Healthy-Left, Unhealthy-Right: Can Displaying Healthy Items to the Left (versus Right) of Unhealthy Items Nudge Healthier Choices?

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Would laterally displaying a healthy item to the left versus right of an unhealthy item influence choice and consumption? The results of seven studies demonstrate that displaying healthy items to the left (vs. right) of unhealthy items enhances preference for the healthy options. In addition, consumption volume of a healthy item (vis-à-vis an unhealthy item) is higher when it is placed to the left (vs. right) of the unhealthy item. We propose that a "healthy-left, unhealthy-right" (vs. healthy-right, unhealthy-left) lateral display pattern is congruent with consumers' mental organization of food items varying in healthfulness, which enhances ease of processing and in turn enhances self-control, thereby leading to a relatively higher likelihood of choosing healthy options. While prior studies have examined the role of several factors in influencing choices between healthy and unhealthy options, the present research is the first to demonstrate the effects of lateral display positions of healthy/unhealthy options on choice and healthful consumption. The findings of our research have important implications for designing retail food displays and restaurant menus as well as for conducting research studies involving healthy and unhealthy food displays.

Keywords: healthy and unhealthy choices, lateral visual display position, food and beverage consumption, sensory marketing

Would the lateral display patterns of food items influence choice? More specifically, would displaying healthy item(s) on the left and unhealthy item(s) on the right lead to different choice outcomes than displaying the items in the opposite pattern? The results of our experiments show that not only does the lateral display pattern of healthy and unhealthy items influence choice, it also has consequential effects on consumption volume. The findings of our research have important conceptual and practical implications, especially in light of growing worldwide concerns related to obesity and a heightened focus on encouraging healthful consumption. Also, given that marketers have considerable flexibility in terms of how they display food items in retail outlets and restaurant menus, they can use the findings of this research to design optimal display patterns that are aligned with their objectives in terms of consumer choices.

Building on research in the domain of left-to-right organization of stimuli (Bueti and Walsh 2009; Casasanto 2009; Lourenco and Longo 2010), we propose and find that the lateral position of healthy/unhealthy foods influences choices. Specifically, we demonstrate that when a healthy and an unhealthy item are organized laterally, there is relatively greater preference for the healthy option when it is displayed to the left (vs. right) of the unhealthy option. Furthermore, we propose and find that consumers' natural

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tendency is to mentally organize healthy items to the left of unhealthy items, which in turn influences self-control and food choices. We base these propositions on research related to spatial representation of magnitude, in which individuals tend to mentally map increases in magnitude from left to right (Chae and Hoegg 2013; Kadosh et al. 2008).

To elaborate, research shows that individuals hold a generalized system of magnitude representation in which dimensions such as time duration, number magnitude, and spatial extent are mentally organized in increasing magnitude from left to right (Bueti and Walsh 2009; Lourenco and Longo 2010; Walsh 2003). In the context of foods, a healthy item is perceived to be less heavy (Deng and Kahn 2009), lower in calories (Chandon and Wansink 2007), less filling (Oakes 2006), and even less tasty (Raghunathan, Naylor, and Hoyer 2006) than an unhealthy item. Since stimuli of lower magnitude tend to be mentally organized on the left and those of higher magnitude tend to be mentally represented on the right (e.g., Hubbard et al. 2005), we propose that consumers naturally represent healthy items to the left of unhealthy items. Additional evidence in favor of this mental representation model is provided by the *body-specificity* theory (Casasanto and Chrysikou 2011) that proposes individuals link desirable products to their dominant side and undesirable products to their nondominant side (Brookshire and Casasanto 2012). Incidentally, about 90% of the world population is right-handed (Eelen, Dewitte, and Warlop 2013). Since consumers often deem unhealthy (vs. healthy) foods as inducing more favorable affect (Shiv and Fedorikhin 1999) as well as being more desirable and tempting (Hofmann et al. 2010), most individuals should mentally associate unhealthy foods with the right lateral field.

Studies across different research streams have shown that when mental representations are congruent (vs. incongruent) with display patterns, ease of processing is higher (Chae and Hoegg 2013; Lee and Aaker 2004). Hence food displays that are congruent (vs. incongruent) with consumers' mental representation should facilitate greater ease of processing. Moreover, ease of processing should enhance self-control and facilitate resistance to temptation, which in turn should lead to a higher likelihood of choosing healthier options (Shiv and Fedorikhin 1999). Accordingly, we hypothesize that choice likelihood of the healthier option will be higher when the healthy items are displayed laterally to the left (vs. right) of unhealthy items. We examine this phenomenon with the help of seven studies.

STUDY 1A: DISPLAY POSITIONS OF HEALTHY AND UNHEALTHY ITEMS

Design, Participants, and Procedure

Study 1a was a between-subjects experiment with two manipulated conditions (healthy items displayed to the left vs. right of unhealthy items). A restaurant menu was used; the menu featured a picture of a healthy item (chicken salad) and of an unhealthy item (bacon cheeseburger). The menu also had a listing of four healthy items and four unhealthy items. (The appendix and online appendix A provide menu details.) To ensure ecological validity, the food items presented on the menu and the overall menu layout were similar to those used by an actual restaurant.

First, a pretest ($n = 22$; average age = 37 years, 50% female) verified the healthiness/unhealthiness of the items chosen. Participants rated the perceived healthfulness of the eight menu items (appendix) on a 7-point scale (1 = not at all healthy, 7 = very healthy). The four salad entrees were perceived as healthier ($M = 4.59$) than the four burger entrees ($M = 2.86$; $t(21) = 4.91$, $p < .01$). Consistent with this pretest finding, we coded participants' choice for any of the four salads as healthy and choices for the four burgers were coded as unhealthy.

