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Research Article

In search of a surrogate for touch: The effect of haptic imagery on perceived ownership

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Abstract

Previous research has shown that individuals value objects more highly if they own them, a finding commonly known as the endowment effect. In fact, simply touching an object can create a perception of ownership that produces the endowment effect. In this paper, we extend this line of research in several ways. First, we show that haptic imagery, or imagining touching an object, can have the same effect on perceived ownership as physical touch. We then demonstrate that haptic imagery can lead to perceptions of physical control, which in turn increase feelings of ownership. Moreover, the more vivid the haptic imagery, the greater the perception of control and the feeling of ownership. Implications for theory and practice are discussed.

Keywords: Touch; Haptic; Haptic imagery; Perceived ownership

Introduction

Pretend for a moment that you are shopping for a sweater on the Internet. You navigate to http://www.landsend.com, scroll through the cardigans, and pause at one that appeals to you. You click on the sweater for more information. A larger photo appears, and the caption reads: "Imagine holding this sweater, feeling the soft, 100% cotton in your hands." What if you did as instructed? Would your perception of the sweater be any different than if you had not imagined feeling it?

This research investigates the effect of haptic imaging—the mental visualization of touch—on perceived ownership. Previous research has shown that consumers value objects more highly when they own them, a finding commonly known as "the endowment effect" (Kahneman, Knetsch, & Thaler, 1990; Knetsch & Sinden, 1984; Thaler, 1980). Importantly, this effect is not limited to legal ownership; perceived ownership, characterized by the feeling that something "is mine," also produces the endowment effect. While numerous antecedents of perceived ownership have been proposed (Pierce, Kostova, & Dirks, 2003), one is of particular interest to consumer researchers: the ability of an individual to touch an object. Consumer research has shown that when individuals are given the opportunity to touch an object, they report a greater sense of ownership of the object (Peck & Shu, 2009; Shu & Peck, 2011).

Unfortunately, touch is not always feasible. For example, when consumers shop online, they are unable to touch merchandise prior to purchase. What if imagining touch could serve as a surrogate for touch? Research on imagery and the tactile system is limited (Klatzky, Lederman, & Matula, 1993), but Intons-Peterson and Roskos-Ewoldsen (1989) found that study participants took longer to mentally transport imagined objects of greater weight, which is an attribute best ascertained by the sense of touch. This suggests that there may be a relationship between imagery and touch. There is also some evidence for the interdependence of touch and visual imagery, as when tactile images are accompanied by visual images (Katz, 1925). Finally, Peck and Shu (2009)

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investigated the effects of ownership imagery on perceived ownership, but they did not address haptic imagery.

We contribute to existing literature in several ways. Previous research, which has demonstrated a link between touch and perceived ownership (Peck & Shu, 2009; Shu & Peck, 2011), has hypothesized, but not shown, that physical control is an antecedent of perceived ownership. We measure both constructs in this research and show the link between them. We also measure the vividness of touch imagery and delineate the relationship between haptic imagery, physical control, and perceived ownership.

Touch, perceived ownership, and haptic imagery

If physical touch leads to an increase in perceived ownership, could haptic imagery have a similar effect? Imaging is a cognitive process in which sensory information is represented in working memory (MacInnis & Price, 1987). Just as perception is a multi-modal experience, imagery may operate as a mental recreation of experience involving multiple senses. Bone and Ellen (1992) conjecture that imagery "may involve sight, taste, smell and tactile sensations" (p. 93). There is also some evidence for a relationship between haptic and visual imagery (Campos, López, & Pérez, 1998; Zhang, Weisser, Stilla, Prather, & Sathian, 2004). For example, Katz (1925) noted that when he thought about the smoothness of a pane of glass, haptic images were usually accompanied by visual images: as he imagined the haptic sensation of touching the glass, he also mentally observed his hand touching the glass. The congenitally blind individuals make use of images (Kerr, 1983; Zimler & Keenan, 1983), but the nature of the imagery can be difficult to interpret because they tend to use visual words to describe the images. Heller (1991) advises that "we should remember that visual images can contain tactile and kinesthetic components" (p. 257).

