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Touch and Go: Merely Grasping a Product Facilitates Brand Perception and Choice

MATHIAS C. STREICHER[1]* and ZACHARY ESTES[2]

[1]*Department of Strategic Management, Marketing & Tourism, University of Innsbruck, Austria*
[2]*Department of Marketing, Bocconi University, Milan, Italy*

Summary: Consumers often touch products, and such haptic exploration can improve consumers' evaluations of the product. We tested whether cross-modal priming might contribute to this effect. Under the guise of a weight judgment task, which served as a haptic prime, we had blindfolded participants grasp familiar products (e.g., a Coca Cola bottle). We then had participants visually identify the brand name as quickly as possible (Experiments 1 and 2), list the first beverage brands that come to mind (Experiment 3), or choose between beverage brands as reward for participation (Experiment 4). Haptic exposure facilitated visual recognition of the given brand and increased participants' consideration and choice of that brand. Moreover, this haptic priming was brand specific and occurred even among participants who did not consciously identify the prime brand. These results demonstrate that haptic brand identities can facilitate recognition, consideration, and brand choice, regardless of consumers' conscious awareness of this haptic priming. Copyright © 2015 John Wiley & Sons, Ltd.

Haptics are cutaneous and kinesthetic perceptions, such as the shape, texture, and weight of an object, typically perceived via the hands (Lederman & Klatzky, 2009; Peck, 2010). Haptic exploration facilitates object recognition (Gallace & Spence, 2009; Lederman & Klatzky, 2009), and the haptic properties of a product, such as the shape, texture, or weight of a package, broadly affect consumer perceptions, attitudes, and behaviors (Krishna, 2012; Spence & Gallace, 2011). We investigated whether grasping a product (e.g., a Coca Cola bottle) facilitates visual recognition of the brand concept (i.e., 'Coca Cola') and a semantically related competitor (e.g., 'Red Bull'), and whether it increases consideration and choice of the brand among competitors. We first briefly consider the importance of haptics in product evaluation, we then review the extant evidence of haptic priming, and finally we present four experiments testing the influence and specificity of haptic priming on the perception, consideration, and choice of brands.

TOUCHING PRODUCTS

The 'feel' of a product or package is an often-overlooked but nonetheless influential marketing tool (Spence & Gallace, 2011). Unique haptic properties, such as Coca Cola's famous contour bottle, can represent and literally shape the brand in consumers' minds (Lindstrom, 2005). Haptic sensations from product touch can differentiate a brand from its competitors, and indeed, consumers often touch products before they reach a purchase decision (Peck & Childers, 2003a). Products for which touch provides important information (e.g., a blanket) are preferred in offline rather than online shopping settings (McCabe & Nowlis, 2003), and moreover, consumers prefer products that are easy to grasp. For instance, people prefer a detergent bottle with the handle oriented toward the dominant hand (Elder & Krishna, 2012; Ping, Dhillon, & Beilock, 2009). However, if the dominant hand is otherwise occupied, then people prefer a bottle with the handle oriented toward the nondominant hand (Eelen, Dewitte, & Warlop, 2013; Shen & Sengupta, 2012). The haptic properties of a product can also influence consumer perceptions. For instance, water tastes better out of a firm cup than a flimsy cup (Krishna & Morrin, 2008).

In general, allowing consumers to touch a product facilitates their evaluations of that product. However, there are important limitations of the current knowledge about product touch. To begin with, rather surprisingly, no published study has tested whether product touch increases actual product choice. Peck and Childers (2003a) had participants evaluate a product that they could either touch or not, and they found that product touch increased participants' confidence in their evaluations and decreased their frustration with the evaluation task. In a subsequent study, Peck and Childers (2006) found that a point of purchase sign that encouraged touch (i.e., 'Feel the freshness') increased the impulsivity of fruit purchases, relative to shoppers who were not exposed to the sign. Unfortunately however, they did not report any measure of whether shoppers actually touched the products, nor did they report any measure of actual purchase quantities. Thus, Peck and Childers (2006) did not provide evidence that the sign increased either touch or purchase quantities.[1] Perhaps the closest effect to actual consumer choice was reported by Grohmann, Spangenberg, and Sprott (2007), who found that product touch increased consumers' evaluations of the product. Collectively then, the prior studies have shown that product touch improves product evaluations, but ultimately, marketers need to know whether touch increases consumers' actual consideration and choice of a product.

A second limitation is that the psychological mechanisms supporting such haptic effects on product perceptions and evaluations are not yet well understood. One contributing factor is perceived ownership: Touching a product increases one's sense of ownership (Peck & Shu, 2009), and given that people tend to value things that they own (Kahneman, Knetsch, & Thaler, 1990), touching a product thus increases

*Correspondence to: Mathias C. Streicher, Department of Strategic Management, Marketing & Tourism, University of Innsbruck, Universitätsstr. 15, 6020 Innsbruck, Austria.
E-mail: mathias.streicher@uibk.ac.at

[1] Moreover, this experimental design cannot rule out the plausible alternative hypothesis that *any* positively worded sign (e.g., 'Fresh') might increase the impulsivity of purchases, regardless of whether the sign encourages touch.

its perceived value (Shu & Peck, 2011). In fact, simply imagining that one has touched a product can induce the same sense of perceived control and ownership of the product (Peck, Barger, & Webb, 2013). Of course, few complex behaviors (e.g., product evaluation) are fully explained by a single psychological mechanism (e.g., perceived ownership). The present experiments therefore test whether another processing mechanism—haptic priming—might also contribute to the effect of product touch on brand perception and choice. Stated simply, we hypothesized that haptic activation of a specific brand would facilitate perception of and preference for that brand.

