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Does In-Store Marketing Work? Effects of the Number and Position of Shelf Facings on 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 attention and works particularly well for regular brand users, for new and low market-share brands, and for consumers whose shopping goal is buying, not browsing. They also find that that merely gaining in-store attention is not always sufficient to drive sales. Some shelf positions, for example, improve attention but these effects do not always carry through to evaluation. This ability to separate effective and ineffective sources of incremental attention underscores 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 layout and management tools (Liljenwall 1994; Parekh 2005). We already have strong evidence that end-of-aisle displays and large increases in shelf space have strong effects on brand sales (Bemmaor and Mouchoux 1991; Curhan 1974; Inman, McAlister, and Hoyer 1990; Wilkinson, Mason, and Paksoy 1982; Woodside and Waddle 1975). The evidence about the effects of less conspicuous in-store marketing changes that keep total category shelf space constant is less conclusive. Some studies showed that the position of a brand in a vertical or horizontal retail display influences quality expectations and hence choice (Christenfeld 1995; Raghubir and Valenzuela 2008). However, these results have only been established for unfamiliar brands or for choices among identical options. Indeed, the results of the field experiments conducted by Drèze, Hoch, and Purk (1994) led them to conclude that the benefits from additional facings are non existent and that shelf position only has a limited influence on sales.

More importantly, prior research has not examined the effects of in-store marketing on visual attention and brand consideration (pre-cursors of choice) and has not compared its effects with those of out-of-store factors such as past brand usage, shopping goals, or the market share and price of the brand. We argue here that it is important to examine multiple measures of attention and evaluation because the point of purchase is increasingly used as an advertising medium aimed at building brand awareness and image over the long term and not just as a distribution channel (Mitchell 2002). In this context, it is particularly important to measure the ability of in-store marketing to increase attention and consideration, and not just brand choice, in order to better understand the decision making process of consumers.

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—e.g. the number and position of shelf facings—and out-of-store factors—past brand usage, the regular price of the brand, its market share, and the shopping goal of the consumer—on attention and evaluation. We then test the predictions derived from this framework in an eye-tracking experiment in which we manipulate or measure all of these factors for established as well as for new brands with no out-of-store history in the US in two standard product categories (soaps and pain-relievers). We then estimate the effects of these factors on visual attention, visual re-examination, recall of visual attention, consideration, and choice. Finally, we use a path analysis to decompose the total effects on evaluation into the direct effects (after controlling for attention) and the indirect effects (mediated by attention).

These findings provide insights into four of the five issues identified as important areas for future eye-tracking research in Wedel and Pieters's (2008) review: 1) studying the interplay between bottom-up salience and top-down expectations in guiding attention, 2) examining eye movements to 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.

These findings also have methodological implications. In particular, our results that not all types of attention improvements lead to choice and that recall of visual attention is not a good proxy for visual attention underscore the importance of combining eye-tracking and purchase decision data to obtain a full picture of the effects of in-store and out-of-store marketing at the point of purchase.

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 for consumers with a choice rather than with a consideration goal. In contrast, the effects of shelf position are mixed. For example, positioning brands near the center of a shelf (vs. on its extreme ends) improves both attention and evaluation but positioning them on the middle shelves (vs. top and bottom) helps attention but not evaluation and positioning them the left or right-hand side of the shelf makes no difference on either attention or evaluation.

THEORETICAL BACKGROUND

Sales Effects of Shelf Space and Position

Starting in the seventies, a number of field experiments found that doubling the amount of shelf space increases unit sales between 28% and 45% on average for a wide variety of grocery products, even when the price and location of the products remained unchanged (Curhan 1974; Wilkinson, Mason, and Paksoy 1982). More recent field experiments found that end-of-aisle displays can increase sales even when prices are not discounted (Inman, McAlister, and Hoyer 1990) and that end-of-aisle displays accompanied by a 5 to 15% price reduction work better for high market share brands than for low market share brands (Bemmaor and Mouchoux 1991).

A few store experiments have also examined the effects on individual brand sales of less conspicuous shelf management changes that keep the *total space* allocated to the category constant. The most comprehensive study was conducted by Drèze, Hoch, and Purk (1994), who examined the effects of a variety of planogram changes in multiple categories. Some changes involved increasing the shelf space allocated to high-selling items by deleting 10% of the less-popular SKUs, while others involved reorganizing shelf layouts to facilitate cross-

category merchandising or to hinder price comparisons. They found that the returns on increasing the number of facings increased rapidly between 3 and 15 square inches and leveled off to their full potential above that number. Because most brands in the categories that they studied were already near that level, they concluded that there was virtually no additional sales potential of increasing the number of facings beyond their current level. They also found weak effects of horizontal position on the shelf, which did not hold across all the categories. In contrast, they found strong effects for vertical position, the best level being near the eye or hand levels (i.e., near the top of the shelves) and the worst level being the lowest shelf.

A related stream of research has examined the effects of the position of products in horizontal or vertical arrays, mostly in laboratory settings. Christenfeld (1995) found that when multiple packages of identical products are available side-by-side on a supermarket shelf, people disproportionately choose the package in the center of the array. Shaw et al. (2000) replicated these results and argued that they occur because the center position receives more attention than the extreme ones (although this claim is based on recall data and not on direct measures of attention). Raghubir and Valenzuela (2006) found that consumers believe that people or products in the middle of an array are the most important or popular, sometimes relying on this inference (vs. direct observation) to evaluate people's performance in television shows. The same authors (Raghubir and Valenzuela 2008) found that consumers have strong beliefs that retailers place expensive high-quality brands on the top shelves and place cheaper brands on lower shelves but are not sure as to what criteria retailers use to order brands left to right. They then conducted three laboratory studies in which they asked people to choose between unfamiliar wines displayed either horizontally or vertically. They found that people tended to choose the brands located in the center of horizontal displays and either

in the top or in the center of vertical displays, depending on whether they were looking for a premium or for a popular brand, respectively.

Overall, store experiments have showed that large in-store activity significantly increases sales but are less conclusive about the effects of smaller interventions that keep the total space allocated to the category constant. Laboratory studies have also shown that the position of a brand in a vertical or horizontal retailer display matters because it influences consumers' quality expectations. Both streams of studies have important limitations, however. First, because they did not measure visual attention or consideration, they cannot determine whether the effects of in-store marketing on choice are caused by enhanced attention, by enhanced consideration, or by other factors that may specifically influence choice, such as position-based inferences. Second, because these store experiments did not manipulate in-store marketing decisions for all the brands of the category, the effects of in-store marketing were confounded with the specific characteristics of the brands which received added (or lower) in-store support. Finally, because they did not manipulate or measure consumer and brand-specific characteristics, neither the store nor the laboratory studies compared the effects of in-store marketing for new vs. established brands or for regular vs. infrequent buyers. In this research, we fill some of these gaps.

Eye Movements in Scene Perception

Henderson & Hollingworth (1999, p. 244) define a scene as a semantically coherent and often nameable view of a real-world environment comprising background elements and multiple discrete objects arranged in a realistic manner. Hence, a supermarket display is a scene. 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 like smooth and conscious eye movements actually consist of 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, a part of the eye with superior visual acuity. Within the fovea, which corresponds to the central 2º of the viewed scene (roughly twice the width of one's thumb at arms length), objects can be easily recognized but visual acuity then rapidly deteriorates. At a distance of 5° for example, visual acuity is reduced by 50%. Taken together, these two facts explain why the position of an eye fixation is a good indicator of attention to scenes.

Second, although a fixation is usually necessary for object identification, the gist of the information about a scene can be extracted from the initial fixation. For example, 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. This is possible because gist extraction takes places pre-attentively and peripherally in parallel across the whole retina, and not just in the fovea (Henderson and Hollingworth 1999). In addition, this stage acknowledges the presence of basic perceptual features, such as the color, size, edges, and orientation of objects. The initial fixation placement in a scene is therefore based on a combination of prior ("out-of-store") knowledge of the scene category and of the ("in-store") low-level visual characteristics of the objects in the scene. Once an object has been fixated on and identified, the number of subsequent fixations on that object depends on its informativeness for the task at hand (e.g., for consideration, the informativeness of a brand might be its expected utility).

Third, 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, it

is unclear whether people are aware of whether or not they have fixated on an object. Pieters and Wedel (2007) argue that they are not always aware because only sometimes is one experiencing smooth uninterrupted vision. However, their argument has not been tested empirically.

