FACING_{ij}$	-½ if for participant *i*, brand *j* had 4 facings, 0 for 8 facings, and ½ for 12 facings.
$FACINGSQ_{ij}$	⅔ if for participant *i*, brand *j* had 8 facings and -⅓ otherwise (= $FACING^2$).
$LEFT_{ij}$	½ if the brand was on the left-hand side of the shelf and -½ otherwise.
$HCENTER_{ij}$	If $FACING_{ij} \leq 0$: ½ if for participant *i*, brand *j* touched the center of the shelf and -½ otherwise. If $FACING_{ij} = ½$: 0 because brands with 12 facings occupy the whole left or right side of the shelf, making it impossible to determine horizontal position since the brand then touches both the center and extremity of the shelf. Note that this coding makes $HCENTER_{ij}$ and $FACING_{ij}$ orthogonal.
TOP_{ij}	½ if for participant *i*, brand *j* was on the top two shelves and -½ otherwise.
$VCENTER_{ij}$	½ if for participant *i*, brand *j* was on the middle two shelves and -½ otherwise.
$PRICE_{ij}$	The brand's shelf price in $, z-scored (mean = 0, variance = 1 for each category).
	Out-of-store factors
$MEDUSE_{ij}$	⅔ if participant *i* bought brand *j* occasionally in the past and -⅓ otherwise.
$HIGHUSE_{ij}$	⅔ if participant *i* bought brand *j* regularly in the past and -⅓ otherwise.
$HIGHMS_j$	½ if the market share of brand *j* is in the top half of the category and -½ otherwise.
$CSDGOAL_i$	½ if participant *i* was asked to name all the brands that she would *consider* buying and -½ if she was asked to name the one brand that she would buy.
$PRICESHOP_i$	⅔ if participant *i* rated her agreement with the item "When buying [soap or pain relievers], price is more important than brand" as a 6 or 7 (where 1 = "completely disagree" and 7 = "completely agree") and -⅓ otherwise.
$VALUSHOP_i$	⅔ if participant *i* rated her agreement with the item "When buying [soap or pain relievers], price is more important than brand" as 3, 4, or 5 and -⅓ otherwise.
$EDUC_i$	-½ if participant *i* has a high school degree or less, 0 if she has some college education, ½ if she has a college degree or more.
AGE_i	The mean-centered age of participant *i*, in decades (i.e., 3.8 = 38 years old).
	Control factors
$CATORDER_i$	1 if participant *i* viewed this *category* first and 2 if it was seen second.
$BRAND_{kj}$	The brand-specific intercepts, equal to 1/12 if $j = k$, -11/12 otherwise.

TABLE 3

Categorical Regression Results: Unstandardized Parameter Estimates and Standard Errors