HAPTIC PRIMING

The present study is theoretically motivated by psychological research on *cross-modal priming*, whereby stimulation of one perceptual modality facilitates perception of a related stimulus in another modality. Early research on cross-modal priming focused on audio-visual language processing, showing for instance that hearing a word facilitates the subsequent reading of that word, and vice versa (e.g., Kirsner & Smith, 1974). Hearing a word or sentence also speeds the visual recognition of a related object, or vice versa (e.g., Hirschfeld, Zwitserlood, & Dobel, 2011; Holcomb & Anderson, 1993), and cross-modal priming has also been observed among more abstract stimuli, such as auditory pitch and visuospatial height (e.g., Connell, Cai, & Holler, 2013; Evans & Treisman, 2010). Thus, the majority of research on cross-modal priming has examined the relation between the auditory and visual modalities.

However, a rapidly growing literature has begun to examine interactions between vision and touch. The visual and haptic modalities converge functionally, in that both modalities contribute similarly to critical aspects of object recognition, categorization, and memory, such as the perception of object size, shape, and location (Ernst & Banks, 2002; Gaissert & Wallraven, 2012; Gallace & Spence, 2009; Helbig & Ernst, 2007; Lacey, Campbell, & Sathian, 2007; Lederman & Klatzky, 2009). In fact, vision and haptics may act as complementary perceptual systems for object recognition, allowing the simultaneous processing of more perceptual information across the two modalities than within either modality alone (Ernst & Bülthoff, 2004; Hillis, Ernst, Banks, & Landy, 2002). Indeed, this view supports the more general theory of *situated simulation*, which asserts that the brain encodes the perceptions, actions, and introspections evoked by a stimulus (i.e., the situation), and that subsequent cognitions about that stimulus reactivate (i.e., simulate) those sensorimotor and introspective experiences (for review, see Barsalou, 2009; Martin, 2007). For example, exposure to a lemon may involve experience of its various sensory properties (e.g., appearance, feel, taste, and smell), and thus, later thoughts about a lemon reactivate this multisensory experience. After repeated experiences with lemons, their specific sensory properties become strongly associated with one another. By this theory, the various sensory modalities that are repeatedly experienced with a concept are integrated into a holistic, 'situated' representation of that concept. The visual and haptic modalities are particularly highly associated, in that strongly visual objects also tend to be strongly haptic (Lynott & Connell, 2013; see also Louwerse & Connell, 2011). And thus, it follows that perception of an object in one of these modalities should facilitate perception of that object in the other modality (i.e., cross-modal priming).

In a particularly influential study, Reales and Ballesteros (1999) presented 60 common objects (e.g., glove, lock, sponge, and spoon) that participants examined either visually or haptically, and then they tested participants' speed at identifying those objects later when re-presented either visually or haptically. Reales and Ballesteros found equivalent priming effects within-modalities (i.e., visual–visual or haptic–haptic) and across-modalities (i.e., visual–haptic or haptic–visual), thus demonstrating visuo-haptic cross-modal priming of object recognition (see also Ballesteros, Gonzalez, Mayas, Garcia-Rodriguez, & Reales, 2009; Bushnell & Baxt, 1999; Easton, Greene, & Srinivas, 1997; Norman, Norman, Clayton, Lianekhammy, & Zielke, 2004). More recently, Pesquita, Brennan, Enns, and Soto-Faraco (2013) had participants manually explore common objects (e.g., a cup) that were hidden from view while viewing an object that slowly appeared onscreen. Critically, the image visually depicted either the identical object (i.e., the cup that had been haptically explored), a categorically related object (i.e., a differently shaped cup), or an unrelated object (e.g., a brush). Pesquita et al. found that visual recognition of the target object was facilitated for both identical and categorically related objects, with greater priming of identical targets than of related targets. The priming of categorically related objects suggests that haptic exposure activates a general semantic representation of the given object (see also Johnson, Paivio, & Clark, 1989).

HYPOTHESES

So in summary, the visual and haptic properties of an object are strongly associated with one another through their repeated co-occurrence during experiences with that object (Barsalou, 2009), and consequently, haptic exposure to a given object facilitates visual recognition of that object. This haptic priming of object recognition underlies our first hypothesis.

H_1: Incidental haptic exposure to a familiar branded product will facilitate the visual perception of that brand.

For instance, merely grasping a Coca Cola bottle (without seeing it) should facilitate the visual perception of 'Coca Cola' later in an ostensibly unrelated task. We also predicted that haptically priming a brand would increase the consideration and choice of that brand. Nedungadi (1990) examined the effects of visual priming on the consideration and choice of brands. In one experiment, participants read a series of 12 general statements about various brands (e.g., 'McDonald's has adequate seating capacity'), but three of those statements were about the same target brand. In another experiment, participants evaluated a series of five print ads, the last of which was the target brand. In both experiments, participants then generated consideration sets (i.e., the set of brands that a consumer considers when making a product choice) and made choices in the given product category (e.g., fast food restaurants). Participants were more likely to include the target brand in their consideration set and were generally more likely to choose the target brand if that brand had been primed than if it had not. Thus, prior visual exposure to a brand facilitates consideration and choice of that brand. We expected a similar priming effect from haptic exposure.

H_2: Incidental haptic exposure to a familiar branded product will increase the consideration and choice of that brand.