Applications of Eye Tracking in Marketing

The vast majority of applications of eye-tracking research in marketing have been done in an advertising context (for a review, see Wedel and Pieters 2008) although some studies have examined visual attention to supermarket shelves and other brand displays. Russo and Leclerc (1994) used sequences of consecutive eye fixations to identify three different stages in in-store decision making: orientation, evaluation, and verification. Two studies (Janiszewski 1998; Lohse 1997) studied eye movements on catalogue pages and found strong effects for increasing the size of the brand display area. 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. Using a decision-path probabilistic model and combining eye tracking and brand consideration data in two categories, 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 consideration increases with the number of eye fixations and that brands located near the center of the display are fixated on more often. Finally, van der Lans, Pieters, and Wedel (2008) tracked the eye movements of consumers asked to find one brand in a retail display consisting of six brands of laundry detergent. They found that both top-down factors (being the target of the search task) and bottom-up factors (package brightness and color) influenced search times, and estimated that the bottom-up factors account for approximately two-thirds of the visual salience of a brand.

Overall, eye-tracking research provides us with a good understanding of how people visually process commercial scenes and demonstrates the value of collecting eye-tracking data to measure the effectiveness of visual marketing stimuli. However, previous eye-tracking studies of attention to supermarket displays did not examine the effects of the number and position of facings on both attention and evaluation, did not use multiple measures of these constructs, and did not use experimental designs capable of disentangling these effects from out-of-store brand-specific 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. Also, the prior studies did not examine whether recall of brand attention is a good proxy for attention, and hence a substitute for eye-tracking data. Finally, with two exceptions (Chandon et al. 2007; van der Lans, Pieters, and Wedel 2008), these studies looked at relatively simple, unrealistic displays with few brands with only one facing per brand. For this reason, it remains to be seen whether their results on how people look at retail displays hold across more realistic and complex shelf layouts.

Framework and Hypotheses

In the framework shown in Figure 1, we summarize a set of in-store and out-of-store factors that can influence in-store attention and evaluation. Among measures of attention, we distinguish between noting (first look) and re-examination (second look). Among measures of evaluation, we distinguish between choice and consideration. We also examined consumers' recall of their visual attention, because it is often used to infer attention (e.g., Barlow and Wogalter 1993; Raghubir and Valenzuela 2006; Shaw et al. 2000). Somewhat surprisingly, our results reveal that recall of attention is so strongly related to consideration and choice that it is best thought of as a measure of evaluation. Thus, recall of attention to brands is essentially the same as brand awareness (Hutchinson, Raman, and Mantrala 1994). Figure 1

incorporates multiple measures of attention and evaluation because each is of interest to marketers now that the point of purchase has become a communication medium. Another reason for looking at attention, recall, and consideration, rather than just at choice, is that these measures are likely to be more sensitive to in-store activity than choice, and thus are better able to provide reliable estimate of these effects.

--- Insert Figure 1 here ---

In-store factors. 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 (i.e., without requiring additional end-of-aisle displays). They include the number of facings of the brand, its vertical position on the shelf, and its horizontal position on the shelf. Because of position-based inferences (Raghubir and Valenzuela 2008), we expect that in-store factors do not necessarily influence attention and evaluation similarly. We also expect that in-store factors have a stronger impact on attention than on evaluation and thus that most of their effects on consideration and choice are mediated by their impact on attention.

Turning to the specific effects of the three in-store factors, we expect positive but marginally diminishing effects on attention from increasing the number of facings. 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. Second, we expect that brands positioned near the center of the shelf receive more attention than brands located either in the vertical or horizontal extremities the shelf. This is because the first fixation tends 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. Because of the vertical position inferences reviewed earlier, we expect a positive direct

effect on evaluation of a position in the top shelves. Hence, a middle vertical position helps attention and, through attention, evaluation but has a negative direct effect on evaluation because people believe the best products are placed on the top shelves. Because inferences based on horizontal position are weaker, we expect that all of the effects of horizontal position on evaluation to be mediated by their effects on attention. We expect in-store price discounts to have a direct positive effect on consideration and choice; however, it is hard to predict what effect it should have on attention, if any, because all price information is potentially relevant.

Out-of-store factors. Out-of-store factors are factors that cannot influence consumers without memory activation. As shown in Figure 1, these factors are brand and individual-specific and include past brand usage, the regular (reference) price of the brand, its market share, and the shopping goal of the consumer (e.g., buying or just browsing). Consistent with prior research which views these factors as determinant of a brand's utility, we expect that out-of-store factors influence evaluation more than attention, and hence that the mediating effect of attention to account for only a small fraction of the total effects of these factors on evaluation.

Drawing on the findings reviewed earlier, we expect that past usage increases both attention and evaluation, although we expect the effects to be stronger on evaluation than on attention. We also expect that facings have the same attention-getting impact for regular and non-users but influence consideration and choice more strongly for regular users than for non-users. Simply put, a high number of facings is unlikely to make people want to buy a brand that they have always rejected in the past. The same studies also predict higher attention and evaluation for high-market share brands because of their superior brand name recognition and image. For the same reason, we expect that brands with a high regular price are more likely to be looked at, but that a high price reduces purchase-related behaviors.

Interactions. Drawing on the findings of Bemmaor and Mouchoux (1991) that promotional end-of-aisle displays work better for low-market share brands and those of Nedungadi (1990) that priming helps brands that are not typically recalled, we expect that facings help low-equity brands more than high-equity brands. Finally, we expect that facings have a stronger impact on the evaluation of consumers with a choice goal, who may not have noticed or considered the brand otherwise, than among participants with a consideration goal, who are already looking and considering all the brands that are acceptable to them for purchase.

EYE-TRACKING EXPERIMENT

Design and Stimuli

We conducted an eye-tracking experiment in which we manipulated, for each brand of two categories, the three 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. A fractional factorial design with two within-subject category replications (soap bars and pain reliever tablets) was used. We manipulated the number of a facings of each brand (4, 8, or 12), its vertical position (first, second, third, or bottom shelf), its horizontal position (far left, center left, center right, or far right shelf), and its shelf price (regular vs. discounted, and regular price varied across brands). We also manipulated the shopping goal of the participants by giving them different tasks while looking at the display (brand consideration or brand choice). Finally, we counterbalanced the order in which participants saw the two product categories. To reduce confusion when verbalizing brand names and to avoid creating sub-groups, we used only one stock-keeping unit per brand (i.e., no product or size variants).

In order to measure the effects of in-store factors independently from the brand-specific effects, we created 12 different planograms according to a fractional factorial design. Figure 2 shows one of the planograms in each product category and Figure 3 shows a schematic of the

12 planograms. As Figures 2 and 3 show, across planogram each brand appeared equally often with 4, 8, or 12 facings, on the top two or bottom two shelves, on the left or right of center, and with a regular or discount price.

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

We chose soaps and pain relievers because of the high level of household penetration of these two categories 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. To allow us to test for the causal effects of in-store factors, we inserted in each category the packages of a brand that is not currently sold in the United States: "Simple" for soaps and "Nurofen" for pain relievers. The price of these two brands was determined during pre-tests to position them as regional or store brands. 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 average price was $2.04 for soaps and $4.93 for pain relievers. 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 talker). This was done to avoid confounding the effects of the price discount with the effects of its advertising. 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 348 adult shoppers in shopping centers in eight US cities and offered $10 for their participation. They were female 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 household income of $25,000. We note that these respondents included a mix of full-time working people, part-time working people and full-time homemakers.

Each person was seated and told that 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 duration of each eye fixation and the coordinates of the fovea during the fixation with a frequency of 60 readings per second. It then mapped the coordinates of the fovea to the position of each area of interest on the picture (e.g., individual brands on a supermarket shelf picture).

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 located approximately 80 inches away from the seat. After the calibration procedure was finished, we instructed the participants that they would look at two pictures of supermarket shelves. In the choice goal condition, the research assistant asked the participants to tell her "the name of the one brand that you would buy." In the consideration goal condition, she asked the participants to tell her "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 making their choice. 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 pack, 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., pack and price together) for the two attention variables: "noting" (whether the brand was fixated on at least once) and "re-examination" (whether the brand was fixated on at least twice). Because four participants provided eye-tracking data for only one category, we have a total of 8,304 observations (24 brands for 344 participants and 12 brands for 4 participants).

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, a 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 goals conditions. After providing the consideration and choice information for the first category, participants followed the same procedure for the second category (i.e., the shopping goal was not manipulated within participants). Participants provided the same information (choice or consideration) as for the first category, while their eyes were being tracked. When the second category was blanked, they provided the missing information (consideration or choice), just as they had done for the first category.

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; 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. As noted earlier, despite the fact that the instructions ask about "seeing" and that this type of measures has been used as a measure of attention, our results (discussed subsequently) clearly show that this measure is much more related to consideration and choice than to noting and re-examination. 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 general questions about their shopping behavior. In total, each interview lasted about 10 minutes.