In the main study, 48 respondents recruited through an online (Mechanical Turk [MTurk]) panel (average age = 35 years; 50% female, 90% right-handed) participated in exchange for monetary compensation. They were evenly and randomly assigned to either the "healthy-left, unhealthy-right" or the "healthy-right, unhealthy-left" condition. Participants viewed a menu and were told that the menu was from a new restaurant and that all portions and prices across the different options were equivalent. They then selected one menu item they would like to eat if they were visiting this restaurant. Finally, they provided general demographic information.

Results and Discussion

Consistent with our hypothesis, there was greater preference for the healthy items when they were displayed to the left (vs. right) of the unhealthy items on the menu (58.33% vs. 29.16%; $\chi^2 = 4.15$, $p < .05$). Next, study 1b replicated these effects using a simpler choice set—one healthy item and one unhealthy item. Also, study 1a used online (MTurk) participants; study 1b was conducted in a controlled lab setting.

STUDY 1B: LATERAL DISPLAY OF A HEALTHY AND AN UNHEALTHY ITEM

Study 1b replicated the findings of study 1a by asking participants to choose an item from a set of two food options: one healthy and one unhealthy. A total of 93 students (average age 22 years, 57% female, 87% right-handed) from a major US university participated in this study in exchange for course credit. Broccoli salad was used as the healthy item; grilled cheese sandwich was the unhealthy item (e.g., Chernev 2011). Participants first arrived at a waiting area and were then brought into a computer lab by a research assistant. Participants had to click through the

introduction page to go to the page (on the computer screen) that displayed the food items. In one condition, the broccoli salad was displayed on the left and the grilled cheese sandwich was displayed on the right. In the other condition, this pattern was reversed (details in online appendix B). The computer software randomly assigned each participant to an experimental condition. After viewing the images of the food items, participants indicated their preference for one of the items.

Consistent with our hypothesis and the findings of study 1a, preference for the healthy item (broccoli salad) was relatively higher when it was on the left (vs. right) of the unhealthy item (41.30% vs. 19.14%; $\chi^2 = 5.42$, $p < .05$). This replicates the finding of study 1a using a display pattern that featured only two food items, one healthy and one unhealthy. Next, studies 2a and 2b provide evidence of the left-to-right mental organization of healthy and unhealthy foods.

STUDIES 2A AND 2B: ORGANIZING ITEMS IN DIFFERENT LATERAL FIELDS

Procedure

Study 2a tested whether consumers naturally organize healthy and unhealthy concepts in different lateral fields. We employed a conceptual classification task, similar to a procedure used in prior studies (e.g., Casasanto 2009). Seventy-eight participants recruited from an online (MTurk) panel (average age 31 years, 30% female, 90% right-handed) performed a task in which they were asked to place word pairs on the left versus right lateral field. There were two empty boxes on a computer screen (one on the left side and one on the right side of the screen). For each trial, participants indicated which one of the two words they would place in the left box. The focal word pairs were "eating healthy–indulging," "strawberries–cheesecake," "nutrition–pleasure," "grilled chicken–fried chicken," and "healthy foods–unhealthy foods." The order of presentation of the words in the pairs was counterbalanced. In terms of counterbalancing, there were order effects for the "nutrition–pleasure" pairing and a marginally significant effect for the "eating healthy–indulging" pairing; however, we did not find order effects ($p > .10$) for any of the other relevant word pairs. To avoid hypothesis guessing, filler trials were included: "email–call," "fruit salad–apples," "bat–net," and "work–enjoyment."

Results and Discussion

Overall, participants consistently associated the healthy (vs. unhealthy) concept with the left lateral field. Specifically, for the "eating healthy–indulging" word pair, 64.10% of participants indicated that eating healthy belonged on the left ($\chi^2 = 6.20$, $p < .05$); for the "nutrition–pleasure" word pair, 62.82% of participants placed "nutrition" on the left ($\chi^2 = 5.13$, $p < .05$), and for the "healthy foods–unhealthy foods" word pair, 71.79% of participants placed "healthy foods" on the left ($\chi^2 = 14.82$, $p < .01$). Additionally, for the specific food pairings, we found the same trend, whereby 65.38% of respondents placed strawberries (vs. cheesecake) on the left ($\chi^2 = 7.38$, $p < .01$), and 64.10% placed grilled chicken (vs. fried chicken) on the left ($\chi^2 = 6.20$, $p < .05$). Handedness did not influence placement decisions ($p > .10$).

The results of this study provide evidence for our theoretical claim that a healthy option is mentally represented to be on the left of an unhealthy option. Also, this study eliminates the possibility of items being organized alphabetically. For example, the word pairing "strawberries–cheesecake" reveals the same pattern of results even though the healthy (unhealthy) item begins with the letter "s" ("c"). The same holds for the "grilled chicken" and "fried chicken" pair.

In a follow-up study (2b), we replicated our findings in the context of a menu design task. Forty-four respondents from an online (MTurk) panel (average age 29 years, 34% female, 91% right-handed) were asked to place two food items, a grilled chicken sandwich (healthy item) and a fried chicken sandwich (unhealthy item), on different sides of a blank menu. The presentation of the items was counterbalanced to avoid order effects. As theorized, a greater proportion of participants placed the healthy (unhealthy) item on the left (right) side of the menu compared to placing the healthy (unhealthy) item on the right (left) side (70.45% vs. 29.55%; $\chi^2 = 7.36$, $p < .01$). No order effects were found for the counterbalanced presentation of the items ($p > .10$). These results provide additional support for the theoretical claim related to mental representation of healthy items being to the left (vs. right) of unhealthy items. Next, study 3 rules out an alternative explanation for the effects observed in studies 1a and 1b.