EXPERIMENT 1

Experiment 1 tested whether haptic priming of a specific brand facilitates perceptual identification of that brand (H_1), as suggested by prior studies of cross-modal priming. Under the guise of a weight judgment task, which served as our haptic prime, we first had blindfolded participants grasp a pair of Coca Cola bottles or Red Bull cans. We then presented the phrase ‘Red Bull’ gradually on a computer display and instructed participants to identify the phrase as quickly as possible. A third group of participants completed the brand identification task without first performing the haptic priming task. If haptic priming of visual perception is stimulus specific, then grasping a competitor brand (Coca Cola) should not facilitate perception of the target brand (Red Bull). On the other hand, to the extent that Coca Cola is semantically related to Red Bull, activating the former brand should spread activation to the latter brand in participants' neurocognitive networks (Collins & Loftus, 1975; Nedungadi, 1990), and hence, grasping Coca Cola could facilitate perception of ‘Red Bull’. For instance, Pesquita et al. (2013) found that haptic exploration of a cup facilitated perception of another, differently shaped cup. Comparison of the different-brand and no-brand conditions thus tests the specificity of haptic brand priming.

Methods

Participants
Participants in all experiments and pretests reported herein were undergraduates at a typical European university. All were recruited on campus and were rewarded with a gift (a beverage in Experiment 4; candy in all other experiments), and none participated in more than one experiment or pretest reported herein. One hundred sixty undergraduates participated in Experiment 1, and an additional 75 participated in a stimulus pretest.

Stimuli
Stimuli were selected from a pretest in which 75 students participated blindfolded in an object naming task. We handed each participant several different beverage containers, one at a time and in counterbalanced order. Participants explored each container manually and then attempted to name the corresponding brand. We chose Coca Cola and Red Bull because the classic 0.25 L Coca Cola bottle (87% correct) and the 0.25 L Red Bull slim can (61% correct) were identified most frequently. See Figure 1 for illustration of the selected prime stimuli.

Red Bull　Coca Cola　Römerquelle

Figure 1. Illustrations of the haptic stimuli grasped by blindfolded participants in the prime tasks of Experiments 1, 3, and 4 (Red Bull and Coca Cola) and in Experiment 2 (Coca Cola and Römerquelle)

Haptic priming procedure
In the haptic priming task, participants were blindfolded, and two objects (i.e., two Coca Cola bottles or two Red Bull cans) that were identically shaped but differing slightly in weight were placed in the participant's hands simultaneously (one object per hand). These haptic stimuli were real Coca Cola bottles and Red Bull cans that had been partially filled with plaster. The two Coca Cola bottles weighed 205 and 225 g, whereas the two Red Bull cans weighed 275 and 295 g. Participants were instructed to focus their attention on an ostensible weight difference and to indicate which of the objects was heavier. This difference of 20 g was difficult to detect and was intended only to verify the cover story of a weight difference (i.e., to avoid unnecessary deception). Participants' accuracy in the weight judgment task was not recorded, nor was any feedback given. Immediately after the participant responded, the experimenter removed the objects from the participant's hands and placed the objects out of view, and then removed the blindfold. Finally, the participant was seated in front of a computer for administration of the perceptual identification task, as described later. The delay between haptic priming and perceptual identification was thus approximately 30 seconds.

This haptic priming task was comparable to Reales and Ballesteros (1999) ‘physical encoding’ condition, in which their participants rated the object's volume. Our weight judgment task was intended to activate the prime brand while also minimizing the likelihood of a demand effect, whereby participants consciously identify the prime brand and then alter their behavior intentionally (see General Discussion). Because merely grasping and lifting an object (without manual exploration) is sufficient for recognizing familiar objects (Klatzky & Lederman, 1992), we assumed that this weight judgment task would activate the brand concept. However, by maintaining participants' attention on a physical feature of the object (i.e., its weight), we hoped to minimize their conscious recognition of the brand. We also questioned participants at the conclusion of the experiment to probe their recognition of the prime (see Awareness Check Procedure).

Perceptual identification procedure

After the haptic priming task, participants were asked to participate in another unrelated study on visual accuracy, in which they attempted to identify as quickly as possible the brand 'Red Bull' on a computer display after judging the weight of two Red Bull cans ('same-brand' condition) or two Coca Cola bottles ('different-brand' condition), or without judging any weights ('no-brand' control condition). The identification task was a clarification procedure (e.g., Perruchet & Baveux, 1989; Pesquita et al., 2013; Reales & Ballesteros, 1999), whereby a stimulus appears gradually onscreen, and participants were instructed to identify the target at the earliest possible point in the clarification process. Participants were seated in front of a 15-in. laptop. After reading the instructions and completing a practice trial with the visual target 'test', a single target trial was presented. When the participant pressed the enter key, the target brand name (i.e., 'Red Bull') appeared gradually, starting with only a few pixels and increasing incrementally until the target was fully visible. Targets were presented in black Arial font on a white background and embedded within a gray 12.5 × 4.5 cm frame. As soon as the target was identified, the participant pressed the enter key again, which triggered a visual mask to cover the brand name. Participants then verbally reported the target.

Awareness check procedure

During debriefing, we sought to identify whether participants were consciously aware of the identity of the brand used in the haptic priming task. At the conclusion of the experiment, the experimenter asked each participant whether he or she had recognized the object in the weight judgment task and, if so, to describe it as precisely as possible.[2] Any imprecise response that suggested possible awareness of the brand (e.g., 'it was a glass bottle') was followed by a second prompt for a more specific answer (e.g., 'Was it any particular kind of bottle?'). Participants' post-experiment responses were subsequently used to examine whether conscious awareness of the prime brand moderated the presumed effect of haptic exposure on perception of that brand.

