The Future Looks "Right": Effects of the Horizontal Location of Advertising Images on Product Attitude

BOYOUN (GRACE) CHAE
JOANDREA HOEGG

Consumers from cultures that read from left to right possess a spatial representation of time whereby the past is visualized on the left and the future is visualized on the right. Across four studies, the current research investigates whether and how this *past-left, future-right* conceptualization of time affects attitudes toward time-related products. Specifically, when consumers view advertisements in which product images are positioned congruently (incongruently) with their spatial representation of time, they have more (less) favorable attitudes toward the product. This effect occurs for both products that naturally involve the progression of time (e.g., self-improvement products) and also products for which a time component is a desired attribute (e.g., antiques). The effect of horizontal position reverses among consumers who read from right to left. The mediating role of processing fluency is highlighted as an underlying mechanism, and the moderating role of need for structure is identified.

There is increasing evidence that the position of images in product-related information can alter processing and impact consumer perceptions. For example, Deng and Kahn (2009) demonstrated that product images presented in the lower right corner of a package results in the product being perceived as heavier. Janiszewski (1990) documented how the position of a brand logo relative to an image and verbal slogan in an advertisement influenced brand liking. Peracchio and Meyers-Levy (1997) investigated the impact of physical integration between verbal and visual advertising components on product evaluation. The current research adds to this growing body of work by investigating whether and how the horizontal position of images in an advertisement, independent of other elements such as text or vertical position, influences consumers' attitude toward the advertised product.

Our theorizing is motivated by prior research in cognitive linguistics, which has documented that people generally conceive of the past as being on the left and the future as being on the right (see, e.g., Boroditsky 2000; Fuhrman and Boroditsky 2010; Maass and Russo 2003). For example, in a sentence-picture matching task, participants responded faster when the agent of action appeared on the left side of a picture and the recipient appeared on the right, so that the action started on the left and was received or completed on the right (Chatterjee, Southwood, and Basilico 1999). Other evidence has been found in categorization tasks, where words referring to the past are categorized faster when they appear on the left side of a screen, and words referring to the future are categorized faster when they appear on the right side (Ouellet et al. 2010).

We propose that when considering a print ad, webpage, package, or other visual information for a product for which time is a relevant component (e.g., self-improvement products where progress occurs over time, antiques, modern furniture, new technologies, etc.), consumers will incorporate location information into their product evaluation. Specifically, if the product image is displayed congruently with the

Boyoun (Grace) Chae is a doctoral candidate in marketing at the Sauder School of Business, University of British Columbia, Vancouver, BC V6T 1Z2, Canada (boyoun.chae@sauder.ubc.ca). JoAndrea Hoegg is an assistant professor in marketing at the Sauder School of Business, University of British Columbia, Vancouver, BC V6T 1Z2, Canada (joey.hoegg@sauder.ubc.ca). Order of authorship is alphabetical. The authors are grateful to Joon-Hyuk Imm for his assistance with the studies, and to Darren Dahl, Jo Lynne Hoegg, Brent McFerran, Xiuping Li, and Juliet Zhu for their helpful comments on an earlier draft of this manuscript.

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manner in which consumers conceive of time (i.e., past-related items on the left and/or future-related items on the right) consumers will be more favorable to the product. Across four studies, we test and show support for this prediction. Further, we identify processing fluency as the mediator of the relationship between this *past-left, future-right* representation of time and product evaluation. We argue and find that advertisements that display images congruently (vs. incongruently) with consumers' spatial representation of time are processed more easily, resulting in more favorable product evaluation. We also show that the influence of horizontal position on product evaluation is reversed for native Hebrew speakers who, due to their reversed reading habits (i.e., from right to left), represent the past on the right and the future on the left.

This research makes several contributions. First, it adds to the body of work demonstrating effects of spatial location on consumer judgment (Meier and Robinson 2006; Meier, Robinson, and Clore 2004; Meier, Sellbom, and Wygant 2007; Nelson and Simmons 2009; Shubert 2005) by identifying another important consideration—horizontal position of product images in advertisements. Second, we provide process evidence of the effect of horizontal position by highlighting processing fluency as the mechanism underlying the relationship between consumers' representation of time and their product evaluations. Third, we show that this effect is dependent on the extent to which they rely on and have a preference for structure in their lives. Finally, the current work offers valuable practical implications by demonstrating how the horizontal position of images in an advertisement can influence consumers' attitude toward products. The findings suggest that advertisers should carefully consider the time aspect of their products when determining the location of images in advertisements.

THEORETICAL BACKGROUND

Previous research has demonstrated several ways in which the position of images in advertisements and on packaging can impact consumer perceptions. For example, Janiszewski (1990) showed that brand evaluation is enhanced when the placement of the brand name relative to visual and verbal information maximizes processing. Peracchio and Meyers-Levy (1997) investigated the integration of visual and verbal material in advertisements and found that persuasion was highest when there was a match between the complexity of the ad and viewers' motivation level. In work on how the appearance of packaging affects judgments, Deng and Kahn (2009) examined how the location of a product image on the package façade alters perception. Specifically, the authors showed that consumers judge a product as heavier when the product image is located on the bottom right of the package façade. When heaviness was considered a positive attribute, packages with the product image placed at the bottom right were preferred.

The horizontal location of images in advertising or on packaging, independent of written information or other spatial elements, has not been directly investigated. However, the issue of how horizontal location might impact judgment has been considered in terms of retail displays (Chandon et al. 2007; Christenfeld 1995; Valenzuela and Raghubir 2009, 2010; Valenzuela, Raghubir, and Mitakakis 2012). Valenzuela and Raghubir (2010) showed that people judge products on the right side of a horizontal shelf as more expensive and of higher quality, although this may not be due to an explicitly held belief about position and quality (Valenzuela et al. 2012). Other research has demonstrated a bias toward the center of an array because the center is presumed to be the most popular (Valenzuela and Raghubir 2009) and may require the least attentional effort (Christenfeld 1995). These findings suggest that a product's horizontal location may provide information that consumers use in their judgments. However, this question has not been considered with regard to consumers' representation of time and its potential implications for judgments of time-related products.

Left-to-Right Directionality

When people imagine an action or sequence of events, they generally conceive of it as occurring from left to right (Chatterjee et al. 1999; Christman and Pinger 1997). For example, Christman and Pinger (1997) showed that adults prefer pictures that illustrate the process of a series of events from left to right. In a sentence-picture matching task, Chatterjee et al. (1999) found that participants responded faster to the pictures when the agent of action was placed to the left of the recipient of the action in the pictures, so that the action was started on the left and received or completed on the right. This left-to-right bias has also been observed in judgments of event sequences presented as movie clips or pictures (Santiago et al. 2008).