STUDY 3: RULING OUT LEFT-SIDE BIAS EFFECTS

The results of studies 1a and 1b show that preference for the healthy item is higher when it is displayed to the left (vs. right) of the unhealthy item. A corollary to that finding is that preference for the unhealthy item is also higher when it is displayed on the left (vs. right). We proposed a mental representation explanation and found empirical evidence of that claim in studies 2a and 2b. Nevertheless, a potential alternative explanation for the findings of studies 1a and 1b is a left-side bias, whereby there is greater overall preference for the item displayed on the left, irrespective of whether it is healthy or unhealthy. Hence in study 3, we examined this alternative explanation. Specifically, while in studies 1a and 1b we displayed healthy/unhealthy

items on the left and on the right, in study 3 we also included a control condition related to displaying the healthy and unhealthy items in a neutral location (i.e., the center) in order to demonstrate how preference for the healthy and unhealthy items changes in comparison to this baseline (control) condition.

Design, Participants, and Procedure

Study 3 was a between-subjects experiment with three manipulated conditions (healthy left–unhealthy right vs. healthy right–unhealthy left vs. healthy and unhealthy both in center). The last condition (i.e., both items in center) was counterbalanced by having the healthy item on the top and the unhealthy item on the bottom or having this in the reverse pattern. There were no effects of top versus bottom positions on choice ($\chi^2 = .30$, $p = .58$). Online appendix C presents the images of the different experimental conditions. Strawberries and chocolate cake slice (both weighing 300 g) were the healthy and unhealthy options, respectively. A total of 109 students (average age 24 years, 59% female, 90% right-handed) from a major US university participated in exchange for course credit. Participants first arrived at a waiting area and were subsequently brought into a lab by a research assistant. The food items were displayed on a screen in the lab after participants sat in the center of the room. After seeing the food image, participants indicated their preference on a survey. One participant (from the "healthy right–unhealthy left" condition) did not look at the displayed image; however, keeping or removing this participant did not alter the pattern of results.

Results and Discussion

Consistent with the findings observed in studies 1a and 1b, preference for the healthy option was higher when it was displayed on the left (vs. right) (70.0% vs. 47.50%; $\chi^2 = 3.54$, $p = .06$). Removing the participant who did not look at the image displayed on the screen made the effect stronger ($\chi^2 = 3.92$, $p < .05$). More interestingly, displaying the healthy item on the left (vs. control condition of center) led to higher preference for the healthy item (70.0% vs. 46.15%; $\chi^2 = 3.92$, $p < .05$), while displaying the unhealthy item on the left (vs. control condition) led to a similar preference for the unhealthy item (52.50% vs. 53.85%; $\chi^2 = .01$, $p = .91$).

These findings rule out the effects of studies 1a and 1b being attributed to a left-side bias. Specifically, if there were a left-side bias, then preference for the unhealthy item also would have been higher when it was displayed on the left versus at the center. Instead, we find that, compared to a baseline (i.e., center) condition, only displaying the healthy item on the left side increases preference; importantly, we see no such effects for the unhealthy item. Next, study 4 rules out another potential alternative explanation.

STUDY 4: RULING OUT POTENTIAL EFFECTS OF GAZE STARTING POINT

Research indicates that when exposed to visual stimuli, people from Western societies tend to process the information starting from the left visual field (Chae and Hoegg 2013; Chokron and De Agostini 2000; Shaki, Fischer, and Petrusic 2009). In other words, consumers tend to first notice items displayed on their left visual field before noticing items on their right visual field. Hence the findings observed in studies 1a and 1b could be attributed to primacy effects (Biswas, Grewal, and Roggeveen 2010; Biswas et al. 2014) whereby consumers notice the healthy item first, leading to higher preference for the healthy item. To rule out primacy effects as an alternative explanation, in study 4, we manipulated gaze starting point position (left vs. right) to test whether it alters the pattern of findings.

Method

Study 4 was a 2 (healthy item displayed to the left vs. right of the unhealthy item) × 2 (gaze starting point: left vs. right) between-subjects experiment. A total of 169 students (average age 23 years, 48% female, 91% right-handed) from a major US university participated in exchange for course credit. We selected raisins as the healthy option and chocolate chip cookies as the unhealthy option (e.g., Laran 2010). As in studies 1 and 3, we manipulated the first factor by presenting the healthy item to the left versus right of the unhealthy item. We also manipulated the location of the gaze starting point by asking participants to focus on a fixation cross (adapted from Mormann et al. 2012), which was presented on the left versus right side of the screen.

Participants first arrived at a waiting area. They were then brought into a lab and instructed to take a seat in the center of the room. The images of the food items were projected on a screen located in the front of the lab. Before showing the two food items, participants were asked to focus on a fixation image (i.e., a cross) placed on either the left or right side of the screen. With participants fixating on the cross, the slide changed and transitioned into an image of two food options laterally displayed (with the healthy and unhealthy items displayed in a left-right vs. right-left pattern). After this, participants indicated their food choice on a survey.

Results and Discussion

The results of a 2 × 2 logistic regression revealed a significant main effect of display position on choice (Wald

$\chi^2 = 7.78$, $p < .01$). The interaction effect and the main effect of gaze starting point were nonsignificant (p's $> .95$), which rules out gaze starting point as an alternative explanation for the effects of lateral display positions on choice.