Results

Eight outlying participants whose response time (*RT*) was more than one-and-a-half interquartile ranges beyond the quartiles were excluded from analyses, which thus included 152 participants. Mean identification RTs are illustrated in Figure 2 (left). A one-way between-participants ANOVA indicated a significant effect of prime condition on target identification RT, $F(2, 149) = 7.37$, $p < .001$. As predicted in H_1, the target brand 'Red Bull' was identified significantly faster after haptic exposure to the same brand (Red Bull; $n = 60$, $M = 2.83$ seconds) than after haptic exposure to a different

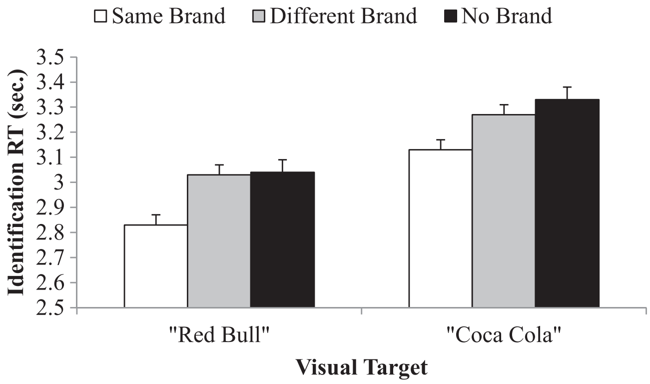

Figure 2. Identification times ($M \pm 95\%$ *CI*) of visually presented target brands after blindfolded haptic exposure to the same brand, a different brand, or no brand in Experiments 1 ('Red Bull') and 2 ('Coca Cola')

brand [Coca Cola; $n = 60$, $M = 3.03$; $t(118) = 3.30$, $p < .001$, Cohen's $d = .61$] or no brand [$n = 32$, $M = 3.04$; $t(90) = 3.05$, $p = .003$, $d = .67$]. The different-brand and no-brand conditions did not differ significantly, $p = .88$, thus revealing that haptic priming was brand specific. That is, priming a competitor brand (Coca Cola) did not facilitate perception of the target brand (Red Bull).

During debriefing, 13 participants explicitly identified Red Bull as the stimuli used in the weight judgment task. We therefore reanalyzed the data without those 13 'brand-aware' participants, and the pattern of statistically significant results remained unchanged: Prime condition still significantly affected RT, $F(2, 136) = 5.77$, $p = .004$, and 'Red Bull' was still identified significantly faster after haptic exposure to the same brand than to a different brand [$t(105) = 2.96$, $p = .004$, $d = .58$] or no brand [$t(77) = 2.90$, $p = .005$, $d = .67$]. Notably, these effect sizes were nearly identical to the original ones observed when the 13 brand-aware participants were included ($d = .61$ and $.67$, as reported earlier). Moreover, within the group who were primed by grasping Red Bull cans, the RTs of participants who explicitly identified Red Bull as the prime stimuli ($n = 13$, $M = 2.77$, $SE = 0.12$) did not differ from those who failed to identify the prime stimuli ($n = 47$, $M = 2.85$, $SE = 0.04$), $p = .47$. Thus, the cross-modal priming of 'Red Bull' did not appear attributable to participants' conscious awareness of the brand during the haptic priming task.

EXPERIMENT 2

Experiment 1 demonstrated haptic priming of brand recognition (H_1) that appeared to be brand specific. Notably however, the same-brand and different-brand primes in Experiment 1 differed markedly in their haptic properties: Whereas a Red Bull can is metal, vertically linear, and texturally flat, a Coca Cola bottle is glass, curved, and textured. So if haptic priming were contingent on the haptic similarity between the prime and target brands, then haptic exposure to a Coca Cola bottle may have failed to prime visual recognition of 'Red Bull' simply because the prime and target brands were too dissimilar haptically. Experiment 2 therefore provided a more stringent test of the specificity of haptic

[2] Participants in the 'no-brand' control conditions were excluded from this questioning.

priming by using a different comparison brand that was more haptically similar to the target brand. In this experiment, Coca Cola was the target brand in the identification task, so participants in one group first judged the weight of two Coca Cola bottles, and participants in the control group again did not perform a weight judgment task. For the different-brand condition, we chose Römerquelle,[3] because its glass bottle is haptically similar to the Coca Cola bottle (unlike a Red Bull can). Thus, Experiment 2 was a conceptual replication of Experiment 1, but with a more similar comparison stimulus for greater specificity and a different target brand for greater generality.

Methods

Two hundred twenty-three undergraduates identified the brand 'Coca Cola' after judging the weight of two Coca Cola bottles ('same brand') or two Römerquelle bottles ('different brand'), or without judging any weights ('no brand'). These stimuli were selected from the pretest reported in Experiment 1, where 87% of the blindfolded participants correctly identified the 0.25 L Coca Cola bottle by haptic exploration. In contrast, the 0.25 L Römerquelle bottle was rarely identified (7% correct). Thus, it provided perceptually similar haptic exposure (see Figure 1) with minimal brand interference. The same plaster-filled Coca Cola bottles from Experiment 1 were used, as well as two Römerquelle bottles weighing 325 and 345 g. The haptic priming, perceptual identification, and awareness check procedures were otherwise identical to those of Experiment 1.

Results

Ten outlying participants (see criterion in Experiment 1) were excluded from analyses, which thus included 213 participants. Results are illustrated in Figure 2 (right).[4] Prime condition again significantly affected RTs, $F(2, 210) = 5.77$, $p = .004$. As predicted in H_1, the target brand 'Coca Cola' was identified significantly faster after haptic exposure to the same brand (Coca Cola; $n = 88$, $M = 3.13$ seconds) than after haptic exposure to a different brand [Römerquelle; $n = 62$, $M = 3.27$; $t(148) = 2.20$, $p = .030$, $d = .37$] or no brand [$n = 63$, $M = 3.33$; $t(149) = 3.14$, $p = .002$, $d = .52$]. The different-brand and no-brand conditions again did not differ significantly, $p = .32$. Thus, despite the increased haptic similarity between the prime and target brands in this experiment, the different-brand condition once again failed to facilitate recognition of the haptically similar target brand.

