Online product experiences : the effect of simulating stroking gestures on product understanding and the critical role of user control

Reference:
Overmars Suzanne, Poels Karolien.- Online product experiences : the effect of simulating stroking gestures on product understanding and the critical role of user control
Computers in human behavior - ISSN 0747-5632 - 51(2015), p. 272-284
DOI: http://dx.doi.org/doi:10.1016/j.chb.2015.04.033

Online Product Experiences: The Effect of Simulating Stroking Gestures on Product Understanding and the Critical Role of User Control.

Abstract

This article builds upon the persuasiveness of touch in consumer settings, extending it to an online store environment. Recognizing that actual touch is not always feasible, the aim is to investigate whether interactive visual stimuli can tap into tactile perceptual information, thus improving understanding (i.e., perceived diagnosticity) regarding product attributes in an online store. In Study 1, an interface with image interactivity to simulate stroking gestures increased perceived diagnosticity of the experience attributes of a product (i.e., a scarf), as compared to a static interface using only pictures. Mediation analysis indicates that this effect is due to visually induced tactile sensations. As expected, no effects were found for search attributes, for which touch is considered less diagnostic. Study 2 reaffirms the importance of tactile sensations in perceived diagnosticity regarding experience attributes using a different product (i.e., a throw blanket), in addition to indicating the crucial importance of user control in invoking tactile sensations. In other words, Study 2 demonstrates that the ability to control the online product (instead of merely watching the product being moved around) is important to induce tactile sensations. Results from both studies indicate that, in the context of online stores, simulated tactile sensations is an important factor in online product understanding.

Keywords: touch; product presentation; image interactivity; perceived diagnosticity; online stores; e-retailing

1. Introduction

Touch is inherently related to our evaluation and appreciation of many different objects (Yazdanparast & Spears, 2012). Our sense of touch “provides us with information about the world, about the shape and weight of things, about its texture and temperature, its verticality and stability, and many other physical properties” (Hekkert, 2006, p. 162). Many studies support the idea that touch is an important sensory modality for acquiring relevant product information and that it is therefore highly effective in influencing product evaluation (Grohmann, Spangenberg, & Sprott, 2007; Peck & Childers, 2003b) and consumer decision-making (McCabe & Nowlis, 2003; Peck & Wiggins, 2006). This is particularly true with regard to products that have important tactile properties (e.g., clothing). In some cases, touch can even outweigh visual input (Balaji, Raghavan, & Jha, 2011), as when visual input is inconclusive and, for example, a leather purse feels unexpectedly soft and smooth. Touch is undoubtedly a powerful tool for information and persuasion in a retailing context.

In online stores, however, the consumer is deprived of actual touch prior to making a purchase. Online consumers are thus “forced” to make their purchase decisions based on the visual attributes of products (Ho, 2014) and/or according to other (less reliable; cf. Ng, Chaya, & Hort, 2013; Szybillo & Jacoby, 1974) product-extrinsic features, including price, brand, and store image (Spence & Gallace, 2011). This phenomenon appears to explain a considerable portion of the high rate of returns in the e-retailing sector, which can be as much as 40% in online clothing stores (De, Hu, & Rahman, 2013; Wiese, Toporowski, & Zielke, 2012). For products with salient experience attributes (i.e., for which sensory input is important for product understanding), the inability to touch has proven a particularly salient reason why consumers remain hesitant to buy these types of products online (Childers, Carr, Peck, & Carson, 2001; Citrin, Stem Jr., Spangenberg, & Clark, 2003; Iglesias-Pradas, Pascual-Miguel, Hernández-García, & Chaparro-Peláez, 2013). Although scholars have identified the inability to touch as a limiting factor in online shopping, they have yet to demonstrate how online retailers can overcome this barrier, or at least decrease it. Optimizing the online product experience requires the identification of a convincing alternative for touch, along with its underlying mechanisms, thereby improving product understanding in online store environments. This article addresses this important knowledge gap.

The primary objective of this study is to demonstrate that an interface with *image interactivity* to simulate stroking gestures can tap into tactile perceptual information, thus enhancing the understanding of a product's attributes (i.e., perceived diagnosticity). We build further on research showing that visual sensory input is capable of eliciting tactile sensations (Anema, de Haan, Gebuis, & Dijkerman, 2012; Keysers et al., 2004; Klatzky, Lederman, & Matula, 1991). This article is based on the results of two studies. Study 1 investigates whether the format of product presentation (i.e., static interface, interactive interface, actual product) influences perceived diagnosticity with regard to product attributes for which sensory input is important (experience attributes) or unimportant (search attributes). In addition, Study 1 examines whether visually induced tactile sensations might mediate this causal relationship. The aim of Study 2 is to replicate the results of Study 1 using a different product (i.e., a throw blanket), subsequently assessing the importance of *user control* in interacting with the product. Study 2 therefore includes a fourth presentation format that resembles the interactive interface, but which uses a video to simulate stroking gestures. This makes it possible to ascertain the importance of the ability to control the online product (instead of merely watching it) to inducing tactile sensations, thereby enhancing perceived diagnosticity.

The two studies are set out to extend the theoretical and practical understanding of mediated product experiences. Most current e-retailers employ basic visual cues (e.g., static pictures) to communicate the product salient attributes (Lee, 2012; Scarpi, 2012). However, the information integration response model (IIRM, Smith & Swinyard, 1982) arguments that direct hands-on experience is superior to persuading consumers than indirect experience (e.g. advertising), because it is processed directly through the senses. Mediated product experience should, therefore, be positioned closely to the real environment through moving towards more multisensory interactions (Klein, 2003; Sukoco & Wu, 2011). Considering the current technological innovations that provide highly realistic product visualizations in online environments (e.g., extensive zoom, video, 3D applications, augmented reality), online experience which offers a better mediated experience could also be more persuasive. Whether or not an interactive interface (i.e., simulating stroking gestures using rich image interactivity and high levels of user control) can offer a way of substituting for missing tactile information and therefore improve product understanding is subject to present studies. Moreover, in this paper we take into account that consumers' experience with a product can range on a spectrum from indirect to direct, going beyond the ubiquitous dichotomous view. At the indirect anchor of the spectrum consumers usually use a single sense in processing product information (Mooy & Robben, 2002). However, simulating the *consumption experience* (i.e., in our studies; handling the product by simulating stroking gestures) rather than simply representing *the product* should increase the use of the tactile modality in information processing, which, in turn, should enhance consumers' product learning. This paper aims to identify different product presentation formats that impact consumers' product understanding.

2. Theoretical background

2.1 Interdependence between touch and vision, and the role of image interactivity

The human brain uses multiple sources of sensory information to form coherent and robust impressions of objects (Hollier, Rimell, Hands, & Voelcker, 1999). In this regard, vision is regarded as an exploratory option that can be used in conjunction with, or instead of, tactile exploration (Yazdanparast & Spears, 2012). To illustrate, the steam rising from a cup of tea tells something about the temperature of the cup. In a similar vein, Anema and colleagues (2012) demonstrate that visual stimuli are able to guide thinking about touch elements, thereby facilitating tactile sensations. More specifically, participants in their study reported feeling the sensation to the skin when visualizing what was depicted in a picture, even in the absence of any tactile stimulus. Further support for a link between touch and vision is provided by neuroscientific studies on illusory tactile experiences. Research involving fMRI scans reveals considerable overlap between neural activation in tactile simulations and that generated by actual tactile exploration (Keysers et al., 2004). These findings suggest that the brain may use a "visuotactile mirroring mechanism," which allows for the mental simulation of touch without any actual tactile input (Brunyé et al., 2012; Ebisch et al., 2008).