Contrast tests showed that overall, there was a main effect of display position, whereby consistent with the findings of our earlier studies, preference for the healthy option was higher when it was displayed to the left (vs. right) of the unhealthy option (26.93% vs. 9.89%; $\chi^2 = 8.34$, $p < .01$). For the "left gaze starting" condition, preference for the healthy option was higher when it was displayed to the left (vs. right) of the unhealthy option (26.83% vs. 9.80%; $\chi^2 = 4.59$, $p < .05$), and the pattern of results remained the same for the "right gaze starting" condition (27.03% vs. 10.0%; $\chi^2 = 3.75$, $p = .05$).

The results of study 4 demonstrate higher preference for the healthy option when it is displayed to the left (vs. right) of the unhealthy option, and this pattern persists irrespective of the initial fixation position. Hence these findings rule out primacy effects, of noticing items on the left first, as a potential alternative explanation for the effects observed in our studies. Next, study 5 demonstrates a downstream behavioral outcome of lateral display positions.

STUDY 5: EFFECTS OF DISPLAY POSITION ON CONSUMPTION VOLUME

In our previous studies, participants indicated their preference for a single item that was either healthy or unhealthy. However, in many real-world contexts, consumers might be able to undertake consumption involving a combination of both healthy and unhealthy items (Chandon and Wansink 2007). Moreover, in our earlier studies, participants indicated preferences, but there were no serious consequences of their choices in terms of amount of consumption. Hence study 5 incorporates an important consequential element in the choice process, whereby participants were allowed to consume healthy and unhealthy items in whatever quantities they wanted.

The results of our studies show that displaying healthy items to the left (vs. right) of unhealthy items nudges healthful choices. Along similar lines, we expect consumption volume of the healthy item (vis-à-vis the unhealthy item) will be higher when it is placed to the left (vs. right) of the unhealthy item.

Design, Participants, and Procedure

Study 5 was a mixed-design experiment where the display positions of the beverages were manipulated across two between-subjects conditions (healthy beverage displayed to the left vs. right of the unhealthy beverage); consumption of healthy and unhealthy drinks was measured within subjects. Sixty students (average age 24 years, 50% female) from a major US university participated in this study. The healthy beverage was a low-calorie orange juice with high vitamin content; the unhealthy beverage was a high-calorie synthetic orange soda with no vitamin content. The beverages had comparable color and texture. A pretest ($n = 30$) confirmed (on a 1 to 7 scale) that the low-calorie orange juice was perceived as healthier than the high-calorie orange soda ($M_{\text{juice}} = 5.20$ vs. $M_{\text{soda}} = 1.50$, $t(29) = 14.54$, $p < .01$).

For the main study, participants arrived at a waiting area. They were then brought into a lab and asked to sit at specific desks. Before bringing in the participants to the lab, a research assistant placed a healthy beverage to the left (vs. right) of an unhealthy beverage based on where the participants would be seated. The serving size for the beverages was 3.5 oz. each.

First, participants were provided with information about the calorie and nutrition contents of each respective beverage and were asked to take a look at each beverage. They were then told that they could drink as much or as little of each beverage as they wanted. The key dependent variable, consumption volume, was measured by weighing the cups before and after consumption (i.e., before participants arrived and after they left the lab). Toward the end of the survey, participants were also asked to indicate how they were feeling at that moment, on six different items based on 1 to 7 scales (such as bad–good, sad–happy, calm–excited, tired–energetic). These items did not differ in their ratings across the two manipulated conditions (all p's $> .25$) and hence are not discussed any further.

Results and Discussion

The results of a 2 (lateral display pattern of healthy/unhealthy options) $\times$ 2 (consumption of healthy and unhealthy beverages) mixed analysis of variance revealed a marginally significant interaction effect ($F(1, 58) = 3.45$, $p < .07$). Follow-up tests showed that participants consumed a higher volume of the healthy beverage when it was placed to the left (vs. right) of the unhealthy beverage ($M_{\text{left}} = 1.79$ oz. vs. $M_{\text{right}} = 1.14$ oz.; $F(1, 58) = 4.86$, $p < .05$). Interestingly, the lateral position of the unhealthy item did not influence its consumption volume (Means = 1.27 oz. vs. 1.07 oz.; $F(1, 58) = .43$, $p = .52$).

Additionally, we find that participants had a higher intake of the healthy (vs. unhealthy) beverage only when the healthy beverage was on the left (Means = 1.79 vs. 1.27; $F(1, 58) = 10.76$, $p < .01$). However, when the healthy beverage was on the right, participants consumed an equal amount of the healthy and unhealthy beverages (Means = 1.14 vs. 1.07; $F(1, 58) = .12$, $p = .74$). Online appendix D graphically presents the key results of this study.

Study 5 demonstrates an important behavioral outcome of lateral positions of healthy and unhealthy items in

the form of overall consumption volume. Specifically, when having the option to consume both healthy and unhealthy beverages, participants had a higher intake of the healthy beverage (vis-à-vis the unhealthy beverage) when it was displayed to the left (vs. right) of the unhealthy beverage. At a broader level, while product choice is an important managerially relevant variable, overall consumption volume has strong practical implications for health and well-being. In that regard, study 5, which examines how the lateral positions of a healthy and an unhealthy item might influence consumption volume of each item, has strong substantive implications.

GENERAL DISCUSSION

Summary and Conclusions

We examined the effects of lateral positions of healthy and unhealthy food items on choice and consumption volume across a robust set of food items. The results of our seven studies demonstrate that in a scenario involving healthy and unhealthy food items placed at different lateral positions, consumers are more likely to choose the healthy item when it is displayed to the left (vs. right) of the unhealthy food item. We also found that when given the option to consume both healthy and unhealthy items placed at different lateral positions, consumption volume of the healthy item (vis-à-vis the unhealthy item) is higher when it is placed to the left (vs. right) of the unhealthy item.