After removing 36 'brand-aware' participants who explicitly identified Coca Cola as the stimuli in the weight judgment task, the pattern of statistically significant results remained unchanged: Prime condition still significantly affected RTs, $F(2, 174) = 6.29$, $p = .002$, and 'Coca Cola' was still identified significantly faster after haptic exposure to the same brand than to a different brand [$t(112) = 2.54$, $p = .013$, $d = .48$] or no brand [$t(113) = 3.36$, $p < .001$, $d = .64$]. If anything, these effect sizes were slightly larger than in the preceding analysis in which the 36 brand-aware participants were included ($d = .37$ and $.52$). However, within the group who were primed by grasping Coca Cola bottles, the RTs of participants who explicitly identified Coca Cola as the prime stimuli ($n = 36$, $M = 3.17$, $SE = 0.08$) did not differ from those who failed to identify the prime stimuli ($n = 52$, $M = 3.09$, $SE = 0.05$), $p = .38$. Thus, the cross-modal priming of 'Coca Cola' did not appear attributable to participants' conscious awareness of the brand during the haptic priming task.

EXPERIMENT 3

Experiments 1 and 2 both revealed haptic priming of visual brand recognition (H_1) that was brand specific. Next, we sought to demonstrate that merely grasping a product increases the salience of that product (H_2). After completion of the haptic priming task (i.e., blindfolded weight judgment of Coca Cola bottles or Red Bull cans), we had participants list the first beverage brands that come to mind. Explicitly visually priming a brand increases its likelihood of being included in the consideration set (Nedungadi, 1990). We predicted that a more subtle haptic exposure to a given brand would also increase the salience of that brand in the consumers' mindset.

Methods

One hundred seventy-one undergraduates grasped either two Coca Cola bottles or two Red Bull cans during the haptic priming task, which was identical to that of Experiment 1. Participants were then asked to participate in an unrelated study on brands, in which they were given a sheet with seven blank lines and were asked to list the first brands that come to mind for the category of beverages. The delay between haptic priming and the target task (i.e., brand listing) was again approximately 30 seconds, and the post-experiment awareness check was also identical to that of Experiment 1.

Results

Figure 3 illustrates the percentages of participants in the Coca Cola ($n = 93$) and Red Bull ($n = 78$) prime groups who listed Coca Cola and/or Red Bull among their beverage brands.[5] Participants in both groups were more likely to list Coca Cola than Red Bull, which simply confirms that Coca Cola is a more salient beverage than Red Bull. However, Coca Cola was significantly more likely to be listed by participants who previously grasped Coca Cola bottles (90%) than by participants who grasped Red Bull cans (79%), $\chi^2(1) = 3.99$, $p = .046$. And conversely, Red Bull was significantly more likely to be listed by participants who previously

[3] Römerquelle (see Figure 1) is a brand of mineral water that is popular at the location of the study.

[4] The faster recognition of 'Red Bull' in Experiment 1 than of 'Coca Cola' in Experiment 2 is most likely due to word frequency. In Brysbaert and New's (2009) corpus, which contains about 51 million words and is the corpus that best predicts word recognition times, 'red' and 'bull' both occur substantially more frequently (7551 and 1403 occurrences, respectively) than both 'coca' and 'cola' (214 and 282 occurrences, respectively).

[5] For simplicity, the figure shows percentages of participants, but the analyses were based on frequencies, so Chi-square is the appropriate statistic.

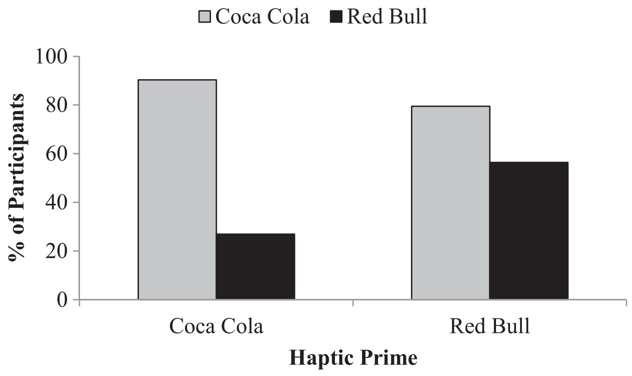

Figure 3. Percentages of participants who included Coca Cola and/or Red Bull among their list of beverage brands after blindfolded haptic exposure to Coca Cola or Red Bull in Experiment 3

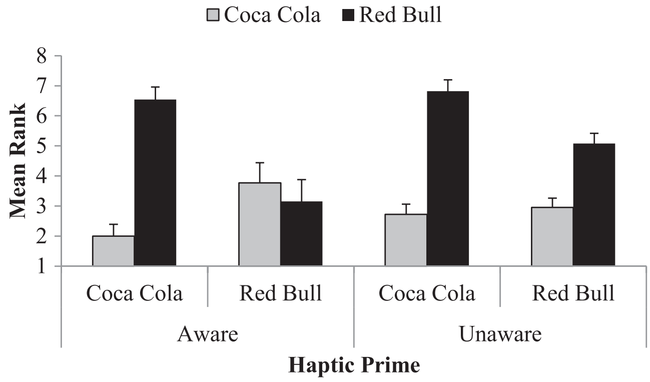

Figure 4. Ranks ($M \pm 95\%$ *CI*) of Coca Cola and Red Bull among participants' list of beverage brands after blindfolded haptic exposure to Coca Cola or Red Bull, as a function of whether participants were unaware or aware of the prime brand, in Experiment 3. Lower scores indicate higher salience (e.g., rank 1 is the first brand listed)

grasped Red Bull cans (56%) than by participants who grasped Coca Cola bottles (27%), $\chi^2(1) = 15.37$, $p < .001$.