		Attention				Evaluation					
		NOTING		REEXAM		RECALL		CONSID		CHOICE	
In-store factors	FACING	1.5**	(.12)	1.4**	(.10)	.50**	(.11)	.55**	(.12)	.41*	(.19)
	FACINGSQ	-.38**	(.07)	-.20**	(.06)	-.01	(.06)	.00	(.07)	-.07	(.10)
	LEFT	.07	(.06)	.09	(.06)	-.02	(.06)	-.05	(.07)	-.13	(.10)
	HCENTER	1.5**	(.08)	1.6**	(.07)	-.06	(.07)	.06	(.09)	.27*	(.13)
	TOP	.28**	(.06)	.33**	(.06)	.14*	(.06)	.15*	(.07)	.14	(.10)
	VCENTER	1.3**	(.07)	1.5**	(.06)	-.04	(.06)	-.11	(.07)	-.12	(.11)
	PRICE	.07	(.05)	-.02	(.05)	.11*	(.04)	.10*	(.05)	.01	(.07)
Out-of-store factors	MEDUSE	.25**	(.09)	.28**	(.08)	1.5**	(.07)	2.2**	(.09)	2.0**	(.18)
	HIGHUSE	.55**	(.12)	.77**	(.10)	3.0**	(.11)	4.1**	(.13)	4.5**	(.19)
	MEDUSE×FACING	-.12	(.20)	-.23	(.18)	.17	(.17)	.43*	(.20)	.54	(.42)
	HIGHUSE×FACING	-.09	(.27)	-.43	(.24)	.59*	(.24)	.67*	(.27)	.82*	(.40)
	HIGHMS	.09	(.19)	.32	(.17)	1.7**	(.15)	1.8**	(.24)	.31	(.53)
	HIGHMS×FACING	.14	(.17)	-.12	(.15)	.08	(.16)	-.52**	(.20)	-.79*	(.34)
	CSDGOAL	.10	(.13)	.15	(.13)	.12	(.08)	.27**	(.09)	---[c]	
	CSDGOAL×FACING	.10	(.16)	.21	(.14)	.25	(.15)	.03	(.18)	-.37	(.25)
	VALUSHOP	.22	(.14)	.12	(.14)	.11	(.08)	.33**	(.09)	---[c]	
	VALUSHOP×FACING	.11	(.17)	.09	(.15)	.04	(.16)	.03	(.19)	.54*	(.27)
	PRICESHOP	-.01	(.22)	-.07	(.21)	-.04	(.13)	.02	(.15)	---[c]	
	PRICESHOP×FACING	-.05	(.25)	-.37	(.23)	.06	(.25)	-.12	(.29)	.53	(.41)
	EDUC	-.55**	(.19)	-.29	(.18)	.36**	(.11)	.07	(.12)	---[c]	
	EDUC×FACING	.10	(.22)	-.03	(.20)	.07	(.21)	.09	(.25)	.82*	(.35)
	AGE	.03	(.06)	.02	(.05)	.00	(.03)	-.07*	(.04)	---[c]	
	AGE×FACING	-.01	(.01)	.00	(.01)	-.01	(.01)	-.01	(.01)	-.03*	(.01)
Control	CATORDER	-.01	(.13)	-.05	(.12)	.16*	(.08)	.04	(.09)	---[c]	
	Brand effects[a]	28		27		193**		164**		30**	
	Subject effects[b]	1000**		1185**		80**		58**		---[d]	

Notes: **: $p < .01$, *: $p < .05$; [a] Value of omnibus test (χ^2, 18) that all brand intercepts are zero;

[b] Value of likelihood ratio test (χ^2, 1) that within-subject effects are zero (i.e., $\rho = \tau^2/(\tau^2 + \sigma^2) = 0$);

[c] Factor removed from the choice model because constant for all the brands in the category.

[d] Not available in a conditional logistic regression (see Web Appendix).

FIGURE 1

Drivers of Attention and Evaluation at the Point of Purchase

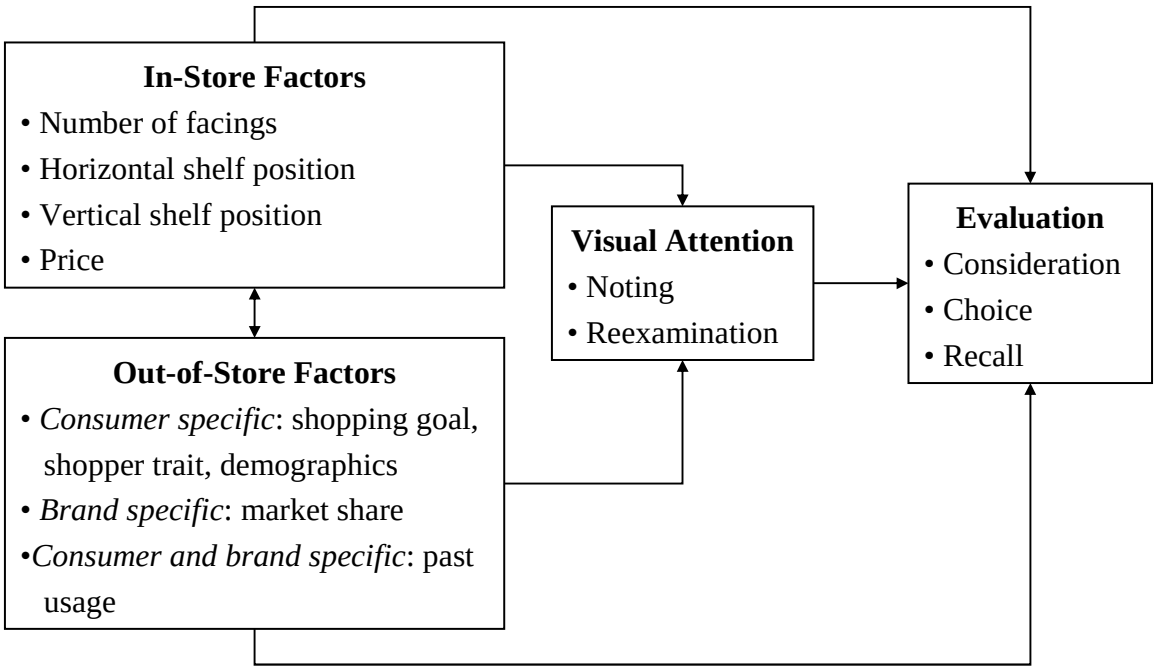


FIGURE 2

Planogram #1 for Soaps (top) and Planogram #11 for Pain Relievers (Bottom)