In the consumer literature, the absence of tactile exploration in product evaluation has been studied primarily in the context of advertising, including print, radio and television campaigns (Street & Till, 2001). Over the years, advertising studies have investigated multiple techniques designed to appeal to consumers' sense of touch, including the use of touch-related adjectives, touch-related pictures, auditory cues relating to touch and instructions to imagine touch (Spence & Gallace, 2011). Examples could include advertising copy that reads "Silky smooth douche crème," a picture of a feather (implying softness and lightness), and the instruction to "imagine holding the rough leather bag in your hands." Such approaches to advertising the tactile qualities of a product have proven successful in evoking the sense of touch, and they are therefore being increasingly used in marketing campaigns (Peck, Barger, & Webb, 2013; Spence & Gallace, 2011; Stephens, 2008; Street & Till, 2001).

It is nevertheless unclear whether and how people might enact tactile simulations when visual stimuli are presented in an online store. Despite recent important technological advances (e.g., 3D technology, virtual mirror, multiple zoom levels, instructional videos), and despite studies on the effectiveness of these interfaces (Fang, 2012; Fiore, Kim, & Lee, 2005;

Kim & Forsythe, 2009; Verhagen, Vonkeman, Feldberg, & Verhagen, 2014), the topic of inducing tactile sensations remains relatively unexplored. For example, with regard to zooming, De and colleagues (2013) report that the increased use of zoom technology to provide primarily factual information is associated with fewer returns. They explain this result by noting that detailed factual product-oriented information positively affects product understanding, which subsequently results in more realistic pre-purchase expectations (De et al., 2013). They do not explain, however, whether this increased product understanding is due to aroused tactile sensations.

Visual cues have been shown to play an important role in eliciting experiences in the tactile sensory modality (Anema et al., 2012). Although most online stores currently employ text and static images to present product information (Lee 2012; Scarpi 2012), providing more interactive cues and therefore more precise, vivid, accessible and realistic simulations of touch might activate the visuotactile mirroring mechanism to a greater extent than static images do. Image interactivity allows users to manipulate objects directly within an online environment. This results in a continuous change of graphics that bears a close resemblance to physical actions—as if events are occurring in the physical world (Schlosser, 2003). An interface that uses image interactivity to simulate stroking gestures could therefore be expected to activate spontaneous tactile simulations that conceptually represent the act of touching the object that is being depicted, thus rendering the simulated tactile experience rich enough to drive tactile sensations (Brunyé et al., 2012). The ShoogleIt (see Fig 1[1]) is one example of an advanced image interactivity interface. Such new, interactive, digital ways of representing objects have been proposed for bringing the digital experience of products closer to reality (Padilla & Chantler, 2011; Wu et al., 2011).

[1] An interactive example is available at http://www.shoogleit.com/2622-0_NOORA-sjaal

Figure 1. Screenshot of the interface using image interactivity to simulate stroking gestures

2.2 Perceived diagnosticity of experience attributes and search attributes

The extent to which a retailer can provide consumers with adequate (sensory) product information in order to enhance product understanding has been recognized as one of the most important determinants of successful e-retailing performance (Dennis, Jayawardhena, & Papamatthaiou, 2010; Jiang & Benbasat, 2004; Ramanathan, 2010; Verhagen et al., 2014). The perceived helpfulness of information gathered in helping make informed product decisions—"*perceived diagnosticity*" (Kempf & Smith, 1998)—is critical to the value of a product experience. Smith and Swinyard (1982) proposed the IIRM theory which outlines the processes by which indirect and direct experiences affect consumer learning. Basically, this model predicts that when consumers can directly experience the product, they will be more inclined to accept the information collected through the multi-sensorial experience. Wright and Lynch (1995) refined this discussion. In their Media Congruence Hypothesis the authors posed that direct experience is superior in communicating experience attributes but not in communicating search attributes. This hypothesis was supported by multiple studies (McCabe & Nowlis, 2003; Micu & Coulter, 2012; Mooy & Robben, 2002). The distinction between search attributes and experience attributes relates to the extent to which consumers can evaluate products or their attributes *prior* to use (Nelson, 1970, 1974; Weathers, Sharma, & Wood, 2007). As research has suggested that perceived diagnosticity may depend on the type of attribute (Jiang & Benbasat, 2004; Nelson, 1974; Wright & Lynch Jr., 1995), we distinguish between the perceived diagnosticity of search attributes and that of experience attributes.

Search attributes are aspects about which information is conveyed most effectively through second-hand sources (Jiang & Benbasat, 2004). Examples of search attributes include price, measurements, and number of calories. Before using a product, consumers believe that there is a reliable link between an observable search attribute and a desired benefit or outcome of the product (Wright & Lynch Jr., 1995). A physical hands-on experience is unlikely to cause any significant improvement in the adequacy of product judgments based on these attributes. In such cases, sensory information appears to be less important (Weathers et al., 2007). There is therefore considerable consensus among researchers that online stores are best suited to communicate information on search attributes (Citrin et al., 2003; McCabe & Nowlis, 2003; Weathers et al., 2007).

In contrast, *experience attributes* can be verified only by (limited) actual use of the product, as they concern subjective experience (Wright & Lynch Jr., 1995). When considering such product attributes as fit, feel, taste, and performance, consumers feel a greater need to experience the product directly (Weathers et al., 2007). Consumers perceive a far less reliable link between the information that is available before use and the benefits or outcomes that are experienced later (Wright & Lynch Jr., 1995). The inferences that consumers make according to sensory information that they have gathered on their own are likely to be more reliable inferences than are those based on exposure to claims obtained through secondhand sources (Micu & Coulter, 2012; Nelson, 1974; Wright & Lynch Jr., 1995). Credible (i.e., sensory) information about experience attributes thus plays a critical role in online buying decisions. This presents a challenge.

We propose that an interface using image interactivity to simulate stroking gestures could provide the tactile information needed for adequate product understanding, as it could be expected to represent the act of touching. The interactive cues generate an impressive presentation of the product’s attributes that facilitates the learning and understanding processes of users (Jiang & Benbasat, 2004). However, tactile information may be useful for understanding only some particular attributes of a product (Wright & Lynch Jr., 1995). The benefits of image interactivity might therefore depend on whether consumers must evaluate a product’s search attributes or its experience attributes. Research suggests that *search* attributes are easily conveyed by indirect product experiences (Micu & Coulter, 2012; Sukoco & Wu, 2011). Sensory stimuli appear to play a secondary role in product evaluation of search attributes (Cervellon & Carey, 2014; McCabe & Nowlis, 2003), thus touch will be perceived as relatively non-diagnostic when assessing search attributes in an online store. Therefore, it is expected that indirect product experiences—regardless whether the presentation format is static of interactive—have the potential to provide salient and credible search attributes information to consumers, which can result in strongly held beliefs comparable with those resulting from hands-on product experiences. On the contrary, we hypothesize that an interactive interface will be perceived as diagnostic when evaluating *experience* attributes, given that image interactivity conveys tactile information on these attributes, in contrast to static interfaces, which do not convey such information. Moreover, an interactive interface may sufficiently capture experience attributes in such a way that actually touching the product would not necessarily provide more information. Our first hypothesis is as follows:

H1: For (a) experience attributes, an interface using image interactivity to simulate stroking gestures leads to greater perceived diagnosticity than does an interface using only static images, with actual touch being equally diagnostic. For (b) search attributes, the presentation format does not influence perceived diagnosticity.

2.3 Tactile sensations as a mediator

As mentioned before, the IIRM (Smith & Swinyard, 1982) proposes that direct experiences are superior to indirect experiences. The rationale behind this model is that an indirect experience is provided by a biased source of information, thus giving rise to weak attribute beliefs. In contrast, an individual's personal experience with a product will establish a strong belief base because hands-on experience is processed directly through the senses. Message acceptance will be higher since the validity of one's own senses is rarely questioned (Fishbein & Ajzen, 1975). Consumers who gain information through direct experience are less likely to engage in counterarguing, source derogation and message rejection (Hoch, 2002; Smith & Swinyard, 1982). In other words, people typically trust themselves more than they trust sources with clearly vested interest. However, Mooy and Robben (2002) are one of the first authors who defined consumers' product experience as a *spectrum,* ranging from indirect to direct. The authors state that by increasing consumer interaction with the product, the number of relevant senses during information processing is increased, which in turn can result in more strongly held beliefs. In this study, image interactivity technology that simulates stroking gestures might provide consumers with information resembling direct experiential tactile contact with products—as if it is a real experience (Wu et al., 2011). More important, rich visual sensory input can activate the same areas into the brain than those that are activated by equivalent real world experience (Keysers et al., 2004). Thus, the positive effect of image interactivity on perceived diagnosticity for experience attributes is likely due to visually induced tactile sensations, as these sensations are expected to be an additional credible (sensory) source of information. Conversely, tactile sensations are unlikely to play a role in product understanding based on search attributes because indirect experiences are able to efficiently communicate credible search attribute information (Micu & Coulter, 2012). The following hypothesis is based on this reasoning:

> **H2:** For (a) experience attributes, tactile sensations mediate the relationship between the level of image interactivity and perceived diagnosticity. For (b) search attributes, tactile sensations have no mediating effect.