Klatzky, Lederman, and Matula (1991) propose two general principles regarding the haptic imagery system. First, the *function* of haptic imagery should be similar to that of actual touch. This could include functional equivalence between imagery and perception, and the possibility that clear haptic imagery may be a cue for the retrieval of associated information (Paivio, 1975). Second, information conveyed by haptic imagery should correspond in *content* to information extracted by touch. For example, salient haptic attributes include softness, texture, weight, and texture; similar attributes should be present in haptic imagery.

In our first study, the participants touch or imagine touching an object and report the extent to which they feel a sense of ownership of the object. We find that imagining touching an object has a similar effect on perceived ownership as physical touch, but only when one's eyes are closed. We hypothesize, and show in our second study, that this is due to a difference in perception of physical control; that is, touching or imagining touching an object with eyes closed results in greater feelings of physical control of the object compared to not touching or imagining touching with eyes open. Further investigating this process, we hypothesize, and show in our third study, that it is the vividness of the haptic imagery that determines the perception of physical control and feeling of ownership. In essence, closing one's eyes and imagining touch are closer to actual touch due to the vividness of the imagined touch experience. The more vivid the haptic imagery, the greater the perception of physical control and, consequently, the stronger the perception of ownership.

Study 1: Haptic imagery leads to perceived ownership

Since perception and imagery are related, might blocking perceptual distractions enhance imagery? Unnava, Agarwal, and Haugtvedt (1996) found that when imaging and perception compete for the same resources, the positive effects of imaging on learning are reduced. Using functional magnetic resonance imaging (fMRI), Marx et al. (2003, 2004) noted different patterns of brain activation when the participants' eyes were open versus closed. They hypothesize that, based on these patterns, closing one's eyes leads to a "state characterized by imagination and multisensory activity" (p. 924). In contrast, when one's eyes are open, the presence of visual stimuli can interfere with visual imagery (Sherwood & Pearson, 2010). Ehrlichman and Micic (2012) report that research on gaze aversion has demonstrated that averting one's gaze frees up cognitive resources, and this occurs even when one's eyes are closed.

When conducting imagery studies, the participants have sometimes been instructed to close their eyes (e.g., Bone & Ellen, 1992; Keller & McGill, 1994 (Experiment 1); Petrova & Cialdini, 2005 (Study 3)), but more often no instructions regarding opening or closing eyes have been given (e.g., Dahl, Chattopadhyay, & Gorn, 1999; Keller & McGill, 1994 (Experiment 2); Petrova & Cialdini, 2005 (Studies 1 and 2); Unnava et al., 1996; Unnava & Burnkrant, 1991). Considering the possibility that blocking perceptual distractions might enhance the effects of haptic imagery, we hypothesize that haptic imagery is more likely to resemble actual touch in terms of its effect on perceived ownership when one's eyes are closed than when one's eyes are open. Formally:

H1. Imagining touching an object with eyes closed will lead to greater perceived ownership of the object compared to imagining touching an object with eyes open.

Method

Study 1 was a 4 (touch/imagery: no touch and no imagery, no touch and haptic imagery with eyes open, no touch and haptic imagery with eyes closed, touch and no imagery) × 2 (product: Koosh ball, blanket) design, with the first factor manipulated between the participants and the second factor within the participants. Conditions with simultaneous touch and haptic imagery were omitted due to our focus on identifying a surrogate for touch; inclusion of a "touch and no imagery" condition enables us to compare the effects of touch with the effects of haptic imagery, whether with eyes open or closed. Thus, in the first three conditions, the participants could not touch the products, but they were instructed to image. In the fourth condition, the participants touched the products and there were no imagery instructions.

Three hundred and twenty-six individuals participated in small groups of between five and ten. The participants sat at a table and a product was placed at the center of the table; the distance between the participants and the product was no more than two feet. The participants were instructed to evaluate the product for one minute as if they were considering buying it. They were not allowed to touch the object. For those participants in the haptic imagery with eyes closed condition, the instructions read as follows:

> In this part of the study, we ask that you evaluate the Koosh ball/blanket as if you were considering buying it. With your eyes closed, imagine touching the Koosh ball/blanket. Imagine holding it in your hands. Think about how it would feel. Please take *one full minute* to evaluate the Koosh ball/blanket from where you're seated. Remember to keep your eyes closed.