FIGURE 3

Planogram Design and Coding

		Far left	Center left	Center right	Far right	Far left	Center left	Center right	Far righ
Shelf 1	P_1	10*	11*	11*	6	6	6	P_7	4	5*	5*	12*	12*	12*
Shelf 2		12	12	12	4	5*	5*		6	6	6	10*	11	11
Shelf 3		9*	9*	9*	2	2	1*		2*	2*	1	9*	9*	9*
Shelf 4		8	8	7	3*	3*	3*		3	3	3	8	8	7*
Shelf 1	P_2	11*	11*	11*	3*	4	4	P_8	3	4*	4*	11	11	11
Shelf 2		9*	10	10	5	5	5		5	5	5	9	10*	10*
Shelf 3		7*	7*	6	2	2	2		1	1	12*	8*	8*	8*
Shelf 4		8*	8*	8*	1*	1*	12		2*	2*	2*	7	7	6*
Shelf 1	P_3	9	9	8*	4*	4*	4*	P_9	4*	4*	4*	8*	9	9
Shelf 2		10*	10*	10*	3	3	2*		3	3	2*	10	10	10
Shelf 3		5	6*	6*	1	1	1		12*	12*	11	7	7	7
Shelf 4		7	7	7	11	12*	12*		1*	1*	1*	5	6*	6*
Shelf 1	P_4	9	9	9	2	2	1*	P_{10}	3	3	3	8	8	7*
Shelf 2		8*	8*	7	3*	3*	3*		1	2*	2*	9*	9*	9*
Shelf 3		6*	6*	6*	10	11*	11*		12	12	12	4	5*	5*
Shelf 4		4*	5	5	12	12	12		11	11	10*	6*	6*	6*
Shelf 1	P_5	7	7	6*	2	2	2	P_{11}	12*	1*	1*	8*	8*	8*
Shelf 2		8*	8*	8*	1*	1*	12		2	2	2	7	7	6*
Shelf 3		5	5	5	9	10*	10*		11	11	11	4*	4*	3
Shelf 4		3*	4	4	11*	11*	11*		9	10	10	5*	5*	5*
Shelf 1	P_6	7*	7*	7*	12	12	11	P_{12}	12*	12*	11*	7*	7*	7*
Shelf 2		6	6	5*	1*	1*	1*		1	1	1	5	6	6
Shelf 3		2*	3*	3*	10	10	10		8	9	9	4	4	4
Shelf 4		4	4	4	8	9	9*		10*	10*	10*	3*	3*	2*

Notes:

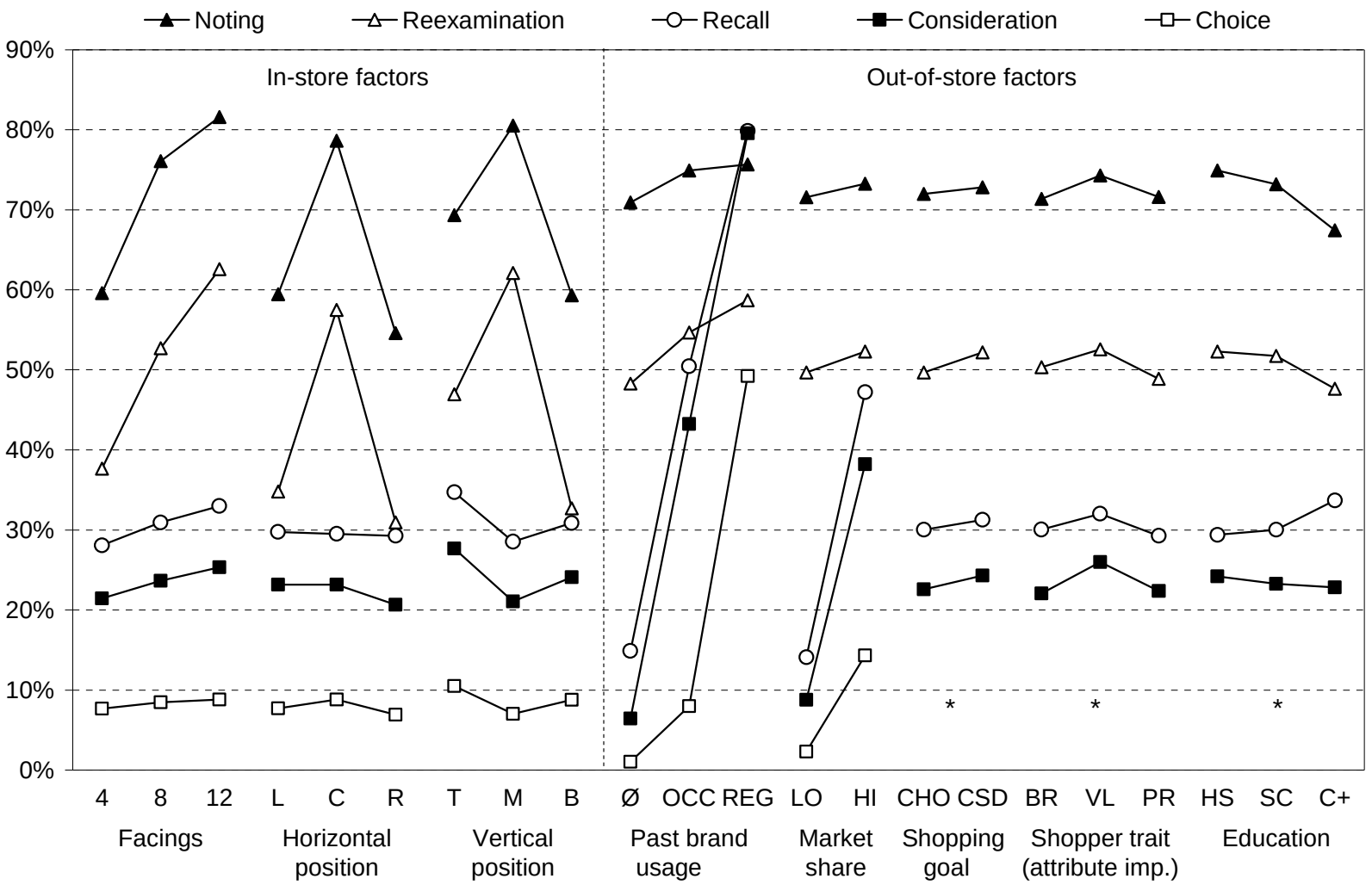
Each number represents a block of 4 facings.

- For soap, numbers 1 to 12 are: Dial, Ivory, Coast, Dove, Caress, Safeguard, Simple, Shield, Zest, Olay, Irish Spring, and Lever.
- For pain relievers, numbers 1 to 12 are: Nurofen, Bayer, Advil, Anacin, St. Joseph, Motrin, Tylenol, Aleve, Ecotrin, Wal-Proxen, Excedrin, and Bufferin.

* indicates that the price of the brand was discounted.

