Journal of the Academy of Marketing Science (2021) 49:1109–1131
https://doi.org/10.1007/s11747-021-00772-4

ORIGINAL EMPIRICAL RESEARCH

Space between products on display: the impact of interspace on consumer estimation of product size

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Received: 2 September 2019 / Accepted: 31 January 2021 / Published online: 30 March 2021

Abstract

This research examines the effect that leaving space between products has on consumers' estimation of product size. We theorize and empirically confirm that when space is left between products (i.e., the display is interspaced), consumers are better able to distinguish the product from the environment, which results in more attention being devoted to the product, and, in turn, larger estimation of the product's size. Furthermore, we demonstrate downstream outcomes (i.e., consumer choices, purchase intentions) of the effect of interspatial product display on product size estimates; that is consumers react more favorably to products that are displayed in an interspatial product display when their product usage goals require large-sized products. Meanwhile, non-interspatial product displays are preferred when consumers holding a consumption goal geared to a small product size. Finally, we validate and solidify these novel interspace effects in both advertising and retailing contexts via a series of six studies including five different product types (e.g., shampoo, food, water bottle).

Keywords Interspatial product display · Product display · Size perceptions · Consumers' product usage goals

Imagine two consumers in a store who have different shopping goals for a juice box: consumer A looks to buy one for a large family while consumer B intends to purchase it for herself/himself. Based on these different shopping goals, their estimates of product size are likely to impact purchasing motivations and decisions. That is, if consumer A perceives that the product on display contains a larger quantity, it is more likely to satisfy the consumer for the sake of the family's needs, leading to the consumer being more likely to purchase this product. In contrast, consumer B will be more likely to select a product that is estimated to contain a smaller quantity because the purchase will be for only herself/himself. We investigate this consumption context with the introduction of a particular sales promotion strategy that can influence consumers' perceived estimations of a product quantity, that is, displaying products with (or without) space between them. We theorize that designing a product display with (vs. without) space between products can enhance (vs. diminish) consumers' estimations of product size, and thus, increase the likelihood that consumers select these products when usage goals call for a larger (vs. smaller) product quantity.

Academic research has long recognized a significant role of space in the marketplace by devoting attention to the study of the downstream consequences of the amount of space allocated to products in a display (e.g., shelf display, POP/advertising display). For instance, prior research on shelf space optimization generally demonstrates that more display space on shelves exerts a significant positive influence on unit sales and firm profits (e.g., Dreze, Hoch, & Purk 1994; Eisend, 2014; Hansen, Raut, & Swami 2010). Importantly,

Maura Scott served as Area Editor for this article.

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as this stream of work keeps space per item constant, it has been found that more shelf space (i.e., shelf length or a number of facings) means more units, which, in turn, increases sales (Dreze, Hoch, & Purk 1994). Another stream of research manipulates the number of items featured within a constant volume of shelf space and demonstrates that more emptied shelf space increases perceptions of product popularity and thus consumer choices (e.g., Castro, Morales, & Nowlis 2013; Parker & Lehmann, 2011; Van Herpen, Pieters, & Zeelenberg 2009). Also, a group of studies that manipulates space per item while holding the number of items featured constant is particularly pertinent to our work (Pracejus, Olsen, & O'Guinn 2006; Sevilla & Townsend, 2016). This work proposes that increasing the space-to-product ratio enhances product perceptions (e.g., aesthetics, quality) and thus product preference. Our research contributes to and extends this stream of research by focusing on the existence or nonexistence of space *between* products in a display (hereafter referred to as "interspace") compared to *overall* space (i.e., space per item), as studied in prior work. In our research, we hold the amount of display space constant and demonstrate that the mere presence of interspace between products has unique consequences for judgments of product size, irrespective of the number of items featured.

Our research makes several new contributions to the literature by investigating the allocation of space between products in a product display via six studies conducted in different product categories and multiple consumption settings. First, by establishing that the existence of space *between* products in a product display increases perceptions of product size, we go beyond the prior research demonstrating that the overall amount of space allocated to products in a display influences product evaluation. The importance of establishing the relationship between the existence of space between products and product size estimates is substantiated by empirical evidence highlighting the impact of product size estimates on consumer purchase decisions (Chandon & Ordabayeva, 2009; Folkes & Matta, 2004; Krider, Raghubir, & Krishna 2001). As such, our work underscores that marketers might take advantage of larger product size estimates driven by the interspace *between* products to influence consumer choices and purchase intentions.

Second, we contribute to the literature on the allocation of space in a product display by shedding light on a novel process that explains the impact of space between products on product size estimates. That is, we theorize and empirically demonstrate that the impact of interspace on product size estimates is driven by greater attention devoted to the displayed products. The basis for this processing mechanism comes from literature highlighting the role of stimulus salience when objects have clearly identifiable boundaries (vs. viewed as a one unit when their boundaries overlap; Hoffman & Singh, 1997; Qiu, Sugihara, & von der Heydt 2007; Rayner, 2011). This research points out that the extent to which people perceive a stimulus as salient directly enhances their attention to the stimulus (Michael & Gálvez-García, 2011; Mizzi & Michael, 2014; Parkhurst, Law, & Niebur 2002) and, consequently, the estimation of product size.

Finally, prior work shows that usage goals qualify the relationship between product size estimates driven by product characteristics (e.g., color saturation Hagtvedt & Brasel, 2017, package size Ailawadi, Ma, & Grewal 2018) and consumers' final product choices. Consistent with this literature, we show that consumers' product usage goals moderate the impact of product size estimates driven by interspace on consumers' product choices and purchase intentions. Overall, apart from important theoretical insights, our work provides significant managerial guidelines for the use of space between products in a product display. Six studies are conducted to validate and solidify our proposed novel product interspace effects in both advertising and retailing contexts through different product types (e.g., shampoo, food items, water bottle).

Space in the marketplace

Prior research is concordant that space is an important environmental factor that influences consumer behavior and judgment (Castro, Morales, & Nowlis 2013; Dreze, Hoch, & Purk 1994; Esmark & Noble, 2018; Hock & Bagchi, 2017; O'Guinn, Tanner, & Maeng 2015; Parker & Lehmann, 2011; Sevilla & Townsend, 2016; Waller et al., 2010; Xu, Shen, & Wyer 2012). Work in this area can be broadly classified into two areas of investigation: (1) social space (e.g., Maeng, Tanner, & Soman 2013; O'Guinn, Tanner, & Maeng 2015; Xu, Shen, & Wyer 2012) and (2) product display space (i.e., space delicated to displayed products; e.g., Castro, Morales, & Nowlis 2013; Parker & Lehmann, 2011; Sevilla & Townsend, 2016). The first stream of research, on social space (social density of a given space; O'Guinn, Tanner, & Maeng 2015), establishes that spaces with high social density result in differential outcomes in terms of product preferences (Maeng, Tanner, & Soman 2013; Xu, Shen, & Wyer 2012), lower estimates of product value (O'Guinn, Tanner, & Maeng 2015), lower satisfaction with the restaurant service (Hwang, Yoon, & Bendle 2012), and lower satisfaction with the retail shopping environment (Eroglu, Machleit, & Barr 2005; Machleit, Eroglu, & Mantel 2000).

The second stream of research that is related to display space consistently demonstrates that the amount of space dedicated to displayed products has significant downstream consequences for consumer perceptions and judgments. Table 1 provides a summary of the relevant literature on the effects of space in a product display. As indicated in Table 1, prior work on shelf space optimization holds space per item constant and assumes a fixed proportion of shelf space to the number of

Table 1 Literature review on space and product display

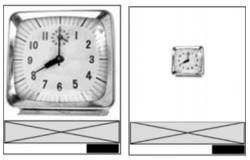
Authors (s)	Space Operationalization	Products Used	Key DVs	Main Results
Pracejus, Olsen, and O'Guinn (2006)	White space (the conspicuously open space found between other design elements or objects within the border of an ad) 	Clock	Product perceptions	People who are exposed to the ad with more (vs. less) white space tend to perceive the advertised product as higher in quality, prestige, trust, and leadership.
Van Herpen, Pieters, and Zeelenberg (2009)	More or less emptied shelf space on shelves 	Wine and fashion products (e.g., shirt)	Product perceptions, Consumer choice	Products presented on a shelf with more (vs. less) emptied shelf space are perceived as more popular, higher in quality, and are more likely to be chosen.
Parker and Lehmann (2011)	Shelf-based scarcity (having the product's stocking level be more or less depleted) 	Wine and frequent-purchase products (e.g., shampoo, paper towels, toothpaste)	Product perceptions, Consumer choice	The scarcer (vs. abundant) products on a shelf are perceived to be more popular, which leads to greater perceptions of product quality, thus increasing consumer choice of the scarcer product.
Castro, Morales, and Nowlis (2013)	The shelf display either fully stocked versus not fully stocked 	Ingestible products (e.g., juice, egg) and noningestible products (e.g., fabric softener, toothpaste, soap, dishwashing liquid)	Purchase likelihood	Consumers are more likely to purchase familiar-brand, ingestible products when they are presented in a many-product disorganized shelf display (vs. one-product disorganized shelf display).

Table 1 (continued)

Authors (s)	Space Operationalization	Products Used	Key DVs	Main Results
Sevilla and Townsend (2016)	Space-to-product ratio: varying the number of items in a set retail space  	Edible products (e.g., chocolate) and nonedible products (e.g., jewelry, hand cream)	Product and store perceptions, Purchase intentions	A higher (vs. lower) space-to-product ratio leads to increased perceptions of product aesthetics and store prestige, thus increasing purchase intentions.
Dreze, Hoch, and Purk (1994)	Shelf length (increasing or decreasing the number of facings); Shelf height	Multiple product assortments (e.g., fast-moving consumer goods such as beverages, food items, toiletries)	Shelf space elasticity (the ratio in change in sales to change in shelf space)	In eight test product categories (e.g., analgesics, canned soup) at a large grocery chain, an average change of 25% in facings of SKUs leads to the average increase of 3.9% in category sales.
Hansen, Raut, and Swami (2010)	Shelf length or number of facings that a product occupies	Products that are complements or substitutes	Shelf space elasticity (the ratio of changes in sales to changes in shelf space)	In a four-foot section of retail shelf-space, increasing the facings of a product on a shelf has a positive effect on the product's profit performance.
Eisend (2014)	Number of facings or space measured in two- or three- dimensions (facing area or room)	Commodities (e.g., salt, sugar), staples (e.g., breakfast food, canned fruits), and impulse buys (e.g., candy)	Shelf space elasticity (the ratio of changes in sales to changes in shelf space)	A Meta-analysis of 31 prior research articles on shelf space elasticities (between 1960 and 2012), showing that shelf space elasticities are higher when shelf space increases (vs. decreases), and shelf space increases result in more sales but at a decreasing rate.
Current research	Interspatial product display: the existence or nonexistence of space only between products in a display	Edible products (e.g., wafers, crackers, mixed nuts) and nonedible products (e.g., shampoo, water bottle)	Size perceptions, Consumer choice, Purchase intentions	An interspatial product display leads to greater product size estimates, which is mediated by greater attention devoted to displayed products. Consumers' product usage goals moderate the effect of interspace on choice and purchase intentions.

items featured. This stream of research investigates the optimal allocation of shelf space that leads to greater sales (e.g., Dreze, Hoch, & Purk 1994; Eisend, 2014; Hansen, Raut, & Swami 2010). For instance, Dreze, Hoch, and Purk (1994) show that in eight test product categories at a large grocery chain, an average change of 25% in facings of SKUs increases an average increase of almost 4% in category sales. Hansen, Raut, and Swami (2010) find that increasing the facings of a product on a shelf positively impacts the product's sales and profits. In contrast is research on shelf space usage that manipulates space per item while holding the shelf space constant (i.e., varying the number of items featured in a constant shelf space). This line of work examines the role of emptied shelf space in influencing product preferences (e.g., Castro, Morales, & Nowlis 2013; Parker & Lehmann, 2011; Van Herpen, Pieters, & Zeelenberg 2009). For example, Van Herpen, Pieters, and Zeelenberg (2009) and Parker and Lehmann (2011) find that products presented on a shelf with more emptied shelf space are perceived to be more popular, thus increasing consumer choice of the product.