Conventionally, it was thought that the left-to-right directionality in the perception of action occurs due to a neural encoding system. According to hemispheric processing theory, when the brain processes information, the left hemisphere directs spatial attention from left to right (Chatterjee et al. 1999). The left-to-right directionality in the encoding stage remains and affects the way people represent events; thus, people tend to represent events and process visual information from left to right (Chatterjee 2001). However, this explanation has been challenged by evidence showing it is not a universal bias. Cognitive linguistic researchers have instead argued that the directionality occurs due to a culturally learned association between time and space (e.g., Boroditsky 2000; Fuhrman and Boroditsky 2010; Maass and Russo 2003). More specifically, they posit that whether people are biased toward a left-to-right or right-to-left directionality depends on their directional reading habits. That is, individuals who read from left to right will conceive of actions as occurring from left to right, and individuals who read right to left will conceive of actions as occurring from right to left.

Consistent with this cultural perspective, Tversky, Kugelmass, and Winter (1991) showed that American schoolchildren ordered pictures of breakfast, lunch, and dinner from left to right, but Arab schoolchildren, who read from

right to left, placed the same pictures in the opposite order. Dobel, Diesendruck, and Bolte (2007) showed that while German- and Hebrew-speaking adults show a left-to-right and right-to-left bias, respectively, for the representation of action sequences, such difference was not observed between German and Hebrew preschoolers who could not yet read.

Although this left-to-right bias has its roots in reading and writing direction, it is not a true linguistic effect, in that there is no lexical usage of the *past-left, future-right* conceptualization of time in any language (Santiago et al. 2007). That is, the left is never used to talk about the past, and the right is never used to talk about the future. Indeed, most studied languages, regardless of reading and writing direction, express time-related events using a past-behind, future-ahead conceptualization (e.g., "looking forward to the holidays" or "the past is behind you" rather than "looking right to the holidays" or "the past is to the left of you"). The *past-left, future-right* conceptualization of time is a visual cognitive representation (Vallesi, Binns, and Shallice 2008). It stems from the visual appearance of numerous cultural symbols, primarily written text, but also more visual objects such as graphs or even comic strips, in which events begin on the left side of the page and end on the right (Santiago et al. 2007). The abundance of such stimuli has led to a bias in visual attention, whereby attentional performance is enhanced for objects that begin on the left and progress to the right (Maass and Russo 2003; Ouellet et al. 2010; Spalek and Hammad 2005). The human attentional system is biased in a manner consistent with momentum, leading humans to focus on an anticipated location of an object in motion and providing an efficient way to estimate where a moving target will end up (Spalek and Hammad 2005). It appears that the speed at which this process occurs develops as a function of practice or habit, and the eye movement required to read text, signs, graphs, or comic strips provides such practice.

Consistent with this perspective, individuals from left-to-right reading cultures are faster at identifying targets when they move from left to right and vice versa for individuals from right-to-left reading cultures (Spalek and Hammad 2005). Ouellet et al. (2010; see also Santiago et al. 2007) extended this notion to show that the starting and finishing locations are conceptually associated with time. They found that Spanish speakers categorized words referring to the past (future) faster when they appeared on the left (right) side of a screen. Hebrew speakers showed the opposite pattern, although the effect was weaker. Similarly, Fuhrman and Boroditsky (2010) presented English and Hebrew speakers with pairs of pictures shown one at a time and asked participants to decide whether the second picture described an earlier or later time-point than the first. Participants responded with two adjacent keyboard keys. English-speaking participants responded faster when the key corresponding to the earlier picture was on the left and the key corresponding to the later picture was on the right. The pattern reversed for Hebrew speakers.

Time-Space Representation and Attitudes toward Time-Related Products

Given that consumers' spatial representation of time can impact how they perceive temporal events and the ease with which they process time-related concepts, it likely has implications for how they process advertising. We expect that when consumers view an advertisement for a product for which time is a relevant aspect, they naturally utilize the *past-left, future-right* representation as they evaluate the product. For example, self-improvement products are often promoted using before-and-after photographs, highlighting the temporal aspect of the product. Similarly, advertisements for products that are related to time by their nature or for which time is an important attribute (e.g., antiques, new technologies, wine, modern art, vintage clothing, nostalgia items) should also be subject to consumers' spatial representation of time. We argue that advertisements for time-related products that are structured in a manner that conforms to the *past-left, future-right* representation of time will enhance processing fluency, which should, in turn, yield enhanced attitudes toward the advertised product.

The Role of Processing Fluency. Processing fluency research suggests that people evaluate objects on the basis of subjective feelings of ease or difficulty that they experience at the time they process information about the objects (Schwarz 2004). Various factors relating to how a target object is presented can contribute to processing fluency, consequently affecting the target object evaluation. For example, ease of reading visual information (Novemsky et al. 2007), distinguishing foreground from background (Reber and Schwarz 1999), and previous exposure to the same or related information (Labroo and Lee 2006; Lee and Labroo 2004) can all increase processing fluency, resulting in a more favorable evaluation of the target (Shen, Jiang, and Adaval 2010).

Of particular relevance to the current research, past literature found that people are more favorable to a target object when information about the target is conveyed in a manner that is consistent with their knowledge structures regarding the object (Kim, Rao, and Lee 2009; Lee and Aaker 2004; Lee, Keller, and Sternthal 2010). Specifically, when consumers' mental representation of a target matches the way the target is presented, this fit increases processing fluency, yielding more favorable target evaluations. For instance, Kim, Rao, and Lee (2009) found that a match between temporal distance (i.e., distant future vs. near future) and the abstractness of the message about an event increased processing fluency, resulting in a more favorable attitude toward the event. Lee and Aaker (2004) demonstrated that a fit between regulatory focus (i.e., promotion vs. prevention) and message frame (i.e., gain vs. loss) influenced the ease of processing a message and determined the persuasiveness of the message. In addition, Lee et al. (2010) showed that a fit between regulatory focus and concreteness of message increased persuasion by enhancing processing fluency.

The studies reported above suggest that a fit between how information about a product is presented and the way consumers naturally think about it affects processing fluency and evaluation of the product. Accordingly, we propose that displaying ad images congruently with the manner in which consumers represent time will enhance processing fluency. As discussed previously, consumers in a left-to-right reading system have a *past-left, future-right* spatial representation of time. For products for which time is a relevant consideration, images that are presented congruent with the *past-left, future-right* representation of time should lead to a sense of fluency from the match between their representation of time and the structure of the given information. This should, in turn, result in more positive evaluations of the product. More formally,

H1: When the horizontal position of images in an advertisement is congruent (incongruent) with the *past-left, future-right* representation of time, attitude toward the advertised product will be higher (lower).