FIGURE 4

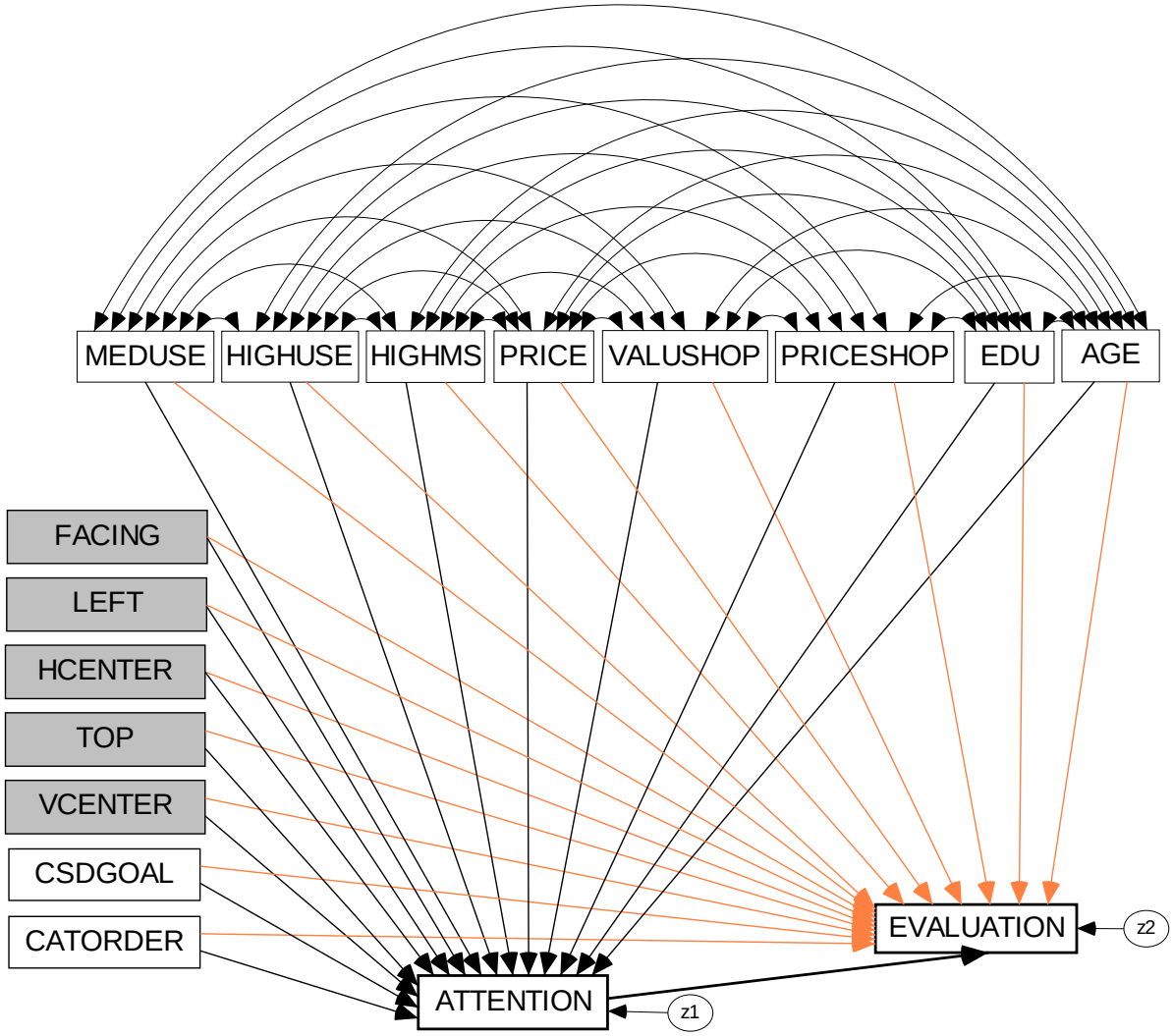
Mean Attention and Evaluation Levels across Experimental Conditions and Brand and Subject Groups



Note: By design, the mean choice probability is 1/12 for all levels of shopping goal, shopper type, and education, and is therefore not reported for these variables.