We also analyzed the mean rank position in which Coca Cola and/or Red Bull were listed among each participant's consideration set. For this analysis, lower scores indicate higher salience (e.g., rank 1 indicates top-of-mind), and we assigned a rank of 8 in all cases where the given brand was not listed among the participant's seven-item consideration set. A 2 (prime brand, between-participants) × 2 (target brand, within-participants) mixed ANOVA revealed a significant main effect of target brand, $F(1, 169) = 107.59$, $p < .001$, with Coca Cola ($M = 2.76$) being listed earlier than Red Bull ($M = 5.73$). This effect replicates the basic finding that Coca Cola is a more salient beverage than Red Bull. More critically, this effect was qualified by a significant prime × target interaction, $F(1, 169) = 20.77$, $p < .001$: Coca Cola was listed marginally earlier after grasping Coca Cola bottles ($M = 2.42$) than after grasping Red Bull cans ($M = 3.09$), $t(169) = 1.78$, $p = .077$, $d = .27$, whereas Red Bull was listed significantly earlier after grasping Red Bull cans ($M = 4.76$) than Coca Cola bottles ($M = 6.70$), $t(169) = 4.59$, $p < .001$, $d = .70$. Thus, results supported H_2.

Fifty-two 'brand-aware' participants explicitly identified the brand that they grasped during the haptic priming task. We thus compared the ranks of brand-aware and brand-unaware participants by adding prime awareness (dummy coded; no = 0, yes = 1) as a third factor in a 2 (prime brand) × 2 (target brand) × 2 (prime awareness) ANOVA. Results are illustrated in Figure 4. The three-way interaction was significant, $F(1, 167) = 5.47$, $p = .021$. This interaction indicates that the effect of haptic prime brand on the mean rank position of the target brand in participants' consideration sets was significantly moderated by participants' awareness of the prime brand. To investigate this moderation further, we conducted separate 2 (prime brand) × 2 (target brand) ANOVAs on the ranks by brand-aware and brand-unaware participants. Among brand-aware participants, the interaction was significant, $F(1, 50) = 20.72$, $p < .001$, $\eta_p^2 = .29$. Coca Cola was listed significantly earlier after haptic exposure to Coca Cola than to Red Bull, $t(50) = 2.30$, $p = .026$, $d = .74$, whereas Red Bull was listed significantly earlier after haptic exposure to Red Bull than to Coca Cola, $t(50) = 4.03$, $p < .001$, $d = 1.29$. Among brand-unaware participants, the interaction was smaller but also significant, $F(1, 117) = 8.21$, $p = .005$, $\eta_p^2 = .07$. Red Bull was again listed significantly earlier after haptic exposure to Red Bull than to Coca Cola, $t(117) = 3.40$, $p < .001$, $d = .63$, but Coca Cola was listed equally early after haptic exposure to Coca Cola or to Red Bull, $p = .61$, $d = .09$. To summarize, the effect size of haptic priming on the salience of Coca Cola decreased from $d = .74$ among brand-aware participants to a very small .09 among unaware participants, and for Red Bull, the effect size decreased from an extremely large 1.29 among brand-aware participants to a medium effect of .63 among brand-unaware participants. Thus, the effect of haptic priming on brand rank was significantly moderated by conscious awareness of the prime brand, such that the cross-modal priming effect was accentuated by prime awareness. With or without prime awareness, however, significant cross-modal priming was observed (H_2).

EXPERIMENT 4

Experiment 3 demonstrated that merely grasping a product increases participants' consideration of that brand. In Experiment 4, we further tested whether grasping a product also increases participants' choice of that product. After completion of the haptic priming task (i.e., blindfolded weight judgment of Coca Cola bottles or Red Bull cans), as reward for their participation, we offered participants a choice between a bottle of Coca Cola or a can of Red Bull. Whereas product touch is known to increase product evaluations and confidence in those evaluations (Grohmann et al., 2007; Peck & Childers, 2003a), this is a more direct test of whether product touch also affects actual consumption (i.e., brand choice). We also tested for two potential moderators of the presumed influence of product touch on product choice. One plausible moderator of the choice between Coca Cola and Red Bull was participants' prior preference for these beverages. We thus assessed participants' prior consumption of those brands. Another plausible moderator was participants' need for touch (*NFT*). Individuals who are high in NFT are strongly affected by the ability to touch a product, whereas those who are low in NFT are largely unaffected (Grohmann et al., 2007; Krishna & Morrin, 2008; Peck & Childers, 2003a, 2003b). Thus, grasping a product might be more likely to influence product choice among high NFT participants.

Methods

One hundred twenty-six undergraduates grasped either two Coca Cola bottles or two Red Bull cans during the haptic priming task, which was identical to that of Experiment 1. Participants were then thanked and immediately were asked to choose between a bottle of Coca Cola or a can of Red Bull as reward for participating. They indicated their choice by ticking a box on a sheet of paper so that the prime objects (Coca Cola or Red Bull) were never in view of participants in either the weight judgment task or the choice task. After asking participants 'What do you think the purpose of this study was?', we had participants rate on a scale from 1 ('never') to 9 ('very often') how often they drink Coca Cola and Red Bull (i.e., each participant rated both brands). Finally, participants also completed the 12-item NFT scale (Nuszbaum, Voss, Klauer, & Betsch, 2010), which distinguishes between autotelic NFT (i.e., hedonic aspects of touch, such as enjoyment) and instrumental NFT (i.e., functional aspects of touch, such as texture; Peck & Childers, 2003b).