3. Study 1

3.1 Method

Design and participants. Study 1 employed three formats of product presentation (static interface, interactive interface, actual product) in a between-subjects design. Given that the experimental product (a scarf) was chosen from a women's collection, only female participants were selected, in order to eliminate gender-specific preferences for the product. Besides, women are likely to suffer the most when tactile information is lacking as women more likely than men base their judgments on sensory perceptions (Schifferstein, 2006). Accordingly, 66 female (M_{age} = 21.8, SD_{age} = 1.92) undergraduates participated in a 20-minute experiment conducted in a controlled laboratory environment. All participants received a participation fee of € 5.

Materials and procedure. A scarf was selected as the stimulus in this study as research has consistently shown that apparel is clearly a product category with characteristics that are best explored by touch (Grohmann et al., 2007; Jansson-Boyd, 2011). A pretest among 56 female students (M_{age}=22.29, SD_{age}=2.34) was conducted in order to determine the salient product attributes of a scarf. Through a free-elicitation assignment, participants were asked to list product attributes that they considered important to consider when purchasing a scarf. Most of the participants (93%) listed both search and experience attributes, implying that tactile input is diagnostic in the evaluation process, thus verifying that a scarf would be an appropriate product for the purposes of this study. The most frequently mentioned attributes were color, shape, length, material, warmth, softness, and thickness (30-80% of the participants). Each of these product features was characterized as either an experience attribute (i.e., material, warmth, softness, thickness) or a search attributes (i.e., color, shape and length) and used in the main study.

For the main study, we created two mediated product presentation formats and one direct product presentation format. For the mediated formats, two web pages of a fictitious online store were designed. In the static interface format (www.static.uasurvey.be), the product was displayed on a web page containing pictures of the scarf and of its details. In the interactive interface format (www.dynamic.uasurvey.be)[2] the scarf was displayed on a web page in the same way as in the static interface condition, with the only difference being that users were able to use the mouse to modify the form of the product. Using ShoogleIt open source software (Padilla & Chantler, 2011), an interactive display of the scarf was created. As a result, the image interactive interface allowed users to move the fabric of the scarf by dragging it with the mouse, thereby simulating stroking gestures. Finally, in the actual product

[2] The look and functionality of the website may differ from what the participants saw, due to type of device, web browser, internet speed, and resolution.

format, participants were physically able to examine and touch the actual scarf. To provide written product information that was identical to that provided in the mediated formats, a product label containing a written description similar to the description on the web page was attached to the scarf.

Participants were invited to visit a lab individually, where they were seated at a table in front of a Dell computer monitor. Potential intervening variables were kept constant, including web browser (Chrome 31.0.1650.63 m), internet connection speed, screen resolution (1920 by 1080 px), and instructions. Participants were randomly assigned to one of the three presentation formats. To ensure that all participants were sufficiently involved in the evaluation task, they were offered the option of participating in a prize drawing (instructions are provided in Appendix A). This created a relevant product evaluation situation, in which participants had to determine whether they considered the scarf worthy/valuable enough to participate in the prize drawing. Participants were subsequently instructed to evaluate the product for 90 seconds using the interface on the website or by taking the scarf out of the drawer (thus ensuring touch). After examining the product, participants completed a questionnaire containing measures relating to the dependent variables and control variables of the study. After completing the questionnaire, participants were debriefed and thanked.

3.2 Measures

Manipulation check. To verify the manipulation of image interactivity, participants were asked to rate perceived image interactivity according to five items (i.e., “The display of the scarf on the website was… dynamic, controllable, customizable, passive, responded to my actions”; α=.86, M=4.87, SD=1.15).

Dependent variables. Tactile sensations[3] were measured according to four items (adapted from Peck et al. (2013): "When evaluating the scarf…" (1) "I felt that I could examine the texture of the scarf;" (2) "I could imagine moving my fingers on the scarf;" (3) "I felt as if the scarf was in my hands;" (4) "I felt as though I could hold the scarf" (α=.78, *M*=4.27, *SD*=1.38). Perceived diagnosticity was measured at the attribute level rather than at the product level. Therefore, perceived diagnosticity was measured across the scarf's salient *search* attributes (i.e., color, length, and shape), as well as across its prominent *experience* attributes (i.e., material, warmth, thickness, and softness). We asked participants, "To what extent did this shopping experience enable you to judge Attribute X?" (Jiang & Benbasat, 2004). The first three items were averaged in order to calculate a measure of perceived diagnosticity for search attributes (α=.68, *M*=5.34, *SD*=0.92), and the last four items were averaged to produce a measure of perceived diagnosticity for experience attributes (α=.80, *M*=4.77, *SD*=1.12). All constructs were measured using 7-point Likert scales ranging from 1 (strongly disagree) to 7 (strongly agree).

*Control variables***.** We also included the person's need for touch (NFT) as a control variable, given that people with a greater predilection for tactile information could potentially perceive an interactive interface that simulates stroking gestures as more (or less) diagnostic than would those with lower NFT. Participants were asked to complete the 12-item NFT scale (α=.88, *M*=5.72, *SD*=0.77) developed by Peck and Childers (2003a) along a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). Further, internet experience and frequency of online shopping could be expected to play a role as well. People who are more skilled in using the internet and/or shop frequently online are likely to find it easier to handle

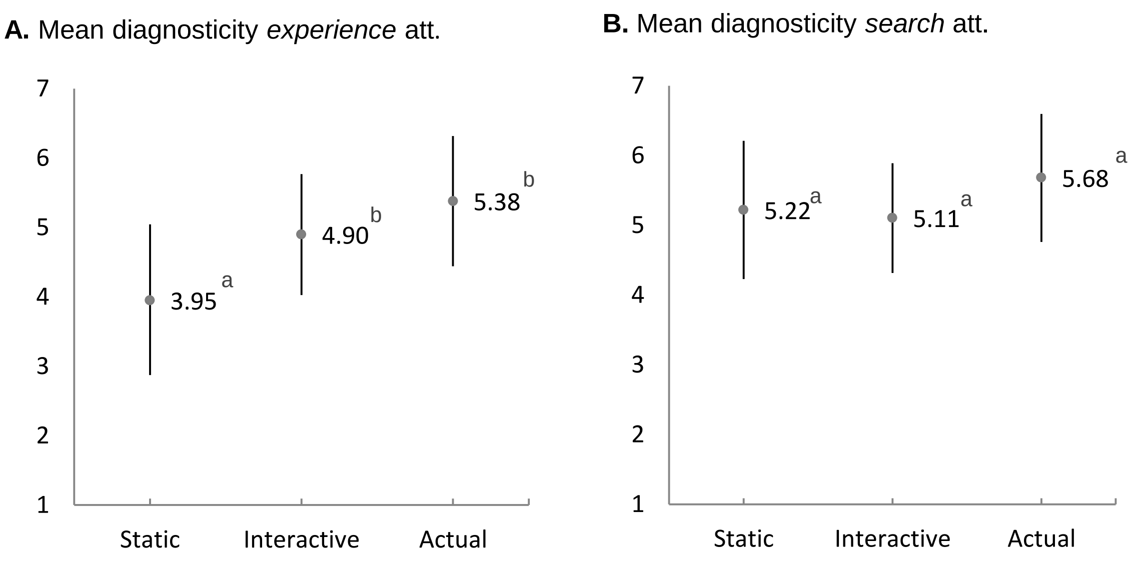
[3] The variables perceived interactivity and tactile sensations were measured only in the mediated conditions, as it would make no sense to measure these variables in the condition in which participants could actually touch the product.

complex interfaces and thus to consider them more diagnostic for product understanding. We therefore measured internet experience (“How often do you use the internet?”) on a scale ranging from 1 (not at all) to 6 (multiple times a day) and online shopping frequency (“How often do you purchase products/services online?”) on a scale ranging from 1 (never) to 8 (daily).