RESULTS

Breadth and Depth of in-Store Attention and Evaluation

Consumers spent a similar amount of time making their purchase decisions in both categories (M = 17.1 seconds for soaps and M = 17.7 seconds for pain relievers, t = .67, p = .49). The shopping goal manipulation was successful and did not interact with the time spent viewing the category ($F(1, 342) = .3$, $p = .62$): In both categories, consumers spent more time in the consideration goal condition (M = 19.2 seconds) than in the choice goal condition (M = 15.5 seconds, $F(1, 347) = 7.3$, $p < .01$). The amount of time spent making the purchase decisions was slightly higher than what is recorded by in-store observations studies of Hoyer (1984) and Leong (1993), respectively 13.2 seconds and 12.2 seconds).

On average, 72% of the brands were noted (the median was 9 brands out of 12) and 51% were re-examined (median = 6 brands). The noting and re-examination frequencies were almost identical in the two categories ($\chi^2(1) < .1$, $p = .98$ for noting and $\chi^2(1) = 1.2$, $p = .28$ for re-examination), and were similar to what is typical in commercial package tests. The correlation between noting and re-examination was .63 and was also very similar in both categories ($z = 1.1$, $p = .28$). There was only a limited association between the eye-tracking and the memory-based measures of visual attention. Participant's recall strongly

underestimates noting, as only 31% of the brands (median = 4 brands) were recalled as being seen, and there was again no differences across categories ($\chi^2(1) < .1$, $p = .91$). Participants therefore forgot 58% of the brands that they had fixated on at least once and 40% of the brands that they had re-examined. The correlation between recall and noting was only .13. Although these results already suggest that recall may not be a good proxy for visual attention, we examine this issue more thoroughly in the modeling section where we document the dissociation in the response of these measures to in-store and out-of-store factors. Also, the correlation between recall and consideration and choice were relatively high (.64 and .40, respectively), revealing that recall is biased toward preferred brands (see also Hutchinson, Raman, and Mantrala 1994).

Only 24% of the brands were included in the consideration set, a proportion that was similar across categories ($\chi^2(1) = 1.30$, $p = .26$). The mean and median number of brands in the consideration set was 2.8 and 3, respectively. Participants therefore considered only a third of the brands noted and a little less than half the brands re-examined, and consideration was weakly correlated with noting and re-examination (.11 and .13, respectively). This shows that noting is not a direct proxy for brand consideration and that one needs to separately model attention and evaluation. These consideration sets are slightly smaller than those obtained in the ASSESSOR studies for soap bars and analgesics (respectively 3.7 and 3.5), perhaps because we did not have multiple product variants per brand (Hauser and Wernerfelt 1990).

Overall, these descriptive results are consistent with extant in-store observation studies and show that visual information processing at the point of purchase is limited. They also provide evidence for a limited but positive correlation between visual attention, consideration, and choice (brands more likely to be fixated are more likely to be considered and chosen). Of course, these results do not show whether in-store factors caused consideration or whether people looked at brands already in their long-term consideration sets. We address this issue in

the next section by examining the relationship between in-store attention, consideration, and choice for the two new brands that no participant had seen before, 'Simple' soaps and 'Nurofen' pain relievers.

Does In-Store Attention Lead to Consideration and Choice for New Brands?

We examined the effects of the number of eye fixations on recall, consideration, and choice (three yes/no decisions) of the two new (fictitious US) brands with three separate binary logistic regressions. The independent variables were the number of fixations, a binary variable for category, and their interaction. The main effect of category and its interaction with the number of fixations were never statistically significant and we excluded these variables from the results reported here. As expected, the number of fixations has a positive and statistically significant effect for all three dependent variables (Wald = 5.3, $p < .02$ for recall, Wald = 5.9, $p < .02$ for consideration, Wald = 10.2, $p < .01$ for choice). 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.

To graphically illustrate the effects of the number of fixations, Figure 4 shows the probability of recalling, considering, and choosing the two new brands (Simple and Nurofen) for participants who never fixated on these brands; who fixated on them less than four times; who fixated on them between 5 and 9 times; or who fixated on them at least 10 times. As expected, the amount of in-store attention has a monotonic effect on these three variables. Figure 4 also shows that brand recall and consideration are not always zero for people who never fixated on the brand (there were 6 instances of recall and one instance of consideration without eye fixation). This shows that there is some measurement error in the eye tracking data. It also could be that some participants were able to extract information about these two brands from peripheral vision (in which case the fixation was attributed to a nearby brand) or

during a fixation lasting less than 50 ms (in which case the fixation was not counted). Nevertheless, the frequency of these results is low enough to confirm that eye-movement data provide valid measures of visual attention to complex marketing stimuli like supermarket shelves.

--- Insert Figure 4 here ---

Overall, the analysis of the results for the two new brands show that in-store attention can increase consideration and choice. Taken together with the earlier descriptive results, we conclude that in-store marketing can work. 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 and led to the improved purchase decisions. Even if we had more observations about 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/multinomial) regressions, one for each dependent variable. The direct and indirect effects of in-store and out-of-store factors will be examined later using a path analysis.

The Effects of In-Store and Out-of-Store Factors on Attention and Evaluation

To take into account the repeated-measures structure of the data, we estimated separate random-effects binary logistic regressions for noting, re-examination, 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 (1974) multinomial logit) because participants were constrained to only choose one brand per category, whereas they could, of course, note, re-examine, 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 factors that are constant across brands for a given respondent and category: shopping goal,

category order, and the category dummy. The variable names and definitions are provided in Table 1 and the model specification in the appendix. Because the interactions with the category-level intercept were never significant, we aggregated the data across both categories. The parameter estimates of these regressions are reported in Table 2. To facilitate the interpretation of the effect sizes, Figure 5 shows the mean noting, re-examination, recall, consideration, and choice across the different levels of the in-store and out-of-store variables. Unobserved brand effects and individual heterogeneity are discussed in the Appendix.

--- Insert Tables 1 and 2 and Figure 5 here ---

In-Store Effects. Except for the price discount manipulation (which had no effect[1]), all the other in-store factors had large effects on attention which carried through weakly (and not uniformly) to evaluation. The number of facings had strong and positive effects on both noting and re-examination that were marginally diminishing (as indicated by significant quadratic effects). Going from 4 to 8 facings increased the probability of noting the brand by 28% (from 60% to 76%) and the probability of re-examining it by 40% (from 38% to 53%) but adding another 4 facings only added an extra 7% to noting (from 76% to 82%) and an extra 19% to re-examination (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 4 to 12 facings improved recall by 17% (from 28% to 33%), improved consideration by 18% (from 21% to 25%), and improved choice by 15% (from 7.7% to 8.8%).

The effects of shelf location were assessed using separate variable for horizontal and vertical positions. We coded the horizontal position on the shelf with two binary variables:

[1] 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 influence attention to prices and because participants paid very little attention to prices in general (and hence simply did not realize that the prices had been discounted). This is consistent with the finding of previous research about the low level of price search and about the need to advertise price reductions (Bemmaor and Mouchoux 1991; Dickson and Sawyer 1990) which we did not do here. We therefore do not further discuss in this paper the effects of the price discount manipulation.

LEFT indicated whether the brand was on the left or right side of the shelf and HCENTER indicated whether it was in the center of the shelf (indicated as "center left" or "center right" in Figure 3) or in 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 5 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 2 and Figure 5 show, being located on the right or left side of the shelf made no difference on either attention or evaluation. However, brands were more likely to be noted and re-examined when they were near the center of the shelf than when they were located on its extremities (M_{Center} = 80% vs. $M_{Extreme}$ = 65%). The same pattern was also evident for re-examination (M_{Center} = 59% vs. $M_{Extreme}$ = 43%), but not for recall. Importantly, the improvement from being near the horizontal center of the shelf 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 3). To show the combined effects of these two variables, Figure 5 reports the means for the top shelf, for the middle two shelves, and for the bottom shelf. Compared to being on the bottom shelves, being on the top shelves had a positive influence on all the dependent variables, increasing noting (M_{Top} = 74% vs. M_{Bottom} = 70%), re-examination (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 significant statistically, p = .11). In contrast, being in one of the middle two shelves helped attention (for noting: M_{Middle} = 80% vs. $M_{Extreme}$ = 64%; for re-examination: M_{Middle} = 62% vs. $M_{Extreme}$ = 40%) but these gains did

not extend to evaluation, which was actually slightly lower for middle two shelves than for extreme shelves (although these differences were not statistically significant).