The instructions for the haptic imagery with eyes open condition were the same, with the exception that the participants were asked to keep their eyes open. In the no touch and no imagery condition, the instructions were as follows:

> In this part of the study, we ask that you evaluate the Koosh ball/blanket as if you were considering buying it. Please take *one full minute* to evaluate the Koosh ball/blanket from where you're seated.

Finally, in the touch and no imagery condition, each subject was provided with a product and instructed as follows:

> In this part of the study, we ask that you evaluate the Koosh ball/blanket in front of you as if you were considering buying it. Please pick up the Koosh ball/blanket and take *one full minute* to evaluate it.

The products were specifically chosen, through a pretest, to provide positive haptic feedback and to be enjoyable to touch. The order of products (Koosh ball, blanket) was counterbalanced across the participants. No order effects were found, so this factor was collapsed in later analyses.

Our primary dependent variable was perceived ownership. Perceived ownership was measured with three items—"I feel like this is my Koosh ball/blanket," "I feel a personal ownership of the Koosh ball/blanket," and "I feel like I own this Koosh ball/blanket"—each on a seven-point scale anchored by endpoints "Strongly Disagree" and "Strongly Agree" ($\alpha = .95$ for product 1 and $\alpha = .96$ for product 2). These items are adapted from a measure of perceived ownership used in workplace settings (Pierce, Kostova, & Dirks, 2001) that has been used previously in consumer behavior research (Peck & Shu, 2009). The perceived ownership of each product was measured immediately after the participant touched/imagined touching the product.

Results

Hypothesis 1 predicted that when the study participants imagined touching a product with their eyes closed, perceived ownership would be greater than when the participants imagined touching with their eyes open. An ANOVA was run with perceived ownership as the dependent variable, and a main effect of the touch/imagery condition was found ($F(3, 322) = 4.31$, $p = .005$, see Fig. 1). Haptic imagery with eyes closed resulted in significantly greater feelings of perceived ownership ($M = 2.29$) than both haptic imagery with eyes open ($M = 1.78$) and no imagery ($M = 1.78$). Similarly, the condition where touch was possible resulted in significantly greater feelings of ownership ($M = 2.21$) compared to both the haptic imagery with eyes open condition and the no imagery condition. Interestingly, there was no significant difference in perceived ownership between the haptic imagery with eyes closed condition and the condition where actual touch was possible. See Table 1 for F values between pairs.

A post hoc study revealed that our instructions to image produced haptic mental images and not just visual mental images. Sixty-nine students wrote down adjectives to describe the blanket they imagined touching. The number of haptic words (e.g., "soft," "smooth") and the number of non-haptic words (e.g., "blue") were analyzed. The average number of haptic words recorded was 3.5 and the mode was 3.0. On average, 68% of the words the participants used to describe the image were haptic. Only one participant did not record any haptic words, and only three students listed less than 25% haptic words. This supports the effectiveness of our instructions in eliciting haptic images rather than merely visual images.

Discussion

In Study 1, we found that individuals who imagine touching an object when their eyes are closed experience a level of perceived ownership similar to individuals who actually touch the object. This effect is not observed when a person imagines touching an object with their eyes open. Thus our hypothesis that imagining touching an object with eyes closed (vs. eyes open) leads to greater perceived ownership is supported. In Studies 2 and 3 we investigate the process through which this occurs.

Study 2: Haptic imagery with eyes closed leads to physical control

Touch is the primary means by which consumers acquire haptic information, such as weight and texture, from products (McCabe & Nowlis, 2003; Peck & Childers, 2003a). However, touch is also the mechanism through which consumers manipulate objects. Pierce et al. (2003) suggest that the direct physical control of objects that is afforded by touch may be an antecedent of perceived ownership. They delineate three paths through which perceived ownership emerges: (1) control of an object, (2) acquisition of intimate knowledge of an object, and (3) investment of the self in an object.