3.3 Results

Manipulation check. The manipulation of image interactivity was successful. Analysis of variance reveals that the participants perceived the interface using image interactivity to simulate stroking gestures as significantly more interactive than they did the interface using only static images (M_{static}=4.08, vs. $M_{interactive}$=5.63; $t_{(41)}$=-5,94, p<.001, r=.68).

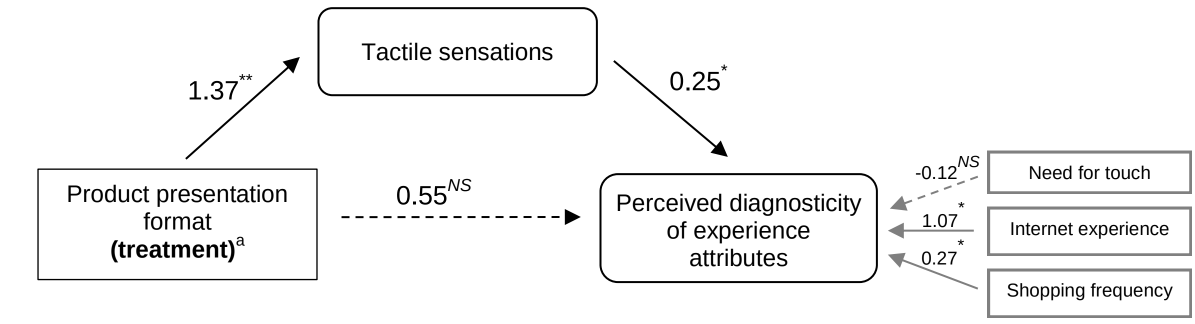
Perceived diagnosticity of product attributes. We used ANOVA in order to examine how the presentation format affected the perceived diagnosticity of experience attributes. According to the results, the product presentation format had a highly significant effect on the perceived diagnosticity of experience attributes ($F_{(2,63)}$=13.34, p<.001, *partial* η^2=.28). Planned contrast tests revealed that participants who had been exposed to an interface using image interactivity to simulate stroking gestures reported significantly higher perceived diagnosticity for experience attributes (M=4.90, SD=0.87) than did participants who had been exposed to an interface using only static images (M=3.95, SD=1.08; $t_{(63)}$= 3.21, p<.01, r=.53). As hypothesized, we observed no significant difference between participants who used the interactive interface and those who could actually touch the scarf with regard to the perceived diagnosticity of experience attributes (M=5.38, SD=0.94; $t_{(63)}$=-1.68, *NS*; see fig. 2A). For search attributes, we conducted ANOVA with the three presentation formats as the independent variable and the perceived diagnosticity of search attributes as the dependent variable. The results indicate that format had no significant effect on perceived diagnosticity ($F_{(2,63)}$=2.57, *NS*, see fig. 2B). These results provide support for H1.



Note. Means with differing subscripts within a figure are significantly different at the *p* < .05 level, based on planned contrast tests.

Figure 2. Mean and standard deviation of perceived diagnosticity for (A) experience attributes and (B) search attributes, by presentation format

Testing the mediation effect of tactile sensations. To determine whether the level of image interactivity affects the perceived diagnosticity of experience attributes due to increased tactile sensations, we conducted mediation analysis according to the procedure proposed by Preacher and Hayes (2008). The results are presented in Fig. 3. We included NFT, internet experience, and online shopping frequency in the mediation model as control variables. As expected, the results revealed a significant indirect bootstrap (5000 samples) effect (*B*=.34, *SE*=.21, 95% *CI* =.014–.888). The level of image interactivity had a significant effect on tactile sensations (*B*=1.37, *SE*=.39, *t*=3.48, *p*<.01) which was subsequently predictive of perceived diagnosticity (*B*=0.25, *SE*=.12, *t*= 2.13, *p*<.05). The total effect of image interactivity on perceived diagnosticity was significant (*B*=0.89, *SE*=.30, *t*=2.98, *p*<.01). Consistent with the requirements for indirect-only mediation (Zhao, Lynch Jr., & Chen, 2010), the direct effect of image interactivity on perceived diagnosticity was reduced to non-significance after controlling for the effect of tactile sensations (*B*=.54, *SE*=.32, *t*=1.67, *NS*). Furthermore, internet experience (*B*=1.07, *SE*=0.45, *t*=2.39, *p*<.05) and online shopping frequency (*B*=0.27, *SE*=0.13, *t*=2.09, *p*<.05) were significantly related to the perceived diagnosticity of experience attributes. Because experienced internet users and frequent online shoppers probably have a better understanding of complex online interfaces, they are likely to consider mediated product experiences more helpful than do inexperienced internet users/shoppers. In contrast, NFT had no significant control effects (*B*=- 0.11, *SE*=.19, *t*=- 0.61, *NS*), and we therefore do not discuss this variable further.



Total effect= .89*, Indirect effect = .34¥, Adj. R^2=.32, $F_{5,37}$= 4.92**.

Note. Unstandardized estimates are shown., *p≤.05,**p<.01, ***p<.001, ¥ significant indirect effect, ^{NS} = Not significant. [a] Only the mediated product experiences (static=0, interactive=1) were included in the analysis as tactile sensations were only measured when actual touch was unavailable.

Figure 3. The mediation model of tactile sensations between product presentation format and perceived diagnosticity

To examine search attributes, we again followed the procedure developed by Preacher and Hayes (2008) to test the significance of tactile sensations as a mediating variable, controlling for internet experience, online shopping frequency, and NFT. The bootstrap procedure (5000 samples) detected neither direct effects (*B*=-.06, *SE*=.28, *t*=-0.22, *NS*) nor indirect effects (*B*=.33, *SE*=.21, 95% CI= -.014–.814), thus confirming our expectations that touch would be perceived as non-diagnostic for search attributes.

In summary, the effect of image interactivity on perceived diagnosticity was thus mediated by tactile sensations for experience attributes, but not for search attributes, thus confirming H2a and H2b.

3.4 Discussion

The results of Study 1 indicate that exposure to an interactive interface using image interactivity to simulate stroking gestures generates greater perceived diagnosticity for experience attributes than does a static interface. Mediation analysis reveals that this effect is due to simulated tactile sensations. Furthermore, people using an interactive interface experience a level of perceived diagnosticity of experience attributes similar to that of people who actually touch the product.

Our results indicate that touch is less important for search attributes, as the analysis failed to reveal any significant direct or indirect effects. As expected, and in line with previous studies (Weathers et al., 2007), information on search attributes can be communicated successfully in online stores regardless of how the product is represented. This result also confirms the idea that direct product experiences are not *always* superior to mediated product experiences for communicating product information (Wright & Lynch Jr., 1995).

It nevertheless remains unclear whether direct manipulation (and thus control of) products in online stores is necessary in order to produce tactile sensations and increase the perceived diagnosticity of experience attributes. It could be that a video simulating stroking gestures would suffice. Additionally, because the static condition in Study 1 did not provide information about moving fabric, we cannot rule out the perception of this information as an alternative explanation for the effects found. One objective of Study 2 is therefore to test whether having *control* over interaction with the product (a crucial element of interactivity) plays a critical role in evoking tactile sensations and perceived diagnosticity for experience attributes, or whether watching a video simulating stroking gestures would suffice. Another objective is to provide further delineation for the relationship between image interactivity, tactile sensations, and perceived diagnosticity for experience attributes. Given that the results of Study 1 confirm that touch is non-diagnostic for search attributes, Study 2 focuses solely on experience attributes.