We base our propositions on research related to spatial representation of magnitude in which individuals tend to mentally map increases in magnitude from left to right (Kadosh et al. 2008). Thus, in the context of food, unhealthy items with relatively higher affective values (Shiv and Fedorikhin 1999), higher perceived taste (Raghunathan et al. 2006), higher desirability, and greater temptation associations (Hofmann et al. 2010) are likely to be organized to the right of healthy items. Furthermore, we conceptualize that when food items are laterally displayed in a manner congruent (vs. incongruent) with consumers' natural mental representation, it enhances the likelihood of choosing healthier options.

To elaborate, we propose that consumers experience greater self-control when healthy/unhealthy items are displayed in a manner congruent with their natural mental representation. That is, as demonstrated by studies 2a and 2b, consumers tend to mentally represent healthy items to the left (vs. right) of unhealthy items. Hence a display pattern that is congruent with this mental representation should facilitate ease of information processing, which in turn should enhance self-control and resistance to temptation (e.g., Shiv and Fedorikhin 1999), thereby leading to a relatively higher likelihood of choosing healthy options. Online appendices E and F report the results of two experiments that provide empirical evidence regarding the role of self-control as a mediator for the effects of healthy/unhealthy food display positions on choice.

Another related (but conceptually different) explanation for our observed effects is that encountering a display pattern that is congruent (vs. incongruent) with the natural mental representation increases consumers' belief that they are capable of exerting self-control. This is in line with recent research linking processing fluency to self-efficacy judgments (White, MacDonnell, and Dahl 2011). Clearly, additional research is needed to examine these underlying processes in greater depth.

Although there can be several possible explanations for our findings, based on the results of study 3, resource depletion is not a viable alternative explanation for the observed effects. Specifically, a resource depletion model would imply that compared to the baseline condition, choice likelihood for the healthy option should be lower for the condition with a high level of cognitive resource depletion; in contrast, choice likelihood for the healthy option should be similar for the baseline condition and the condition with a low level of cognitive resource depletion. In study 3, the "healthy-right" ("healthy-left") condition was incongruent (congruent) to the natural mental representation and hence required higher (lower) cognitive resources. So a resource depletion model would predict choice likelihood difference between the baseline and the "healthy-right" conditions and no difference between the baseline and the "healthy-left" conditions. However, we find a greater likelihood of healthy food choices in the "healthy-left" (vs. baseline) condition, effectively ruling out the alternative explanation related to a resource depletion model. Similarly, the results of study 2a rule out the role of price as an alternative explanation. Specifically, research shows that consumers place less expensive items on the left than on the right (Cai, Shen, and Hui 2012; Valenzuela and Raghubir 2015) and perceive healthy items as more expensive than unhealthy items (Drewnowski and Barratt-Fornell 2004); however, the findings of study 2a demonstrate effects in the opposite direction.

The findings of this research have important conceptual implications. While prior research has examined different factors that can influence choices between healthy versus unhealthy foods, such as affective/cognitive states (Shiv and Fedorikhin 1999), temptation (Dhar and Wertenbroch 2000), body types of others (McFerran et al. 2010), assortment structure (Kahn and Wansink 2004), self-control (Baumeister 2002; Kivetz and Simonson 2002), and health claims (Chandon and Wansink 2007), among others, no study, to the best of our knowledge, has examined the effects of lateral display positions of healthy and unhealthy options on consumer choices. The present research takes an important step in this direction. In essence, choosing between healthy and unhealthy options often entails trading off between short-term benefits in terms of taste/pleasure and long-term benefits in terms of health/

well-being. As a result, self-control in resisting temptation plays an influential role in determining final choice outcome between healthy and unhealthy options. Our research shows that laterally displaying healthy options to the left (compared to the right) of unhealthy options is congruent with their natural mental representation. This increases ease of processing and enhances self-control, which in turn increases the likelihood of choosing the healthy option (the experiments reported in online appendices E and F provide empirical evidence regarding the role of self-control).

Our findings also contribute to research in the domain of sensory marketing and specifically to the domain of visual marketing. In particular, visual cues are usually encountered prior to other sensory cues (e.g., olfactory, gustatory, haptic, or auditory) because they usually require the least amount of proximity and are processed faster neurologically compared to the other sensory cues (Herz and Engen 1996). Hence, not surprisingly, visual cues play a dominant role in influencing food choices and evaluations (Biswas et al. 2014; Chandon and Ordabayeva 2009; Hoegg and Alba 2007). The findings of our research add to this growing literature in the domain of visual marketing by highlighting how subtle cues such as lateral visual positions can influence healthful choices.

Additionally, the findings of this research contribute to the literature on lateral and visual field positions. Prior studies examining lateral positions and mental representation of magnitude have focused on a variety of topic domains such as number processing, time perception, aesthetics, and ad evaluations (Calabria and Rossetti 2005; Chae and Hoegg 2013; Chokron and De Agostini 2000; Janiszewski 1990, 1993). Also, previous research has demonstrated how items displayed in the center lead to higher preference and value inferences (Raghubir and Valenzuela 2006; Valenzuela and Raghubir 2009), as well as higher visual attention (Atalay, Bodur, and Rasolofoarison 2012). The present study, however, is the first to examine how lateral display patterns of healthy and unhealthy food options influence choice and consumption volume.

Our research also has potentially serious implications for lab-based (or even field-based) research studies involving healthy and unhealthy options. At the very least, the lateral display positions (left vs. right) of healthy and unhealthy items need to be counterbalanced for such research studies. This is an important issue that future research studies need to factor in when designing studies/experiments involving food displays, to avoid potential confounding effects related to lateral display positions.