People value their possessions because these can be used to exhibit control over the physical environment and other people (Furby, 1978b). "Control over the physical environment stems from control of the object, control over the use of the object,

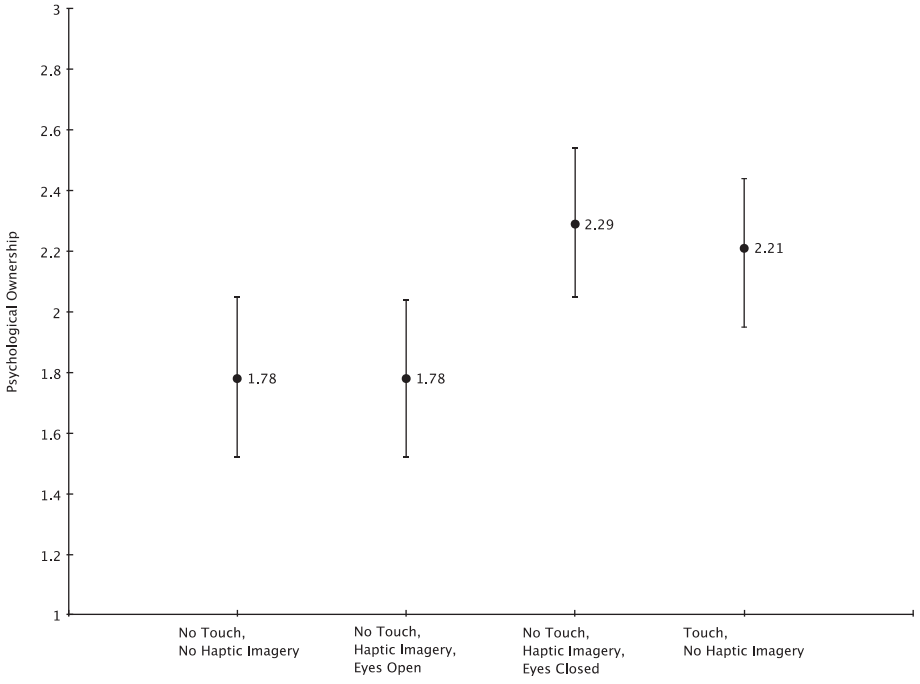


Fig. 1. Mean perceived ownership (1–7) by imagery/touch condition (Study 1).

and use of the object as a mechanism to exert control over other parts of the environment" (Pierce et al., 2003, p. 89). In a study on ownership semantics, objects over which individuals exercised the most control were most likely to be perceived as theirs (Rudmin & Berry, 1987). Others have noted that objects that can be physically controlled are more likely to be associated with the self (Belk, 1988; Ellwood, 1927; Furby, 1978a; Lewis & Brook, 1974; Seligman, 1975). Since control is associated with the self, objects that are under one's control engender greater feelings of ownership.

Although control of an object has been hypothesized to be an antecedent of perceived ownership, this has not been empirically tested (Peck & Shu, 2009; Shu & Peck, 2011). If control is in fact an antecedent, we would expect that touch and touch imagery would result in greater perceived control compared to no touch and no touch imagery. We would also expect, from Study 1, that a condition with touch imagery with eyes closed would result in greater perceptions of control than a condition with touch imagery with eyes open. Formally:

H2. Actual touch and imagining touch (haptic imagery) with eyes closed will lead to greater perceived physical control of an object compared to both a haptic imagery with eyes open and a no touch without haptic imagery condition.

Table 1
F values and *p* values of specific contrasts between conditions for perceived ownership (Study 1). All *F* degrees of freedom are (1, 322).

Perceived ownership	Haptic imagery (eyes open)	Haptic imagery (eyes closed)	Touch
No imagery	.00	6.45	4.90
	$p=.99$	$p=.01$	$p=.03$
Haptic imagery (eyes open)		6.61	5.02
		$p=.01$	$p=.03$
Haptic imagery (eyes closed)			.09
			$p=.77$

The purpose of Study 2 was to examine the link between touch and touch imagery and the perceived sense of physical control of an object. We also included an individual difference in preference for touch as a covariate, since individuals greater in their "need for touch" (Peck & Childers, 2003b) could potentially feel more control when they haptically image compared to those lower in their need for touch.