Results

Two participants who correctly guessed the purpose of the experiment were removed from analyses, which thus included 124 participants. As illustrated in Figure 5, the likelihood of choosing Coca Cola (i.e., light gray bars) differed significantly across the two haptic prime conditions (i.e., 65% vs. 41%), $\chi^2(1) = 6.91$, $p = .009$.[6] Indeed, participants who previously grasped Coca Cola bottles ($n = 68$) were more likely to choose Coca Cola (65%), whereas those who previously grasped Red Bull cans ($n = 56$) were more likely to choose Red Bull (59%). Results thus supported H_2. We then tested, via separate logistic regressions, whether autotelic ($\alpha = .94$) or instrumental NFT scores ($\alpha = .91$) moderated the effect of the haptic prime on brand choice. We dummy coded the prime brand and the chosen brand (in both cases, 0 = Red Bull, 1 = Coca Cola), and entered the prime in the first step as the predictor of the chosen brand. This initial step statistically replicated the Chi-square reported earlier, $\chi^2(1) = 6.96$, $p = .008$, with the prime brand significantly predicting brand choice. In separate analyses, we then added in a second step either autotelic or instrumental NFT scores (both continuous predictors) and their interactions with the prime brand. Neither interaction significantly predicted brand choice, both $p > .38$, thus indicating that NFT did not moderate the effect of the haptic prime on brand choice. Finally, we also tested whether participants' brand choices were moderated by their prior consumption frequencies of the given brands. We repeated the stepwise logistic regressions but including either Coca Cola or Red Bull consumption frequencies (and the critical interaction with prime brand) instead of NFT scores. Again, neither interaction approached significance, both $p > .32$. So in sum, haptic priming significantly influenced brand choice, and this effect was not moderated by either NFT or prior consumption of the brands.

[6] Note that because the brand choice was binary, the likelihood of choosing Red Bull was perfectly complementary and therefore also was statistically significant.

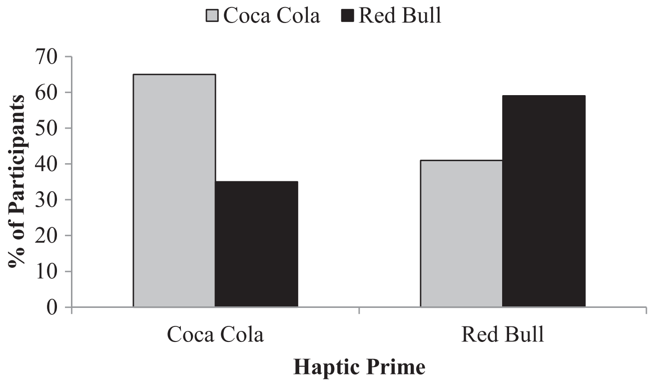

Figure 5. Percentages of participants who chose to receive Coca Cola or Red Bull after blindfolded haptic exposure to Coca Cola or Red Bull in Experiment 4

GENERAL DISCUSSION

Experiments 1 and 2 demonstrated that merely grasping a product (i.e., in the absence of visual stimulation) facilitated perceptual identification of that brand, thus supporting H_1. For instance, participants identified 'Red Bull' more quickly after holding Red Bull cans than after holding Coca Cola bottles. Experiments 3 and 4 further demonstrated that haptic exposure to a familiar brand significantly increased participants' consideration and choice of that brand, thus supporting H_2. Participants who previously grasped Coca Cola bottles or Red Bull cans were more likely to list Coca Cola or Red Bull, respectively, among their most salient beverage brands and were more likely to choose Coca Cola or Red Bull, respectively, as their reward for participating. This latter effect was observed regardless of participants' need for touch and regardless of their prior consumption frequency of the two brands. Overall then, these studies have shown that a unique haptic brand identity facilitates processing of brand-specific stimuli cross-modally and thus reliably increases consideration and choice of that brand.

How, exactly, does haptic stimulation facilitate visual and conceptual processing of the target stimulus? Following the prior theoretical development on situated simulation in general and cross-modal priming in particular, we suggest a simple explanation: Haptic exposure to the given object activated the conceptual representation of that object (e.g., Barsalou, 2009; Martin, 2007; Pesquita et al., 2013; Reales & Ballesteros, 1999), which then facilitated subsequent processing of the given concept. Through repeated experiences with Coca Cola, our brains encode and associate the various sensory properties of this brand, including not only its taste, but also the look and feel of its bottle, the sound of the brand name, etc. The mental representation of Coca Cola thus includes its sensory properties, which are strongly associated with one another and with the brand name. Consequently, grasping a Coca Cola bottle activated the conceptual representation of Coca Cola (Experiment 3), which facilitated perception of 'Coca Cola' (Experiments 1 and 2), and in turn, this increased processing fluency led participants to choose Coca Cola (Experiment 4).

Although product touch was previously known to increase product evaluations (Grohmann et al., 2007) and consumers' confidence in those evaluations (Peck & Childers, 2003a), ours is the first demonstration that product touch increases actual consumer choice. Moreover, ours is also the first to demonstrate 'pure' effects of touch: Whereas the prior marketing studies allowed consumers to see and touch products (Grohmann et al., 2007; Krishna & Morrin, 2008; Peck & Childers, 2003a, 2003b), our participants grasped the products without seeing them. Our results thus provide the first evidence, under the most controlled conditions, that haptic exposure facilitates preference for the given brand. Moreover, the failure of the perceptually similar Römerquelle bottle to facilitate perception of 'Coca Cola' in Experiment 2 indicates that the haptic activation of the brand concept was highly specific. Furthermore, unlike several prior studies (Grohmann et al., 2007; Peck & Childers, 2003a, 2003b), we found that individuals' need for touch did not moderate the effect of product touch on choice. Thus, haptic exposure to a product has even more general and direct effect on consumer behavior than previously known.

We also examined whether these effects of haptic priming depended critically on participants' conscious awareness of the brand used in the priming task or whether the haptic priming was 'presemantic' (to use the terminology of Reales & Ballesteros, 1999). For instance, one might reasonably suppose that conscious awareness of the prime led people to expect the prime on a subsequent perceptual task or perhaps to feel compelled to choose the primed brand during a subsequent choice task (i.e., a 'task demand' effect). Indeed, when explicitly asked to identify the brands by touch, most of the blindfolded participants in our pretest were able to identify a Coca Cola bottle and a Red Bull can. But this does not necessarily indicate that participants in the haptic priming task spontaneously did so, especially given that the haptic exposure occurred under the guise of a weight judgment task. Haptic properties are detected significantly less accurately than visual, auditory, gustatory, and olfactory properties (Connell & Lynott, 2010; see also Gallace & Spence, 2008). Moreover, during visuo-haptic object recognition, the haptic modality is dominated by the visual modality (Kassuba, Klinge, Hölig, Röder, & Siebner, 2013; Klatzky, Lederman, & Matula, 1993), and object shape is identified more accurately by vision than by touch (Norman et al., 2012). So, merely grasping these products may have implicitly activated the brand concept rather than eliciting conscious awareness of the brands. In fact, relatively few of our participants indentified the brands later in post-experiment questioning.

In Experiments 1 and 2, the facilitated identification of the previously grasped brand remained significant and equally large after removing the subset of participants who explicitly identified the prime brand, and a direct comparison of those brand-aware participants to the brand-unaware participants revealed no significant difference in identification times in either experiment. In Experiment 3, awareness of the prime did indeed significantly moderate the effect of haptic priming on brand consideration. However, significant cross-modal priming was observed among both brand-aware and brand-unaware participants. That is, awareness of the prime accentuated its effect on brand consideration, but the effect also occurred among unaware participants. Finally, in Experiment 4, we used a more general question to identify participants who correctly guessed the purpose of the experiment, and only two participants did so. We were less concerned about prime awareness in this experiment for practical reasons: We assume that marketers would be happy to capitalize on touch-induced choice regardless of consumers' awareness of this effect. In sum, we did find some evidence that conscious awareness of the prime brand accentuates the effect of haptic priming, but haptic priming was observed regardless of participants' awareness. Further research is needed to address this issue more definitively.

The haptic priming of brand identification, consideration, and choice that we observed was highly reliable across experiments, although the effect sizes varied substantially depending on the measures employed. For instance, relative to the unprimed control condition, the 'same brand' condition in the perceptual identification measure of Experiments 1 and 2 elicited medium effect sizes (Cohen's $d = .67$ and .52, respectively), whereas the brand rank measure used in Experiment 3 produced effects that ranged from nonsignificant ($d = .09$) to extremely large (1.29), depending on the given brand and participants' awareness of the prime brand. And in raw terms, grasping a Red Bull increased the likelihood of listing Red Bull among one's most salient beverage brands by 29% (Experiment 3), and it increased the likelihood of actually choosing Red Bull by 24% (Experiment 4). In general then, the haptic priming of brands appears to have medium-to-large effects. One may reasonably question, however, whether these tasks and measures overestimate the true effect of haptic brand priming in more realistic consumer contexts. For instance, whereas our experiments focused on two target beverages (Coca Cola and Red Bull), most actual purchasing contexts (e.g., supermarket shelves and refrigerated cases) entail more than two beverage choices. The magnitude of the haptic priming effect would likely be attenuated in such conditions. On the other hand, recall that our participants were blindfolded while they grasped the target brand, and the majority of them were unable to explicitly identify the brand. In more realistic shopping conditions, however, consumers are fully aware of the brands that they grasp. So, given that awareness of the haptic prime brand increases the magnitude of the effect (Experiment 3), our experimental conditions might actually *underestimate* the true magnitude of the effect in many real-world contexts. Thus, both researchers and marketers alike should be aware that the impact of haptic brand priming is highly sensitive to other contextual factors.

Shopping environments differ in whether products can be grasped, with some products being displayed in cases (e.g., watches) and others being available for touching (e.g., mobile phones). Moreover, some products are sold unpackaged or in minimal packages that promote touch (e.g., vegetables), whereas others are fully enclosed in their packages (e.g., cereals). Interestingly, our finding of touch-induced preference—even in the absence of conscious awareness of the haptic prime brand—suggests that implicit or incidental haptic activation can influence consumer choice. To give some real-world examples, many Dutch beer brands emboss their brand names onto glass containers, and Heineken just recently launched a new can design using tactile ink, which vividly elicits the illusion of condensed water on the can's surface. Hence, incidentally consuming beer from a tactile can could establish haptic memory for this brand, thus rendering the brand more accessible in mind when haptically exploring products in a subsequent shopping situation (Peck & Childers, 2003a).

Similarly, many retail shops have refrigerators that consumers can open to select a beverage. Our results suggest that consumers' choices are routinely affected by the shape of the refrigerator handle. If the handle were shaped like a Coca Cola bottle, people would presumably be more likely to choose Coca Cola. And conversely, rounded handles should promote the choice of Red Bull. Indeed, a few examples of such brand-shaped handles do exist in the marketplace, but they are by far the exception rather than the rule. One might similarly expect haptic priming of consumer choices based on the haptic properties of a shopping basket, for instance, or indeed of any object that the consumer grasped before the given choice. Preliminary work in our lab supports these speculations, and more generally, we hope that our research will motivate further integration of cognitive psychology and consumer behavior.

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