4. Study 2

4.1 The effect of user control

The concept of *user control* is intertwined with interactivity. User control refers to the potential of users to modify their environments. It has been conceptualized as a key component of interactivity (Klein, 2003; Steuer, 1992). In brick-and-mortar consumer settings, consumers have high levels of control over the ways in which they interact with products. For example, they can select what to touch, for how long, and in what order. In contrast, in highly mediated product experiences such as watching a video, active user control is limited to using the play and stop buttons (Klein, 2003). Nevertheless, in mediated environments that offer consumers extensive options for customizing their browsing experiences, the malleability of the environment allows consumers to select the product information that is most relevant to their informational needs and interests (Lee, Li, & Edwards, 2012; Liu & Shrum, 2002). As stated by Hutchins and colleagues (1985), direct manipulation results in feelings of directness.

Direct manipulation (as made possible through ShoogleIt and similar forms of software) provides immediate and intuitive feedback. In other words, it readily transforms the thoughts of users into physical action. The system outputs are easy for users to interpret, thus diminishing the distance (Hutchins et al., 1985; Jiang & Benbasat, 2004). Direct manipulation also generates a qualitative feeling of direct engagement with control of the objects. In other words, it creates a feeling of “first-personness” (Hutchins et al., 1985), in which users feel as if they are interacting with the objects of their interest, and not with a program or a computer. Given that consumers associate direct product experiences with high levels of control, they might perceive environments in which they have greater active control as less mediated. Accordingly, we propose the following hypothesis:

H3: Actual touch and an interface using image interactivity to simulate stroking gestures results in significantly greater perceived user control than does either a video interface or an interface using static images.

4.2 User control and tactile sensations

Touch is the major mechanism through which consumers manipulate objects (Peck et al., 2013). That is to say, consumers actively control tactile feedback at a fingertip by deciding where and how to move that finger around an object’s surface. Daugherty et al. (2008) suggest that it is the high level of user control that positions a virtual experience similarly to direct experience. Simulated touch sensations are therefore most likely aroused when the virtual experience closely mimics the direct experience (Keysers et al., 2004), thus involving high levels of user control. This level of control is not simply a representation of an product, but rather a simulation of the consumption experience (i.e. handling the product) (Daugherty et al., 2008). Moreover, the IIRM (Smith & Swinyard, 1982) positions that direct experiences are less subjected to counterarguing because the consumer lacks the vested interest normally attributed to external sources. Following this rationale we predict that high levels of user control are more likely to simulate the objective, non-partisan nature of direct experiences, probably enhancing tactile sensations, thereby increasing the perceived diagnosticity of experience attributes. This leads to the following hypothesis:

H4: Higher levels of user control generate greater tactile sensations, resulting in increased perceived diagnosticity for experience attributes.

The proposed research model of Study 2 is presented in Figure 4.

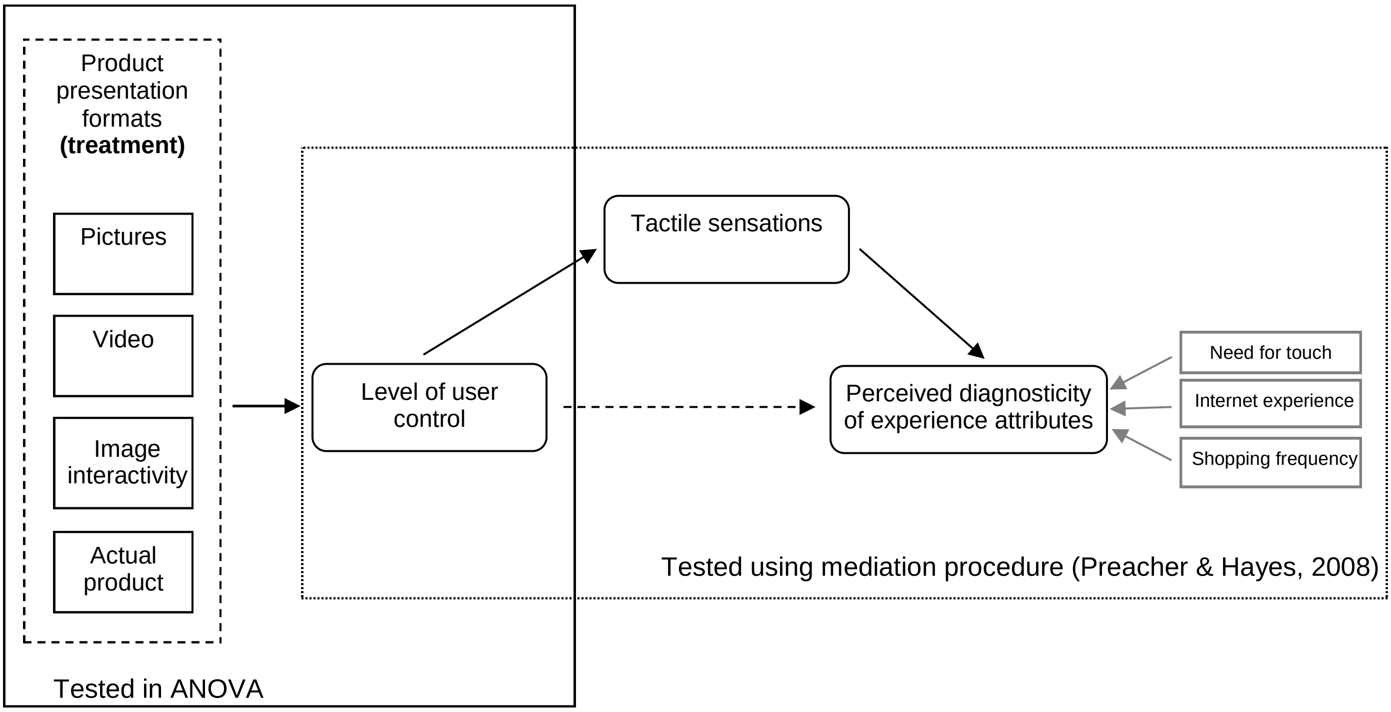


Figure 4. Proposed conceptual model Study 2

5. Method

5.1 Design and procedure

Study 2 employed four product presentation formats (static interface, interactive interface, video interface, and actual product) in a between-subjects design. In this study, we selected a throw blanket as the product stimulus. There were several reasons for choosing this product. First, a throw blanket represents a product for which tactile input is diagnostic. Consumers buy a throw blanket mainly for its salient tactile attributes. The tactile sensation should give consumers information about weight, texture and softness in order to assess its functioning. Second, by choosing a product other than apparel we intend to establish greater generalizability. To vary the level of control, we designed four product presentation formats. In addition to using web pages similar to those created in Study 1 for the static [www.static.uasurvey.be] and interactive [www.shoogle.uasurvey.be] formats, we designed another web page to represent the video [www.video.uasurvey.be] format. In addition to pictures of the throw blanket and some of its details, the web page also contained a video that simulated stroking gestures. As in Study 1, only female participants were selected, in order to eliminate gender-specific preferences for the product. Accordingly, 97 female (M_{age}=21.2, SD_{age}=2.62) undergraduates were selected to participate in a 20-minute experiment. Each participant received a participation fee of € 7. Participants were randomly assigned to the four presentation formats.

The procedure was identical to Study 1, except for the measure of user control. To measure user control, participants were asked to indicate the extent to which they agreed or disagreed with the following 7-point Likert items: (1) “I felt that I had a great deal of control over my experiences with the throw blanket;” (2) “While evaluating the throw blanket, my actions determined the kind of experience I had;” (3) “I was able to control the throw blanket in my own way;” (4) “I was able to control the interaction with the throw blanket (based on Yoo, Lee, & Park, 2010; α=.89, M=4.32, SD=1.42). Tactile sensations (α=.76, M=3.86, SD=1.23) were measured according to the same items used in Study 1. Because the results of Study 1 confirmed that touch was non-diagnostic for search attributes, we focused solely on the perceived diagnosticity of experience attributes. The salient experience attributes of the throw blanket were warmth, thickness, softness, and flexibility. These four items were averaged to produce a measure of perceived diagnosticity for experience attributes (α=.92, *M*=3.98, *SD*=1.32). See appendix B for the descriptive statistics of the measures.