Method

Study 2 employed four conditions (touch/imagery: no touch and no imagery, no touch and haptic imagery with eyes open, no touch and haptic imagery with eyes closed, touch and no imagery) in a between-subjects design. A blanket, as in Study 1, was used for Study 2. Two hundred and eighty individuals participated in small groups, and each group was randomly assigned to a condition. The participants sat at a table and a closed folder was placed in front of each participant. The front of the folder read "Do Not Open Until Instructed." Inside each folder was a swatch of a blanket. The purpose of the folder was to ensure that each participant viewed the swatch for exactly the same amount of time; the participants were instructed to open their folders simultaneously, and after 30 s had elapsed they were instructed to close them. The swatches of fabric were cut from the same blanket, and the same swatches were used across all conditions. All participants were initially instructed to evaluate the swatch, without touching it, as if they were considering buying a blanket. The instructions read as follows:

> We ask that you evaluate a blanket as if you were considering buying it. A swatch of the blanket has been placed inside the

> folder in front of you. Please do NOT open the folder until told to do so. You have 30 s to look at the swatch. Do not touch the fabric swatch. The researcher will tell you when to close the folder.

In the haptic imagery conditions, the participants were then instructed to imagine touching the blanket for one minute, as follows:

> After that, we want you to take one minute and imagine touching the blanket. Please close your eyes/leave your eyes open while imagining. Imagine holding it in your hands. Think about how it would feel. Please close your eyes/leave your eyes open as you are imagining touching the blanket.

In the no touch and no imagery condition, the participants were asked to evaluate the blanket for one minute. In the touch and no imagery condition, the participants were asked to touch the swatch and evaluate the blanket for one minute. After the minute, in all conditions, a measure of physical control and the twelve-item need for touch scale were administered (Peck & Childers, 2003b).

The primary dependent variable was physical control over the object. This was measured with two items: "When evaluating the blanket, I felt as though I: (1) could move it and (2) had physical control over it." Each item was rated on a seven-point scale, anchored by "strongly disagree" and "strongly agree", and the items were averaged ($r = .91$). Need for touch was measured with twelve items that were averaged ($\alpha = .91$).

Results

With physical control as the dependent variable, there was a main effect of touch/imagery condition ($F(3, 276) = 193$, $p < .001$). Not surprisingly, the condition where the participants could touch resulted in the greatest level of physical control ($M = 6.30$) and the no touch, no imagery condition resulted in the least amount of physical control ($M = 1.86$). Interestingly, a planned contrast revealed that the no touch haptic imagery with eyes closed condition resulted in significantly greater physical control than the no touch haptic imagery with eyes open condition ($M = 4.71$ and 2.09, $F(1, 276) = 144$, $p < .001$, Fig. 2). The individual difference in preference for touch ("need for touch") was included as a covariate but was not significant ($F(1, 275) = .35$, $p = .56$) and will not be discussed further.

Discussion

In Study 2, perception of physical control varied by haptic imagery condition, supporting H2. The condition where touch was possible resulted in the greatest level of physical control, as expected. In the haptic imagery conditions, imagining touch with eyes closed resulted in greater feelings of physical control than imagining touch with eyes open. This provides additional support for Study 1, in which ownership was greater in the eyes closed versus eyes open condition while imagining touching an object. Furthermore, haptic imagery, particularly when one's eyes are closed, leads to perceived ownership (Study 1) and gives rise to varying levels of physical control (Study 2). We combine these findings in Study 3 and consider vividness of haptic imagery as a mediator of the effect of haptic imagery on physical control and perceived ownership.

Study 3: Haptic vividness leads to physical control and perceived ownership

Study 1 showed that perceived ownership after haptic imaging with eyes closed was similar to perceived ownership after actual touch. Study 2 helped explain the process through physical control; closing one's eyes while imaging led to greater feelings of physical control compared to imaging with eyes open. In Study 3, we examine the vividness of haptic imagery when one's eyes are open vs. closed and the corresponding effect on perceived ownership through physical control. Previous research has shown that the effects of visual imagery are mediated by the vividness of the imagery (Pearson, Rademaker, & Tong, 2011). Although haptic imagery vividness and visual imagery vividness are not identical, they appear to be correlated (Campos et al., 1998). Thus we expect that closing one's eyes leads to more vivid haptic imagery than imaging with one's eyes open, and this increased vividness makes haptic imaging with eyes closed more similar to actual touch, giving rise to greater feelings of physical control and perceived ownership. Formally:

H3. Haptic imaging with eyes closed leads to greater perceived ownership than haptic imaging with eyes open due to the effect of haptic vividness on perceived physical control.