Out-of-store Effects. As expected, out-of-store factors primarily influenced evaluation, although some also had statistically significant effects on attention as well. Compared to non-users, regular users were more likely to note the brand ($M_{Regular\ user}$ = 76% vs. $M_{Non\ user}$ = 71%) and to re-examine it ($M_{Regular\ user}$ = 59% vs. $M_{Non\ user}$ = 48%) and both effects were statistically significant. Still, Figure 5 shows that these effects are small compared to the massive effects of past usage on recall ($M_{Regular\ user}$ = 80% vs. $M_{Non\ user}$ = 15%), consideration ($M_{Regular\ user}$ = 80% vs. $M_{Non\ user}$ = 6%), and choice ($M_{Regular\ user}$ = 49% vs. $M_{Non\ user}$ = 1%). Because facings had the strongest and most consistent in-store effect, we also examined its interaction with past usage. As Table 2 shows, increasing the number of facings had a stronger effect among occasional and regular past brand users than among non-users. For example, increasing the number of facings from 4 to 12 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.

The coefficient of the market share variable (HIGHMS) shows that being in the high market share group had no statistically significant effect on attention but strongly helped recall ($M_{High\ share}$ = 47% vs. $M_{Low\ share}$ = 14%), consideration ($M_{High\ share}$ = 39% vs. $M_{Low\ share}$ = 9%) and choice ($M_{High\ share}$ = 14% vs. $M_{Low\ share}$ = 2%), and all these effects were statistically significant. Interestingly, the number of facings had a stronger impact on consideration and choice for low-market share brands than for high-market share brands (cf. Nedungadi 1990). For example, going from 4 to 12 facings increase choice by 60% (from 1.9% to 3%) for low-market share brands but increased choice by 9% only (from 13.4% to 14.7%) for high-market share brands.

The effects of the long-term price positioning of the brand (captured by the REGPRICE variable) are consistent with those of HIGHMS. After controlling for category, brand-specific,

and market share effects, brands with a high regular (reference) price were more likely to be noted and re-examined. However, a high price reduced recall, consideration, and choice (although the effect on consideration was not statistically significant).

Finally, the shopping goal manipulation influenced the size of the consideration set but had no effect on attention and recall (note that it could not influence choice because participants had to choose exactly one brand in all conditions). Participants who were asked to say which brands they would consider buying while their eyes were being tracked (and who provided brand choice information only later) had larger consideration sets than participants who were asked to say which brand they would purchase (and who provided brand consideration information only later). Consistent with this finding, brand choice was more influenced by the number of facings in the choice goal condition, when consideration sets were smaller, than in the consideration condition, when consideration set tended to include all the brands worthy of being considered for purchase.

Mediation Analyses

The separate analyses of noting, re-examination, 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 these total effects was mediated by attention. Decomposing these total effects into direct effects (controlling for the effects of attention) and indirect effects (through attention) allows us to isolate the effects that are not mediated by attention. It also allows us to quantify the relative importance of the direct and indirect routes for factors, such as past brand usage, which the separate analyses showed influence both attention and evaluation. Finally, the strong similarities between the patterns of responses of the two attention measures and, to a lower extent, of the three evaluation measures suggest that it may be useful to construct

summary measures of the two theoretical constructs, attention and evaluation, so as to provide single estimates the effects of these factors on these broad constructs. In this section, we address these issues by estimating all the causal relationships shown in Figure 1 simultaneously through a structural equation model with observed variables (i.e., a path analysis).

Variables and Method. For the path analysis, we used the same independent variables as for the previously reported separate analyses but used two causally related dependent variables, attention and evaluation. To compute the summary measure of attention, we leveraged the nested nature of noting and re-examination (since all the brands re-examined 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., some brands were considered but not recalled). However, the path analysis results are very similar if we incorporate recall data and compute a four-level 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) using the MCMC algorithm. The Bayesian estimation allows us to incorporate 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 total, direct,

and indirect effects (see the Appendix for a graph of the path analysis and for details on the estimation procedure).

--- Insert Figure 6 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 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.

These analyses show that evaluation is primarily driven by out-of-store effects, so we will discuss these effects first. Even though the indirect effects were statistically significant at the 5% level for all the out-of-store variables (except for HIGHMS), the coefficients were small, showing that only a small fraction of the total effects of out-of-store factors were mediated by attention. For example, although past usage had a statistically significant effect on attention, only 3% of its effects on evaluation were mediated by attention. For HIGHMS (capturing the effects of being in the high market share group), indirect effects through attention accounted for only 1% of the total effect and for CSDGOAL (capturing the effects of the shopping goal manipulation), they accounted for 16%.

Among in-store variables, the role of attention as mediator is much greater than for out-of-store variables. Both the direct and indirect effects of the number of facings on evaluation were positive but only the indirect effect through attention, which accounted for 95% of the total effect, was statistically significant. As in the separate analyses, there were no differences on either attention or evaluation between the right and the left side of the store shelf. However, compared to a position in the ends of the shelves, a central horizontal position

increase evaluation, but entirely because of its indirect effect through attention (the direct effect were not significant). Interestingly, the direct and indirect effects of being on the top two shelves (vs. the bottom two shelves) were both positive and statistically significant. In contrast, and as portended in the separate analyses, the positive indirect effects of a central vertical position were negated by negative direct effects not mediated by attention, and thus the total effect on evaluation was not statistically significant.

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 evaluation over and above the contribution of out-of-store factors, (c) do these effects depend on out-of-store factors such as past brand usage, and (d) how much are the observed effects on evaluation mediated by attention? To answer these questions, we manipulated the number of facings and the vertical and horizontal position of 12 brands of soap and pain relievers, while keeping total shelf space constant, manipulated consumers' shopping goal and price discounts, and measured consumers' past brand usage.

Effects of the Number and Position of Shelf Facings

Our results show that in-store marketing, and particularly the number of shelf facings, strongly influence not just visual attention (the probability of a first and of a second look) but also evaluation (brand recall, consideration, and choice). In addition, the mediation analyses show that the improvements in evaluation caused by in-store marketing are mostly mediated by their impact on attention. However, some in-store marketing decisions—notably the vertical location of the brand—also directly influence evaluation over and above their effects on attention and these direct effects 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.

This shows that not all improvement in attention is equal in its ability to improve consideration or choice.

In the best case scenario, for occasional users of a low market share brand, increasing the number of facings from 4 to 12 improved noting by 26% (from 63% to 80%), re-examination by 40% (from 43% to 61%), consideration by 50% (from 24% to 36%), and choice by 261% (from 3% to 8%). For the average brand and consumer, simply doubling the number of facings (from 4 to 8) increased noting by 28%, re-examination by 35% and choice and consideration by 10% each. Our results stand therefore in sharp contrast with the conclusion of Drèze, Hoch, and Purk (1994, p. 324) that "the benefits from additional facings are non existent". Rather, they 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). The discrepancy with the results of Drèze, Hoch, and Purk (1994) may be explained by differences in the base level of facings, in the magnitude of the facing increase or by the fact that their facing manipulation was accompanied by changes in the category assortment.

Changing the position of the brand on the shelf also had strong impact on attention and some of these changes, but not all, led to significant changes in evaluation. Placing a brand near the horizontal center of a shelf (rather than on either of its ends) increased noting by 22%, re-examination by 37%, consideration by 5%, and choice by 17%. Vertical position also had a significant effect: Being in the top two shelves (vs. the bottom two) increased noting by 5%, re-examination by 11%, consideration by 8%, and choice by 12%. Other changes in shelf position (such as left vs. right) made no difference on attention or evaluation. This 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. right side of a shelf. In fact, these authors found that a right-hand side location is really preferred to a left-hand side location only when consumers want to purchase a premium brand or when they are choosing from among unfamiliar products.

Effects of Brand- and Individual-Specific Out-of-Store Factors

Our results show that out-of-store factors do influence visual attention but that their effect is less strong than the effect of in-store factors. Our results therefore replicate those of van der Lans, Pieters, and Wedel, (2008) about the primacy of bottom-up factors like color and brightness over top-down factors like search task in guiding attention among brands in supermarket displays. However, we also found that out-of-store factors have a much stronger impact than in-store factors on evaluation, and that almost all of this impact is direct and only a fraction indirectly mediated through 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.

Among out-of-store factors, we found that past brand usage increase 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, the consideration and choice benefits of brand preference cannot help. In addition, past brand usage improved the effectiveness of facings in driving consideration and choice. These results therefore suggest that brand preference and familiarity, i.e., brand equity, do not just increase the expected utility of the brand. Brand equity 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). 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 of preference given forced exposure.