H2: Processing fluency will mediate the impact of the horizontal position of ad images on attitude toward the advertised product.

Disruptions of the Position Effect

Although the *past-left, future-right* conceptualization is a commonly held representation of time, there is reason to suspect it would not always play a role in product judgments. Below we identify several factors that should mitigate its influence.

Conceptualization of Time. Lakoff and Johnson (1980) have argued that spatial relation is one of a very small set of fundamental experiential concepts that humans use to understand abstract ideas. For instance, vertical heights are used to describe the divinity (e.g., God is in the highest place, the devil lives down in hell; Meier et al. 2004), valence (e.g., good is up and bad is down; Meier and Robinson 2006), and power (e.g., high vs. low status, look up to vs. down on; Shubert 2005). In some instances, people use a variety of different spatial relationships to conceive of the same abstract concept. Time is one such concept that can be conceptualized with different spatial relationships (Boroditsky 2011). People generally visualize time horizontally from left to right, but time can be represented with different directionality. As noted previously, a past-behind, future-ahead axis is used across cultures to refer verbally to the past or future. Time can also be represented vertically, both lexically (e.g., Christmas is coming up) and visually (e.g., in a daytimer). Thus, despite the tendency to conceptualize the past on the left and the future on the right, people are capable of conceiving of time in different ways. Given this, providing an alternate way of conceiving of time should mitigate the influence of the *past-left, future-right* spatial representation of time on product judgment.

Applying this rationale, we will test the influence of the *past-left, future-right* spatial representation of time on product judgment. By priming an alternative conceptualization of time (e.g., projecting time along a vertical line from top to bottom) the connection between time and horizontal position should be diminished, mitigating the influence of horizontal position on product evaluation. Formally, we predict,

H3: Altering consumers' spatial representation of time will attenuate the impact of horizontal position of product images on attitude.

Cultural Reading Habit. As noted above, prior research has established that the left-to-right spatial representation of time-related events is a learned representation and occurs only for individuals in left-to-right reading cultures (Dehaene, Bossini, and Giraux 1993; Tversky et al. 1991; Zebian 2005). Individuals from right-to-left writing systems (e.g., Arabic, Hebrew) tend to represent time in the opposite direction, (i.e., the past on the right and the future on the left; Ouellet et al. 2010; Tversky et al. 1991). Because of this difference in the conceptualization of time, we expect that the effect of the horizontal position of advertising images on product evaluation will be reversed for consumers from right-to-left reading cultures. Formally,

H4: When the horizontal position of images in an advertisement is congruent (incongruent) with the *past-left, future-right* representation of time, attitude toward the advertised product will be higher (lower) for those who read from left to right (right to left).

Need for Structure. We have argued that seeing time-related products advertised in a manner congruent with the *past-left, future-right* spatial representation creates a feeling of fluency because of a fit between the structure of the advertisement and consumers' conceptualization of time. However, while people generally try to maintain structure and minimize processing, not all consumers desire structured information (Neuberg and Newsom 1993). Individuals with a low chronic need for structure are less likely to rely on knowledge structures and will be more flexible in thinking and in creative tasks (Rietzschel, De Dreu, and Nijstad 2007) and less likely to form prototypical trait inferences (Moskowitz 1993) or judge people based on stereotype (Neuberg and Newsom 1993; Schaller et al. 1995). For such individuals we expect little reliance on the *past-left, future-right* spatial representation of time when evaluating an advertisement. We predict that the horizontal position of advertising images will have no effect on product evaluation. Specifically,

H5: The effect of the horizontal position of images in an advertisement on product attitude will be weaker for consumers low in need for structure.

In the four studies that follow, we investigate the hypotheses outlined above. In the first study, we test our pre-

dictions in an advertising context where improvement over time is expected. Specifically, we used advertisements for self-improvement products in which an advertisement displays before-and-after pictures horizontally and test whether displaying product images in a manner congruent (vs. incongruent) with the *past-left, future-right* spatial representation of time lead to more favorable attitudes toward the product (hypothesis 1). Study 1 also examines whether altering how people conceptualize time attenuates the impact of positioning on product evaluation (hypothesis 3). In particular, priming participants with a different temporal presentation (i.e., top to bottom) mitigates the position effect. Study 2 generalizes the findings to advertisements with a single product image and demonstrates that when a consumption context is linked to time (i.e., a product is valued for being old/antique or for being new/modern), presenting a product image in a position that is consistent with consumers' time-space representation results in a more favorable product attitude. Study 2 also reveals the mediating role of processing fluency (hypothesis 2). Study 3 tests the moderating role of personal need for structure (hypothesis 5). Study 4 demonstrates that the *past-left, future-right* effect is language based by showing that the position effect is reversed among consumers who use a right-to-left writing system (hypothesis 4).

STUDY 1

Study 1 examined the effect of the *past-left, future-right* spatial representation of time in a self-improvement product advertising context. As self-improvement products are often advertised with before-and-after images of product users, we investigated whether switching the position of the two images would affect attitude toward the product. We expected when the horizontal position of the images was congruent (vs. incongruent) with the *past-left, future-right* time-space representation, people would be more favorable toward the advertised product. Study 1 also tested whether altering how people think about elements of the spatial representation of time would attenuate the position effect. We altered how people conceptualized time by priming people to think of time as running from top to bottom rather than left to right. We expected attenuation of the position effect.

Method

Design and Participants. Study 1 was a 2 (position: time-space representation congruent vs. incongruent) × 3 (card task: horizontal time flow vs. vertical time flow vs. control) between-subjects design. One hundred ninety-four students from the University of British Columbia (60 females) who grew up using a left-to-right writing system (e.g., English, French, Mandarin, Korean, and Hindi) successfully completed the study either for course credit or for a $10 payment.

Procedure. Upon arrival, participants were told they would be completing two separate studies. The first task was a card sorting task, which comprised our manipulation of the spatial representation of time. Participants were provided with a set of seven cards that each had a movie title and a corresponding movie poster. Participants in the *horizontal time flow* and *vertical time flow* conditions were provided with a sheet of paper with seven blank boxes and were asked to arrange the cards in order of the release date of the movies from earliest to latest and write down the corresponding titles. Participants in the horizontal time flow condition were asked to arrange the cards on a horizontal line. To induce a different spatial representation of time, participants in the vertical time flow condition were asked to arrange the cards on a vertical line. All participants in the time conditions were asked to indicate the direction they arranged the cards using an arrow. In the control condition, participants were not given any initial task and only completed the second task.