Method

Study 3 employed two conditions (haptic imagery with eyes open, haptic imagery with eyes closed) in a between-subjects design. A blanket, as in Studies 1 and 2, was selected as the stimuli, and the same procedure utilized in Study 2 was used in Study 3. One hundred and thirty-three individuals participated in small groups, and each group was randomly assigned to a condition. The instructions read:

> We ask that you evaluate a blanket as if you were considering buying it. A swatch of the blanket has been placed inside the folder in front of you. Please do NOT open the folder until told to do so. You have 30 s to look at the swatch. Do not touch the fabric swatch. The researcher will tell you when to close the folder.

> After that, we want you to take one minute and imagine touching the blanket. Please close your eyes/leave your eyes open while imagining. Imagine holding it in your hands. Think about how it would feel. Please close your eyes/leave your eyes open as you are imagining touching the blanket.

The primary dependent variables were perceived ownership, as measured in Study 1 ($\alpha = .96$), and physical control over the blanket, as measured in Study 2 ($r = .62$). Three items measured the vividness of the haptic imagery: (1) "I could imagine moving

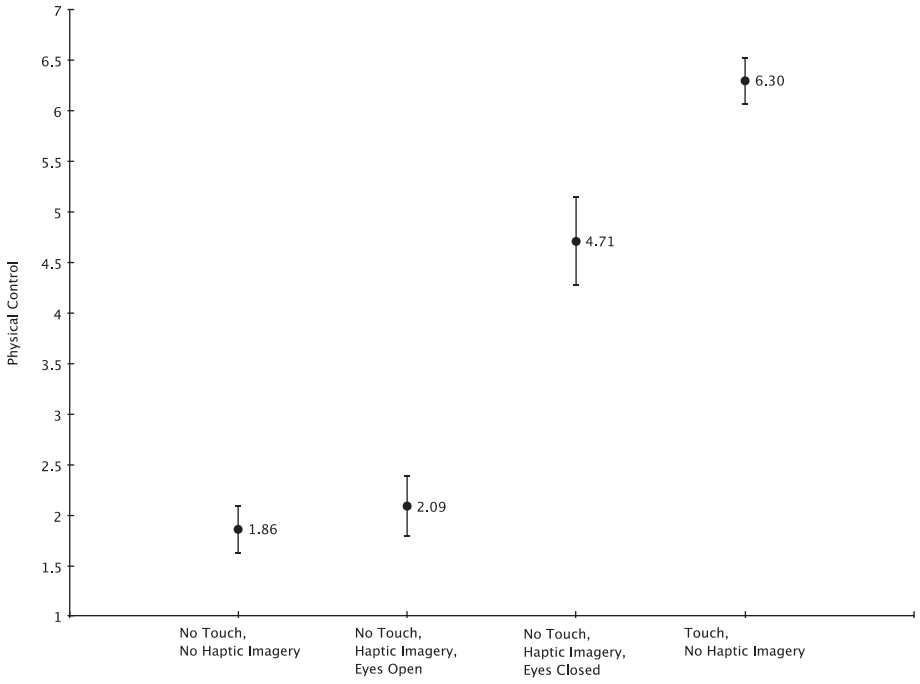


Fig. 2. Mean physical control (1–7) by touch/haptic imagery condition (Study 2).

my fingers on the blanket," (2) "I felt that I could examine the texture of the blanket," and (3) "I felt as if the blanket was in my hands." These items were rated on seven-point scales anchored by endpoints "Strongly Disagree" and "Strongly Agree" and averaged ($\alpha = .81$).