We also found that, after controlling for 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 individual-level differences in brand usage and the overall sales effects of the brand. Increasing the number of facings is therefore particularly useful for small niche brands with a loyal customer base. Consistent with this result, we found that brands' regular (reference) price reduced consideration and choice but helped noting and attention, perhaps because premium brands had packages that attracted more attention.

The results of the shopping goal manipulation are instructive in many ways. First, facings had a stronger impact on brand choice when participants were given a purchase task than when they were given a consideration task. Second, people with the choice task spent less time and had smaller consideration sets than those with the consideration task, yet they did not note or re-examine fewer brands. This suggests that facings work better when consumers are focused on buying (vs. browsing) perhaps because of inferences consumers make about the attractiveness of brands prominently displayed, and not just because of their extra visibility that facings cause.

Measuring Attention and Evaluation

The comparison of the five dependent variables showed that they can be clearly categorized into two groups, depending on whether they are based on attention and measured by eye movements (noting and re-examination) or based on evaluation and measured by verbal reports (recall of visual attention, consideration, and choice). This is a particularly important measurement issue because the recall task was nominally about attention, but our

results show that recall is biased to favor highly evaluated brands. This is consistent with research on brand recall tasks (e.g., Hutchinson et al. 1994).

In addition, our results show that recall of visual attention is an indicator of evaluation and cannot be used as a proxy for visual attention. First, recall misses about half of the brands that were actually fixated. We therefore replicated in a point-of-purchase context Krugman's (1977) conclusions that "conclusions about amount of exposure [to media advertising] based on recall data will greatly underestimate exposure". More importantly, drawing inferences about visual attention from recall data would lead to important errors. Recall was poorly correlated with attention ($r = .13$ with noting and $r = .14$ with re-examination) and, as a dependent variable, it was influenced by the factors that influenced consideration and choice rather by those that influenced the two eye-tracking measures. We therefore validate the claims of Pieters and Wedel (2007; 2008) that researchers need to measure attention and not just evaluation and that eye-tracking data are required to measure attention.

Managerial Implications and Future Research

The traditional justification for in-store marketing and for attention studies is that "unseen is unsold." According to various studies, the vast majority of purchase decisions are made inside the stores, yet consumers only evaluate a fraction of the products available (e.g., Liljenwall 1994). 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 some extent. However, our results show that improving attention is not a sufficient condition, for not all in-store attention is equal in its ability to drive choice. Some improvements in in-store attention, such as those caused by a higher number of facings, reliably improve consideration and choice. Others, such as the one given by being on one of the middle shelves, did not significantly improve choice.

There can be two explanations for our finding that not all attention is equal. First, some enhancements in visual attention may be mostly covert and driven by the visual characteristics of the display, whereas others may be goal-directed, and hence more likely to lead to consideration and choice. For example, a position on the middle two shelves may automatically improve noting and re-examination simply because of the limited visual angle of saccades (Rayner 1998). Consumers wishing to evaluate brands located on the top shelf after having fixated on brands on the bottom shelf will automatically fixate on brands on the middle shelves "on their way" to the bottom shelf, without the fixation serving any purpose other than orientation. In other words, some fixations serve the "where" (orientation) component of attention and not the "what" (identification) component of attention (Liechty, Pieters, and Wedel 2003).

Marketplace meta-cognitions provide another explanation for the dissociation between attention and evaluation. Inman, McAlister, and Hoyer (1990) showed that consumers believe that brands placed in end-of-aisle displays are discounted. Buchanan, Simmons, and Bickart (1999) showed that consumers believe that important brands are given precedence in retail displays. Raghubir and Valenzuela (2008) showed that consumers believe that retailers position brands on the shelf according to general, meaningful criteria. Their earlier work (Raghubir and Valenzuela 2006) suggests that some position-based inferences are not mediated by attention.

An important area for future research would therefore be to study the inferences people make about brands due to the number and position of facings. It may be that people reliably expect that a higher number of facings indicate an important brand, but make different inferences about its shelf position based on characteristics of the shelf or the brand (e.g., its equity). For example, Raghubir and Valenzuela (2008) found that schema-inconsistent shelf displays in which premium brands are in the bottom shelves (which occurred in some of our

planograms) make the effect of vertical position go away. This would explain why being in the middle shelves helped attention but not choice. In contrast, there is converging evidence from a variety of studies that a high vertical position is associated with positive evaluation and with power (Meier and Robinson 2004; Schubert 2005). More generally, the interplay between attention-based and inference-based effects seems an area worthy of future investigations.

Future research should also examine the relationship between the dependent variables. One issue would be to examine 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 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

Variable Names and Definitions

	Attention dependent variables
$NOTING_{ij}$	A variable equal to 1 if participant i fixated on brand j at least once and 0 otherwise.
$RE\text{-}EXAM_{ij}$	A variable equal to 1 if participant i fixated on brand j at least twice and 0 otherwise.
	Cognitive dependent variables
$RECALL_{ij}$	A variable equal to 1 if participant i recalled having seen brand j and 0 otherwise.
$CONSID_{ij}$	A variable equal to 1 if participant i considered buying brand j and 0 otherwise.
$CHOICE_{ij}$	A variable equal to 1 if participant i stated a choice to buy brand j and 0 otherwise.
	In-store factors
$FACING_{ij}$	The standardized number of facings (equal to -1 for 4 facings, 0 for 8 facings, and 1 for 12 facings).
$FACINGSQ_{ij}$	$(FACING_{ij})^2$ (equal to 1 for 4 and 12 facings and to 0 for 8 facings).
$LEFT_{ij}$	A variable equal to ½ if the brand was on the left-hand side of the shelf and -½ otherwise.
$HCENTER_{ij}$	A variable equal to ½if the brand touched the center of the shelf and -½ otherwise.
TOP_{ij}	A variable equal to ½ if the brand was on the top two shelves and – ½ otherwise.
$VCENTER_{ij}$	A variable equal to ½ if the brand was on the middle two shelves (the second and third shelf) and -½ otherwise.
$SALE_{ij}$	A variable equal to ½ if the brand's price was reduced and -½ if it was not.
	Out-of-store factors
$MEDUSE_{ij}$	A variable equal to 2/3 if the participant indicated that she bought the brand occasionally in the past and equal to -1/3 if it was never bought or bought regularly.
$HIGHUSE_{ij}$	A variable equal to 2/3 if the participant indicated that she bought the brand regularly in the past and equal to -1/3 if it was never bought or bought it occasionally.
$HIGHMS_j$	A variable equal to ½ if its market share is among the top 50% of the category and - ½ if it is in the bottom 50%
$REGPRICE_j$	The brand's regular price, in $.
$CSDGOAL_i$	A variable equal to 1 if participant i was asked to name all the brands that she would *consider* buying and 0 if she was asked to name the one brand that she would buy.
	Control factors
$CATORDER_i$	A variable equal to 1 if this category was seen first and 2 if it was seen in second.
$CATPR_j$	A variable equal to ½ if the category is pain reliever and -½ otherwise (soaps).

NOTE: Cases in which the brand had 12 facings and thus occupied the whole left or right-hand side of the shelf (e.g., Lever, Zest, Safeguard, and Coast in Planogram #1; see Figure 3) were randomly allocated to the center or far levels of the horizontal center variable to ensure that the facing and horizontal position variables are uncorrelated.

TABLE 2

Categorical Regression Results: Unstandardized Parameter Estimates and Standard Errors

		Attention				Evaluation					
		NOTING		RE-EXAM		RECALL		CONSID		CHOICE	
In-store factors	FACING	.75**	(.06)	.64**	(.06)	.18**	(.06)	.27**	(.07)	.26**	(.10)
	FACINGSQ	-.33**	(.07)	-.17**	(.06)	-.02	(.06)	-.01	(.07)	-.04	(.10)
	LEFT	.07	(.06)	.09	(.05)	-.02	(.06)	-.05	(.07)	-.14	(.10)
	HCENTER	1.1**	(.07)	1.1**	(.06)	-.03	(.06)	.11	(.07)	.23*	(.11)
	TOP	.29**	(.06)	.33**	(.06)	.14*	(.06)	.15*	(.07)	.15	(.10)
	VCENTER	1.3**	(.07)	1.4**	(.06)	-.01	(.06)	-.06	(.07)	-.09	(.11)
	SALE	-.09	(.06)	.04	(.06)	-.01	(.06)	.03	(.07)	.10	(.11)
Out-of-store factors	MEDUSE	.26**	(.09)	.29**	(.08)	1.5**	(.07)	2.3**	(.09)	2.0**	(.18)
	HIGHUSE	.56**	(.12)	.76**	(.10)	3.0**	(.11)	4.1**	(.13)	4.5**	(.19)
	MEDUSE×FACING	-.05	(.10)	-.10	(.09)	.10	(.08)	.23*	(.10)	.27	(.21)
	HIGHUSE×FACING	-.01	(.13)	-.17	(.12)	.29*	(.12)	.35**	(.13)	.37*	(.20)
	HIGHMS	.18	(.18)	.12	(.16)	1.7**	(.17)	1.8**	(.25)	1.2*	(.48)
	HIGHMS×FACING	.07	(.09)	-.04	(.08)	.03	(.08)	-.27**	(.10)	-.36*	(.17)
	REGPRICE	.12**	(.04)	.12**	(.04)	-.18**	(.06)	-.09	(.09)	-.45*	(.20)
	CSDGOAL	.10	(.13)	.15	(.12)	.13	(.08)	.22**	(.09)	---[c]	
	CSDGOAL×FACING	.05	(.08)	.14	(.07)	.11	(.07)	.02	(.09)	-.26*	(.12)
Control	CATPR	-.62**	(.21)	-.73**	(.20)	.21	(.22)	-1.0**	(.32)	---[c]	
	CATORDER	-.01	(.13)	-.06	(.12)	.17*	(.08)	.05	(.09)	---[c]	
	Brand effects[a]	31.0*		23.5		217**		166**		35.4**	
	Subject effects[b]	1009**		1170**		87**		64**		---[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 because it is a conditional logistic regression (see Appendix).