Most relevant to our research is work that manipulates space per item but holds the number of items featured constant

(Pracejus, Olsen, & O'Guinn 2006; Sevilla & Townsend, 2016). In particular, Sevilla and Townsend (2016) identify that a high space-to-product ratio facilitates processing ease, which leads to increased perceptions of product aesthetics and, thus, purchase intentions. Similarly, Pracejus et al. (2006) demonstrate that the use of white space in advertisements exerts a significant impact on product perceptions (e.g., quality, prestige). The current research differs from this prior work in that (1) it focuses on space between products (i.e., existence or nonexistence of interspace) compared to overall space (i.e., space per item), (2) it investigates the effect of space on a novel outcome, namely, consumer perceptions of product size, and (3) it demonstrates that the effect of interspace holds irrespective of the number of items featured. Overall, our research uncovers unique impacts of interspace in a product display on consumers' product size judgments and identifies specific contexts where greater product size estimates are likely to drive consumer choices and purchase intentions.

Interspatial product display in product size estimates

In this research, we posit that an interspatial (vs. a non-interspatial) product display is likely to increase consumers' perceptions of product size. We derive this prediction by bridging together two diverse streams of research and testing the impact of interspace: first, we examine whether interspace in a product presentation increases consumer attention to displayed products and second, we examine the relationship between increased product attention and perceived product size.

Prior research on visual processing demonstrates that space between entities facilitates an entity's recognition or increases its delineation from the background (Brandt, 1942; Hoffman & Singh, 1997; Qiu, Sugihara, & von der Heydt 2007; Rayner, 2011). In this regard, prior research points out that objects are more readily recognizable when they are separated by background space than when they are connected to each other or overlapping (Qiu, Sugihara, & von der Heydt 2007). That is because when objects are connected, the visual system tends to process available stimuli as one unit, making boundaries of each object less discernible and noticeable, compared to when objects are segregated by space (Hoffman & Singh, 1997; Qiu, Sugihara, & von der Heydt 2007). Indeed, Cutright (2012) observes that space can serves as intangible boundary in an environment that allows individuals to separate and contain the object within the boundary. This argument is also evident in prior research that suggests that when space disappears between objects, people tend to perceive the objects as a continuous entity, leading to difficulty in distinguishing between them, whereas when space exists, it serves as a disruptive gap to help differentiate discrete objects (Rayner, 2011). In situations where distinction from the background is enhanced, this causes increased salience of the target stimulus (Moore, Stammerjohan, & Coulter 2005; Nothdurft, 2000), which in turn affects the allocation of attention to that stimulus (Bacon & Egeth, 1994; Michael & Gálvez-García, 2011; Mizzi & Michael, 2014; Parkhurst, Law, & Niebur 2002; Treisman & Gelade, 1980). Because individuals have limited working memory capacity, which requires selective attention to information that is more accessible, highly salient stimuli tend to draw greater attention (Bettman, Luce, & Payne 1998).

Overall, prior research posits that when space isolates objects in a visual field from the background the objects are more salient and, thus, attract more attention. The finding that space increases attention paid to objects has found support in related streams of research. For instance, the advertising literature suggests that the use of white space between advertisements on an ad board increases the attention paid to each ad by marking out their physical boundaries and distinguishing them from the competitive field (Brandt, 1942; Strong, 1926). Similarly, empirical findings from the visual aesthetics literature suggest that additional space surrounding products in an ad effectively serves as a form of visual rhetoric that facilitates attention to an advertised product (Pracejus, Olsen, & O'Guinn 2006). Building on these lines of evidence, we propose that an interspatial (vs. a non-interspatial) product display is likely to make the product more salient and thus increase consumer attention to a product.

We further theorize that increased attention to products in an interspatial (vs. a non-interspatial) product display subsequently results in greater size perceptions. According to prior research, an object appears to be larger and/or of greater quantity when people's attention is automatically directed to this object (Folkes & Matta, 2004; Hagtvedt & Brasel, 2017). The visual perception literature posits that this outcome is likely to occur because when judging size, the attention devoted to an object affects the decision making process by influencing perceptions of an object's size more than actual object size (Ginsburg, 1984). According to Folkes and Matta (2004), people's perceptions of an object's size are often shaped via consistent physical experiences of larger objects coming into view first, as opposed to smaller objects. Indeed, a number of studies postulate that advertisements that are larger in size or depict larger brand logos are more likely to capture consumer attention (Finn, 1988; Pieters & Wedel, 2004). In light of the covariance of size and attention, a reverse-attention bias has also been identified. Folkes and Matta (2004) demonstrate that a more attention-attracting product package is judged to be larger than a less attention-grabbing product package. Similarly, Hagtvedt and Brasel (2017) show that objects with highly saturated colors attract more attention and, thus, are perceived to be larger. Taken together, these findings point out that increased attention devoted to an object prioritizes

processing mental resources that help make size estimation better. Overall, based on these two streams of past work related to visual processing and visual perception, we hypothesize that products displayed with interspace will results in greater product size estimates compared to products displayed with no space between them:

H1: An interspatial product display will lead to greater product size estimates than a non-interspatial product display.

H2: The impact of an interspatial product display on product size estimates will be mediated by greater attention devoted to products in a display.

The moderating role of product usage goals

Thus far, we have argued that interspace in a product display leads to increased size perceptions. We further postulate that product size estimates driven by interspace will influence actual consumers' product choices and purchase intentions dependent upon consumers' product usage goals. A large body of work has shown that goal activation facilitates goal-consistent consumption behaviors (Chartrand et al., 2008; Fitzsimons, Chartrand, & Fitzsimons, 2008; Van Osselaer & Janiszewski, 2011).

More specifically, prior research documents that consumers' product usage goals drive product size preferences. For example, prior work shows that an individual with a weight-loss goal is motivated to restrict consumption and eat smaller amounts of food (Williams et al., 1996). Relatedly, research shows that households with larger consumption levels are more likely to shop at warehouse club stores where product package sizes are much larger (Ailawadi, Ma, & Grewal 2018). Additional work by Hagtvedt and Brasel (2017) reveals that consumers make product size estimates from color saturation and in turn, tend to prefer more saturated products estimated to be larger (i.e., a carry-on suitcase) when they have a goal that requires greater volume (i.e., carrying a higher quantity of belongings), whereas they prefer less color-saturated products which are estimated to be smaller when their goal calls for a small product volume (i.e., fitting the suitcase easily into a finite storage space). Because interspace is likely to increase consumer perceptions of product size, we propose that products in an interspatial display will be more likely to be chosen and elicit greater purchase intentions when consumers' product usage goals call for a large-sized product. In contrast, we expect that consumers will prefer products in a non-interspatial display when their usage goals call for a small-sized product. Therefore, our work extends prior lines of work by adding to our understanding of factors (e.g., going beyond color saturation Hagtvedt & Brasel, 2017, package size Ailawadi, Ma, & Grewal 2018) that influence product size estimates which in turn interact with consumers' product usage goals in affecting consumer choices. Our overall conceptual model is presented in Fig. 1.

H3: Consumers' product usage goals will moderate the effect of product size estimates on choice and purchase intentions driven by interspace. That is, when consumer goals call for a large-sized (small-sized) product, they will be more likely to choose and exhibit higher purchase intentions for the product in an interspatial (a non-interspatial) product display.

Study 1

The first objective of Study 1 is to provide initial evidence for H1, predicting that interspace in a product display enhances product size estimates. A second goal is to investigate the underlying process of the effect of interspace on product size estimates, namely, attention devoted to products in a display. The third is to rule out possible alternative explanations of the effect of interspace. In particular, prior research points out that more space assigned to products in a product display triggers a belief that the product is popular (Parker & Lehmann, 2011). Because larger-sized products are often associated with greater value and, hence, increased popularity (Mckenzie, 2003; Zlatevska, Dubelaar, & Holden 2014), it is possible that more popular products might be judged as larger. In addition to popularity, past work also suggests a quality explanation for the effect of interspace. Specifically, Pracejus, Olsen, and O'Guinn (2006) find that additional space surrounding product images in advertising is likely to increase perceived product quality. The idea is that consumers might learn to associate product quality with product size because high quality is associated with high price that often co-occurs with large size. Thus, in addition to our other objectives, we attempt to rule out these alternative explanations for the effect of interspace on product size perceptions.

Participants, design, and procedure

One hundred and three participants (40% female, mean age = 34 years) were recruited through Amazon's Mechanical Turk (MTurk) to participate in Study 1 in exchange for a small financial incentive. At the beginning of the study, participants were informed that they would be viewing a print ad and evaluating the advertised product. The ad included an image of three cans of a fictitious product (i.e., Popio wafer rolls) and a detailed product description. In this print ad, we manipulated interspatial versus non-interspatial product display. Specifically, in the interspatial display condition, the three product cans were presented with a perceptually recognizable space between them, whereas in the non-interspatial display condition, they were presented next to and touching each other (Fig. 2). After viewing the ad, participants responded to a set of questions that measured their attention processes,

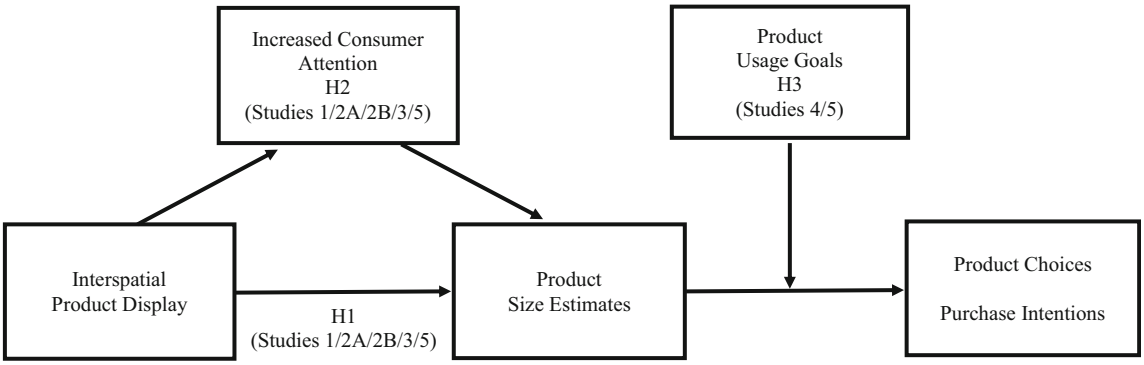


Fig. 1 Overall conceptual model

provided their perceptions of the product's size, popularity, and quality, and responded to manipulation check questions. The study ended with participants providing demographic information.