Results

The multiple group structural equation model shown in Fig. 3 was estimated using a maximum likelihood estimator. The model demonstrated acceptable fit as assessed by the exact fit test ($\chi^2 = 61$, $df = 46$, $p = .07$), the close-fit test (RMSEA = .07, 90% C.I.: .00 to .11, *pclose* = .25), and the comparative fit index (CFI = .98). All coefficients are statistically significant at $p < .05$, with the exception of the effect of haptic vividness on physical control in the eyes open group ($p = .46$). A direct effect from haptic vividness to perceived ownership was estimated and found to be not statistically significant ($p = .18$ for the eyes open group, $p = .26$ for the eyes closed group). We thus conclude that closing one's eyes affects haptic vividness, which in turn affects perceived ownership through physical control, supporting H3.

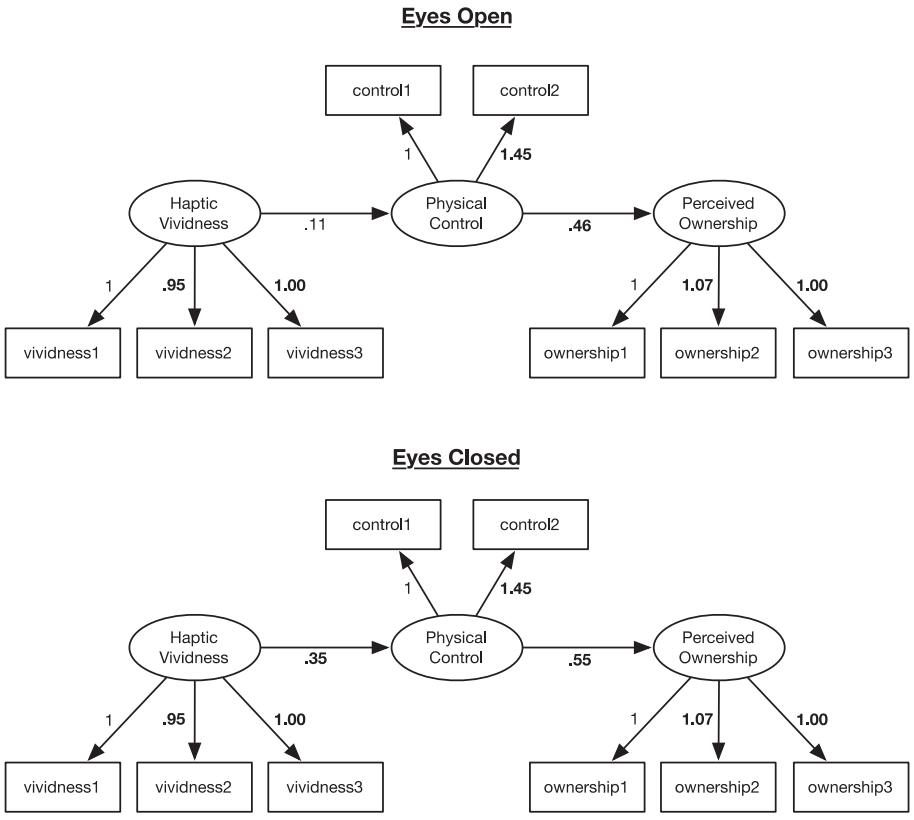
General discussion

Product touch is a key component of consumer behavior. Whether consumers touch to obtain information or to enjoy sensory feedback, touch plays an important role in purchase decisions. What happens when consumers are not given the opportunity to touch a product? Is the inability to touch insurmountable? Acknowledging that product touch is not always feasible, we set out in search of a surrogate for physical touch. Since previous research had shown that perceived ownership produces effects similar to actual ownership, we conjectured that perceived touch—in the form of haptic imagery—could produce effects similar to actual touch.

Our first study showed that haptic imagery can in fact serve as a surrogate for touch when people imagine touching a product with their eyes closed. Specifically, the extent to which a person feels a sense of ownership of an object is similar whether the person actually touches the object or closes his eyes and imagines touching the object. We suspected that the process through which this occurs is physical control; that is, just as touching an object leads to feelings of physical control over the object and thereby perceptions of ownership, closing one's eyes and imagining touching an object leads to feelings of physical control and perceived ownership. Study 2 suggests that this is in fact the case, and Study 3 demonstrated that the effect of vividness of haptic imagery on perceived ownership is mediated by physical control when one's eyes are closed.