FIGURE 1

Antecedents and Consequences of Attention and Evaluation at the Point of Purchase

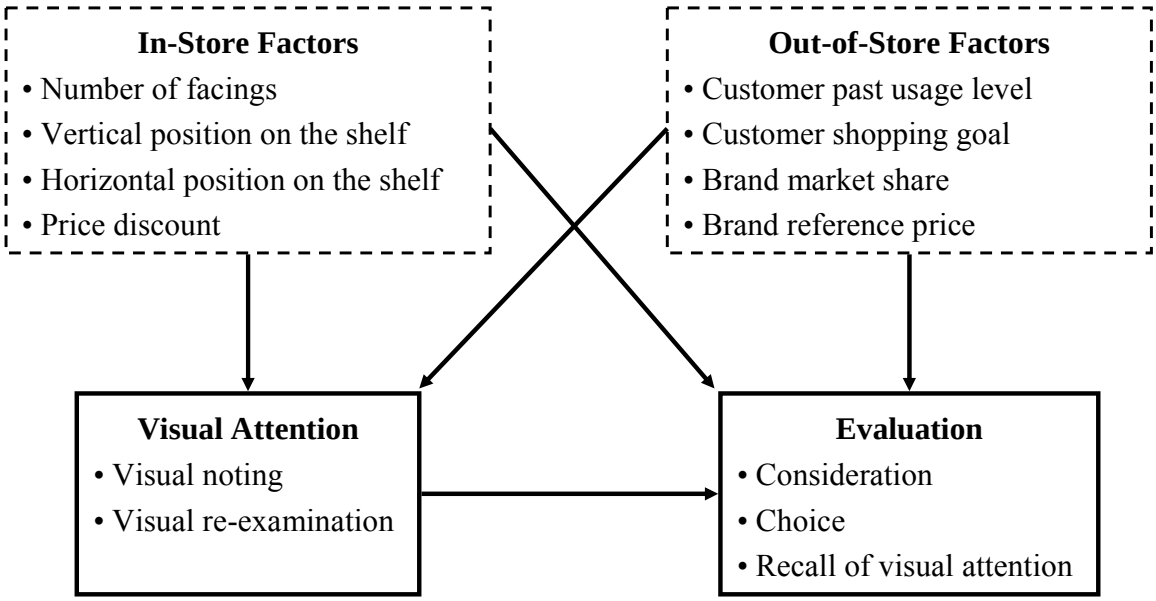


FIGURE 2

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
Shelf 1	P_1	10*	11*	11*	6	6	6
Shelf 2		12	12	12	4	5*	5*
Shelf 3		9*	9*	9*	2	2	1*
Shelf 4		8	8	7	3*	3*	3*

		Far left	Center left	Center right	Far right
Shelf 1	P_7	4	5*	5*	12*	12*	12*
Shelf 2		6	6	6	10*	11	11
Shelf 3		2*	2*	1	9*	9*	9*
Shelf 4		3	3	3	8	8	7*

		Far left	Center left	Center right	Far right
Shelf 1	P_2	11*	11*	11*	3*	4	4
Shelf 2		9*	10	10	5	5	5
Shelf 3		7*	7*	6	2	2	2
Shelf 4		8*	8*	8*	1*	1*	12

		Far left	Center left	Center right	Far right
Shelf 1	P_8	3	4*	4*	11	11	11
Shelf 2		5	5	5	9	10*	10*
Shelf 3		1	1	12*	8*	8*	8*
Shelf 4		2*	2*	2*	7	7	6*

		Far left	Center left	Center right	Far right
Shelf 1	P_3	9	9	8*	4*	4*	4*
Shelf 2		10*	10*	10*	3	3	2*
Shelf 3		5	6*	6*	1	1	1
Shelf 4		7	7	7	11	12*	12*

		Far left	Center left	Center right	Far right
Shelf 1	P_9	4*	4*	4*	8*	9	9
Shelf 2		3	3	2*	10	10	10
Shelf 3		12*	12*	11	7	7	7
Shelf 4		1*	1*	1*	5	6*	6*

		Far left	Center left	Center right	Far right
Shelf 1	P_4	9	9	9	2	2	1*
Shelf 2		8*	8*	7	3*	3*	3*
Shelf 3		6*	6*	6*	10	11*	11*
Shelf 4		4*	5	5	12	12	12

		Far left	Center left	Center right	Far right
Shelf 1	P_{10}	3	3	3	8	8	7*
Shelf 2		1	2*	2*	9*	9*	9*
Shelf 3		12	12	12	4	5*	5*
Shelf 4		11	11	10*	6*	6*	6*

		Far left	Center left	Center right	Far right
Shelf 1	P_5	7	7	6*	2	2	2
Shelf 2		8*	8*	8*	1*	1*	12
Shelf 3		5	5	5	9	10*	10*
Shelf 4		3*	4	4	11*	11*	11*

		Far left	Center left	Center right	Far right
Shelf 1	P_{11}	12*	1*	1*	8*	8*	8*
Shelf 2		2	2	2	7	7	6*
Shelf 3		11	11	11	4*	4*	3
Shelf 4		9	10	10	5*	5*	5*

		Far left	Center left	Center right	Far right
Shelf 1	P_6	7*	7*	7*	12	12	11
Shelf 2		6	6	5*	1*	1*	1*
Shelf 3		2*	3*	3*	10	10	10
Shelf 4		4	4	4	8	9	9*

		Far left	Center left	Center right	Far right
Shelf 1	P_{12}	12*	12*	11*	7*	7*	7*
Shelf 2		1	1	1	5	6	6
Shelf 3		8	9	9	4	4	4
Shelf 4		10*	10*	10*	3*	3*	2*

NOTES:

Each number represents a stack of 2 facings of a brand.

- 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

Recall, Consideration, and Choice as a Function of the Number of In-Store Eye Fixations for the Two New Brands ('Simple' Soap and 'Nurofen' Pain Reliever)