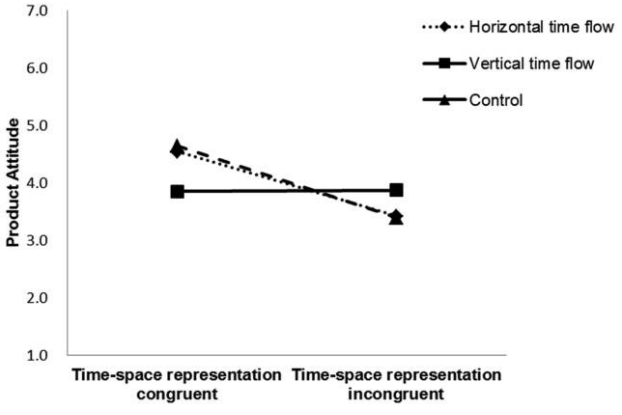
For the second task, participants were asked to evaluate a weight loss program advertisement that displayed a *before* image and an *after* image (see app. A). In the *time-space representation congruent* condition, the ad displayed the before picture on the left and the after picture on the right. The position of the two images was reversed in the *time-space representation incongruent* condition. Product attitudes were assessed with five items on a 7-point scale (good, favorable, effective, reliable, and likelihood to have a side-effect [reverse coded]; 1: not at all, 7: very much). As these five items loaded onto one factor and exhibited high reliability ($\alpha = .78$), they were averaged to create a product attitude index. At the end of the study, demographic items, including gender and handedness ("Are you a left-handed person?" and "I usually use my right hand for writing"), were collected.

Results

Handedness and gender were not significant covariates and did not interact with any other variables in this or any subsequent studies; thus, they are not discussed further. A 2 × 3 ANOVA on product attitude revealed a significant two-way interaction of position and card tasks ($F(2, 188) = 3.25$, $p < .05$). Consistent with hypothesis 1, participants in the horizontal time flow condition and those in the control condition showed a more favorable attitude toward the product when the advertisement images were displayed congruently with the *past-left, future-right* representation than when displayed incongruently ($M_{\text{congruent}} = 4.54$ vs. $M_{\text{incongruent}} = 3.42$; $t(188) = 3.01$, $p < .01$ for the horizontal time flow condition; $M_{\text{congruent}} = 4.64$ vs. $M_{\text{incongruent}} = 3.39$; $t(188) = 3.33$, $p < .01$ for the control condition). There were no significant differences between the horizontal time flow condition and the control condition ($p > .70$). In contrast, and in support of hypothesis 3, the position of the images had no influence on product evaluation among people in the vertical time flow condition ($M_{\text{congruent}} = 3.84$ vs. $M_{\text{incongruent}} = 3.87$; $t < 1$; see fig. 1).

FIGURE 1

PRODUCT ATTITUDE AS A FUNCTION OF POSITION AND PRIMING (STUDY 1)



Discussion

Study 1 demonstrated that consumers' spatial representation of time (i.e., the past on the left and the future on the right) affects product evaluation. In support of hypothesis 1, control participants evaluated the advertised product more favorably when before images were displayed on the left and after images on the right, consistent with the *past-left, future-right* spatial representation of time. The pattern of results for control participants was identical to that of the horizontal time flow participants, who were primed to think about the past on the left and the future on the right. This suggests that people naturally relied on the *past-left, future-right* representation and used the horizontal position of the images in their evaluation of the products. In contrast to the control and horizontal conditions, participants in the vertical time flow condition did not evaluate the product differently as a function of horizontal position. Although the vertical conceptualization of time is far less common (Boroditsky, Fuhrman, and McCormick 2011), its activation can reduce the influence of the horizontal representation.

STUDY 2

Study 2 extends our investigation in several important ways. First, we generalize our findings to a different advertising context. In study 1, we used an advertisement for a self-improvement product with two images—before and after—and varied their position. However, one image position (i.e., before on the left and after on the right) is far more commonly used in the marketplace than the other (i.e., before on the right and after on the left); thus, the format of the two ads likely also differed on familiarity. To address this issue, in study 2 we use an advertisement that has only one product image and manipulate whether it appears on the left or the right.

The use of a single product image also enables an examination into whether the position effect is robust when a static temporal concept (*either* future *or* past) rather than temporal progression (*from* past *to* future) is implicated in consumption. Study 1 focused on a self-improvement product, which by its very nature, suggests the passage of time. In the current study we investigate a product that does not involve the passage of time per se but rather is simply associated with the past or the future. Specifically, we present participants with a shopping scenario in which they are searching for a product in an old/classic versus new/modern style. We expect that if a desirable attribute is past-related (e.g., an antique), people should be more favorable toward the product when the advertisement displays the product on left (vs. right).

Study 2 also provides evidence for the process by which the *past-left, future-right* spatial representation of time affects product attitude. Hypothesis 2 predicts that processing fluency is the mechanism underlying the influence of horizontal position on attitude. We expect that when there is congruency between a focal attribute (e.g., being antique) and horizontal position (e.g., past on the left), processing fluency will be enhanced, resulting in more favorable attitudes toward the product.

Method

Design and Participants. The study was a 2 (position: left vs. right) × 3 (desirable attribute: antique vs. modern vs. control) between-subjects design. One hundred ninety-four native English-speaking participants (105 females) from a national subject pool completed an online study for monetary payment.

Procedure and Materials. First, participants read a scenario that constituted the manipulation of the desirable attribute. Participants were asked to imagine that they were decorating their new home and, in anticipation of a housewarming party, were shopping for a few furniture pieces. Depending on the desirable attribute condition, they were looking for antique-style furniture, modern-style furniture, or no mention of the type of furniture was made. Participants in the antique (modern) conditions were given the following instructions (italics added here for emphasis): "Imagine that you've recently moved and are planning to have a housewarming party. You have decided to decorate your new place *with classic looking things* (*with modern looking things*). You are interested in purchasing a few *traditional and antique* (*state-of-the-art and contemporary*) furniture pieces. You are browsing through a magazine and you happen to see the following ad for a crystal lamp." For participants in the control conditions, the text shown here in italics was not displayed.

All participants were then presented with the advertisement that displayed the product image on the left or the right (app. B). Participants evaluated the lamp along four semantic differential items, each on a 9-point scale (bad-good, dislike-like, unfavorable-favorable, and unappealing-

appealing; $\alpha = .98$). After the product attitude measurement, participants were asked to think about the advertisement and responded to processing fluency items used by Lee and Aaker (2004), each on a 9-point scale (difficult to understand–easy to understand; difficult to process–easy to process; well organized–not at all organized; well structured–not at all structured; logical–illogical; clear-unclear). These items loaded on a single factor and exhibited high reliability ($\alpha = .90$) and thus were averaged to create a fluency index. At the end of the study, we included a manipulation check to ensure participants understood the shopping goal ("Please think back to the scenario that you read. What was the shopping goal?" (1 = buy modern and contemporary products, 2 = buy antique and vintage-style products, and 3 = neither).