FIGURE 5

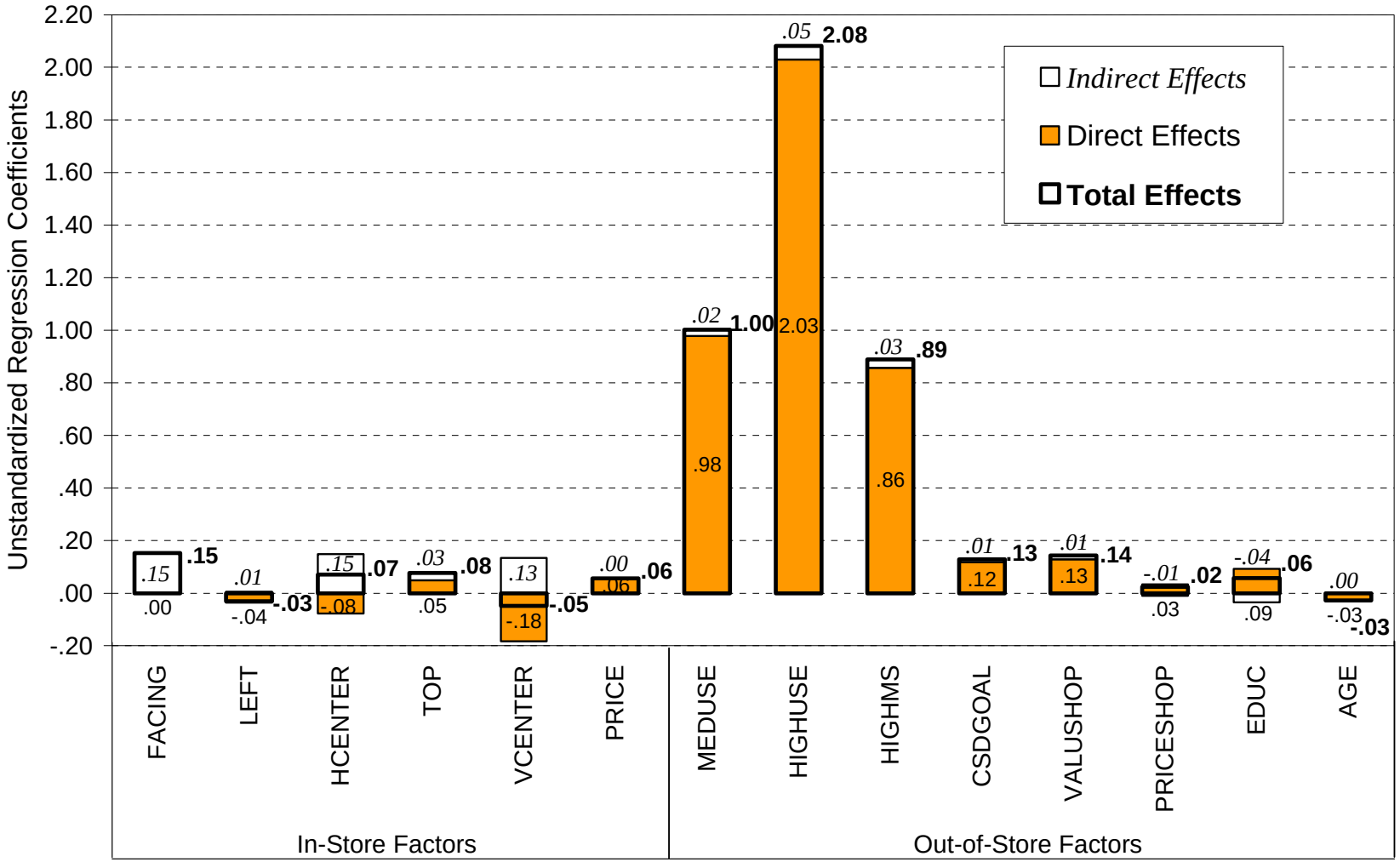
Path Analysis Model



Note: The path analysis model is shown here without the twenty brand intercepts, which are correlated with the measured variables in the top of the figure. Variables in the left column were experimentally manipulated. Variables in the top row were measured and are therefore correlated. Variables with dark background measure in-store effects. Light arrows represent direct effects on evaluation. Black arrows represent indirect effects through attention. Double arrows represent covariances.

FIGURE 6

Path Analysis Regression Parameters for In-store and Out-of-store Variables:
Direct Effects (Controlling for Attention), Indirect Effects (Mediated by Attention), and Total Effects on Evaluation



REFERENCES

Alba, Joseph W., J. Wesley Hutchinson, and John G. Lynch, Jr. (1991), "Memory and Decision Making," in *Handbook of Consumer Behavior*, Thomas S. Robertson and Harold H. Kassarjian, eds. Englewood Cliffs, New Jersey: Prentice-Hall, 1-49.

Arbuckle, James L. (2007), *Amos 16.0 Users' Guide*. Chicago, IL: SPSS, Inc.

Barlow, Todd and Michael S. Wogalter (1993), "Alcoholic Beverage Warnings in Magazine and Television Advertisements," *Journal of Consumer Research*, 20 (June), 147-56.

Beatty, Sharon E. and Elizabeth M. Ferrell (1998), "Impulse buying: Modeling its precursors," *Journal of Retailing*, 74 (2), 169-91.

Bell, David R. , Daniel Corsten, and George Knox (2009), "Unplanned Category Purchase Incidence: Who Does It, How Often, and Why," *Working Paper, Wharton School*.

Bemmaor, Albert C. and Dominique Mouchoux (1991), "Measuring the Short-Term Effect of In-Store Promotion and Retail Advertising on Brand Sales: A Factorial Experiment," *Journal of Marketing Research*, 28 (2), 202-14.