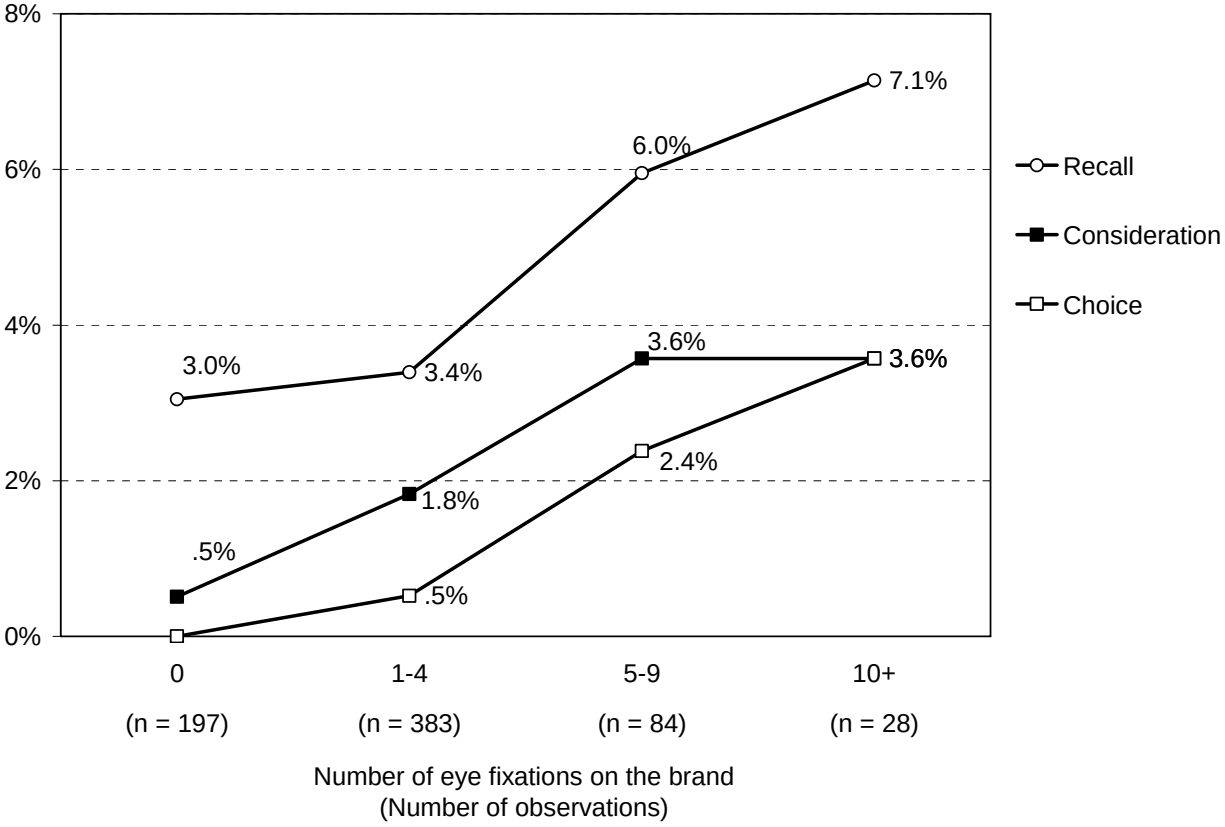
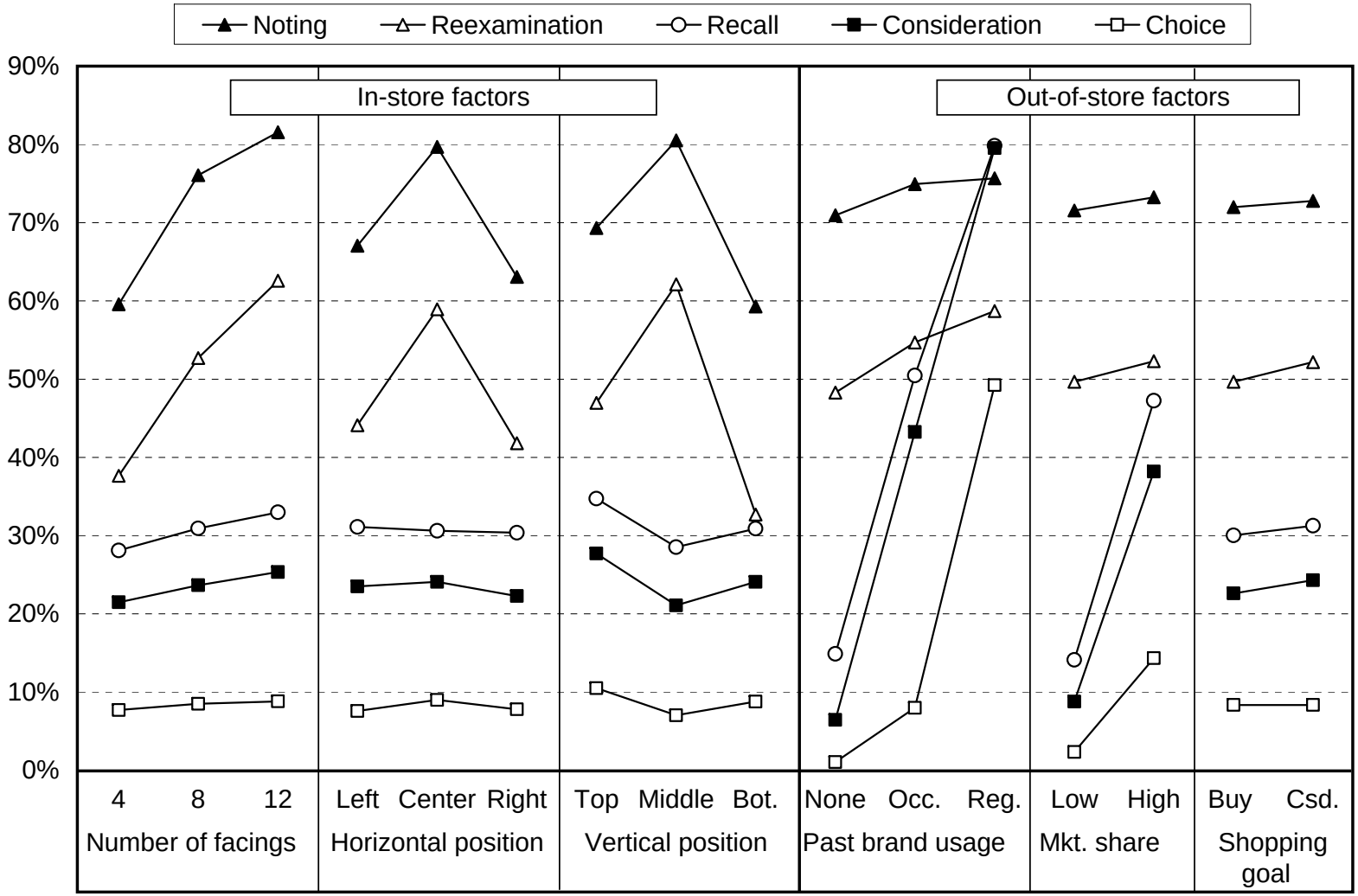


FIGURE 5

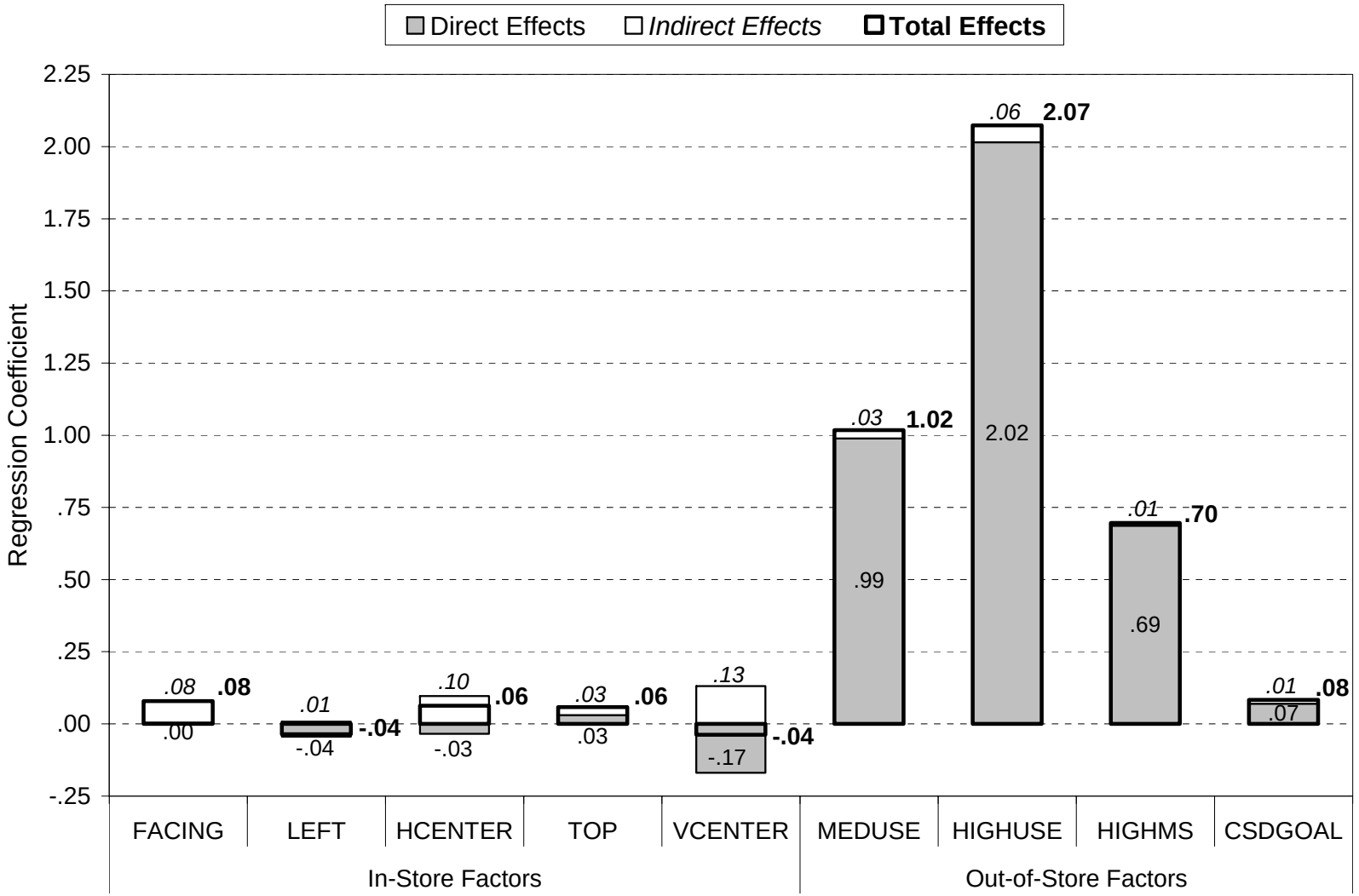
Mean Attention and Evaluation Levels across Experimental Conditions and Brand Groups



Note: Average choice probabilities are 1/12 in both shopping goals conditions (by design) and are therefore not reported here.