Results and Discussion

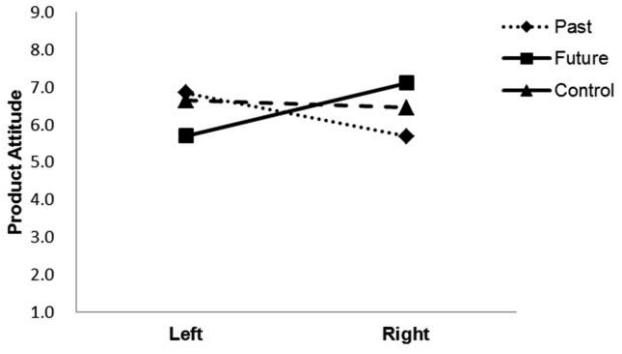
Fifteen participants were unable to identify the shopping goal in the manipulation check and were removed, leaving the responses of 179 participants in the analysis. A 2 (position: left vs. right) × 3 (desirable attribute: antique vs. modern vs. control) ANOVA indicated no main effects (F values < 1) but did reveal an interaction between position and desirable attribute on product attitude ($F(2, 173) = 6.62$, $p < .01$). As shown in figure 2, participants in the antique conditions were more favorable to the product when the ad displayed the product image on the left than on the right (M_{left} vs. $M_{right} = 5.69$; $t(173) = 2.28$, $p < .05$), whereas participants in the modern conditions were more favorable to the product when the ad displayed the product image on the right than on the left (M_{left} vs. $M_{right} = 7.12$; $t(173) = -2.80$, $p < .01$). Participants who were not given a shopping goal showed no difference in evaluation as a function of ad position ($M_{left} = 6.65$ vs. $M_{right} = 6.46$; $t < 1$).

Mediated Moderation Analysis. Next, we examined the mediating role of processing fluency in the interactive effect between horizontal position of an image and desirable attribute on product attitude. We predicted that an ad that displayed the product image congruently (vs. incongruently) with the *past-left, future-right* spatial representation of time would enhance processing fluency, resulting in a more favorable product attitude.

As our interest was in the time-relevant conditions, we focused on the two shopping goal conditions (i.e., antique and modern) and conducted a least-squares regression coefficient analysis for mediated moderation (Muller, Judd, and Yzerbyt 2005). First, the interaction between position and desirable attitude on product attitude was significant ($b_{13} = 2.58$). Second, the interaction between position and desirable attribute on fluency was significant ($b_{23} = 1.88$), and the main effect of fluency was significant when fluency and the interaction between fluency and desirable attribute were included in the first equation ($b_{34} = .34$). Finally, the interactive effect between position and desirable product attribute was reduced in magnitude after controlling for fluency effects ($|2.58| > |1.68|$) (see table 1 for estimated coefficients and associated t-values).

FIGURE 2

PRODUCT ATTITUDE AS A FUNCTION OF POSITION AND DESIRABLE ATTRIBUTE (STUDY 2)



Bootstrapping procedures also showed that the mediating role of fluency was significant in both levels of desirable attribute. In this case, the moderated mediation model specified that the path from position to fluency would be moderated by desirable attribute. In both the antique and modern conditions, the estimate of the indirect effect of processing fluency was significant (95% CI = −.48 to −.01 and 95% CI = .06–.48, respectively).

Discussion. Study 2 showed that the horizontal position effect also occurs in a single product image context when time is an important aspect of the product. Even though the linear progression of temporal events was absent, giving participants a time-related shopping goal led to the same effect. We found that when participants were primed to desire a modern product, they were more favorable when it appeared on the right side of the advertisement. In contrast, when participants were primed to desire an antique, they were more favorable when the product appeared on the left. When there was no shopping goal, and hence time was no longer a relevant attribute, the position of the image in the advertisement did not influence judgment. The study also provided additional evidence that processing fluency underlies the impact of the time-space representation on product attitude. Processing fluency mediated the relationship between position and evaluation for both the antique and modern conditions. For the control conditions, we observed no effect of position. For these conditions, time was not a relevant aspect of the product; hence, the spatial representation of time played no role in evaluation and one position was not more fluent than the other.

STUDY 3

We have argued that the position effect is an outcome of consumers' reliance of the *past-left, future-right* spatial rep-

TABLE 1

LEAST-SQUARES REGRESSION RESULT FOR MEDIATED MODERATION (STUDY 2)

	Criterion					
	Product attitude (1)		Fluency (2)		Product attitude (3)	
Predictors	*b*	*t*	*b*	*t*	*b*	*t*
(1) X: Position (congruent = −1/incongruent = 1)	.07	.38	.06	.39	−.02	−.10
(2) Mod: Desirable product attribute (antique = 0/modern = 1)	−1.15	−2.26[b]	−.87	−2.16[b]	−.73	−1.50
(3) X × Mod: Interaction between position and desirable attribute	2.58	3.51[a]	1.88	−3.24[b]	1.68	2.31[b]
(4) Med: Fluency					.34	2.23[b]
(5) X × Med: interaction between position and fluency					.25	1.07

[a] *t*-statistic is significant at $p < .10$.
[b] *t*-statistic is significant at $p < .05$.

resentation of time. Advertising images that are structured in accordance with this representation are easier to process, leading to higher product evaluations. However, not all consumers are favorable to easy-to-process structures. For some consumers, a more complex structure that requires additional processing might be preferred. Specifically, individuals low in need for structure (Neuberg and Newsom 1993) should not be positively influenced by an ad structure that maximizes ease of processing. To address this issue, study 3 investigates the role of personal need for structure (PNS; Neuberg and Newsom 1993). As predicted by hypothesis 5, we expect that consumers high in PNS would be more likely to exhibit the position effect because the *past-left, future-right* representation simplifies ad processing. However, people low in PNS should be less likely to show the effect.

Certainly, a preference for simple structures is linked to a desire for less cognitive effort, which may imply that involvement in the ad or task would also moderate the effect. However, people high in PNS actively attend to and gather structure-consistent information (Neuberg and Newsom 1993), suggesting that need for structure may be quite distinct from experienced involvement. To examine this possibility we included questions to measure participants' involvement with the task.