Implications for Managers, Regulators, and Consumers

The findings of our study have interesting implications for retail product displays and menu designs. For instance, if a store wants to enhance sales of their healthy items, they can display them to the left (vs. right) of the unhealthy options, from the consumer's visual perspective. Similarly, while designing restaurant menus, a restaurant wanting to enhance sales of healthy food items might want to display the healthy items on the left side of the menu and the unhealthy items on the right side. With growing trends toward focusing on healthy eating, optimal menu designs can help restaurant managers in driving sales of healthy versus unhealthy items. Incidentally, while there is high interest in the popular press about the psychological aspects of menu designs (Zhang 2014), there is very limited research in the marketing academic literature examining psychological phenomena behind menu design. Our research aims to take an important step in this direction by identifying how lateral display patterns of healthy/unhealthy items on a menu can potentially influence choice. Clearly, additional studies, especially in field settings, are needed to examine this phenomenon in greater depth.

Given the worldwide concerns related to obesity and factors influencing choices for healthy (vs. unhealthy) options, understanding how visual cues influence choice has important consequential implications. In particular, policymakers could use the findings of this research to nudge consumers toward healthier choices. Specifically, the findings of this research have implications for consumer welfare in terms of facilitating healthy choice behavior. Policymakers and consumers might want to promote having healthy items displayed to the left (vs. right) of unhealthy items in order to nudge healthier food choices and consumption.

Limitations and Future Research Directions

In our studies, we examined only healthy and unhealthy items, while many food items might be "neutral" (i.e., neither healthy nor unhealthy). Additional studies are required to examine how the left-to-right mental organization holds for "neutral" products. Similarly, there can be several relevant moderators that can influence the pattern of effects observed in this research. For instance, would a person's orientation toward a healthy lifestyle or health goals influence the results observed here? Cultural background can be another relevant moderator. That is, in our studies, all the participants were based in the United States and were expected to be oriented to process information from left to right. It will be interesting to examine if the pattern of our results hold for consumers who tend to read and process information from right to left.

In this research, we focused primarily on the interesting effects of lateral display positions of food items on choice. We did not explore the underlying processes in depth. While we report the findings of process studies demonstrating mediating effects, in online appendices E and F, there is scope for additional research on the process front.

In other words, future research should explore the underlying process in greater depth.

As mentioned previously, something "good" (or "positive") is often represented on the right, whereas something "bad" (or "negative") is represented on the left (Casasanto 2009). From a scholarly or regulatory perspective, healthy (unhealthy) items are considered to be "good" ("bad"). However, from a consumer standpoint, "good" can refer to "good taste" (and not necessarily "good for you in the long term"), as has been highlighted earlier. Hence the situational concept of what is considered "good" or "bad" might moderate the effects observed in our studies. Similarly, can the handedness (right vs. left) of a person moderate our effects? This can be even more interesting when considering individuals who have flexible concepts of handedness (Eelen et al. 2013).

This research focused on the effects of lateral displays of food items on the left versus on the right. Future research can extend this by examining the implications of display patterns in other formats, such as vertical (top-bottom) displays of healthy and unhealthy items. Given the relatively nascent stage of research on effects of food display patterns, there is scope for significant additional work in this area.

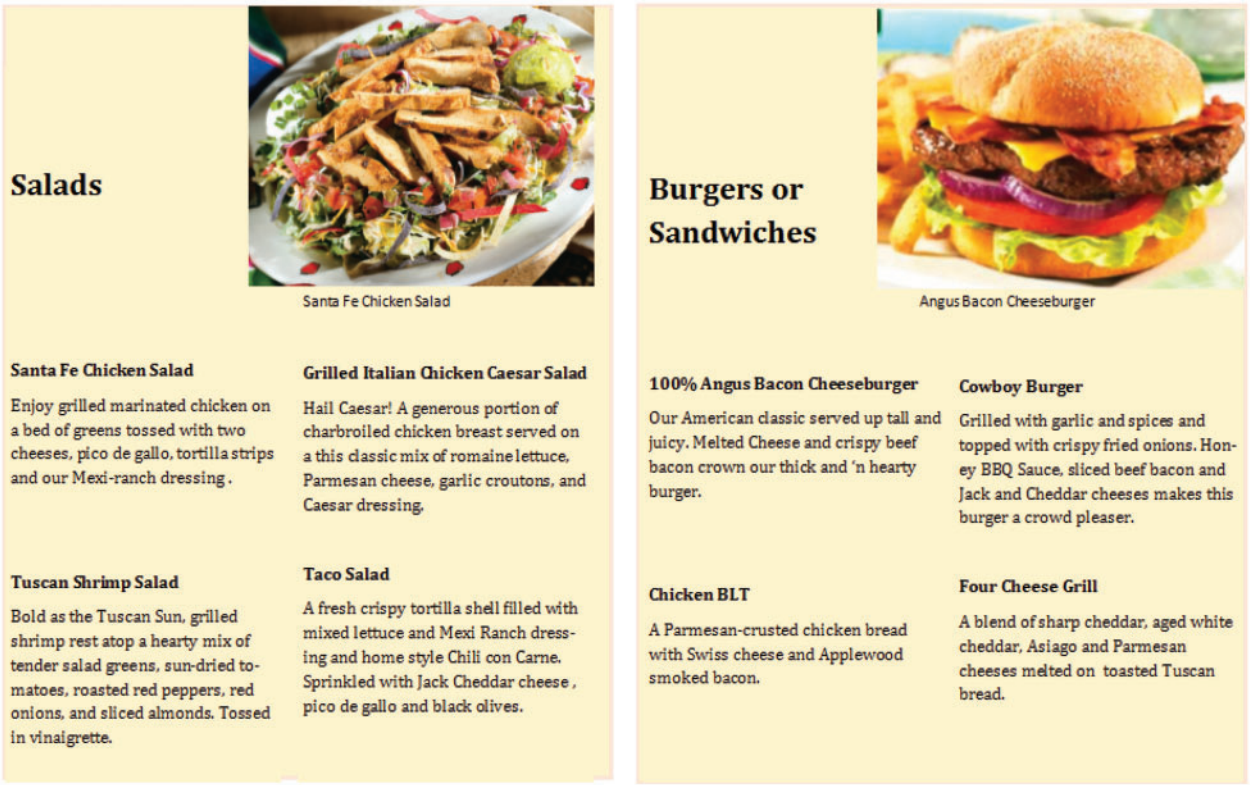
Finally, while it is important to understand choices between healthy and unhealthy options, display positions can possibly also bias choices in other marketplace scenarios (Chandon et al. 2009). For example, would lateral positions of two items, with different price or indulgence levels, influence choice? Such studies would be conceptually interesting and have relevant managerial implications. Indeed, with hardly any research examining the effects of lateral display positions of products on choice, there is scope for substantial future research studies in this domain. We hope our research will encourage work in these and related areas.