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



APPENDIX

Model Specification for the Attention and Evaluation Models

For noting, re-examination, recall, and consideration, we estimated logistic regressions with normal random-effect intercepts. These models allow us account for the correlated errors within each group (one respondent for a product category), thus providing the correct estimates for the fixed-effect factors. They also provide the estimate (ρ) of the proportion of the variance in the error term that is due to within-subject errors, which captures unobserved heterogeneity. We estimated the following models using PROC XTLOGIT in STATA 9.0.

$$(1) \qquad P(Y_{ij} = 1) = \frac{\exp(n_{ij})}{1 + \exp(n_{ij})},$$

where Y_{ij} is either $NOTING_{ij}$, $RE\text{-}EXAM_{ij}$, $RECALL_{ij}$, or $CONSID_{ij}$

and $n_{ij} = \beta_0 + \beta_1 \times FACING_{ij} + \beta_2 \times FACINGSQ_{ij} + \beta_3 \times LEFT_{ij} + \beta_4 \times HCENTER_{ij} + \beta_5 \times TOP_{ij}$

$+ \beta_6 \times VCENTER_{ij} + \beta_7 \times SALE_{ij} + \beta_8 \times MEDUSE_{ij} + \beta_9 \times HIGHUSE_{ij} + \beta_{10} \times MEDUSE_{ij} \times FACING_{ij}$

$+ \beta_{11} \times HIGHUSE_{ij} \times FACING_{ij} + \beta_{12} \times HIGHMS_j + \beta_{13} \times HIGHMS_j \times FACING_{ij} + \beta_{14} \times REGPRICE_j$

$+ \beta_{15} \times CSDGOAL_i + \beta_{16} \times CSDGOAL_i \times FACING_{ij} + \beta_{17} \times CATPR_j + \beta_{19} \times CATORDER_j$

$+ \sum_{j-2} \alpha_j \times BRAND_j + \beta_i + \varepsilon_{ij}$

where i = {1, 2, …, 692} indexes study participants in each category, j = {1, 2, …, 24} indexes brands, $BRAND_j$ are the brand-specific intercepts, β_i are the individual-specific intercepts and are iid ~ $N(0, \tau^2)$, and ε_{ij} is the residual error term and is iid ~ $N(0, \sigma^2)$.

For choice, we estimated the following conditional logistic regressions with PROC CLOGIT in STATA 9.0:

$$(2) \qquad P(CHOICE_{ij} = 1) = \frac{\exp(n_{ij})}{\sum_{j=1}^{12} \exp(n_{ij})},$$

where $\beta_0 + \beta_1 \times FACING_{ij} + \beta_2 \times FACINGSQ_{ij} + \beta_3 \times LEFT_{ij} + \beta_4 \times HCENTER_{ij} + \beta_5 \times TOP_{ij}$

$+ \beta_6 \times VCENTER_{ij} + \beta_7 \times SALE_{ij} + \beta_8 \times MEDUSE_{ij} + \beta_9 \times HIGHUSE_{ij} + \beta_{10} \times MEDUSE_{ij} \times FACING_{ij}$

$+ \beta_{11} \times HIGHUSE_{ij} \times FACING_{ij} + \beta_{12} \times HIGHMS_j + \beta_{13} \times HIGHMS_j \times FACING_{ij} + \beta_{14} \times REGPRICE_j$

$+ \beta_{15} \times CSDGOAL_i \times FACING_{ij} + \sum_{j-2} \alpha_j \times BRAND_j + \beta_i + \varepsilon_{ij}$

Unobserved Heterogeneity and Control Factors in the Attention and Evaluation Models

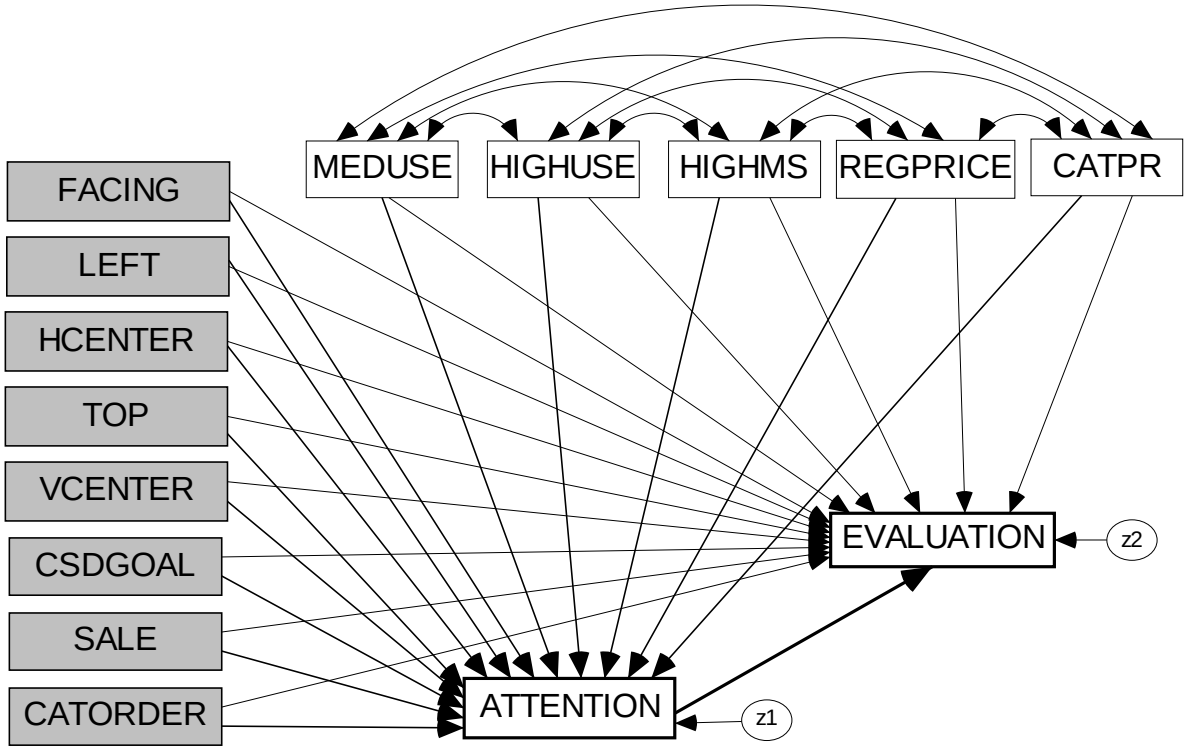
For attention, there are almost no differences across brands after controlling for all the other factors in the equation, but still large differences across individuals. It is the opposite pattern for the three evaluation measures, which have large amounts of unobserved heterogeneity for brands and smaller unobserved heterogeneity for individuals (note that the value of the brand test for choice is not comparable with its value for the other dependent variables because of the different model specification). Finally, the category intercept (CATPR) shows that pain reliever brands were less likely to be noted, re-examined, and considered than soap brands. The CATORDER variable shows that recall was higher for the second than for the first category. This is simply because the recall question was first asked for the second category (the one that participants had just finished looking at) and only then about the first category.

Model Specification for the Path Analysis

For the path analysis, we estimated the structural equation model shown in Figure A-1 but with all the brand dummies (which are not shown in the Figure). All the variables were observed except the two error terms z1 and z2. 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). For the Bayesian estimation, we generated 4,038 samples using the MCMC algorithm and utilized the last 3,538 for estimation.

FIGURE A-1

Path Analysis Model (Shown here without the Brand Dummies)



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