Method

Design and Participants. The study was a 2 (position: left vs. right) × 2 (desirable attribute: antique vs. modern) × PNS (continuous variable). One hundred eighty-three (114 females) native English-speaking participants from a national subject pool completed an online study.

Procedure and Materials. The procedure and materials were similar to those used in study 2. First, participants read a shopping scenario that asked them to find either an antique style or modern style of crystal lamp, although in this study they were asked to imagine they were shopping for a gift for a friend rather than for themselves. Next, participants were presented with an advertisement that displayed the product on the left or the right. After presenting the advertisement, product attitude was assessed using the same items used in study 2 ($\alpha = .96$). Participants then completed the personal need for structure scale and the shopping goal manipulation check. Involvement was measured at the end of the study with two items ("How involved were you when reading the scenario and answering the questions?" and "How seriously did you take the study?"; $r = .76$, $p < .001$).

Results and Discussion

A 2 (position: left vs. right) × 2 (desirable product attribute: antique vs. modern) ANOVA revealed a significant interaction ($F(1, 179) = 16.91$, $p < .001$). Consistent with the *past-left, future-right* spatial representation of time, participants in the antique condition were more favorable toward the product when the ad displayed the product image on the left rather than on the right ($M_{left} = 5.04$ vs. $M_{right} = 4.16$; $t(179) = 3.85$, $p < .001$). In contrast, participants in the modern condition were more favorable toward the product when the ad displayed the product image on the right rather than on the left ($M_{left} = 4.57$ vs. $M_{right} = 5.04$; $t(179) = -1.99$, $p < .05$). Considered from another perspective, when the product image was pictured on the left side of the advertisement, participants in the antique condition showed a more favorable attitude toward the product than participants in the modern condition ($t(179) = 1.98$, $p < .05$). In contrast, when the product image was displayed on the right side of the advertisement, participants in the modern condition were more favorable to the product than those in the antique condition ($t(179) = -3.89$, $p < .001$).

To assess the role of need for structure in our findings, we conducted multiple regression analysis with position, desirable attribute, the standardized PNS score, and all interaction terms as independent variables and product attitude as the dependent variable (Aiken and West 1991). The regression revealed a significant three-way interaction ($\beta = .70$, $t(175) = 2.10$, $p < .05$). Considering only those participants high in PNS, we found a significant two-way interaction between position and desirable attribute ($t(175) = 4.40$, $p < .001$ using a spotlight analysis 1 standard deviation [SD] above the mean PNS score). In support of hypothesis 5, we found that among

people with high PNS, those in the antique condition were more favorable toward the product when the product image was on the left than on the right ($\beta = -1.08$, $t(175) = -3.25$, $p < .001$). In contrast, those in the modern condition were more favorable toward the product when the product image was on the right rather than on the left ($\beta = .99$, $t(175) = 2.86$, $p < .001$). For participants low in PNS, we observed no such effect ($t(175) = 1.40$, $p = .16$; using a spotlight analysis of 1 SD below the mean PNS score; fig. 3).

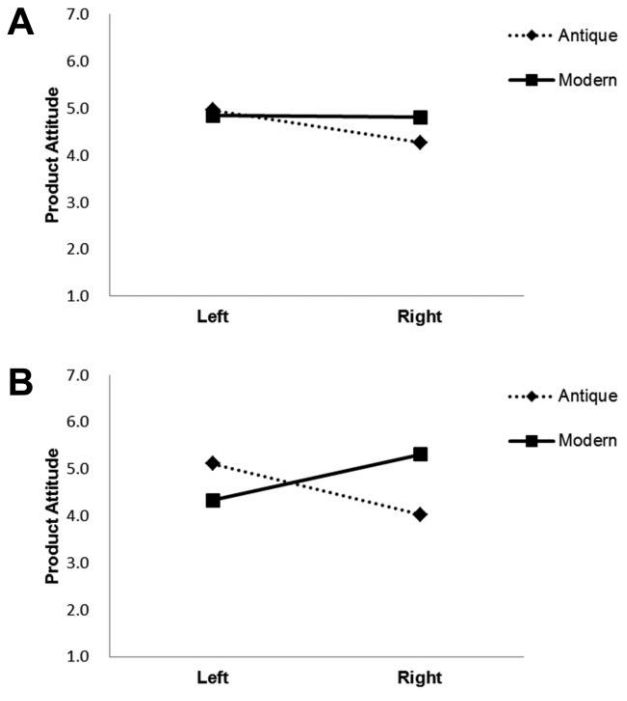
Involvement. Personal need for structure was not significantly correlated with involvement ($r = .10$, $p > .20$). Further, involvement did not moderate the relationship between position and desirable attribute ($\beta = .38$, $t(175) = 1.04$, $p = .30$).

Discussion

Study 3 showed that the horizontal position effect was only found among people with high PNS. This result implies that consumers' use of the *past-left, future-right* representation of time depends on the extent to which they seek structured information. We also found that the moderating role of need for structure was independent from individuals' involvement in the ad evaluation. Participants' level of involvement in the task did not impact the extent to which they were influenced by the position of the ad, which suggests the effect is not one that is overcome by additional effort.

FIGURE 3

PRODUCT ATTITUDE AS A FUNCTION OF POSITION, DESIRABLE ATTRIBUTE, AND PERSONAL NEED FOR STRUCTURE (STUDY 3): (*A*) LOW NEED FOR STRUCTURE, (*B*) HIGH NEED FOR STRUCTURE



STUDY 4

Consumers' conceptualization of time (whereby the past is represented on the left and the future on the right) has been shown to stem from left-to-right reading and writing habits (Dobel et al. 2007; Ouellet et al. 2010). In the studies thus far, we have observed how consumers' reliance on this spatial representation of time can influence evaluation of time-related products. However, all of our participants have been from left-to-right reading cultures. Given that reading and writing systems are the root of the spatial representation of time, hypothesis 4 predicts that people in a right-to-left writing system will show the reversed pattern.

To test this, we conducted a cross-linguistic study with English and Hebrew native speakers. Testing the position effect with Hebrew speakers also enabled us to rule out an alternative explanation for the horizontal position effect: numerical progression. People also use an imaginary horizontal line to present numerical sequences, and in English-speaking cultures people associate smaller numbers with the left and larger numbers with the right (Shaki and Fischer 2008). Dehaene et al. (1993) documented the existence of a spatial-numerical association of response codes (SNARC) effect, whereby manual parity judgments (i.e., judging which of two numbers is larger or smaller when they are presented as a pair) are faster on the left side for small digits and faster on the right side for larger digits.

Although the pattern of our results are consistent with a numerical ordering explanation, the prior research showing an attentional bias for starting and ending points (Spalek and Hammad 2005), as well as the response time effects for past and future words (Santiago et al. 2007) renders the explanation less likely. Rather, the parsimonious explanation may be that biases of numerical ordering such as the SNARC effect are also a result of reading direction. Indeed, Dehaene et al. (1993) demonstrated a left-to-right SNARC effect for French participants (who read from left to right), a reversed SNARC effect for Farsi participants who read from right to left, and no effect among Farsi-French bilinguals (see also Zebian 2005).

Nonetheless, to provide direct evidence that the horizontal position effect is driven by reading direction rather than numerical ordering, we tested the effect with Hebrew speakers. In Hebrew, reading and writing occurs from right to left but the numerical system ascends from left to right. If Hebrew speakers show the same position effect as English speakers, the result would support a numerical ordering explanation. However, if, as predicted, the effect reverses for Hebrew speakers, the result will support our *past-left, future-right* spatial representation explanation.

Method

Design and Participants. The study was a 2 (position: left vs. right) × 2 (desirable attribute: antique vs. modern) × 2 (language: English vs. Hebrew) between-subjects design. One hundred thirty-three native Hebrew speakers from Israel and 157 native English speakers from the United States were recruited to complete an online study.

Procedure and Materials. The procedure and materials were the same as those used in study 2. The advertisement and surveys were translated into Hebrew. Product attitude was assessed using the same items used in study 2 (α = .96 with all groups; α = .95 for Hebrew speakers and α = .97 for English speakers). The shopping goal manipulation check and demographic measures also followed.

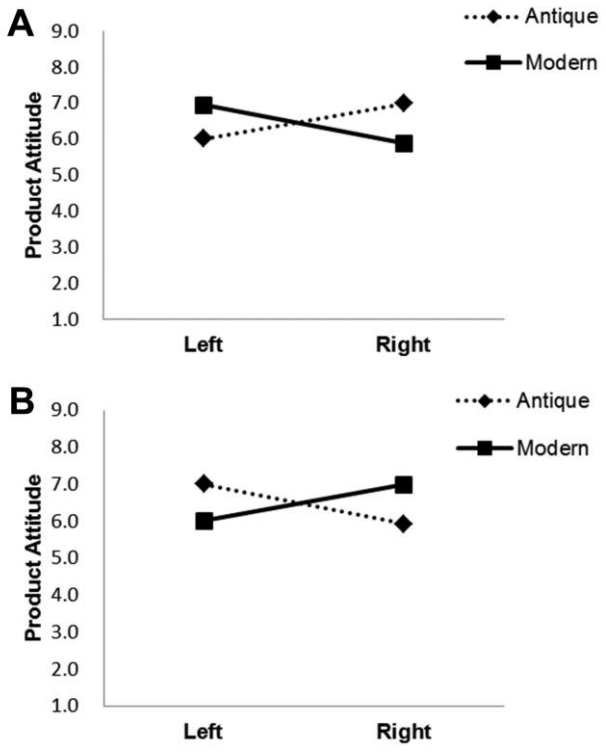
Results and Discussion

Twenty-seven participants were unable to identify the shopping goal and were removed, leaving responses from 263 participants in the analysis. A 2 (position: left vs. right) × 2 (desirable attribute: antique vs. modern) × 2 (language: Hebrew vs. English) ANOVA revealed a significant three-way interaction ($F(1, 255) = 18.28$, $p < .001$). In both language groups, the two-way interaction between position and desirable attribute was significant ($t(255) = -2.93$, $p < .01$ for Hebrew speakers; $t(255) = 3.12$, $p < .01$ for English speakers); however, the patterns were completely different. As shown in figure 4, for English speakers, the previously observed pattern based on the *past-left, future-right* spatial representation of time was replicated. English-speaking participants in the antique condition were more favorable toward the product when the ad displayed the product image on the left rather than on the right (M_{left} = 6.96 vs. M_{right} = 5.92; $\beta = -.54$, $t(255) = -2.22$, $p < .05$). In contrast, participants in the modern condition were more favorable toward the product when the ad displayed the product image on the right rather than on the left (M_{left} = 6.06 vs. M_{right} = 6.99; $\beta = .49$, $t(255) = 2.10$, $p < .05$). However, Hebrew speakers showed the reverse pattern. Specifically, participants in the antique condition were more favorable toward the product when the ad displayed the product image on the right rather than on the left (M_{left} = 6.01 vs. M_{right} = 7.03; $\beta = .49$, $t(255) = 2.10$, $p < .05$). In contrast, participants in the modern condition were more favorable toward the product when the ad displayed the product image on the left rather than on the right (M_{left} = 6.93 vs. M_{right} = 5.84; $\beta = -.53$, $t(255) = -2.16$, $p < .05$).

Study 4 provided additional evidence that the effect of the horizontal position of images in advertising is based on writing direction. English speakers who read from left to right showed more favorable product attitudes when the horizontal location of the ad image was congruent with the *past-left, future-right* representation of time. However, the reversed pattern was found among Hebrew speakers who read and write from right to left. As Hebrew speakers use a numerical system that runs from left to right (as in English), the results also ruled out the possibility that numerical ordering, rather than a mental representation of time, drove the results.

FIGURE 4

PRODUCT ATTITUDE AS A FUNCTION OF POSITION, DESIRABLE ATTRIBUTE, AND LANGUAGE (STUDY 4): (*A*) HEBREW, (*B*) ENGLISH



GENERAL DISCUSSION

The current research investigated whether and how the horizontal position of images in advertisements influences product evaluation. We found that when time is an important aspect of a product, advertisements that display product images congruent (incongruent) with consumers' spatial representation of time lead to higher (lower) product evaluations. Specifically, for consumers who conceptualize the past on the left and the future on the right, past-related product images lead to higher evaluations when they appear on the left side of an advertisement, and future-related product images lead to higher evaluation when they appear on the right side of an advertisement.

Across four studies we provided evidence of this horizontal position effect and illuminated the process by which it occurs. Study 1 showed that for self-improvement products (for which progression over time is a natural element),

participants had a more positive attitude toward the product when the advertisement displayed *before* images on the left and *after* images on the right. Moreover, we provided evidence that this occurs as a function of people's reliance on the *past-left, future-right* spatial representation of time by demonstrating that the effect is attenuated when people think about time in a different manner. Specifically, study 1 showed that priming people to conceptualize time in a different configuration (i.e., top to bottom) mitigated the position effect.