5.2 Results

User control. We conducted ANOVA with the four product-presentation formats as the independent variable and user control as the dependent variable. The results revealed a significant main effect for user control ($F_{(3,89)}$=25.94, *p*<.001, *partial* η^2=.46). Participants obviously reported the highest levels of control when they could actually touch the product (*M*=5.71, *SD*=0.89). Participants exposed to an interface using image interactivity to simulate stroking gestures during product evaluation also reported relatively high levels of user control (*M*=4.70, *SD*=1.08). The level of user control dropped considerably when tactile information was limited because the product was presented through an interface using only static images (*M*=3.62, *SD*=.85). When tactile information was presented through a video, the perceived level of user control was the lowest (*M*=3.28, *SD*=1.36). As expected, planned contrast tests revealed that the interactive interface elicited more feelings of control than did the interface using video ($t_{(92)}$=4.57, *p*<.001, *r*=.43) or static pictures ($t_{(92)}$=3.51, *p*<.01, *r*= 34). These results, which support H3, are presented in Fig. 5.

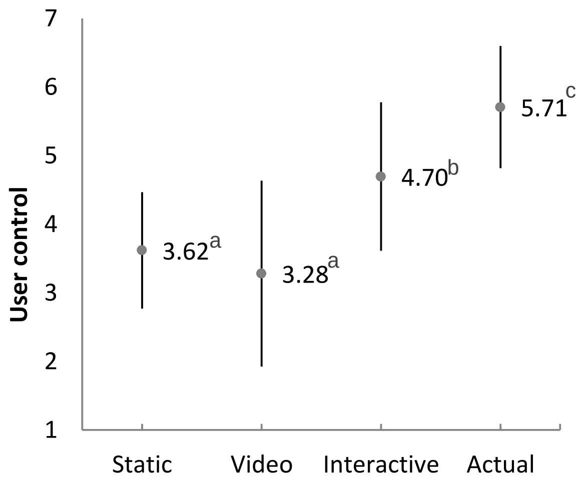
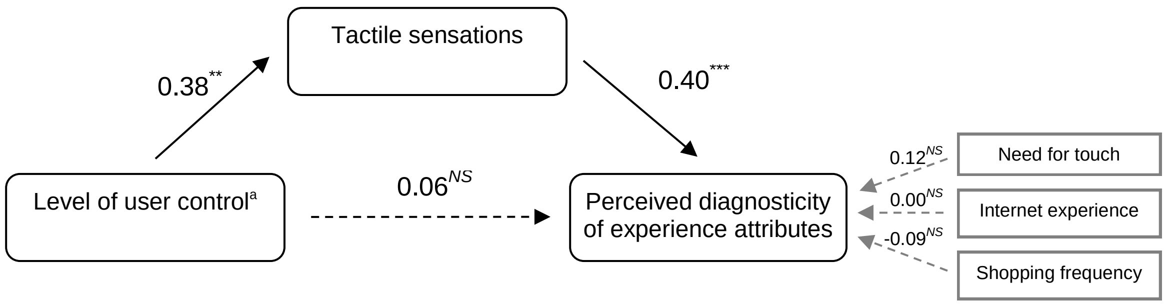


Figure 5. Mean level of user control, by product presentation format

Testing the mediation effect of tactile sensations. The manipulation of the level of image interactivity was successful in creating variance in the scores for perceived user control. It was therefore possible to use these scores as the independent variable, given our particular interest in the effect of user control on tactile sensations[4]. In order to determine whether having control plays a critical role in evoking tactile sensations and perceived diagnosticity or whether watching a video simulating stroking gestures might suffice, we conducted mediation analysis according to the procedure developed by Preacher and Hayes (2008). Internet experience, online shopping frequency, and NFT were included in the mediation model as control variables. The mediation effect of tactile sensations between user control and perceived diagnosticity is presented in Fig. 6. The results reveal a significant, indirect bootstrap (5000 samples) effect (B=.15, SE=.06, 95% CI=.057–.306). The results indicate that user control had a significant effect on tactile sensations (B=.38, SE=0.11, t=3.43, p<.01), which subsequently predicted perceived diagnosticity (B=.40, SE=0.11, t=3.70, p<.001). The total effect of user control on perceived diagnosticity was significant (B=.21, SE=0.11, t=1.99,

[4] Although the results were virtually the same when the four presentation formats were inserted as independent variables, we chose user control as the variable of interest.

p=.05), although the direct effect of control on perceived diagnosticity was reduced to non-significance (*B*=.06, *SE*=0.11, *t*=0.56, *NS*) after controlling for the effect of tactile sensations. This result is consistent with the requirements for indirect-only mediation (Zhao et al., 2010). None of the three control variables had significant effects (all *p* values > .05), and they are not discussed further. These results confirm H4, which stated that user control predicts tactile sensations, thereby increasing the perceived diagnosticity of experience attributes.



Total effect= .21*, Indirect effect = .15¥,Adj. R^2=.20, $F_{5,65}$= 4.44**.

Note. Unstandardized estimates are shown., *p≤.05,**p<.01, ***p<.001, ¥ significant indirect effect, *NS*= Not significant.
[a]Only the mediated product experiences (static=0, video=1, interactive=2) were included in the analysis as feelings of touch were only measured when actual touch was unavailable.

Figure 6. The mediation model of tactile sensations between user control and perceived diagnosticity

5.3 Discussion

Consistent with our predictions, participants who experienced high levels of user control reported more tactile sensations, which subsequently increased the perceived diagnosticity of experience attributes. If the level of control that a user can exert over products plays a critical role in generating tactile sensations, the direct manipulation of online products through image interactivity is likely to be essential for producing tactile sensations. The video simulating stroking gestures proved less efficient. Actually, an unexpected but interesting result occurred in the video experience condition. Participants reported very little control over the video product experience, even less control than participants exposed to the static product experience (although not significant but an obvious trend is present). As argued by Mooy and Robben (2002), a typical reaction of consumers when the real thing is close, is that they expect to be able to handle it. In the present study, the video might have aroused such an unsatisfying yearning to interact with the product (because it was so close). Participants were passively subjected to the additional 'moving' information that could have created a feeling of "third-personness". The static condition, on the other hand, did apparently not arouse an unsatisfying yearning to interact with the product (because it was unreachable), so participants felt less submissive. Virtually acting on a product and deciding when, where, and how to explore the product (first-personness) is thus highly effective in stimulating a consumer's sense of touch. In other words, establishing a direct and active connection with the virtually touched product (and not merely being a passive spectator) provides an important dimension to the tactile sensations when exploring products online, thereby enhancing the perceived diagnosticity of experience attributes.

6. General discussion

Touch has been shown to play a vital role in consumer decisions regarding products (Grohmann et al., 2007; Jansson-Boyd, 2011; Peck et al., 2013). In online stores, however, consumers are limited in the number of tactile inputs available for product evaluation. This paper builds on research focusing on tactile perceptual information provided through the sense of vision, extending it to the online shopping environment. With the help of ShoogleIt software, we designed a product display using image interactivity to simulate stroking gestures, in order to provide consumers with tactile information in a mediated environment.

Our results indicate that such an interactive interface seems to offer a more intuitive way of substituting for missing tactile information in a number of respects.

First, consistent with previous studies (Anema et al., 2012; McKenzie, Poliakoff, Brown, & Lloyd, 2010), visual stimuli are able to guide thinking about touch elements, which subsequently facilitate tactile sensations. In our study, individuals exposed to an interactive interface and those exposed to a static interface both reported some tactile sensations (i.e., the sensation that they could hold, move their fingers across, and examine the texture of the depicted object). In line with our expectations, however, the interface using image interactivity to simulate stroking gestures generated notably higher tactile sensations, as compared to the static interface.