Research on imagery and the tactile system is limited, and this extension of the literature on haptic imagery holds promise for further sensory research. In addition, haptic imagery may facilitate research in the area of touch. Haptic experiments are time and resource intensive, since the study participants must be physically present at a laboratory to handle physical stimuli. When haptic imaging can act as a surrogate for physical touch, studies may be conducted online, or at least moved to a computer lab. Greater understanding of the effects of haptic imaging will enable researchers to determine when physical stimuli are necessary and when haptic imagery may suffice.

Physical control over an object, intimate knowledge of an object, and identification with an object are three possible paths to perceived ownership (Pierce et al., 2001, 2003). In this research, we focused on the effect of haptic imagery on perceived ownership through physical control. Future research



Coefficients in bold are statistically significant at $p < .05$

Fig. 3. Physical control as a mediator of haptic vividness on perceived ownership when imaging with eyes open vs. eyes closed (Study 3).

could investigate the other two paths to perceived ownership and consider the possibility of interactions among the three. For instance, it may be possible to enhance the effect of haptic imagery on perceived ownership by encouraging identification with an object. Similarly, educating consumers on the attributes of an object could lead to greater perceived ownership when coupled with haptic imaging. It may also be informative to try discouraging object identification to reduce perceived ownership. The additive, or multiplicative, effects of pairing physical control with other antecedents of perceived ownership would enhance the theoretical model linking the antecedents to ownership.

Our investigation of haptic imagery as a surrogate for touch suggests that the vividness of the imagery is key; the more vivid the haptic imagery, the greater the sense of physical control and the stronger the perceived ownership. Are some types of haptic information inherently more vivid than others, though? For example, the haptic attribute of softness may be easier to imagine than weight. Moreover, what happens when haptic imagery is followed by actual touch? The imagined haptic experience could be either more or less favorable than the actual haptic experience. If there is a discrepancy, how will it be interpreted by the individual? Could vivid haptic imagery negatively impact product satisfaction due to disappointment with subsequent actual touch? Alternatively, might the haptic experience itself be affected by prior haptic imagery? Research on the effects of prior visual imagery on perception suggests that this could be the case (Pearson, Clifford, & Tong, 2008). There is also a question of past experience with a product category. If an object is familiar, haptic imagery may be facilitated by stored past experience, enhancing vividness, whereas haptic imagery with unfamiliar objects may not be as effective.

In this research, we did not find individual differences in preference for touch information to be significant. However, we know that haptic information is more accessible for high need for touch individuals (Peck & Childers, 2003b). In the absence of explicit instructions to image haptically, high need for touch individuals may be more likely to spontaneously form haptic images. If this is the case, they may be disappointed with the actual product when they eventually have the opportunity to touch it. While they may be able to compensate for a lack of touch through spontaneous imagery, the end result could be decreased satisfaction.

Future research should also investigate the relationship between visual imagery and haptic imagery. While little is known about haptic imagery, there is some evidence that visual imagery includes haptic features (Campos et al., 1998; Zhang et al., 2004). For example, Katz (1925) imagined the smoothness of a windowpane and noted the presence of a hand in the image. Since a function of imagery is the recreation of an experience, which may be comprised of multiple modalities, the interplay of different types of perceptual images warrants investigation.

Managerially, this research has important implications for online and direct marketing. Consumers in these environments are likely to experience greater uncertainty due to the absence

of haptic sensory input. This is particularly problematic in categories such as clothing, where haptics play a key role in product evaluation. Lands' End, for example, deals with this on its website by providing detailed product descriptions, large product photos, and free swatches. Haptic imagery could be added to the mix to further enhance consumer perceptions of merchandise. Indeed, there has been a call for touch research to explore alternatives to direct physical contact (Elder et al., 2010), especially given the growth of non-touch media such as online and catalog shopping. Consumers who prefer tactile input are less likely to purchase online (Citrin, Stem, Spangenberg, & Clark, 2003) and are more frustrated and less confident in their product evaluations when touch is not available (Peck & Childers, 2003a). The present research is a first step in examining haptic imagery as a surrogate for actual touch, an area that holds promise for future research in haptics.

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