Buchanan, Lauranne, Carolyn J. Simmons, and Barbara A. Bickart (1999), "Brand Equity Dilution: Retailer Display and Context Brand Effects," *Journal of Marketing Research*, 36 (3), 345-55.

Burke, Raymond R., Bari A. Harlam, Barbara E. Kahn, and Leonard M. Lodish (1992), "Comparing Dynamic Consumer Choice in Real and Computer Simulated Environments," *Journal of Consumer Research*, 19 (June), 71-82.

Campo, Katia and Els Gijsbrechts (2005), "Retail assortment, shelf and stockout management: issues, interplay and future challenges," *Applied Stochastic Models in Business & Industry*, 21 (4/5), 383-92.

Chandon, Pierre, J. Wesley Hutchinson, Eric T. Bradlow, and Scott Young (2007), "Measuring the Value of Point-of-Purchase Marketing with Commercial Eye-Tracking Data," in *Visual Marketing: From Attention to Action*, Michel Wedel and Rik Pieters, eds. Mahwah, New Jersey: Lawrence Erlbaum Associates, 225-58.

Chevalier, Michel (1975), "Increase in Sales Due to In-Store Display," *Journal of Marketing Research*, 12 (4), 426-31.

Christenfeld, Nicholas (1995), "Choices from Identical Options," *Psychological Science*, 6 (1), 50-55.

Curhan, Ronald C. (1974), "The Effects of Merchandising and Temporary Promotional Activities on the Sales of Fresh Fruits and Vegetables in Supermarkets," *Journal of Marketing Research*, 11 (3), 286-94.

Egol, Matthew and Christopher Vollmer (2008), "Major Media in the Shopping Aisle," *Strategy+Business*, 53 (Winter), 68-79.

Fazio, Russell H., Martha C. Powell, and Carol J. Williams (1989), "The Role of Attitude Accessibility in the Attitude-to-Behavior Process," *Journal of Consumer Research*, 16 (3), 280.

Hauser, John H. and Birger Wernerfelt (1990), "An Evaluation Cost Model of Consideration Sets," *Journal of Consumer Research*, 16 (4), 393-408.

Henderson, John M. and Andrew Hollingworth (1999), "High-level Scene Perception," *Annual Review of Psychology*, 50, 243-71.

Hoyer, Wayne D. (1984), "An Examination of Consumer Decision Making for a Common Repeat Purchase Product," *Journal of Consumer Research*, 11 (December), 822-29.

Hutchinson, J. Wesley, Kalyan Raman, and Murali Mantrala (1994), "Finding Choice Alternatives in Memory: Probability Models of Brand Name Recall," *Journal of Marketing Research*, 31 (4), 441-61.

Inman, J. Jeffrey and Leigh McAlister (1993), "A Retailer Promotion Policy Model Considering Promotion Signal Sensitivity," *Marketing Science*, 12 (4), 339-56.

Inman, J. Jeffrey, Russell S. Winer, and Rosellina Ferraro (2009), "The Interplay between Category Characteristics, Customer Characteristics, and Customer Activities on In-Store Decision Making," *Journal of Marketing*, forthcoming.

Janiszewski, Chris (1998), "The Influence of Display Characteristics on Visual Exploratory Search Behavior," *Journal of Consumer Research*, 25 (3), 290-301.

Leong, Siew Meng (1993), "Consumer Decision Making for Common, Repeat-Purchase Products: A Dual Replication," *Journal of Consumer Psychology*, 2 (2), 193-208.

Liechty, John, Rik Pieters, and Michel Wedel (2003), "Global and Local Covert Visual Attention: Evidence from a Bayesian Hidden Markov Model," *Psychometrika*, 68 (4), 519-41.

Loftus, Elizabeth F., Hunter Hoffman, and Geoffrey R. Loftus (1999), "Eye Fixations and Memory for Emotional Events," *Journal of Experimental Psychology: Learning, Memory and Cognition*, 17 (4), 693-701.

Lohse, Gerald L. (1997), "Consumer Eye Movement Patterns on Yellow Pages Advertising," *Journal of Advertising*, 26 (1), 61-73.

Lynch, John G., Jr., Howard Marmorstein, and Michael F. Weigold (1988), "Choices from Sets Including Remembered Brands: Use of Recalled Attributes and Prior Overall Evaluations," *Journal of Consumer Research*, 15 (September), 169-83.

Meier, Brian P. and Michael D. Robinson (2004), "Why the Sunny Side Is Up Associations Between Affect and Vertical Position," *Psychological Science*, 15 (4), 243-47.

Nedungadi, Prakash (1990), "Recall and Consumer Consideration Sets: Influencing Choice without Altering Brand Evaluations," *Journal of Consumer Research*, 17 (3), 263-76.

Pechmann, Cornelia and David W. Stewart (1990), "The Effects of Comparative Advertising on Attention, Memory, and Purchase Intentions," *Journal of Consumer Research*, 17 (2), 180-91.

Pieters, Rik and Luk Warlop (1999), "Visual Attention during Brand Choice: The Impact of Time Pressure and Task Motivation," *International Journal of Research in Marketing*, 16 (1), 1-16.

Pieters, Rik, Luk Warlop, and Michel Wedel (2002), "Breaking Through the Clutter: Benefits of Advertisement Originality and Familiarity for Brand Attention and Memory," *Management Science*, 48 (6), 765-81.

Pieters, Rik and Michel Wedel (2007), "Informativeness of Eye Movements for Visual Marketing: Six Cornerstones," in *Visual Marketing: From Attention to Action*, Michel Wedel and Rik Pieters, eds.: Lawrence Erlbaum, 43-72.

Raghubir, Priya and Ana Valenzuela (2006), "Center-of-inattention: Position biases in decision-making," *Organizational Behavior and Human Decision Processes*, 99 (1), 66-80.

---- (2008), "Center of Orientation: Effect of Vertical and Horizontal Shelf Space Product Position," *Working Paper, Baruch College, CUNY*.

Rayner, Keith (1998), "Eye Movement in Reading and Information Processing: 20 years of Research," *Psychological Bulletin*, 124 (3), 372-422.

Russo, J. Edward and France Leclerc (1994), "An Eye-Fixation Analysis of Choice Processes for Consumer Nondurables," *Journal of Consumer Research*, 21 (September), 274-90.

Schubert, Thomas W. (2005), "Your Highness: Vertical Positions as Perceptual Symbols of Power," *Journal of Personality & Social Psychology*, 89 (1), 1-21.

Shaw, Jerry I., Jon E. Bergen, Chad A. Brown, and Maureen E. Gallagher (2000), "Centrality Preferences in Choices among Similar Options," *Journal of General Psychology*, 127 (2), 157-64.

Van der Lans, Ralf, Rik Pieters, and Michel Wedel (2008), "Competitive Brand Salience," *Marketing Science*, 27 (5), 922-31.

van Diepen, Paul M. J., P. De Graef, and G. d'Ydewalle (1995), "Chronometry of Foveal Information Extraction During Scene Perception," in *Eye movement research: Mechanisms, processes and applications*, J. M. Findlay and R. Walker and R. W. Kentridge, eds. Amsterdam: Elsevier, 349-62.

Van Heerde, Harald J., Sachin Gupta, and Dick R. Wittink (2004), "Is 75% of the Sales Promotion Bump Due to Brand Switching? No, Only 33% Is," *Journal of Marketing Research*, 40 (4), 481-91.

Wedel, Michel and Rik Pieters (2008), "A Review of Eye-Tracking Research in Marketing," *Review of Marketing Research*, 4, 123-47.

Wilkinson, J.B., J. Barry Mason, and Christie H. Paksoy (1982), "Assessing the Impact of Short-Term Supermarket Strategy Variables," *Journal of Marketing Research*, 19 (1), 72-86.

Wood, Michael (1998), "Socio-economic Status, Delay of Gratification, and Impulse Buying," *Journal of Economic Psychology*, 19 (3), 295-320.

Zhang, Jie, Michel Wedel, and Rik Pieters (2009), "Sales Effects of Attention to Feature Advertisements: A Bayesian Mediation Analysis," *Journal of Marketing Research*, forthcoming.

Europe Campus
Boulevard de Constance,
77305 Fontainebleau Cedex, France
Tel: +33 (0)1 6072 40 00
Fax: +33 (0)1 60 74 00/01

Asia Campus
1 Ayer Rajah Avenue, Singapore 138676
Tel: +65 67 99 53 88
Fax: +65 67 99 53 99

www.insead.edu

INSEAD

The Business School
for the World