Furthermore, the interactive interface in our study served an informational function for experience attributes, but not for search attributes. For search attributes, tactile simulations did not necessarily enhance product understanding. This result confirms the idea that direct product experiences are not consistently superior to indirect experiences (Smith & Swinyard, 1988; Wright & Lynch Jr., 1995). Nevertheless, tactile information has been shown to play an important role when evaluating the experience attributes of products (Nelson, 1974). Our results suggest that an interface using image interactivity to simulate stroking gestures can provide relevant information about experience attributes (e.g., softness, thickness), and that this information is likely to be perceived as highly diagnostic during product evaluation in online stores. Tactile sensations have been shown to mediate this relationship. One particularly exciting finding is that the effects of image interactivity simulating stroking gestures on perceived diagnosticity do not seem to significantly differ from those of actual touch.

Next, the results from Study 2 suggest that user control is a crucial key concept in consumers' perceived diagnosticity of experience attributes. The level of control that users can exert over objects has been identified as an important predictor of tactile sensations. The direct manipulation of an online object through image interactivity is necessary in order to produce tactile sensations. In our study, a video simulating stroking gestures proved less effective. In turn, tactile sensations predict the perceived diagnosticity of experience attributes. These results are in line with previous studies (e.g., Kempf & Smith, 1998; Wright & Lynch Jr., 1995), which have consistently reported a positive relationship between hands-on product trials and the perceived diagnosticity of experience attributes.

6.1 Theoretical and managerial implications

This study makes important theoretical contributions. First and foremost, the findings lend empirical support to the predictions of Wright and Lynch's (1995) Media Congruence Hypothesis. Drawing further upon the IIRM, Wright and Lynch (1995) hypothesized that direct experience was generally superior in communicating product information on experience attributes. As hypothesized, we found evidence for a direct experience effect on product learning for experience attributes but not for search attributes. In this way, we contribute to the established link of media type to belief strength, as we confirm that processing information directly through the senses results in a much stronger belief base for experience attributes. While, on the other hand, valid search attribute information can be inferred from mediated sources because source credibility is less questioned when it concerns search attributes.

Our results also help to extend the findings of (fading) boundaries between indirect and direct product experiences (Jiang & Benbasat, 2004; Mooy & Robben, 2002). That is, we further support the idea that product experience should be conceptualized as a spectrum rather than a dichotomy. By positioning mediated experience closely to the real thing by rendering the simulated tactile experience rich enough to drive tactile sensations led to higher degrees of product learning for experience attributes. Through increasing direct experience in a mediated environment, additional senses (more specifically the sense of touch) became more relevant in the shopping experience, which seems to offer consumers an additional credible source of information. As such, and recognizing the growth of innovative online product presentation formats, simulating tactile sensations seems a viable conceptual extension to the research field, making the online world increasingly tangible.

One important managerial implication following from the results obtained in the current study is that employing an interactive interface that can simulate tactile movements (e.g., ShoogleIt) can be especially useful for communicating about products with predominantly touch-related experience attributes. As demonstrated in our study, an interface that uses image interactivity to simulate stroking gestures can provide detailed tactile information, thereby substituting for missing tactile information in online shopping environments. This improves product understanding, which is an important determinant of successful e-retailing (Dennis et al., 2010; Ramanathan, 2010). Interestingly, Kim and Lennon (2000) demonstrate that the amount of product information has a positive effect on purchase intent (Kim & Lennon, 2000). In this regard, it seems plausible to expect that enhancing the perceived diagnosticity of product attributes would also increase purchase intentions. The potential financial benefits of implementing the interactive interface in online stores should be investigated. Next, for products with mainly search attributes, however, the costs associated with implementing such image-interactive product presentations might outweigh the benefits, as the information that they convey contains no more detail on this type of attributes than does that conveyed by interfaces based on static images. For this reason, before adopting image interactivity, e-retailers should verify the nature of the attributes on which consumers are most likely to base their product evaluations.

Second, drawing on transaction data from an online clothing retailer, De and colleagues (2013) indicate that the use of a zoom function to provide detailed, factual, product-oriented information has a positive effect on product returns (i.e., it decreases the rate of product returns). Investing in technologies that provide additional factual product-oriented information (e.g., an interactive interface that simulates stroking gestures) could thus also help to reduce returns. On the other hand, however, it is crucial to set *realistic* pre-purchase expectations of a product. Otherwise, the technology is likely to increase the propensity to return. Future research might therefore investigate the inter-relationships existing between product presentation, pre-purchase expectations, post-purchase satisfaction, and returns.

6.2 Limitations and future research

The present research is subject to several limitations that should be considered in future research. First, this study was restricted to products for which tactile input is diagnostic (i.e., a scarf and a throw blanket). For this reason, it may not be possible to generalize the present findings to other product categories. Future research could incorporate product type as a moderator in order to investigate the boundary conditions in which mediated touch experiences are elicited and in which they affect product understanding.

The use of students rather than actual consumers as participants in the study also limits the ability to generalize the results. Nevertheless, an increasing number of college students today are actually online consumers. In Europe, 81% of highly educated young people (16-24 years of age) had made online purchases in 2013 (Eurostat - Data Explorer, 2014). This figure is considerably higher than the overall population average (46%).

In this study, only female students participated. This choice was based on the finding that in the United States, 75% of female internet users had purchased clothing online in 2014, while only 63% of male internet users had bought clothing online (Harris Interactive, 2014).

In Europe we note the same trend among young college students (Eurostat - Data Explorer, 2014). Besides, women do not just shop online more frequently, they also spend more money each year on clothes than men (Boland Abraham, Mörn, & Vollman, 2010). For many online fashion retailers, women are therefore the main target group (Ruigrok, 2013). However, at the same time the return rate of clothing items is much higher for women than for men. Providing accurate presentations of products seems especially fruitful for female shoppers. Moreover, women tend to be more likely than men are to base their judgments on sensory perceptions (Schifferstein, 2006). Women attach considerable importance to sensory modalities in product evaluations, while men are less aware of their sensory processes and tend to consider cognitive information (e.g., product packaging, advertising, recommendations of friends and family) more important (Citrin et al., 2003). For this reason, women are likely to suffer the most when tactile information is lacking, which may be why the return rate is considerably higher for women. Following this line of reasoning, improved (sensory) product understanding may even reduce return shipments, an interesting avenue for further research.

In a similar vein, and contrary to our expectations, NFT did not affect the results of either Study 1 or Study 2. This may have been due to lack of variance in NFT, given that women generally tend to have a higher need for tactile input than men do (Citrin et al., 2003). Future research should include men as well, in order to generate more variance in NFT scores, thus highlighting differences between consumers with higher and lower levels of NFT. This would increase the likelihood of NFT to affect the dependent variables.

The image-interactivity interface used in our study simulated stroking gestures. There are obviously other common ways in which people handle fabrics (e.g., pinching, scrunching, and rubbing). Future research could include interactive interfaces that simulate multiple gestures, in order to examine whether they encourage users to behave in ways that are even more similar to those observed in brick-and-mortar stores. We also acknowledge that our study addressed only one sensory modality (e.g. sight), even though other sensory modalities could be of importance as well. In particular, studies have demonstrated that sound is strongly related to tactile experience (Kitagawa & Spence, 2006) and can potentially excel effects of an interactive interface when combined.

In the human-computer interaction literature, tactile exploration is taken a step further. A new interface type that links the digital and physical worlds has emerged—Tangible User Interfaces (TUIs). This interface type draws upon the human urge to be active with one's hands (Shaer & Hornecker, 2010; Ullmer & Ishii, 2000). In the present study the standard paradigm for human computer interaction, graphical user interfaces (GUI), was employed. The graphical representation was manipulated with a generic remote controller (i.e., computer mouse). Dragging the mouse resulted in a pointer moving on the screen accordingly. The relationship between the behaviors shown by a system strongly aligns with the movements of the mouse. However, TUI enables fluid transitions between "the digital" and "the real" (Shaer & Hornecker, 2010). Interaction with TUIs is not limited to the visual senses, but also relies on haptic feedback. The main idea of TUIs is to give digital information a physical form. Ishii (2008, p. XVI) describes TUI as a tool to "make digital information directly manipulatable with our hands, and perceptible through our peripheral senses by physically embodying it". Future research might focus on introducing TUI as an alternative to the current GUI paradigm, taking mediated product interactions to a next level (see for overview of the TUI literature: Ullmer & Ishii, 2000).