Studies 2 and 3 examined a single product image context in which a product is valued for its time-related style (e.g., being antique or being modern). These studies also found higher product evaluations when product images were displayed in a manner consistent with the *past-left, future-right* time-space representation. That is, when an antique style was desired, products were evaluated more favorably when they appeared on the left side of an advertisement, whereas when a modern style was desired, products were evaluated more favorably when they appeared on the right. Study 2 also revealed the mediating process through which the horizontal position of ad images alters judgment. Specifically, advertising images presented in a manner consistent with the *past-left, future-right* representation of time enhanced processing fluency, which subsequently impacted product evaluation. Study 3 documented how individual differences in chronic need for structure moderate the position effect.

In our final study we showed that, consistent with the notion that reading direction influences how people conceptualize time, the position effect reversed for people from cultures that read from right to left. We ran a cross-linguistic study using English and Hebrew speakers. By using a subject pool that reads and writes from right to left but sequences numbers from left to right (i.e., Hebrew speakers), the study also provided evidence that the position effect is a function of reading direction rather than numerical ordering.

The current research contributes to literature on how position of product images can influence product attitude. Although prior work has examined effects of image position relative to written information (Janiszewski 1990; Peracchio and Meyers-Levy 1997), it has not examined the location of images relative to each other or the location of a single image in an advertisement. Research in product packaging has examined product perceptions based on the location of a product image (Deng and Kahn 2009) but has not specifically isolated horizontal positioning and has not addressed position effects in the context of the conceptualization of time. Our research shows that the horizontal position of product images can influence consumers' attitude toward products, and this is driven by reliance on a *past-left, future-right* spatial representation of time.

Our findings also extend prior work on the use of spatial representations. Most past research has focused on documenting the influence of spatial relations (Meier and Robinson 2006; Meier et al. 2004, 2007; Nelson and Simmons 2009; Shubert 2005) but has not examined underlying mechanisms. We help to illuminate the process by which consumers' spatial representation of time influences product attitude by documenting the mediating role of processing fluency.

More broadly, the current research enriches the growing literature on how linguistics influences perception. Although past research has documented a language-based left-to-right bias, ours is the first to demonstrate downstream implications of this bias. Further, our research provides evidence that the left-to-right bias is a function of writing direction, not numerical representation (i.e., the SNARC effect).

In terms of practical implications, our studies suggest that marketers should consider how consumers represent time onto space when determining the location of images in their advertisements, on their websites, on their packaging, or in any other visual product information. The research highlights the importance of considering product characteristics and consumer shopping goals when designing layouts of product information. In studies 2–4, we used a single product and manipulated consumer shopping goals to be related to oldness or newness. The results imply that for people in left-to-right writing systems, products that are naturally perceived as classic (e.g., Tiffany lamps, estate jewelry, traditional-style furniture, vintage clothing, aged wines or scotch, nostalgia items, etc.) should appear on the left side, whereas products that are naturally perceived as contemporary (e.g., technology products, modern art, contemporary-style furniture, etc.) should appear on the right side.

Of course, there are limitations to the work. For example, each of the experiments used only one advertisement. Although we made this choice deliberately to maximize the control in our studies by simply manipulating position, additional work should consider multiple products across a variety of antique versus modern categories. Similarly, all our studies were run either in a lab setting or online using a compensated participant pool. It would be fruitful to run an experiment in a field setting to test the robustness and generalizability of the effect.

In our studies we limited our investigation to a static conceptualization of time whereby the past is represented on the left and the future is represented on the right. However, there are many ways in which consumers can think about time, even along a horizontal line. For example, if one thinks about the movement of time, rather than a static representation of it, one could imagine the passage of time actually moving from right to left. That is, if the past is on the left, then newer things should appear on the right and gradually move left as they get older. The perceived movement of the sun is consistent with this conceptualization. Although an investigation of a static versus moving conceptualization of time was beyond the scope of our investigation, it would be interesting to understand how thinking about time flow might alter our effects.

We also did not investigate other static conceptualizations of time. As noted in our theoretical development, it is possible to conceive of time as being displayed in different ways. For example, although not the default cognitive representation for left-to-right or right-to-left readers, consum-

ers can conceive of time as being represented vertically from top to bottom, with the past at the top and the future on the bottom, as one would see in a daytimer (Boroditsky 2001). As our research question was on the horizontal position of images in an advertisement, we elected not to consider other representations of time. However, the findings from study 1, where we did employ a different conceptualization of time, suggest that thinking about time in different ways can lead to different effects. A deeper understanding of the different ways in which people think about time and the consequent implications for product attitude would be useful.

There are other prfomising avenues for future research. For example, the results of our last three studies found an interaction of horizontal position of ad image and time (i.e., desiring oldness or newness as a product attribute) but no main effects of position, as might be expected from a hemispheric processing account. Some previous research on hemispheric processing has shown a preference for pictorial ads presented on the left (Janiszewski 1988), and other research has found preferences for objects that shift one's gaze to the right (Drake 1987). Although our focus was on the use of a spatial representation of time and the resulting relative difference between evaluations when an image was on the left versus on the right, it would be useful to investigate the possible role of hemispheric processing and to attempt to reconcile the effects in different contexts and across different dependent measures.

Research could also examine conditions under which the time-space representation incongruent image would lead to higher product attitude. Although we find a preference for time-space-representation congruent images, past research has documented a preference for moderate incongruity in some cases (Campbell and Goodstein 2001; Meyers-Levy, Louie, and Curren 1994; Meyers-Levy and Tybout 1989). Specifically, a stimulus that is moderately incongruent with a preexisting schema is sometimes preferred to a more congruent option (Campbell and Goodstein 2001; Meyers-Levy and Tybout 1989). Our effect occurred due to enhanced processing fluency from the congruent position; however, it might be possible that if consumers desire a novel experience while they view an advertisement, they may prefer the time-space-representation incongruent ad. Indeed, the finding that need for structure moderated our results is consistent with this general speculation.

In addition, although our research documents a horizontal position effect in an advertising layout context, research in domains such as shelf location has found inconsistent effects of horizontal location (Chandon et al. 2007; Christenfeld 1995; Nisbett and Wilson 1977; Valenzuela and Raghubir 2010). This previous research has not investigated time-related products in particular; however, it would be interesting to attempt to reconcile these bodies of work to understand the extent to which the current pattern of results might occur in a shelf-space context.

APPENDIX A

MANIPULATION OF POSITION IN THE SELF-IMPROVEMENT PRODUCT AD CONTEXT (STUDY 1)

A **Get the shape you've always wanted with the SlimFit Program!**

B **Get the shape you've always wanted with the SlimFit Program!**

APPENDIX B

THE MANIPULATION OF POSITION IN A SINGLE PRODUCT IMAGE AD CONTEXT (STUDY 2)

A

B

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