Measures

As a measure of attention, participants indicated the extent to which the wafer (cookie) roll container attracted their attention (1 = not at all, 9 = very much; adopted from Folkes & Matta, 2004). Additionally, participants responded to measures of popularity and quality by indicating how popular they thought the Popio wafer rolls were (1 = not popular at all, 9 = very popular; adopted from Sevilla & Townsend, 2016), and their agreement on the statement that the Popio wafer rolls were of high quality (1 = strongly disagree, 7 = strongly agree; adopted from Pracejus, Olsen, & O'Guinn 2006). Consistent with prior research that suggests that larger objects generally appear to contain higher quantity (Bevan, Maier, & Helson 1963; Krueger, 1972), we measured perceived size by asking participants to report how many wafer rolls they thought one Popio wafer can included. The manipulation check on interspatial product display was measured by asking participants to provide their agreements with three questions: (1) "When viewing the ad, I saw no space between the Popio cans", (2) "When viewing the ad, there was no space between the Popio cans", and (3) "The cans of the Popio wafer rolls were touching each other" (1 = strongly disagree, 7 = strongly agree; $\alpha = .96$).

Results

Manipulation check An independent samples t-test confirmed that participants were more likely to agree that the non-interspatial display included no space between products than the interspatial display ($M_{non\text{-}interspatial} = 4.90$ vs. $M_{interspatial} = 2.38$; $t(101) = 7.02$, $p < .001$).

Product size estimates Consistent with our expectations, an independent samples t-test revealed that participants in the

Fig. 2 Stimuli for Study 1

Non-interspatial display

Interspatial display

interspatial (vs. non-interspatial) display condition estimated a greater quantity of wafer rolls per product package ($M_{interspatial} = 23.06$ vs. $M_{non\text{-}interspatial} = 17.21$; $t(101) = 2.21$, $p < .05$). These results indicate that an interspatial product display increases perceptions of product size. Thus, H1 is supported. Table 2 provides specific details regarding all of our studies.

Process test Consistent with our theorizing, an independent samples t-test showed that products in the interspatial (vs. non-interspatial) display condition attracted greater attention ($M_{interspatial} = 6.74$ vs. $M_{non\text{-}interspatial} = 6.02$; $t(101) = 2.05$, $p < .05$). To further examine whether attention mediated the effect of interspace on product size estimates, a bootstrapping analysis on product size estimates was conducted with interspatial product display (0 = non-interspatial, 1 = interspatial) as the independent variable and attention as the mediator (Hayes, 2013, Model 4). Consistent with H2, we found a significant indirect path from interspatial product display to product size estimates through attention (point estimate of the effect = 1.44; 95% confidence interval (CI) = [.2317, 3.9667]). These results reveal that the positive impact of interspace is driven by increased attention to the products.

To rule out the popularity and quality explanations, we further conducted an independent samples t-test. The analysis revealed that the effects of popularity ($M_{interspatial} = 5.70$ vs. $M_{non\text{-}interspatial} = 5.85$; $t(101) = -.40$, $p > .60$) and quality ($M_{interspatial} = 5.44$ vs. $M_{non\text{-}interspatial} = 5.09$; $t(101) = 1.49$, $p > .10$) were not significant. Further mediation analysis of interspace on product size estimates including all three mediators (i.e., attention, popularity, and quality) demonstrated that an indirect path from interspatial product display to product size estimates through attention remained significant (point estimate of the effect = .97; 95% CI = [.0301, 2.8540]), whereas the indirect paths through popularity (point estimate of the effect = .05; 95% CI = [−.4719, 1.2854]) and quality (point estimate of the effect = .95; 95% CI = [−.1359, 2.7994]) were not statistically significant. These results rule out alternative explanations that the effect of interspace on product size perceptions operates through product popularity and quality.

Discussion

Study 1 establishes that interspace in a product display influences consumers' judgments of product size. That is, consumers are likely to estimate a larger quantity contained per package when the product is presented in an interspatial (vs. a non-interspatial) product display. Results of Study 1 also reveal that greater attention devoted to a product serves as the underlying process for the effect of interspace on product size estimates. Our findings contribute to prior work on the allocation of space in a product display by demonstrating that product display space does not only affect consumer perceptions of product characteristics (i.e., popularity, quality, aesthetics) (Parker & Lehmann, 2011; Pracejus, Olsen, & O'Guinn 2006; Sevilla & Townsend, 2016) but also influences consumer attention to displayed products and, thus, product size perceptions. Finally, the results of Study 1 rule out popularity and quality as an alternative explanation for our core effect.

Study 2

The primary goal of Study 2 is to replicate the findings of Study 1 with a different product category (i.e., mixed nuts) and in a different context (i.e., retail setting). To this end, we conducted two sub studies. Similar to Study 1, Study 2A investigates consumers' reactions to interspace (vs. no interspace) in a product display by keeping the number of products and the amount of white space between conditions constant. A second goal of Study 2 is to rule out the size of a product display as an alternative explanation. One can argue that consumers may infer that the larger the size of a product display, the larger the size of items within the display. To address this possibility, we designed and ran Study 2B, where we held the size of the product display constant. Study 2B is also designed to enhance the generalizability of our findings by examining the role of interspace with real consumers at a shopping mall.

Participants, design, and procedure

Study 2A respondents were 160 volunteers (33% female, mean age = 37 years) recruited from Amazon MTurk for modest financial compensation. Study 2B involved 87 retail shoppers (39% female, mean age = 26 years) from a national shopping mall located on the East Coast of the U.S. We conducted Study 2B during the holiday season, during which a sizable number of shoppers visited the mall. Upon getting consent from shoppers, they were taken to a table where they filled out a paper-and-pencil questionnaire. The subsequent procedure was identical between Studies 2A and 2B. Participants were first informed that they would be participating in a study on consumer shopping activities. Participants were then asked to imagine going to a store and considering buying mixed nuts. Next, they were presented with a shelf image displaying the fictitious brand of mixed nuts, named Oakry. In both Studies 2A (Fig. 3a) and 2B (Fig. 3b), we manipulated interspatial product display in a manner similar to that of Study 1, with only slight modifications. In both studies, the product cans were presented with a perceptually recognizable space between them in the interspatial display condition, whereas in the non-interspatial display condition, they were presented as touching each other. To rule out the size of a product display as an alternative explanation, we held the size of the display between interspatial and non-interspatial display

Table 2 Summary of major results

	Interspatial product display	Non-interspatial product display	Sig.
Study 1			
The effect of interspatial product display on product size estimates in advertising (N=103; 40% female, M_{age}=34 years; MTurk study; product category: wafer rolls)			
Dependent measures			
Size estimates	(i.e., how many rolls per package)		
	23.06 (16.96)	17.21 (8.98)	.030
Mediator measures			
Attention	6.74 (1.89)	6.02 (1.67)	.043
Popular	5.70 (2.06)	5.85 (1.74)	.692
Quality	5.44 (1.18)	5.09 (1.18)	.141
Major findings			
	Interspace in a product display enhances the perceived size of a product and this effect is driven by increased attention to the products, and not by product popularity or quality		
Studies 2A/2B			
The effect of interspatial product display on product size estimates in retailing (study 2A: N=160; 33% female, M_{age}=37 years; MTurk study; product category: mixed nuts, study 2B: N=87; 39% female, M_{age}=26 years; shopping mall study; product category: mixed nuts)			
Dependent measures			
Size estimates	(i.e., how many servings per can)		
(Study 2A)	11.38 (7.91)	9.26 (5.24)	.048
(Study 2B)	6.54 (2.92)	5.28 (2.69)	.040
Mediator measures			
Attention			
(Study 2A)	6.50 (1.86)	5.79 (2.09)	.024
(Study 2B)	5.98 (1.86)	5.07 (1.90)	.027
Major findings			
	An interspatial product display leads to increased perceptions of product size and this effect is driven by increased attention triggered by the interspatial product display, rather than the size of a product display		
Study 3			
A two-way interaction between interspatial product display and distraction on product size estimates in retailing (N=155; 40% female, M_{age}=39 years; MTurk study; product category: shampoo)			
Dependent measures			
Size estimates	(i.e., how many washes per bottle)		
	With distraction	With distraction	
	42.43* (29.54)	45.76* (30.39)	.620
	With no distraction	With no distraction	
	58.55* (34.26)	37.71* (27.48)	.003
Size estimates	(i.e., how long to use up (days))		
	With distraction	With distraction	
	48.75* (36.33)	52.96* (34.61)	.592
	With no distraction	With no distraction	
	68.81* (39.42)	47.97* (28.07)	.010
Major findings			
	When consumers' attention is directed away from viewing the shelf display, the effect of interspace on product size estimates diminishes. In addition, the difference in perceived product size estimates is driven by existence of interspace, rather than the varied amount (more or less) of interspace or the space surrounding products		
Study 4			
A two-way interaction between interspatial product display and consumer's product usage goals on actual consumer choices (N=180; 50% female, M_{age}=38 years; MTurk study; product category: crackers)			
Dependent measures			
Product choice	Hungry	Hungry	

Table 2 (continued)

	Interspatial product display	Non-interspatial product display	Sig.
	71%	29%	.007
	Not hungry	Not hungry	
	46%	54%	
Major findings			
	Consumers will be more likely to choose a product (i.e., crackers) from the interspatial (vs. non-interspatial) display when they have a larger consumption goal (i.e., feel hungry)		
Study 5			
A two-way interaction between interspatial product display and consumers' product usage goals on purchase intentions (N=150; 42% female, M_{age}= 40 years; MTurk study; product category: water bottles)			
Dependent measures			
Purchase intentions	Large-size usage goal	Large-size usage goal	
	4.84 (1.49)	3.89 (1.82)	.008
	Small-size usage goal	Small-size usage goal	
	4.40 (1.42)	5.11 (1.28)	.039
Mediator measures			
Attention	6.79 (1.44)	6.05 (1.70)	.005
Size estimates	(i.e., how many ounces per bottle)		
	21.23 (6.23)	18.52 (5.44)	.005
Major findings			
	(1) When a usage goal demands a large-sized product, an interspatial product display leads to higher purchase intentions, whereas the reverse holds true when a usage goal calls for a small-sized product (i.e., a non-interspatial product display is more effective) (2) Full framework test: Interspatial product display increases consumer attention to the displayed product and, thus, enhances product size perceptions, which in turn interacts with consumers' product usage goal to influence consumers' purchase intentions of the product		

*Notes: *1.* Standard deviations are in parentheses. *2.* Product usage frequency is a covariate

conditions constant in Study 2B (Fig. 3b). After viewing the product display, participants responded to a question measuring their attention, indicated their perceptions of product size, and then completed the manipulation check questions and demographic information.

Measures

Participants' attention to the displayed products was measured with the same item as in Study 1. Perceptions of product size were measured by asking the subjects to indicate how many servings of mixed nuts they thought one can of Oakry contained. A manipulation check on interspatial product display (Study 2A: $\alpha = .98$; Study 2B: $\alpha = .93$) was performed using the same items as in Study 1 but phrased to capture the retail setting (e.g., "When viewing the shelf display, I saw no space between the Oakry cans").

Results

Manipulation check The manipulation check on interspatial product display confirmed the effectiveness of our manipulation. That is, an independent samples t-test showed that participants were more likely to agree that there was no space between products in the non-interspatial display condition than in the interspatial display condition (Study 2A: $M_{non\text{-}interspatial} = 6.04$ vs. $M_{interspatial} = 3.10$; $t(158) = 10.16$, $p < .001$; Study 2B: $M_{non\text{-}interspatial} = 5.55$ vs. $M_{interspatial} = 2.38$; $t(85) = 8.85$, $p < .001$).

Product size estimates An independent samples t-test revealed that participants estimated that one product package contained a higher number of servings of mixed nuts in the interspatial (vs. non-interspatial) display condition (Study 2A: $M_{interspatial} = 11.38$ vs. $M_{non\text{-}interspatial} = 9.26$; $t(158) = 1.99$, $p < .05$; Study 2B: $M_{interspatial} = 6.54$ vs. $M_{non\text{-}interspatial} = 5.28$; $t(85) = 2.09$, $p < .05$). In other words, participants inferred greater product size in the interspatial (vs. non-interspatial) product display, thus, providing additional evidence for H1.

Process test First, an independent samples t-test showed that participants devoted greater attention to the displayed products in the interspatial (vs. non-interspatial) display condition (Study 2A: $M_{interspatial} = 6.50$ vs. $M_{non\text{-}interspatial} = 5.79$; $t(158) = 2.28$, $p < .03$; Study 2B: $M_{interspatial} = 5.98$ vs. $M_{non\text{-}interspatial} = 5.07$; $t(85) = 2.24$, $p < .03$). Next, to test the

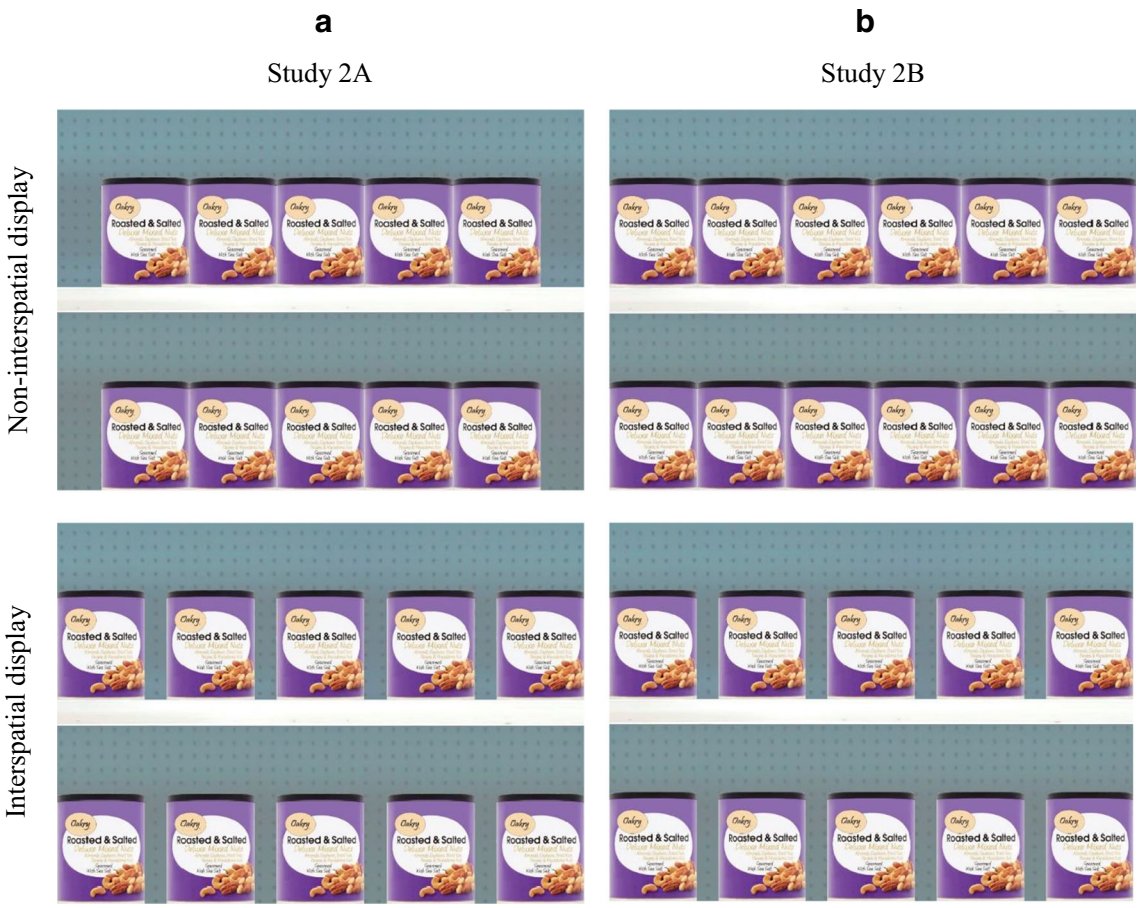


Fig. 3 Stimuli for Studies 2A and 2B

mediating effect of attention, we conducted a mediation analysis using the PROCESS SPSS macro (model 4; Hayes, 2018) with interspatial product display (0 = non-interspatial, 1 = interspatial) as the independent variable, attention as the mediator, and product size estimates as the dependent variable. The results revealed a significant indirect path from interspatial product display to product size estimates through attention (Study 2A: a point estimate of the effect = .47; 95% CI = [.0525, 1.0726]; Study 2B: a point estimate of the effect = .36; 95% CI = [.0319, .8221]). These findings support H2, which posited that the impact of interspace on product size estimates is driven by greater attention devoted to the displayed products.

Discussion

The results of Studies 2A and 2B provide further support for Hypotheses 1 and 2 by replicating the findings of Study 1 in a different product category and in a different context (i.e., retailing). Furthermore, Study 2B enhances the generalizability of our findings by examining the effect of interspace using a different sample, consumers at a shopping mall.

Importantly, Study 2B also rules out an alternative process by controlling for the size of a product display. Prior research from the field of Gestalt psychology (Krueger, 1972; Vos et al., 1988) shows that individuals may use the entire space occupied by the items in a display as a cue for the total quantity. To that end, Redden and Hoch (2009) establish that the presence of variety in a product set reduces the salience of the whole, thereby diminishing the perceived amount of space occupied by the set and in turn the perceived quantity. The results of Study 2 add to this stream of work by demonstrating the entire space occupied by the items in a display does not affect the estimates of size of individual items within the display.

Study 3

The primary goal of Study 3 is to provide further evidence of the underlying process behind the effect of interspace. In particular, if consumers' attention is indeed driving the effect of interspace, then distracting an individuals' attention from a product display should attenuate the effect of interspace on product size estimates. We test this theorizing by manipulating individuals' level of attention during their exposure to a product display (i.e., through exposure to music). A second goal of Study 3 is to generalize our findings to a non-edible

product category where the size of the product matters to the consumer (i.e., shampoo).

Participants, design, and procedure

We recruited 155 MTurk subjects (40% female, mean age = 39 years) to participate in this study in exchange for modest financial compensation. At the beginning of the study, participants were informed that they would be participating in a study that investigated consumer responses to a new product, a fictitious brand of shampoo called HK. They were also instructed to have their computer/laptop/smartphone speaker volume on so that they were able to listen to familiar music that might play while they were exposed to the products. Next, all participants viewed a one-tier shelf image displaying HK shampoo. Interspatial product display was manipulated in a manner similar to that of Study 1 such that the shampoo bottles were touching each other in the non-interspatial display condition, whereas the bottles were presented with a perceptually recognizable space between them in the interspatial display condition (Fig. 4a). At the same time, participants' level of attention was manipulated via a distraction task. In particular, we selected music as a distraction cue based on prior work that has found that atmospheric music, particularly, popular and familiar music, is an effective tool to divert one's attention away from a task at hand (Bailey & Areni, 2006). That is, in the distraction condition, while participants were exposed to the HK shampoo display, we played a popular song (i.e., the instrumental version of the Ed Sheeran song "Shape of You," ranked as the most-streamed song on Spotify; Savage, 2019). In the no distraction condition, participants were not exposed to music and, thus, their attention was not diverted from a product display. After viewing the product display image, participants indicated their perceptions of product size and responded to questions regarding their product usage frequency (used as a covariate in our analysis), the manipulation checks, and demographics.

Measures

For this study, we employed two measures of participants' perceptions of product size. The first measure asked participants to indicate how many washes from one bottle of the HK shampoo they would expect to get (referred to as "how many washes" hereafter). For the second measure, participants responded to the question "how long would it take you to use up one bottle of the HK shampoo? (days)" (referred to as "how long" hereafter). Product usage frequency was measured by asking respondents to indicate how often they washed their hair per month on a 7-point Likert-type scale (1 = very rare, 7 = very often). The manipulation check on interspatial product display was gauged with the same items used in Study 2 ($\alpha = .97$). In the manipulation check on attention, we asked participants to indicate the degree to which any external factors distracted them while viewing the shelf image of the HK shampoo on a 7-point Likert-type scale (1 = not at all, 7 = very much).

Results

Manipulation checks The manipulation check for interspatial product display was successful. A 2 (interspatial product display: interspatial vs. non-interspatial) × 2 (distraction: present vs. absent) between-subjects ANOVA with the manipulation check item for interspatial product display as the dependent variable showed a significant main effect of interspatial product display ($F(1, 151) = 68.35$, $p < .001$). That is, participants were more likely to agree that there was no space between products in the non-interspatial (vs. interspatial) display condition ($M_{non\text{-}interspatial} = 6.08$ vs. $M_{interspatial} = 3.53$; $F(1, 151) = 68.35$, $p < .001$). The effect of distraction or its interaction with interspatial product display was nonsignificant. Our intended manipulation of the extent of attention devoted to displayed products was also successful. A similar two-factor ANOVA as above with the manipulation check item for distraction as the dependent variable revealed a significant main effect of distraction ($F(1, 151) = 21.75$, $p < .001$). That is, participants felt more distracted by external factors while viewing the shelf image of the HK shampoo in the distraction (vs. no distraction) condition ($M_{distraction} = 2.74$ vs. $M_{no\ distraction} = 1.51$; $F(1, 151) = 21.75$, $p < .001$). The effects of interspatial product display or its interaction with distraction were nonsignificant.

Product size estimates We tested our predictions using a 2 (interspatial product display: interspatial vs. non-interspatial) × 2 (distraction: present vs. absent) between-subjects ANCOVA with product size estimate (either how many washes or how long) as the dependent variable and product usage frequency as the covariate. The results revealed a significant two-way interaction between interspatial product display and distraction on product size estimates (how many washes: $F(1, 150) = 6.31$, $p < .02$; how long: $F(1, 150) = 4.99$, $p < .03$), accompanied by a significant effect of product usage frequency (how many washes: $F(1, 150) = 10.00$, $p < .01$; how long: $F(1, 150) = 4.15$, $p < .05$). Further planned contrasts revealed that when participants were not distracted while viewing the product display, they estimated the product to contain more quantity in the interspatial (vs. non-interspatial) display condition (how many washes: $M_{interspatial} = 58.55$ vs. $M_{non\text{-}interspatial} = 37.71$; $F(1, 150) = 9.15$, $p < .01$; how long: $M_{interspatial} = 68.81$ vs. $M_{non\text{-}interspatial} = 47.97$; $F(1, 150) = 6.74$, $p < .02$; Fig. 5), replicating the effect observed in Studies 1 and 2. However, when participants were distracted while viewing the product display, there was no significant difference in perceived product size between the interspatial and non-interspatial display conditions (how many washes:

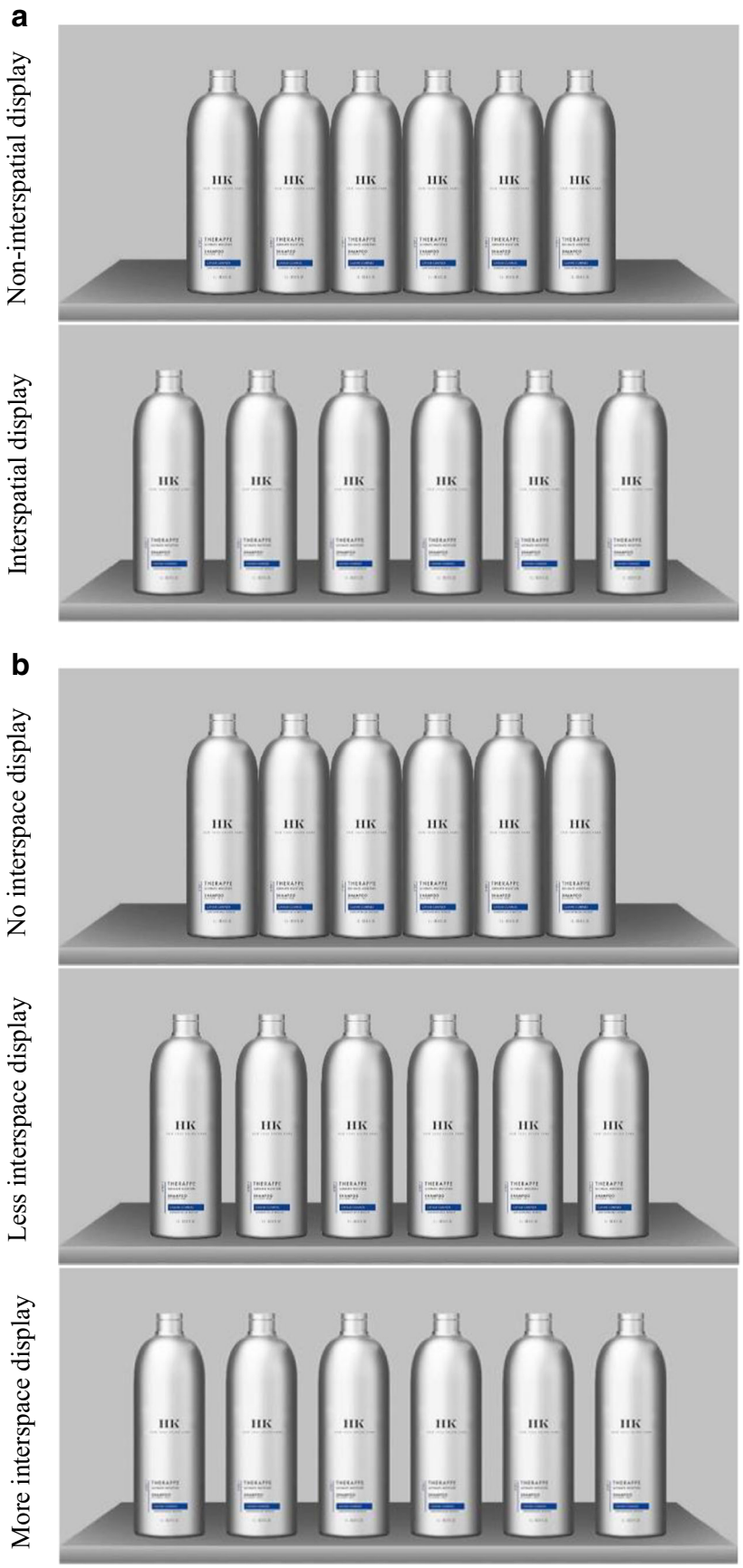


Fig. 4a Stimuli for Study 3 (main analysis)

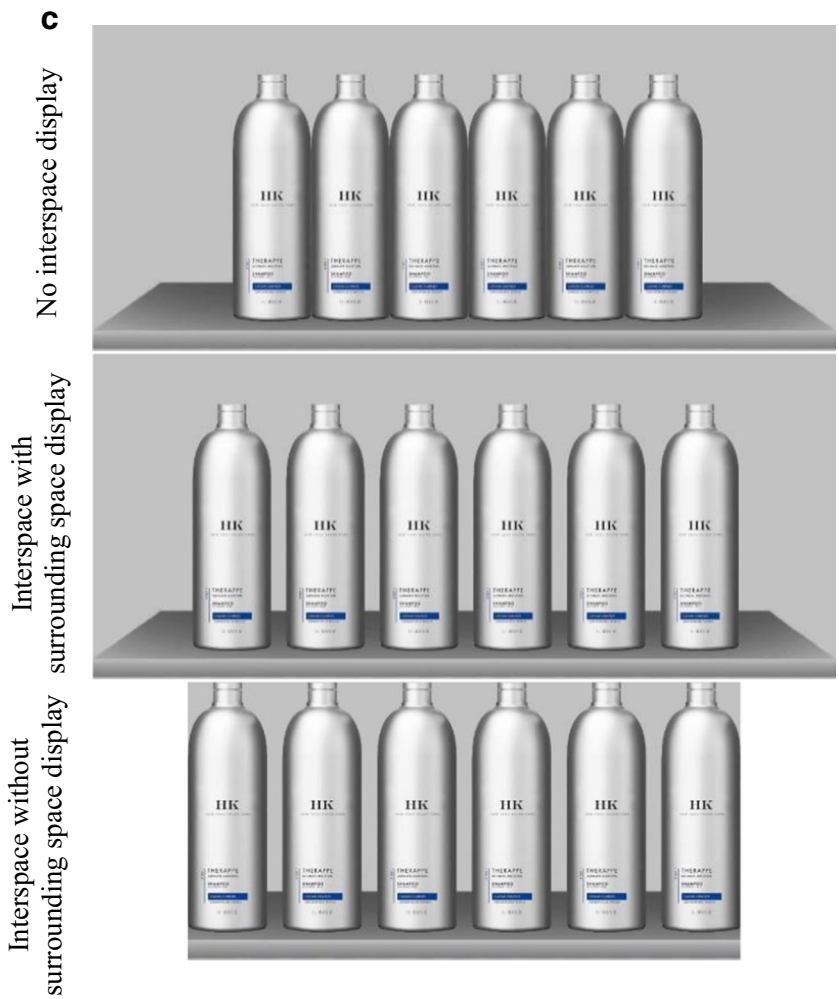


Fig. 4 continued.

$M_{interspatial} = 42.43$ vs. $M_{non\text{-}interspatial} = 45.76$; $F < 1$; how long: $M_{interspatial} = 48.75$ vs. $M_{non\text{-}interspatial} = 52.96$; $F < 1$). In addition, the effect of interspace on product size estimates held when the covariate was excluded from the analysis. Overall, the results provide additional evidence for H2, which states that increased attention triggered by the interspatial product display drives the effect of interspace on product size estimates.

Further analysis

We conducted two further analyses to rule out alternative explanations for our observed relationships. First, to rule out the possibility that the *amount* of interspace between products may have differential effects on consumers' perceived size estimations, we collected additional data for a new condition that has less interspace (1x distance between products) by decreasing by one-third of the original (1.5x) distance between products from the main analysis settings. Then, we employed a one-factor between-subjects design with three conditions: (a) 1.5x between-products distance representing more interspace, (b) 1x between-products distance representing less interspace, and (c) no interspace (Fig. 4b). The analyses employed a one-way ANCOVA, with the varied amount of interspace (more interspace vs. less interspace vs. no interspace) as the independent variable, product size estimates as the dependent variable, and product usage frequency as the covariate. Results revealed a significant main effect of the amount of interspace on product size estimates (how many washes: $F(2, 104) = 4.92$, $p < .01$; how long: $F(2, 104) = 4.17$, $p < .02$). Specifically, participants estimated the product to contain less quantity in the no interspace condition compared to both more interspace condition (how many washes: $M_{no\ interspace} = 38.02$ vs. $M_{more\ interspace} = 59.44$; $F(1, 104) = 8.70$, $p < .01$; how long: $M_{no\ interspace} = 47.92$ vs. $M_{more\ interspace} = 67.97$; $F(1, 104) = 5.59$, $p < .03$) and less interspace condition (how many washes: $M_{no\ interspace} = 38.02$ vs. $M_{less\ interspace} = 55.91$; $F(1, 104) = 5.65$, $p < .02$; how long: $M_{no\ interspace} = 47.92$ vs. $M_{less\ interspace} = 70.82$; $F(1, 104) = 6.78$, $p < .02$). However, there were no significant differences in perceived product size between the more and less interspace conditions ($Fs < 1$). In addition, the results did not differ when the

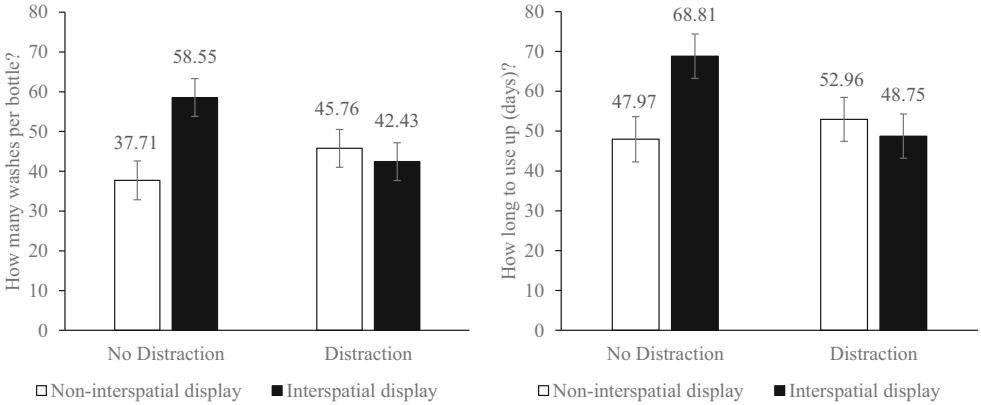


Fig. 5 A two-way interaction between interspatial product display and distraction in Study 3

covariate was excluded from the analysis. These outcomes further support our theoretical expectations that the *existence* of interspace between products causes the difference in product size perceptions, regardless of the varied amount (more or less) of interspace present between products.

Second, to rule out the possibility of interstitial space (space-to-product ratio) effects (cf. Sevilla & Townsend, 2016) related to the idea that space *surrounding* products (rather than space *between* products) may drive consumers' product size perceptions, we collected additional data with a new condition of a between-products space that has no surrounding space except for the original between-product space from the main analysis of this study. Accordingly, we conducted a one-factor between-subjects design with three conditions: (a) no surrounding space among products with original between-products space, representing no surrounding interspace, (b) our original between-products space with surrounding space, representing interspace, and (c) no interspace (Fig. 4c). A one-way ANCOVA with the control of surrounding space among products (no surrounding interspace vs. interspace vs. no interspace) as the independent variable, product size estimates as the dependent variable, and product usage frequency as the covariate, revealed a significant main effect on product size estimates (how many washes: $F(2, 99) = 4.25$, $p < .02$; how long: $F(2, 99) = 5.83$, $p < .01$). In other words, the product was estimated to contain a lower amount in the no interspace condition compared to both no surrounding interspace conditions (how many washes: $M_{\text{no interspace}} = 39.05$ vs. $M_{\text{no surrounding interspace}} = 56.88$; $F(1, 99) = 6.31$, $p < .02$; how long: $M_{\text{no interspace}} = 45.57$ vs. $M_{\text{no surrounding interspace}} = 65.83$; $F(1, 99) = 6.71$, $p < .02$) and interspace condition (how many washes: $M_{\text{no interspace}} = 39.05$ vs. $M_{\text{interspace}} = 57.23$; $F(1, 99) = 6.16$, $p < .02$; how long: $M_{\text{no interspace}} = 45.57$ vs. $M_{\text{interspace}} = 71.20$; $F(1, 99) = 10.08$, $p < .01$). However, no significant differences in perceived product size were observed between the no surrounding interspace and interspace conditions ($Fs < 1$). The results did not differ when the covariate was excluded from the analysis. The results support the proposition that the existence of interspace, rather than the space surrounding products, is the main independent factor that causes the difference in consumers' product size estimations.

Discussion

The results of Study 3 provide further evidence of attention being the underlying process responsible for the impact of interspace on product size estimates. In particular, the results demonstrate that when consumers' attention is directed away from viewing the shelf display, the effect of interspace on product size estimates is attenuated. Study 3 also enhances the generalizability of our findings by demonstrating that the effect of interspace holds in a non-edible product category (i.e., shampoo). Importantly, the results of our additional analyses further demonstrate that the difference in product size perceptions is driven by the *existence* of interspace, rather than either a specific amount (more or less) of interspace between products (Fig. 4b) or interstitial space surrounding products (Fig. 4c). This finding provides an important insight beyond prior work that highlights the impact of the amount of space surrounding products (Pracejus, Olsen, & O'Guinn 2006; Sevilla & Townsend, 2016).

Study 4

The main objective of Study 4 is to investigate the proposed moderating role of consumers' product usage goals on the effect of interspace in a display on actual consumer choices through consumers' product size estimates (i.e., Hypothesis 3). Theoretically, we predict that consumers are more likely to choose a product from an interspatial (vs. non-interspatial) product display when they have a goal that calls for large quantity consumption. In this study, we used crackers as the product category and operationalized a larger product consumption goal through an individual's hunger level. Our expectation was that when people feel hungry, they are likely to desire and consume more food (Evers et al., 2011) and, as a

result, prefer a product that satisfies this goal to a greater extent (i.e., has more quantity of a product that satisfies hunger). Because interspace leads to perceptions of greater product size, we expected that consumers will be more likely to choose a product (i.e., crackers) from the interspatial (vs. non-interspatial) display when they feel hungry. However, when people do not feel hungry, their greater product consumption goal will not be activated and, thus, they will show an undifferentiated preference for products displayed in the interspatial and non-interspatial displays.

Participants, design, and procedure

One hundred and eighty MTurk panel members (50% female, mean age = 38 years) were recruited to participate in this study in exchange for a nominal payment. Participants were informed that they would participate in a study that investigated consumer product preferences. To increase the ecological validity of this study, participants were informed that as a token of appreciation for their participation they would be eligible to receive the actual product that they would choose as a part of ten random drawings. At the beginning of the study, participants indicated their hunger level (i.e., "Are you hungry at the moment?" 1 = yes, 0 = no; "How hungry are you at the present moment?" 1 = not at all hungry, 7 = very hungry; adopted from Suher, Raghunathan, & Hoyer 2016). Next, they were instructed to view an image of two one-shelf shelving units that were placed next to each other. As a cover story, we asked participants to choose a product that they would like to try at the moment from one of the shelving units that displayed one of the two flavors of the Pepperidge Farm Goldfish crackers (i.e., original vs. parmesan). Those two flavors were selected because they received similar popularity ratings among consumers (Ranker Food, 2020). Participants were also reminded about the possibility of receiving an actual product of their choice as a part of a random drawing. One of the shelving units displayed products with no space between them (non-interspatial product display) and the other presented the crackers with a perceptually recognizable space between them (interspatial product display; Fig. 6a). We counterbalanced the location of a shelf with interspace and with no space in the following manner: (1) the shelf with original flavor with interspace next to the shelf with parmesan cheese flavor with no space and (2) the shelf with original flavor with no space next to the shelf with parmesan cheese flavor with interspace. After making their choice of the crackers, participants reported their demographic information and were thanked for their participation.

Results

We used logistic regression to test our predictions. The key dependent variable was cracker choice, coded as 1 if participants selected the crackers in the interspatial product display and 0 if they selected the product in the non-interspatial product display. Cracker choice was regressed on hunger, cracker flavor (original vs. parmesan), and their interaction. We found a significant effect of hunger on cracker choice ($B = -1.037$, Wald's $\chi2(1) = 7.201$, $p < .01$). Consistent with our expectations, when feeling hungry, 71% of participants (61 out of 86) chose the crackers from the interspatial product display, whereas only 46% of participants (43 out of 94) chose the crackers from the interspatial product display when not feeling hungry. There were no significant effects of cracker flavor ($B = .300$, Wald's $\chi2(1) = .332$, $p > .50$) or its interaction with hunger ($B = -.119$, Wald's $\chi2(1) = .031$, $p > .80$). We also ran logistic regression with another measure of hunger (i.e., "How hungry are you at the present moment?" 1 = not at all hungry, 7 = very hungry). The results were identical to those obtained previously. Overall, the results provide evidence for H3 by demonstrating that when consumers have a goal that demands more consumption of a product, they are more likely to choose a product in an interspatial (vs. a non-interspatial) product display.

Further analysis

To rule out the possibility that the horizontal position of flavors (i.e., whether the original flavor was presented in the left or right shelving unit) may affect cracker choice, we collected additional data from 180 MTurk subjects (36% female, mean age = 35 years). That is, the study design was identical to the one we reported above with the exception of the positioning of each flavor (Fig. 6b). Using the same logistic regression analysis as before, we found a significant effect of hunger on cracker choice ($B = -.813$, Wald's $\chi2(1) = 3.938$, $p < .05$). As predicted, only 43% of the participants who were not hungry (35 out of 81) chose the crackers presented in the interspatial display, whereas hungry participants were significantly more likely to select the crackers in the interspatial display (68%; 67 out of 99). Additionally, the results revealed no significant effect of flavor ($B = .230$, Wald's $\chi2(1) = .279$, $p > .50$) and no significant interaction ($B = -.461$, Wald's $\chi2(1) = .536$, $p > .40$). Identical results were found when the data were analyzed including the other measure of hunger (i.e., "How hungry are you at the present moment?" 1 = not at all hungry, 7 = very hungry). These outcomes further support our prediction that consumers' product usages goals moderate the effect of product size estimates driven by interspatial product display on actual consumer choices, regardless of the position of flavors in retail shelves.

Discussion

The results of Study 4 are consistent with our theoretical argument; that is, consumers prefer products in an interspatial

display when their usage goal calls for a larger-sized product because an interspatial product display increases consumer perceptions of product size. Our results shed light on the importance of consumers' product usage goals in influencing downstream outcomes of the effect of interspace on product size estimates. Furthermore, this study involving consumer choices resembling an actual consumption context enhances ecological validity of our findings by establishing the effect of interspace in the context of consumer choice. Finally, we conducted a field study in a real consumption context near the entrance of an on-campus cafeteria with an actual energy drink brand (i.e., V8 + Energy) in order to collect behavioral outcome measures, which replicated and validated the findings of Study 4 (see Web Appendix for details). We believe that this additional field study provides significant behavioral evidence of the effect of interspace on actual product choice.

Study 5

Study 4 established that consumers' product usage goals interact with interspatial product display in influencing actual consumer choices. In Study 5, we aim to examine the moderating role of consumers' product usage goals on the effect of interspace on another downstream outcome (i.e., purchase intentions). Inclusion of this study allows us to test the full conceptual framework (Fig. 1) pertaining to interspatial product displays enhancing product size perceptions (through greater attention) and influencing purchase intentions.

Participants, design, and procedure

One hundred and fifty MTurk subjects (42% females, mean age = 40 years) were recruited to participate in this study in exchange for modest financial compensation. Participants were randomly assigned to one of four conditions in a 2 (interspatial product display: interspatial vs. non-interspatial) × 2 (usage goals: large-size vs. small-size) between-subjects design. Participants first read a scenario that stipulated a usage goal. In the large-size (small-size) goal condition, participants read "Imagine that you are shopping for a water bottle at a store. You want to purchase a water bottle that is large enough to contain water that will keep you hydrated all day long (small enough to fit easily into a standard-sized cupholder and a small lunch box)." Next, participants were shown a two-tiered retail shelf image displaying Purova (a fictitious brand) water bottles. Similar to previous studies, we manipulated the interspatial (non-interspatial) product display by presenting the bottles with a perceptually recognizable degree of space between them (next to each other with no space between them) (Fig. 7). After participants examined the image, they responded to the attention measure, the perceived product size measure, and indicated their intention to purchase the Purova water bottle. Finally, they responded to the manipulation check questions (consumers' product usage goals and interspatial product display) and demographic questions.

Measures

Participants' attention to the displayed products was measured with the same item as in Studies 1 and 2. Their perceptions of product size were measured by asking them to indicate how many ounces of water they thought one Purova bottle contained. As a reference, participants were informed that a regular Coca-Cola can contains 12 fluid ounces. Purchase intentions were measured on a three-item, seven-point semantic differential scale (1 = unlikely, definitely would not, improbable, 7 = likely, definitely would, probable; $\alpha = .96$). The manipulation check on consumers' product usage goals was measured by asking participants to indicate their shopping goal on a seven-point scale (1 = shopping for a small-sized water bottle, 7 = shopping for a large-sized water bottle). The manipulation check on interspatial product display was measured with the same items used in Study 2 ($\alpha = .97$).

Results

Manipulation checks The manipulation of consumers' product usage goals was successful. A 2 (interspatial product display: interspatial vs. non-interspatial) × 2 (usage goals: large-size vs. small-size) between-subjects ANOVA with the manipulation check item for consumers' product usage goals as the dependent variable revealed a significant main effect of usage goals ($F(1, 146) = 486.16$, $p < .001$). The results indicated that participants reported they were shopping for a larger-sized water bottle in the large-size (vs. small-size) goal condition ($M_{large\text{-}size} = 6.50$ vs. $M_{small\text{-}size} = 1.94$; $F(1, 146) = 486.16$, $p < .001$). The effect of interspatial product display or its interaction with usage goals was not significant. The manipulation check on interspatial product display also confirmed the effectiveness of the manipulation. That is, a similar ANOVA with the manipulation check item for interspatial product display as the dependent variable revealed a significant main effect of interspatial product display ($F(1, 146) = 115.65$, $p < .001$). That is, participants were more likely to agree that they perceived no space between products in the non-interspatial display condition than in the interspatial display condition ($M_{non\text{-}interspatial} = 6.19$ vs. $M_{interspatial} = 3.10$; $F(1, 146) = 115.65$, $p < .001$). The effect of usage goals or its interaction with interspatial product display were nonsignificant.

Preliminary analysis First, consistent with our expectations, an independent samples t-test showed that products presented in the interspatial (vs. non-interspatial) display attracted greater attention ($M_{interspatial} = 6.79$ vs. $M_{non\text{-}interspatial} = 6.05$; $F(1,$

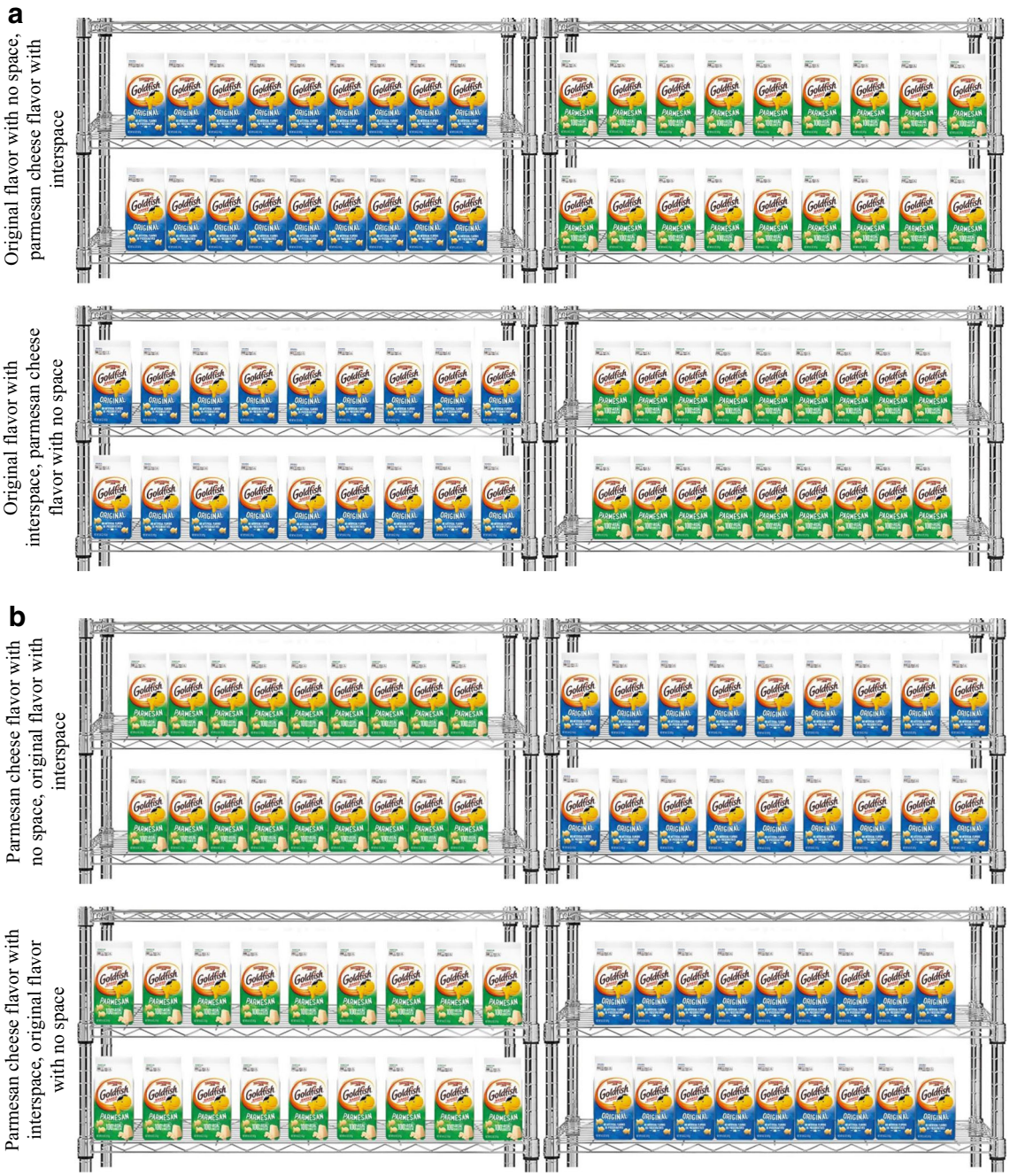


Fig. 6 a Stimuli for Study 4 (main analysis), b Stimuli for Study 4 (further analysis)

148) = 2.85, $p < .01$) and were perceived to contain more volume ($M_{interspatial} = 21.23$ vs. $M_{non\text{-}interspatial} = 18.52$; t(148) = 2.83, $p < .01$).

Second, an ANOVA with interspatial product display as the independent variable, consumers' product usage goals as a moderator, and purchase intentions as the dependent variable revealed a significant two-way interaction (F(1, 146) = 11.40, $p < .01$; Fig. 8). No other significant effects were found ($p's > .1$). Planned contrasts revealed that when participants had the goal of obtaining a large-sized product, they were more likely to purchase the product in the interspatial (vs. non-interspatial) display condition ($M_{interspatial} = 4.84$ vs. $M_{non\text{-}interspatial} = 3.89$; F(1, 146) = 7.21, $p < .01$). In contrast, when participants had a goal that called for a small-sized product, their purchase likelihood for the product in the interspatial (vs. non-interspatial) display condition was lower ($M_{interspatial} = 4.40$ vs. $M_{non\text{-}interspatial} = 5.11$; F(1, 146) = 4.34, $p < .04$). These results support H3 that interspace has an impact on purchase intentions dependent on consumers' product usage goals.

Fig. 7 Stimuli for Study 5

Full framework test To test the full conceptual model, a moderated mediation analysis (Model 87, Hayes, 2018) was conducted with interspatial product display (0 = non-interspatial, 1 = interspatial) as the independent variable, attention as the first mediator, product size estimates as the second mediator, consumers' product usage goals (0 = large-size, 1 = small-size) as the moderator, and purchase intentions as the dependent variable. The results revealed a significant indirect path from interspatial product display to purchase intentions through the two mediators of attention and product size estimates in sequence at each level of the moderator (large-size usage goal: point estimate of the effect = .04; 95% CI = [.0083, .1112]; small-size usage goal: point estimate of the effect = −.05; 95% CI = [−.1132, −.0064]). These results provide further evidence in support of our proposed framework.

Discussion

Study 5 extends the findings of Study 4 by examining the role of consumers' product usage goals in moderating the effect of product size estimates driven by interspace on another important downstream outcome (i.e., purchase intensions). Specifically, our results suggest that when a usage goal demands a large-sized product, an interspatial product display leads to higher purchase intentions, whereas the reverse holds true when a usage goal calls for a small-sized product (i.e., a non-interspatial product display is more effective). The results support our theorizing that consumers perceive a product displayed using interspace as containing greater quantity and thus fitting in more with a usage goal that calls for a large-sized product. The findings contribute to the literature by demonstrating how consumers' product usage goals that align with consumers' product size perceptions driven by interspace in a product display influence product preference. Furthermore, Study 5 provides further evidence for our proposed framework. That is, interspace in a product display increases consumer attention to the displayed products and, in turn, perceptions of product size, consequently interacting with consumers' product usage goals to influence product preference.

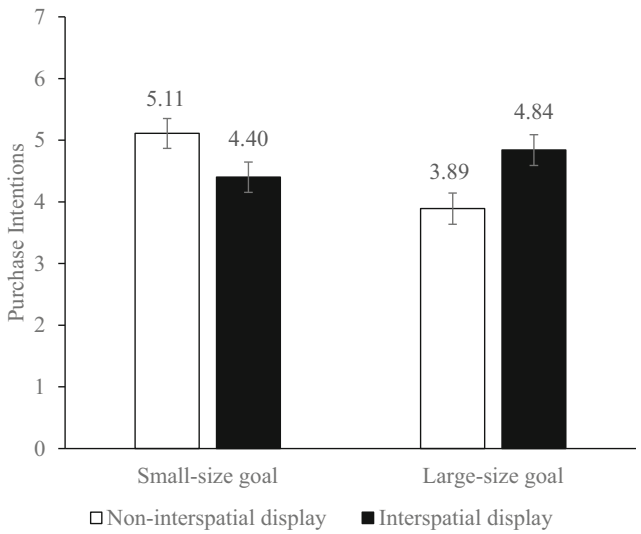


Fig. 8 A two-way interaction between interspatial product display and consumers' product usage goals in Study 5

General discussion

The current research demonstrates that including interspace in a product display increases consumers' perceived estimations of product size. In combination, six studies confirm our theoretical predictions regarding the role of interspace on product size estimates across distinct contexts (i.e., advertising, retailing), five different product categories (i.e., cookies, mixed nuts, shampoo, crackers, water bottles), edible and non-edible product categories, and different populations, including actual consumers. Our research consistently reveals that interspace (vs. no interspace) in a product display influences consumers' product size estimates through increased attention devoted to products in a product display. In particular, our findings provide compelling evidence of the process by both measuring (Studies 1, 2A, 2B, and 5) and manipulating (Study 3) attention as a process variable through a distraction task. Studies 1 and 2 also rule out alternative explanations, such as perceptions of product popularity, product quality, and the size of a product display. Study 3 further demonstrates that differential product size perceptions are driven by the existence of interspace, rather than either a particular amount (less or more) of interspace between products or interstitial space surrounding products. Finally, Studies 4 and 5 elucidate the moderating impact of consumers' product usage goals in driving consumers' product choices and purchase intentions based on interspace. That is, when consumers' usage goals require a large product quantity, interspace enhances individuals' product selection and purchase intentions, whereas this effect reverses for a small-sized product usage goal. Importantly, Study 5 provides empirical support for our entire conceptual model by demonstrating that interspace enhances consumers' attention to products, which, in turn, drives product size estimates and subsequently, purchase intentions dependent upon consumers' product usage goals.

Theoretical contributions

The current research makes multiple important theoretical contributions. First, this research advances our knowledge regarding the role of product display space. Previous research has investigated the effects of display space by focusing on the amount of display space surrounding products, namely the space-to-product ratio effect (Sevilla & Townsend, 2016) or the product variables that differ in a display space (e.g., the number of items, the size of items (Parker & Lehmann, 2011; Van Herpen, Pieters, & Zeelenberg 2009). We provide an important contribution beyond past work by identifying a novel spatial factor, the mere existence of space between products in a display, that has an important downstream consequence for consumers' product size estimates. In doing so, we go beyond the established relationships between product display space and product preferences, as our findings reveal that interspace does not always enhance product evaluations, but rather favorably influences product preferences only when a product usage goal calls for large product quantity. Empirically (as evidenced in our further analysis in Study 3), we also provide strong evidence that the difference in product size perceptions is driven by the existence of interspace, independent of either the amount (less or more) of interspace between products or the space surrounding products. These findings add to prior knowledge regarding the impact of space on important downstream judgments, such as product size estimates, choice, and purchase intentions.

Importantly, prior research finds that product display space affects consumer evaluations through such product characteristics as popularity, quality, and aesthetics. Extending this past work, our research establishes that interspace in a product display induces consumers to devote greater attention to displayed products, thereby enhancing their perceptions of product size. Theoretically, we bring these insights from work on visual processing and stimuli delineation to help conceptualize the unique workings of interspace in a product display (Brandt, 1942; Hoffman & Singh, 1997; Qiu, Sugihara, & von der Heydt 2007; Rayner, 2011). In shedding light on the underlying mechanism of greater product attention, our work is likely to provide further insights into past work on spatial product arrangements. For example, Mishra and his colleagues (Mishra, 2009; Mishra, Mishra, & Nayakankuppam 2009) demonstrate that products with potential loss for customers (e.g., potentially defective products) should be placed more distantly from each other because of the lower likelihood of product quality contagion. In contrast, our work identifies that more space between products can benefit products in general (and not limited to the conditions of products with potential loss) because of greater product attention.

Our findings can also add insight into most recent work on the benefits of presenting multiple product replicates as a group (Vanbergen, Irmak, & Sevilla 2020). Specifically, this work shows that presenting multiple product replicates as a group (vs. a single unit) leads consumers to increase perceived product entitativity (unity/coherence), thus increasing product efficacy beliefs because a unifying benefit is more effective at delivering the benefit. In their work, the authors demonstrate that presenting multiple product replicates as a group with both space and no space between products within a group leads to greater product efficacy judgments. Although the current work does not examine the impact of interspace on product efficacy perceptions, it would be interesting to see whether the outcomes of Vanbergen, Irmak, and Sevilla (2020) vary if an interspace cue was added to the design in future studies.

Next, our research adds new theoretical dimensions to existing work on product size estimates. Prior work has largely focused on visual cues internal to a product itself that affect

product size estimates. For instance, past research sheds light on the impact of product color saturation (Hagtvedt & Brasel, 2017), product or package shape including elongated shapes (Krishna, 2006; Raghubir & Krishna, 1999; Wansink & van Ittersum, 2003), attention-attracting shapes (Folkes & Matta, 2004), and completed shapes (Sevilla & Kahn, 2014) on consumers' product size judgments. Our study broadens this line of work by identifying how an external visual cue (i.e., an interspatial product display) that does not change the diagnostic elements of a product (e.g., the shape or color of a product) can influence product size perceptions.

Furthermore, our research sheds light on the downstream behavioral outcomes of the effect of interspace on product size perceptions by demonstrating that consumers will be more likely to select a product from an interspatial product display when their consumption goals call for a larger product quantity. These findings are consistent with prior work delineating that consumption goals moderate the impact of product size estimates on product choices (Hagtvedt & Brasel, 2017). At the same time, our work adds to our understanding of the factors, such as color saturation (Hagtvedt & Brasel, 2017) and package size (Ailawadi, Ma, & Grewal 2018), that influence product size estimates, which, in turn, interact with consumers' product usage goals in affecting consumer choices.

Our findings also add to the literature on the effect of spatial arrangement on quantity estimates. Prior research suggests that the area occupied by a set of items serves as a visual cue to estimate the item quantity (Krueger, 1972; Vos et al., 1988). One line of research shows that more area occupied indicates greater item quantity. Specifically, research points out that quantity estimates are subject to how the area occupied is perceived (Allïk & Tuulmets, 1991). When people apply a Gestalt approach (i.e., outlining a global figure of the items) (vs. an addition process, i.e., putting together each item's space) to perceive the area occupied, they tend to overestimate the item quantity. For example, a single large cluster that creates a coherent Gestalt is perceived to contain more items than several small clusters equal in number (Frith & Frit, 1972). A set of identical or homogeneous products seem more numerous as oppose to a set of varied products because identical or homogeneous products tend to be perceived as a single whole (Redden & Hoch, 2009). Overall, prior research documents the importance of spatial arrangement in estimating the quantity of items occupying the area. Our work expands this literature by pointing out that spatial arrangement of items also influences perceived quantity attributes intrinsic to the item, namely item size.

Managerial implications

Our findings illuminating the role of interspace in a product display in consumers' product size estimates have important practical implications in retail, sales promotion, and advertising settings. In retail and sales promotion settings, both display types (i.e., interspatial vs. non-interspatial) are widely used to manage on-shelf merchandise. For example, displayed products are frequently organized next to and touching each other on retail shelves, whereas in other situations they are displayed at POP in ways that leave space between items. Despite the broad use of these two distinct product displays, our findings reveal that such product displays result in significantly differentiated product size perceptions and thus varied product choices and purchase intentions. For instance, our results suggest that consumers are more likely to choose a brand of shampoo in an interspatial product display because of a desire for a greater volume. Overall, store managers could benefit from employing our findings in shelf layout designs. For example, when consumers search for diet food items, a smaller-sized product might be preferred. As such, marketers appear to be better off promoting these products in a display where the products touch each other. However, when consumers seek a higher quantity-to-price ratio for many frequently used grocery items (e.g., milk, mixed nuts), store managers may wish to use pusher trays to develop an interspatial product display in order to enhance product size perceptions and increase product selection and purchase likelihood.

Furthermore, we show that the intended interspatial product display effects are equally significant through a two-dimensional view (e.g., a product display in print ads) in addition to a three-dimensional view (e.g., a real product display at a grocery store). Accordingly, advertising practitioners can take advantage of the effect of interspatial product display appeal to affect consumers' behavioral motivations. Specifically, with precision targeting, advertisers can use such an appeal in ads to facilitate Fast-Moving Consumer Goods (FMCG) purchases where the desire for more quantity is often expected. Our findings of the effect of interspace can also be applied to a wide variety of promotional materials, such as print and digital ads, product packages, and coupons. For instance, warehouse club stores might apply the interspace practice in their monthly coupon books since consumers who frequently shop at warehouse club stores tend to seek product-value maximization from bulk purchases and, thus, greater product size perceptions might facilitate purchase.

Finally, our findings indicate that store managers should be aware of consumers' product usage goals triggered by messages on a product package. For instance, snacks marked with "family size" might activate the goal of consuming snacks with others (i.e., a larger usage goal), whereas food items labeled as "healthy choice" might stimulate the goal of consuming less (i.e., a smaller usage goal). If a product is presented in a product display (e.g., an interspatial display) in a way that fits with a consumer's product usage goal (e.g., demanding more quantity), consumers might be more likely to purchase it.

Limitations and future research

Our research raises several possibilities for further inquiry. An interesting avenue for further research would be to consider visual load as a potential moderator of our core effect. Consumers rely on the interspace cue as a simplifying heuristic to infer a product's size. However, prior work also suggests that the reliance of visual cues is subject to visual load in decision making (Krishna, 2006). Specifically, when visual cognitive resources are occupied, people might make product size judgments on the basis of other available sensory inputs such as touch. As such, it is important to uncover whether visual load will qualify the effect of interspace on product size estimates. It would also be worthwhile to explore how various advertising or retailing cues or individual differences and momentarily states can trigger consumers' product usage goals, which in turn can interact with interspatial product displays to impact downstream outcomes. For example, prior research shows that the variety of product assortment influences consumption goals. For instance, Rolls et al. (1981) show that people tend to consume more yogurt when they are offered an assortment of three different flavors of yogurt (vs. only one flavor). Hence, it is possible that retail environments that increase perceptions of product variety (vs. duplication) can enhance consumers' preferences for products presented in an interspatial product display. Additionally, it would be valuable for future research to examine the effects of product interspace on actual consumption amounts through field studies, as our work sheds light on consumers' intended choices and purchase intentions.

In conclusion, our research identifies a novel visual cue (i.e., an interspatial product display) that has significant consequences for product size estimates. Our findings reveal interesting nuances in the workings of this spatial cue through increased consumer attention and its interplay with consumers' product usage goals in affecting consumers' product choices and purchase likelihood.

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