DATA COLLECTION INFORMATION

The first author managed the collection of data for all the studies, under the supervision of the second author. Both authors jointly analyzed the data. Studies 1b, 2b, and 5 were conducted and analyzed between October 2012 and October 2013. Study 2a was conducted and analyzed in March 2014. The data for studies 1a, 3, and 4 were collected and analyzed between January and August 2015. Studies 1a, 2a, and 2b were MTurk studies, and studies 1b, 3, 4, and 5 were lab experiments conducted at the University of South Florida, Tampa.

APPENDIX: RESTAURANT MENU USED IN STUDY 1A

Healthy Left–Unhealthy Right



REFERENCES

Atalay, A. Selin, H. Onur Bodur, and Dina Rasolofoarison (2012), "Shining in the Center: Central Gaze Cascade Effect on Product Choice," *Journal of Consumer Research*, 39 (4), 848–66.

Baumeister, Roy F. (2002), "Yielding to Temptation: Self-Control Failure, Impulsive Purchasing, and Consumer Behavior," *Journal of Consumer Research*, 28 (4), 670–76.

Biswas, Dipayan, Dhruv Grewal, and Anne Roggeveen (2010), "How the Order of Sampled Experiential Products Affects Choice," *Journal of Marketing Research*, 47 (3), 508–19.

Biswas, Dipayan, Lauren I. Labrecque, Donald R. Lehmann, and Ereni Markos (2014), "Making Choices While Smelling, Tasting, and Listening: The Role of Sensory (Dis) Similarity When Sequentially Sampling Products," *Journal of Marketing*, 78 (1), 112–26.

Brookshire, Geoffrey and Daniel Casasanto (2012), "Motivation and Motor Control:Hemispheric Specialization for Approach Motivation Reverses with Handedness," *PLoS One*, 7 (4), e36036.

Bueti, Domenica and Vincent Walsh (2009), "The Parietal Cortex and the Representation of Time, Space, Number and Other Magnitudes," *Philosophical Transactions of the Royal Society of London B: Biological Sciences*, 364 (1525), 1831–40.

Cai, Fengyan, Hao Shen, and Michael K. Hui (2012), "The Effect of Location on Price Estimation: Understanding Number-Location and Number-Order Associations," *Journal of Marketing Research*, 49 (5), 718–24.

Calabria, Marco and Yves Rossetti (2005), "Interference Between Number Processing and Line Bisection: A Methodology," *Neuropsychologia*, 43 (5), 779–83.

Casasanto, Daniel (2009), "Embodiment of Abstract Concepts: Good and Bad in Right-and Left Handers," *Journal of Experimental Psychology: General*, 138 (3), 351–67.

Casasanto, Daniel and Evangelia G. Chrysikou (2011), "When Left Is "Right": Motor Fluency Shapes Abstract Concepts," *Psychological Science*, 22 (4), 419–22.

Chae, Boyoun Grace and JoAndrea Hoegg (2013), "The Future Looks "Right": Effects of the Horizontal Location of Advertising Images on Product Attitude," *Journal of Consumer Research*, 40 (2), 223–38.

Chandon, Pierre and Brian Wansink (2007), "The Biasing Health Halos of Fast-Food Restaurant Health Claims: Lower Calorie Estimates and Higher Side-Dish Consumption Intentions," *Journal of Consumer Research*, 34 (3), 301–14.

Chandon, Pierre, Wesley Hutchinson, Eric T. Bradlow, and Scott H. Young (2009), "Does in Store Marketing Work? Effects of the Number and Position of Shelf Facings on Brand Attention and Evaluation at the Point of Purchase," *Journal of Marketing*, 73 (6), 1–17.

Chandon, Pierre and Nailya Ordabayeva (2009), "Supersize in One Dimension, Downsize in Three Dimensions: Effects of Spatial Dimensionality on Size Perceptions and Preferences," *Journal of Marketing Research*, 46 (6), 739–53.

Chernev, Alexander (2011), "Semantic Anchoring in Sequential Evaluations of Vices and Virtues," *Journal of Consumer Research*, 37 (5), 761–74.

Chokron, Sylvie and Maria De Agostini (2000), "Reading Habits Influence Aesthetic Preference," *Cognitive Brain Research*, 10 (1), 45–49.

Deng, Xiaoyan and Barbara E. Kahn (2009), "Is Your Product on the Right Side? The 'Location Effect' on Perceived Product Heaviness and Package Evaluation," *Journal of Marketing Research*, 46 (6), 725–38.

Dhar, Ravi and Klaus Wertenbroch (2000), "Consumer Choice Between Hedonic and Utilitarian Goods," *Journal of Marketing Research*, 37 (1), 60–71.

Drewnowski, Adam and Anne Barratt-Fornell (2004), "Do Healthier Diets Cost More?" *Nutrition Today*, 39 (4), 161–68.

Eelen, Jiska, Siegfried Dewitte, and Luk Warlop (2013), "Situated Embodied Cognition: Monitoring Orientation Cues Affects Product Evaluation and Choice," *Journal of Consumer Psychology*, 23 (4), 424–33.

Herz, Rachel S. and Trygg Engen (1996), "Odor Memory: Review and Analysis," *Psychonomic Bulletin & Review*, 3 (3), 300–13.

Hoegg, JoAndrea and Joseph W. Alba (2007), "Taste Perception: More Than Meets the Tongue," *Journal of Consumer Research*, 33 (4), 490–98.

Hofmann, Wilhelm, Guido M. van Koningsbruggen, Wolfgang Stroebe, Suresh Ramanathan, and Henk Aarts (2010), "As Pleasure Unfolds: Hedonic Responses to Tempting Food," *Psychological Science*, 21 (12), 1863–70.

Hubbard, Edward M., Manuela Piazza, Philippe Pinel, and Stanislas Dehaene (2005), "Interactions Between Number and Space in Parietal Cortex," *Nature Reviews Neuroscience*, 6 (6), 435–48.

Janiszewski, Chris (1990), "The Influence of Print Advertisement Organization on Affect toward a Brand Name," *Journal of Consumer Research*, 17 (1), 53–65.

———. (1993), "Preattentive Mere Exposure Effects," *Journal of Consumer Research*, 20 (3), 376–92.

Kadosh, Roi Cohen, Warren Brodsky, Michal Levin, and Avishai Henik (2008), "Mental Representation: What Can Pitch Tell Us About the Distance Effect?" *Cortex*, 44 (4), 470–77.

Kahn, Barbara E. and Brian Wansink (2004), "The Influence of Assortment Structure on Perceived Variety and Consumption Quantities," *Journal of Consumer Research*, 30 (4), 519–33.

Kivetz, Ran and Itamar Simonson (2002), "Self-Control for the Righteous: Toward a Theory of Precommitment to Indulgence," *Journal of Consumer Research*, 29 (2), 199–217.

Laran, Juliano (2010), "Choosing Your Future: Temporal Distance and the Balance between Self-Control and Indulgence," *Journal of Consumer Research*, 36 (6), 1002–15.

Lee, Angela Y. and Jennifer L. Aaker (2004), "Bringing the Frame into Focus: The Influence of Regulatory Fit on Processing Fluency and Persuasion," *Journal of Personality and Social Psychology*, 86 (2), 205–18.

Lourenco, Stella F. and Matthew R. Longo (2010), "General Magnitude Representation in Human Infants," *Psychological Science*, 21 (6), 873–81.

McFerran, Brent, Darren W. Dahl, Gavan J. Fitzsimons, and Andrea C. Morales (2010), "I'll Have What She's Having: Effects of Social Influence and Body Type on the Food Choices of Others," *Journal of Consumer Research*, 36 (6), 915–29.

Mormann, Milica Milosavljevic, Vidhya Navalpakkam, Christof Koch, and Antonio Rangel (2012), "Relative Visual Saliency Differences Induce Sizable Bias in Consumer Choice," *Journal of Consumer Psychology*, 22 (1), 67–74.

Oakes, Michael E. (2006), "Filling Yet Fattening: Stereotypical Beliefs About the Weight Gain Potential and Satiation of Foods," *Appetite*, 46 (2), 224–33.

Raghubir, Priya and Ana Valenzuela (2006), "Center-of-Inattention: Position Biases in Decision Making," *Organizational Behavior and Human Decision Processes*, 99 (1), 66–80.

Raghunathan, Rajagopal, Rebecca Walker Naylor, and Wayne D. Hoyer (2006), "The Unhealthy = Tasty Intuition and Its Effects on Taste Inferences, Enjoyment, and Choice of Food Products," *Journal of Marketing*, 70 (4), 170–84.

Shaki, Samuel, Martin H. Fischer, and William M. Petrusic (2009), "Reading Habits for Both Words and Numbers Contribute to the Snarc Effect," *Psychonomic Bulletin & Review*, 16 (2), 328–31.

Shiv, Baba and Alexander Fedorikhin (1999), "Heart and Mind in Conflict: The Interplay of Affect and Cognition in Consumer Decision Making," *Journal of Consumer Research*, 26 (3), 278–92.

Valenzuela, Ana and Priya Raghubir (2009), "Position-Based Beliefs: The Center-Stage Effect," *Journal of Consumer Psychology*, 19 (2), 185–96.

——. (2015), "Are Consumers Aware of Top-Bottom But Not of Left-Right Inferences? Implications for Shelf Space Positions,"*Journal of Experimental Psychology: Applied*, 21(3), 224–41.

Walsh, Vincent (2003), "A Theory of Magnitude: Common Cortical Metrics of Time, Space and Quantity," *Trends in Cognitive Sciences*, 7 (11), 483–88.

White, Katherine, Rhiannon MacDonnell, and Darren W Dahl (2011), "It's the Mind-Set That Matters: The Role of Construal Level and Message Framing in Influencing Consumer Efficacy and Conservation Behaviors," *Journal of Marketing Research*, 48 (3), 472–85.

Zhang, Maggie (2014), "11 Pyschological Tricks Restaurants Use to Make You Spend More Money," http://www.businessinsider.com/restaurant-menus-spend-more-money-2014-7.