7. Conclusion

Despite important recent technological advances, mediated touch sensations in online store environments remain relatively unexplored. This study respond to the calls made by Grohmann and colleagues (2007) and by Jansson-Boyd (2011) to enhance the existing knowledge regarding how to overcome the inherent inability to integrate tactile input into online shopping. The results of this study suggest that visual sensory input is capable of eliciting experiences in the tactile sensory modality. One particularly new finding of this current paper is that image interactivity that simulates stroking gestures seems to respond to people’s desire to feel and touch material products. The results of this study revealed that the product understanding of the experiential properties of a product was improved by implementing the interactive interface in an online store. In summary, when online retailers are thinking about communicating a product’s experiential attributes, it is important for them to consider how best to convey them using the available visual modes of the online communication medium. The key point here is that the inability to stimulate the consumer’s skin directly does not mean that online stores cannot draw upon other senses in order to evoke tactile sensations in consumers (Spence & Gallace, 2011). The level of user control is a particularly powerful predictor of tactile sensations. The malleability of an interface using image interactivity enhances the precision, vividness, accessibility, and realism of simulations of the act of touching. Online retailers could use the mechanisms highlighted in this article to help appeal to the sense of touch using the commonly available visual interfaces.

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Appendix A.

Instructions

In this study, we ask you to evaluate a product. In a moment you get to see a scarf which is available in this city. At the end of the questionnaire you can choose to participate in a prize drawing. Hand in three euros of your newly acquired five euros and you then have the chance to win the scarf. We would like for you to visit the webpage [test the product] enough so that you know what the product is like. Open the webpage [take the product] and take 1½ minutes to examine the scarf. Your task today is to evaluate the product.

Appendix B.

Table B1

The descriptive statistics of measurement instrument

STUDY 1					
Construct	**Item**	**n**	**Mean**	**SD**	**Cronbach's α**
Perceived interactivity	1) The display of the scarf on the website was dynamic	43	5.30	1.47	0.86
	2) The display of the scarf on the website was controllable	43	5.07	1.32	
	3) The display of the scarf on the website was passive	43	5.05	1.40	
	4) The display of the scarf on the website responded to my actions	43	4.63	1.70	
	5) The display of the scarf on the website was customizable	43	4.30	1.30	
Tactile sensations (Peck et al., 2013)	1) When evaluating the scarf I felt that I could examine the texture of the scarf	43	5.00	1.48	0.78
	2) When evaluating the scarf I could imagine moving my fingers on the scarf	43	4.33	1.81	
	3) When evaluating the scarf I felt as if the scarf was in my hands	43	3.47	1.70	
	4) When evaluating the scarf I felt as though I could hold the scarf	43	4.30	2.17	
Perceived diagnosticity of search attributes (Jiang & Benbasat, 2004)	To what extent did this shopping experience enable you to judge the…				
	1) …color of the scarf	66	5.92	0.95	0.68
	2) …length of the scarf	66	5.23	1.13	
	3) …shape of the scarf	66	4.88	1.45	
Perceived diagnosticity of experience attributes (Jiang & Benbasat, 2004)	To what extent did this shopping experience enable you to judge the…				
	1) …material of the scarf	66	5.15	1.36	0.80
	2) …warmth of the scarf	66	4.30	1.55	
	3) …thickness of the scarf	66	4.76	1.37	
	4) …softness of the scarf	66	4.85	1.40	
Need for touch (Peck & Childers, 2003a)	1) I feel more confident making a purchase after touching a product	66	6.15	0.88	0.88
	2) When browsing in stores, it is important for me to handle all kinds of products	66	6.08	0.83	
	3) If I can't touch a product in the store, I am reluctant to purchase the product	66	5.50	1.33	
	4) When walking through stores, I can't help touching all kinds of products	66	5.92	1.13	
	5) I feel more comfortable purchasing a product after physically examining it	66	6.23	0.80	
	6) I place more trust in products that can be touched before purchase	66	5.94	0.99	
	7) I like to touch products even if I have no intention of buying them	66	5.55	1.42	
	8) The only way to make sure a product is worth buying is to actually touch it	66	4.88	1.61	
	9) I find myself touching all kinds of products in stores	66	5.74	1.26	
	10) When browsing in stores, I like to touch lots of products	66	5.59	1.25	
	11) There are many products that I would only buy if I could handle them before purchase	66	5.36	1.43	
	12) Touching products can be fun	66	5.71	1.15	
Internet experience	1) How often do you use the internet? *1 (not at all) to 6 (multiple times a day)*	66	5.89	0.31	N/A
Online shopping frequency	1) How often do you purchase products/services online? *1 (never) to 8 (daily)*	66	5.21	1.18	N/A

STUDY 2					
Factors	**Item**	**n**	**Mean**	**SD**	**Cronbach's α**
Perceived control (Yoo et al., 2010)	1) I felt that I had a great deal of control over my experiences with the throw blanket	96	4.11	1.70	0.89
	2) While evaluating the throw blanket, my actions determined the kind of experience I had	96	4.57	1.46	
	3) I was able to control the throw blanket in my own way	96	4.19	1.83	
	4) I was able to control the interaction with the throw blanket	96	4.39	1.54	
Tactile sensations (Peck et al., 2013)	1) When evaluating the scarf I felt that I could examine the texture of the scarf	71	4.13	1.70	0.76
	2) When evaluating the scarf I could imagine moving my fingers on the scarf	71	4.14	1.52	
	3) When evaluating the scarf I felt as if the scarf was in my hands	71	3.24	1.41	
	4) When evaluating the scarf I felt as though I could hold the scarf	71	3.94	1.76	
Perceived diagnosticity of experience attributes (Jiang & Benbasat, 2004)	To what extent did this shopping experience enable you to judge the…				
	1) …flexibility of the scarf	96	4.47	1.64	0.87
	2) …warmth of the scarf	96	3.32	1.44	
	3) …thickness of the scarf	96	4.16	1.63	
	4) …softness of the scarf	96	3.68	1.80	
Need for touch (Peck & Childers, 2003a)	1) I feel more confident making a purchase after touching a product	96	5.99	1.11	0.92
	2) When browsing in stores, it is important for me to handle all kinds of products	96	5.86	1.14	
	3) If I can't touch a product in the store, I am reluctant to purchase the product	96	5.35	1.41	
	4) When walking through stores, I can't help touching all kinds of products	96	5.37	1.36	
	5) I feel more comfortable purchasing a product after physically examining it	96	5.98	1.08	
	6) I place more trust in products that can be touched before purchase	96	5.66	1.27	
	7) I like to touch products even if I have no intention of buying them	96	5.01	1.61	
	8) The only way to make sure a product is worth buying is to actually touch it	96	4.48	1.54	
	9) I find myself touching all kinds of products in stores	96	5.30	1.45	
	10) When browsing in stores, I like to touch lots of products	96	5.05	1.57	
	11) There are many products that I would only buy if I could handle them before purchase	96	5.21	1.42	
	12) Touching products can be fun	96	5.32	1.30	
Internet experience	1) How often do you use the internet? *1 (not at all) to 6 (multiple times a day)*	96	5.93	0.26	N/A
Online shopping frequency	1) How often do you purchase products/services online? *1 (never) to 8 (daily)*	96	4.92	1.19	N/A

Note. Some constructs were only measured in the mediated product experience conditions therefore *n* is not constant over all constructs. N/A represents 'not applicable'. Unless specified otherwise, all items were measured on a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree).