A Touching Experience: *Designing for Touch Sensations in Online Retail Environments*

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Optimizing the product experience in a mediated environment, where the multisensory experience is limited, is a challenge many designers of online retail environments face today. In this study we aim to identify product presentation design elements that appeal to the sense of touch and therefore affect the extent to which the displayed product can be experienced emotionally. An experimental approach was adopted to examine whether two online product presentation formats (i.e., static interface, interactive interface) that vary in their ability to generate touch sensations influence emotional responses toward the product differently. First, the results show that an interface using image interactivity to simulate stroking gestures provokes more positive emotional responses and suppresses negative emotional responses relative to an interface using static pictures. Then, moderation analyses demonstrate that the individual's level of hedonic urge to seek enjoyment and fun through touch (i.e., autotelic NFT) is a boundary condition for these effects to occur. Individuals who are high in autotelic NFT, in particular, are responsive to the consequences of an interactive interface. Moreover, bringing the online tactual product experience closer to reality may appeal to a new group of online consumers, which is an important finding for web designers to attend to.

Keywords **–** Emotional Responses, Need For Touch, Online Retail Environments, Product Presentation, Touch.

Relevance to Design Practice – The present study extends the knowledge of "tactile" webdesign in the context of online retail environments by adopting an affective perspective. We investigate how a consumer's emotional response toward the product is influenced by online product presentation design elements that emphasize touch sensations. We further distinguish between tactile prone individuals and individuals that have little desire to touch objects.

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Introduction

Consumers' experiences with retail offerings are intrinsically multisensory in nature (Rahman, 2012; Wastiels, Schifferstein, Wouters, & Heylighen, 2013). A product design can instantly stimulate multiple sensory modalities. Take, for example, the soft but cool touch of a silk scarf or the distinctive odor, light aluminum barrel, and intense color of a permanent marker. Previous research has established that both vision and touch are likely to dominate the perception and experience of product designs (Rahman, 2012; Schifferstein & Cleiren, 2005). Whereas vision is often almost instantly available even when the object is far away, touch is considered as a "proximal" sense since it is the only sense that requires contact with the skin (Krishna, 2009). Touch plays an important role in interpersonal intimacy and has therefore a large emotional component (Hertenstein, Holmes, McCullough, & Keltner, 2009; Schifferstein & Spence, 2008). Studies have indicated that touch can have strong influence on the liking of both animated and unanimated objects (Armel & Ramachandran, 2003; Essick et al., 2010; Morrison, Löken, & Olausson, 2010; Singh et al., 2014). More specifically, by exploring a product's intrinsic sensory attributes such as a surface's topographical and material properties using touch, it has been proposed that it is possible to make consumers feel attached to a product on an emotional level (Atakan, 2014; Essick et al., 2010; Peck & Wiggins, 2006; Shu & Peck, 2011). In fact, in consumer settings, affective attachment experienced during tactile exploration has been recognized as a strong driver of product liking (Millar, M. & Millar, K., 1996; Peck & Shu, 2009; Schifferstein, 2006; Sonneveld & Schifferstein, 2008). These results encourage retailers to provide interaction in stores with products that are pleasant to touch, such as having samples available for consumers to feel. However, in an online retail environment, where touch is unavailable prior to purchase, consumers typically evaluate products on visual attributes and/or according to other (rather rational; cf. Ng, Chaya, & Hort, 2013) product-extrinsic features, including price, brand, and reliability of the store, instead of the product-intrinsic sensory attributes. Therefore, the lack of tactile exploration may leave consumers less emotionally engaged in online product experiences, which might be linked to the failure of certain products to be successfully sold online.

While it is clear that the act of tactile caressing cannot (yet) realistically be reproduced in the online store environment, consumers seem at least to expect to feel that products can be

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touched or that they can visualize how it would be like to hold the product in their hands (Kim & Forsythe, 2009; Okonkwo, 2010). T. Verhagen, Vonkeman, Feldberg, and P. Verhagen (2014) revealed that the perceived tangibility of the online product increased when consumers can experience the product by directly interacting with it, not when consumers passively receive static stimuli. In addition, studies in the field of neuroscience have noted that observing the act of an object (animated or unanimated) being touched can already activate brain regions involved in tactile perception, even when the observer's body is not directly stimulated (Serino, Pizzoferrato, & Làdavas, 2008). Such activation can even result in a behavioral effect, i.e., feeling actual tactile sensations (Blakemore, Bristow, Bird, Frith, & Ward, 2005; Keysers et al., 2004; Serino et al., 2008). In this study we propose that the integration of visual interactive cues simulating stroking gestures may psychologically evoke the sense of touch in the online store environment. Notwithstanding that research has already indicated that technological advancements (e.g., 360-spin rotation, video, virtual model, augmented reality) bring the online product experience closer to reality (Kim & Forsythe, 2008; Verhagen et al., 2014) and help users to forget that they are looking at a computer screen (Fiore, Kim, & Lee, 2005; Klein, 2003; Li, Daugherty, & Biocca, 2002), we believe that there are certainly thresholds left to cross.

The rise of new online product presentation formats that bridge the gap between online and physical environments calls for crossing boundaries that are traditionally associated with the limitations of online environments. The current focus is not on the most computing-intensive and information-rich contexts such as Virtual Reality systems (Second life) and haptic feedback devices (Novint Falcon), but on more simple, omnipresent online retailing contexts. In this study we apply what is known about unmediated sensory perception to the product interactions enabled by computers, and investigate whether and how interactive visual cues that simulate stroking gestures affect the extent to which the displayed product can be experienced emotionally. The purpose of the present study is twofold. Firstly, we study whether two different product presentation formats (i.e., static interface vs. interactive interface) that vary in their ability to appeal to the sense of touch influence the extent to which consumers report emotional responses toward the product. Secondly, we consider the moderating impact of consumers' chronic need for touch. Although research indicates that consumers differ with respect to their use of tactile input during human-product interactions (Peck & Childers, 2003a), it has not examined how such differences may moderate the effect of product presentation format on emotional responses toward the online product. In sum, this study aims to identify product presentation design elements that appeal to the sense of touch to create an emotional bond between consumers and their products, and explores the individual differences that affect this process.

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Literature Review and Hypotheses

Touch as A Powerful Persuasion Tool

Most studies have focused on the informational function of physical touch, demonstrating that tactile input influences product learning due to the information extracted through touch (e.g., Grohmann, Spangenberg, & Sprott, 2007; McCabe & Nowlis, 2003; Rahman, 2012). Far less studies have considered the immediate, automatic emotional response toward the touched product (Chen, Shao, Barnes, Childs, & Henson, 2009; Peck & Wiggins, 2006). Research has revealed a relation between a product's material properties and people's emotional responses (e.g., Essick, James, & McGlone, 1999). Soft textures were consistently perceived as more pleasant to touch than those that were hard (Chen et al., 2009). Interestingly, multiple studies have demonstrated that emotional response toward the product such as desire, satisfaction, and inspiration was influenced more by sensory characteristics of the product than product-extrinsic cues (Hinton & Henley, 1993; Ng et al., 2013). The same was found to be true for product liking (Ng et al., 2013). Peck and Wiggins (2006) revealed that even when tactile cues provided no information regarding the product, the mere presence of a touch element had a positive effect on persuasion because of an emotional response to the experience of touch. In sum, human senses are powerful elicitors of emotions (Chen et al., 2009; Ng et al., 2013; Shu & Peck, 2011). In an online retail environment, however, consumers are deprived of actual touch, leaving them most likely less emotionally engaged with the product. Recent product visualization techniques like multiple zoom levels, 360-spin rotation, and alternative views have shown to increase realism (Klein, 2003; Li et al., 2002; Verhagen et al., 2014) but it remains to be studied whether such techniques influence emotional responses toward the product by activating spontaneous tactile simulations (i.e., concretizing the product's sensory intrinsic attributes).

Visually Induced Touch Sensations and Positive Emotional Responses

In a situation where touch is unavailable, research suggests that visual stimuli are able to guide thinking about touch elements, thereby facilitating tactile sensations (Anema, de Haan, Gebuis, & Dijkerman, 2012; Brunyé et al., 2012). For example, seeing an image of a soft cashmere scarf may cause the consumer not only to perceive and encode its look but also generate internal imagery

containing tactile sensations, which can be "experienced" as well (Hirschman & Holbrook, 1982). Neuroscientific research involving fMRI scans reveals that observing touch gestures activates brain regions involved in tactile perception, even when the observer is not directly stimulated (Blakemore et al., 2005; Keysers et al., 2004; Simmons, Martin, & Barsalou, 2005). This finding suggests the existence of a "tactile mirror system" (Brunyé et al., 2012; Ebisch et al., 2008). Moreover, research has demonstrated that the activation of the tactile system due to observation of touch is maximized when subjects translate the observation of touch into a self-related experience (Serino et al., 2008).

In the context of online stores, one contributor to a self-related experience may be *image interactivity technology*, which consists of "website features that enable creation and manipulation of product images to simulate (or surpass) actual experience" (Fiore et al., 2005). Hence, image interactivity allows for a continuous change of graphics that bears a close resemblance to physical actions, as if events are occurring in the physical world (Schlosser, 2003). Static images, on the other hand, are assumed to only provide "a quick glance that results in broad but coarse information about the haptic properties of an object" (Klatzky, Lederman, & Matula, 1993). Consequently, for interactive cues that enhance the precision, vividness, accessibility, and realism of tactile product interactions (Jiang & Benbasat, 2007; Schlosser, 2003) it should be easier to relate the observed tactile experience to the self. We argue that an interface using image interactivity to simulate stroking gestures of a product activates spontaneous tactile impressions more than static images of the product because of the direct interaction with the dynamism of the product. In this way, appealing to the sense of touch highlights the sensory intrinsic attributes of the product rather than the product-extrinsic cues, and is therefore likely to elicit more positive emotional reactions toward the product. To exemplify, when consumers feel that a clothing item can be touched they may feel desire, joy, and hope because the clothing item must be really soft. It is expected that one can more easily draw assumptions regarding the tactile attributes of the product because these are made far more salient using an interactive interface rather than a static interface. In fact, static images do not normally translate into a highly self-related experience (Serino et al., 2008; Suh & Chang, 2006). Therefore, sensory intrinsic attributes of the product are less enhanced and optimized, and website visitors are likely to rely more on rational product-extrinsic cues (Spence & Gallace, 2011), resulting less positive emotional responses toward the product. More formally:

H_1: An interface using image interactivity to simulate stroking gestures results in more positive emotional responses toward the product compared to an interface using only static images.

A Lack of Touch and Negative Emotional Responses

Many studies understandably emphasize positive emotions, but it is also important to acknowledge the presence of negative, unpleasant emotions (Saariluomaand & Jokinen, 2014). Consumers who expect to touch products to experience its intrinsic sensory attributes but are unable to do so (i.e., in a mediated environment), may experience negative emotions toward the product as intrinsic sensory attributes are often an integral part of product expectations (Fiore & Damhorst, 1992; Lu, Yu., Lu, Ya., & Wang, 2012; Peck & Childers, 2003a; Schifferstein & Spence, 2008). Making them evaluate products less positive (Grohmann et al., 2007) or even making them avoid online shopping environments altogether (Citrin, Jr., Spangenberg, & Clark, 2003; McCabe & Nowlis, 2003). The inability to touch seems therefore to be a true limiting factor in an online shopping context. In this regard, coarse tactile information provided by static images in particular seems to be insufficient to respond to the feeling to hold the product in the hands, thus giving way to negative emotions (Peck & Childers, 2003b). In other words, when products do not appeal to the senses because tactile impressions are missing, consumers may evaluate the product as boring or even experience fear of making the wrong inferences about its properties (Ng et al., 2013). However, we propose that recent product visualization techniques may be able to overcome this barrier, or at least decrease it. We hypothesize that when touch is unavailable, an interface using image interactivity to simulate stroking gestures is more likely to reduce negative feelings than a static interface. Our second hypothesis is as follows:

H_2: An interface using image interactivity to simulate stroking gestures results in less negative emotions toward the product compared to a regular interface using only static images.

Autotelic Need for Touch as A Moderating Variable

To draw a more comprehensive understanding of the effect of product presentation format on emotional responses toward the product, we examine Need for Touch (NFT) as a relevant individual-difference factor. NFT is a key consumer trait that defines the amount of touch consumers exert while shopping (Peck & Childers, 2003a). Peck and Childers (2003a) conceptualized NFT as having two dimensions: instrumental NFT and autotelic NFT. In the instrumental view, consumers are concerned with gathering relevant information of a product's performance. In contrast, the autotelic dimension of NFT is related to hedonic aspects of touch. Everyday observation indicates that material that appears soft or smooth, or a product with a sleek design, invites hedonic touch (Klatzky & Peck, 2012). The autotelic dimension measures the predisposition of consumers to use the hedonic (not necessarily the functional) information evoked by the stimuli. Touch does not necessarily solely provide attribute or structural information about a product, touch can also have a major affective component that leads to increased emotional response toward the product (Peck & Wiggins, 2006). Therefore, it is proposed that the autotelic (rather than the instrumental) dimension of NFT will shape the emotional responses of consumers to the type of stimuli.

Individuals with high levels of autotelic NFT often feel an irresistible need to engage in exploratory touch, and are focused on the sensory aspects of touch as an end in itself (Peck & Childers, 2003a). Recent evidence suggests that touch that provides

positive sensory feedback increases affective responses more for high autotelics than for low autotelics (Peck & Childers, 2003b; Peck & Wiggins, 2006, 2011). More precisely, Peck and Wiggins (2006) showed that individuals who were high in autotelic NFT, in particular, were likely to be more susceptible to the increase in persuasion that comes from an enjoyable touch experience. In fact, the presence of a touch element did not significantly influence persuasion for individuals with low levels of autotelic NFT (Peck & Wiggins, 2006). Peck and Childers (2003b) showed that individuals with low levels of autotelic NFT considered even coarse tactile information provided by a visual presentation as a substitute for autotelic direct experience. Hence, an interface using image interactivity to simulate stroking gestures is not likely to offer much of an advantage in intensifying emotional responses toward the product because individuals with low levels of autotelic NFT are far less likely to extract and utilize the hedonic information evoked during tactile exploration (Peck & Childers, 2003a). This line of reasoning leads to the following hypothesis:

H_3: For higher autotelics, positive emotional responses toward the product will increase in the presence of an interface using image interactivity to simulate stroking gestures versus an interface using only static images, while no difference is expected for lower autotelics.

At the same time, taking away the object that provides such tactile pleasure has proven to be particularly painful for individuals with high levels of autotelic NFT (Peck & Childers, 2003b; Peck & Wiggins, 2006). Higher autotelics, in particular, are likely to feel negative emotions toward the product when deprived of tactile input (i.e., when only static images are present) precisely because an enjoyable substitute for tactile product exploration is lacking. On the other hand, Peck and Childers (2003b) repeatedly found in a series of experiments that for individuals with no preference for touch the level of negative emotions did not differ depending on whether touch was available or deterred. Therefore we propose the following hypothesis:

H_4: For higher autotelics, negative emotional responses toward the product will decrease in the presence of an interface using image interactivity to simulate stroking gestures versus an interface using only static images, while no difference is expected for lower autotelics.

Previous research has demonstrated that individuals high in NFT (relative to individuals low in NFT) evaluated a product more favorably when touch was available rather than deterred (Grohmann et al., 2007). In fact, Peck and Wiggins (2006) revealed that for individuals who were high in autotelic NFT, a positive attitude toward the product was due to the affective response resulting from the touch experience. However, for individuals who were low in autotelic NFT this effect did not occur because they barely responded emotionally to a touch element. Because an interface using image interactivity to simulate stroking gestures is expected to represent the act of touching, we propose that for individuals who are high in autotelic NFT an interactive interface compared to a static interface will result in a more favorable attitude toward the product. On the contrary, for individuals who are low in autotelic NFT we expect no difference in attitude toward the product between an interactive interface and a static interface due to lack of interest in touch. We, therefore, formulate the following hypothesis:

H_5: For higher autotelics, attitude toward the product will be more favorable in the presence of an interface using image interactivity to simulate stroking gestures versus an interface using only static images, while no difference is expected for lower autotelics.

Method

This study employed two product presentation formats (static interface, interactive interface) in a between-subjects design. To control for possible confounds in gender and age, only female undergraduates (aged from 19 to 29) were invited to participate. Accordingly, 43 females (M_{age} = 21.7, SD_{age} = 1.59) participated in a 20-minute experiment conducted in a controlled laboratory environment. All participants received a participation fee of € 5.

Procedure

Participants were invited to visit a lab individually and were seated at a table in front of a computer monitor. Potential intervening variables were kept constant including instructions, web browser (Chrome 31.0.1650.63 m), internet connection speed, and screen resolution (1920 by 1080 px). A scarf was used as the experimental product as research has consistently shown that clothing is clearly a product category with characteristics that are best explored by touch (Grohmann et al., 2007; Jansson-Boyd, 2011). Subsequently, participants were instructed to explore a scarf presented on a webpage of a fictitious online store. After visiting the webpage for one and a half minute, participants filled out measures relating to the variables of the study. After completing the questionnaire, participants were debriefed and thanked.

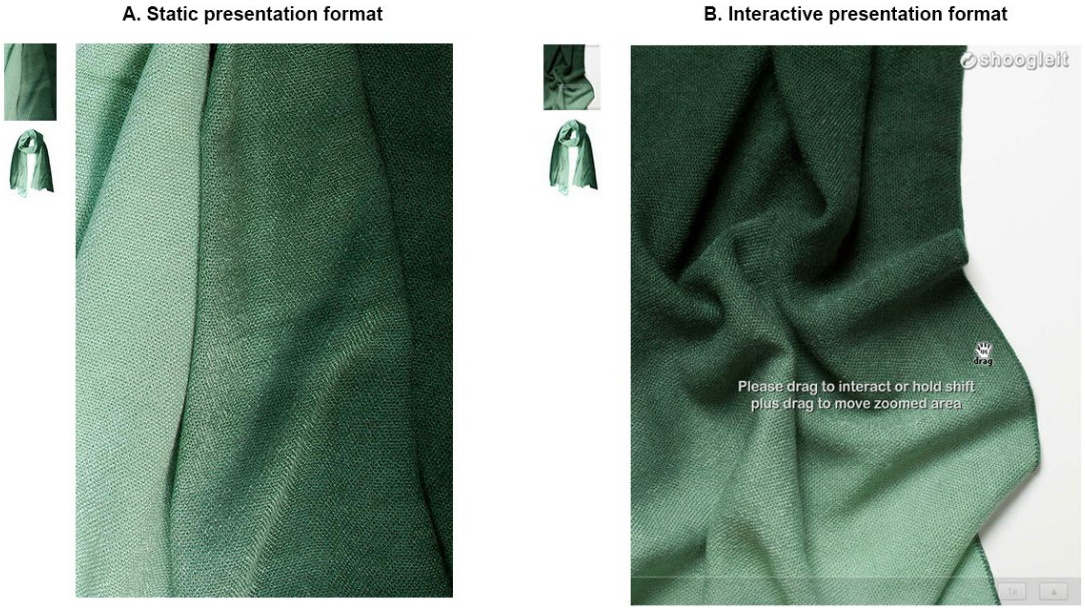
Independent Variables

Product Presentation Format

Two online product presentation formats were created. In the static interface condition (www.static.uasurvey.be), the product was displayed on a web page containing static images of the scarf and of its details. In the interactive interface condition (www.dynamic.uasurvey.be), 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 (Padilla & Chantler, 2011), the interactive interface allowed users to move the fabric of the scarf by dragging it with the mouse, thereby simulating stroking gestures. Figure 1 illustrates the two different product presentation formats.

Autotelic Need for Touch

To identify individual differences in a participant's motivation or preference to touch, participants had to complete the NFT scale developed by Peck and Childers (2003a). The scale is composed of



Note: (A) Static presentation format: the scarf is displayed by an interface using only static images,
(B) Interactive presentation format: the scarf is displayed by an interface using image interactivity to simulate stroking gestures.
An interactive example is available at http://www.shoogleit.com/2622-0_NOORA-sjaal.

Figure 1. Product presentation format manipulation.

12 items (e.g., When walking through stores, I can't help touching all kinds of products; If I can't touch a product in the store, I am reluctant to purchase the product) measured on a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). The autotelic component of the NFT scale consisted out of six items (e.g., I find myself touching all kinds of products in stores) and were averaged in order to calculate a measure of autotelic NFT ($\alpha = .89$). The instrumental component consisted out of six items (e.g., I feel more confident making a purchase after touching a product) and were averaged in order to calculate a measure of instrumental NFT ($\alpha = .81$).

Dependent Variables

Touch Sensations

To verify whether the manipulation of product presentation format was successful we assessed the level of the generation of touch sensations. The internal generation of touch sensations was measured according to four items adapted from a scale developed by Peck, Barger, and Webb (2013) (e.g., I felt that I could examine the texture of the scarf) on a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). The items were averaged ($\alpha = .82$) for a measure of touch sensations.

Emotional Responses Toward the Product

In the current study the focus was on emotions elicited by product appearance. Desmet (2003) revealed that the appearance of products can be differentiated on a set of 12 emotions. Therefore, this study adopts the specific emotion approach rather than the dimensional approach of emotions (Poels & Dewitte, 2006). Specific emotions toward the product were measured using the PrEmo tool, short for Product Emotion Measurement instrument (Desmet, 2003). This is a validated instrument for recording nonverbal emotional responses toward products. The visual self-report instrument includes 12 animated characters with corresponding sounds of 1-2 seconds representing six positive emotions (desire, satisfaction, pride, hope, joy, fascination) and six negative emotions (disgust, dissatisfaction, shame, fear, sadness, and boredom). Figure 2 shows an example of one of the animations. The PrEmo has been validated in a series of studies and has shown to be relevant for adequately describing emotional responses to product appearance (Desmet, 2002). In the present experiment, participants were exposed to either the static picture or the *ShoogleIt* of the scarf (depending on which condition the participant was randomly assigned to), and had to indicate to what extent the feeling expressed by the character in the PrEmo corresponded with his/her own feelings toward the scarf on a 5-point scale ranging from 0 (I don't feel this) to 4 (I feel this strongly).

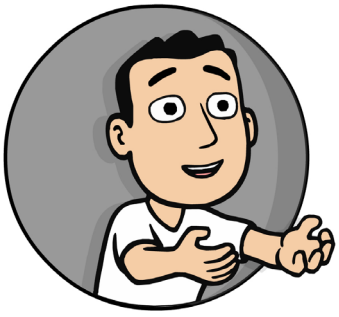


Figure 2. One example of the 12 emotions represented in the nonverbal self-report instrument PrEmo.

Note: Print-screen showing one of the animated characters included in the PrEmo tool expressing feelings of desire.

Attitude Toward the Product

Participants were asked to rate their attitude toward the scarf on a rating scale adapted from Shamdasani, Stanaland and Tan (2001). The scale is composed of six sets of brief, opposing, complete sentences using a 5-point scale (e.g., I approve of the product/I disapprove of the product). These were averaged ($\alpha = .91$) for a measure of attitude toward the product.

Table A.1 in the Appendix shows an overview of all items and corresponding descriptives of the measurement instrument.

Analysis

First, two multivariate analyses of variance (MANOVA) were conducted to test the main effects of product presentation format (independent variable) on positive and negative emotional responses toward the scarf (dependent variables). Since our dependent variables were a set of (related) emotions, a MANOVA was preferred to study the overall patterns and to reduce false positive findings. The Phillai's trace (considered as the most powerful and most robust of the four statistics cf. Field, 2013) provided a single overall statistical test on the set of dependent variables. Univariate analyses of variance (ANOVA) for each dependent variable were conducted as follow-up tests to the MANOVA. Next, to examine the moderation effect of autotelic NFT, Rucker, McShane, and Preacher (n.d.) recommend to preserve the continuous nature of the variable and perform simple effects tests in moderated regression. We used spotlight analysis (cf. Spiller, Fitzsimons, Lynch Jr., & McClelland, 2013) to obtain predicted means for individuals at critical points. Unlike dichotomization, linear regression retains individual-level variation and increases predictive performance (Rucker et al., n.d.; Spiller et al., 2013). The spotlight analysis tests post hoc for what values of the continuous variable there are significant group differences at the sample mean, one standard deviation below and above the mean, representing "moderate", "high" and "low" autotelic NFT respectively. Utilizing the spotlight analysis allows to relax the assumption of homogeneous slopes across treatments and identifies significant group differences ($p < .05$) when the treatment effect differs depending on the continuous variable (Hayes & Matthes, 2009). The spotlight analyses were conducted according to the procedure and the SPSS macro PROCESS proposed by Hayes (2013).

Results

Touch Sensations: *Manipulation Check*

The first step was to test whether the product presentation format affected participants' visually induced touch sensations. An independent samples *t*-test comparing the two presentation formats was run. As expected, a significant effect of product presentation format on touch sensations was found ($t(42) = -4.64$, $p < .001$, $r = .52$). An interface using image interactivity to simulate stroking gestures resulted in significantly greater touch sensations ($M = 4.97$, $SD = 1.31$) than a static interface ($M = 3.55$, $SD = 1.05$), implicating that participants in the interactive condition reported more frequently that they actually had the sensation that they could hold, move their fingers across, and feel the texture of the depicted scarf, indicating a successful manipulation.

Main Effects

The next step was to examine whether the product presentation format affected participants' positive emotional responses toward the scarf. As predicted, the main effect of type of presentation format in the MANOVA test was significant ($V = 0.43$, $F(6, 36) = 4.56$, $p < .01$, partial $\eta^2 = .43$). In order to distinguish the emotional responses individually, the MANOVA was followed up with separate univariate ANOVAs. Results showed significant main effects for desire ($F(1, 41) = 6.89$, $p < .02$, partial $\eta^2 = .14$), fascination ($F(1, 41) = 7.64$, $p < .01$, partial $\eta^2 = .16$), and joy ($F(1, 41) = 17.60$, $p < .001$, partial $\eta^2 = .30$). Results revealed that feelings of desire toward the scarf were more prominent when it was presented using an interactive interface ($M = 1.64$, $SD = 1.26$) than using a static interface ($M = 0.73$, $SD = 0.89$). Further, participants reported more feelings of joy toward the scarf in the presence of an interface using image interactivity to simulate stroking gestures ($M = 2.64$, $SD = 1.18$) than those in the presence of a static interface ($M = 1.19$, $SD = 1.08$). The same pattern was true for fascination ($M_{interact} = 2.95$, $SD_{interact} = 1.21$; $M_{static} = 1.95$, $SD_{static} = 1.17$). Presentation format did not influence feelings of satisfaction, pride, and hope toward the scarf, as the differences failed to reach significance (p's $> .47$). In sum, the significant MANOVA following the expected direction indicate that, in general, participants in the interactive condition reported more positive emotional responses toward the scarf than those in the static condition; H_1 was supported.

Further, a MANOVA examined whether the product presentation format affected participants' negative emotional responses toward the scarf. As predicted, a significant main effect of product presentation on negative emotions was found ($V = 0.28$, $F(6, 36) = 2.32$, $p = .05$, partial $\eta^2 = .28$). Looking at the emotions individually, separate univariate ANOVA's revealed that product presentation format differently affect feelings of dissatisfaction ($F(1, 41) = 4.26$, $p < .02$, partial $\eta^2 = .14$) and boredom ($F(1, 41) = 8.91$, $p < .01$, partial $\eta^2 = .19$). An interactive interface using image interactivity to simulate stroking gestures provoked less feelings of dissatisfaction toward the scarf ($M = 0.36$, $SD = 0.53$) than an interface using static images ($M = 0.81$, $SD = 1.01$). In the same way, participants clearly evaluated the scarf as less boring when the scarf was presented by means of an interactive interface ($M = 0.59$, $SD = 0.85$) than a static interface ($M = 1.62$, $SD = 1.40$). Similar patterns were shown for disgust and fear, but differences failed to reach significance (both p's $> .18$). The difference between feelings of shame was also not significant ($p > .18$). As to sadness, both participants exposed to an interactive and a static interface reported virtually no feelings of sadness. Consequently, the significant MANOVA following the expected direction indicated that, generally speaking, participants in the interactive condition reported less negative emotional

responses toward the scarf than those in the static condition; supporting H_2. Results from both positive and negative emotions are visually depicted in Figure 3.

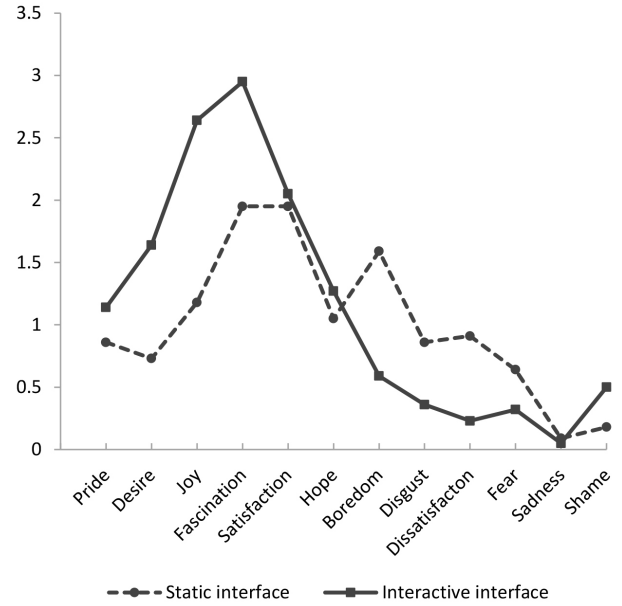


Figure 3. Mean scores emotional responses toward the scarf for static interface and interactive interface.

Moderation Effects

In order to test for moderation of the effect of product presentation format on emotional responses toward the scarf by the level of autotelic NFT, separate regressions were performed on emotional response with presentation format (dummy coded: static = 0, interactive = 1), autotelic NFT, and their interaction as independent variables. The results showed a significant two-way interaction between presentation format and autotelic NFT for joy (b = 0.88, t = 2.01, p = .05, partial η^2 = .09), disgust (b = -0.82, t = -2.03, p < .05, partial η^2 = .10), fear (b = -0.78, t = -2.07, p < .05, partial η^2 = .10), and shame (b = -0.69, t = 2.49, p < .02, partial η^2 = .14). Additionally, a marginal significant predictive value of the interaction term for desire (b = 0.75, t = 1.76, p = .09, partial η^2 = .07) was shown. These results indicate that the emotional responses toward the scarf were not uniformly more favorable in the presence of an interactive interface. Rather, the emotional responses toward the scarf were likely to depend on the individual's autotelic need for touch. To further understand the nature of autotelic NFT and product presentation format, conditional effects of product presentation format on emotional responses toward the scarf were estimated using the "spotlight" approach (Hayes & Matthes, 2009), with the sample mean and plus and minus one standard deviation from the mean representing "moderate", "high", and "low" autotelic NFT respectively. Figure 4 shows an overview of the results (see Table B.1 in Appendix B for the full list of conditional effects of product presentation format).

With regard to positive emotional responses toward the scarf, the product presentation format was significantly and positively related to feelings of desire and joy at moderate and high autotelic NFT levels (p < .05), the effect disappeared when autotelic NFT was low (respectively p > .90 and p > .58). The results were plotted in Figure 4A-B. Moderate and high autotelics reported more positive emotional responses in the presence of an interface using image interactivity to simulate stroking gestures versus an interface using only static images of the scarf, while no difference was observed for lower autotelics, thus supporting H_3.

As to negative emotional responses, the extent to which the participant felt feelings of fear, disgust, and shame toward the scarf was contingent on autotelic NFT. The product presentation format was significantly and negatively related to feelings of disgust and fear at high levels of autotelic NFT (p < .05). When autotelic NFT was moderate or low, the slopes did not significantly differ from each other for both disgust (respectively p = .20 and p = .54) and fear (respectively p = .42 and p = .36). The results are plotted in Figure 4C-D. In terms of feelings of shame, the probed interaction showed a different pattern. As plotted in Figure 4E, the product presentation format was significantly and positively related to feelings of shame at low and moderate levels of autotelic touch (p < .05), the effect disappeared when autotelic NFT was high (p = .74). In fact, feelings of shame remained consistently mild for low, moderate, and high levels of autotelic NFT in the static condition. Therefore, H_4 was only partially supported as—unlike feelings of disgust and fear—feelings of shame toward the scarf revealed a pattern contrary to our expectations.

In order to test for moderation of the effect of product presentation format on attitude toward the scarf by the level of autotelic NFT, a regression was performed. As predicted, the results showed a significant two-way interaction between presentation format and autotelic NFT on attitude (b = 0.75, t = 2.48, p < .02, partial η^2 = .14). Figure 5 shows the pattern of results. The product presentation format was significantly and positively related to the attitude toward the scarf at high autotelic NFT levels (p < .05), this effect disappeared when autotelic NFT was moderate (p = .59) or low (p = .18). Thus, individuals with high levels of autotelic NFT reported a more favorable attitude toward the scarf in the presence of an interface using image interactivity to simulate stroking gestures versus an interface using static images, while no difference was observed for individuals with moderate or low levels of autotelic NFT; H_5 was supported.

Further, as expected, the *instrumental* dimension of NFT did not have a main effect or interacts with product presentation format to affect emotional responses and attitude toward the scarf (all p's > .20). Thus, the product presentation format affected the emotional responses toward the scarf and product attitude among those participants that had high *autotelic* NFT but not among those participants that had high *instrumental* NFT. This result confirms that—apart from an instrumental component—touch can have a major affective component that leads to increased emotional response toward the product.

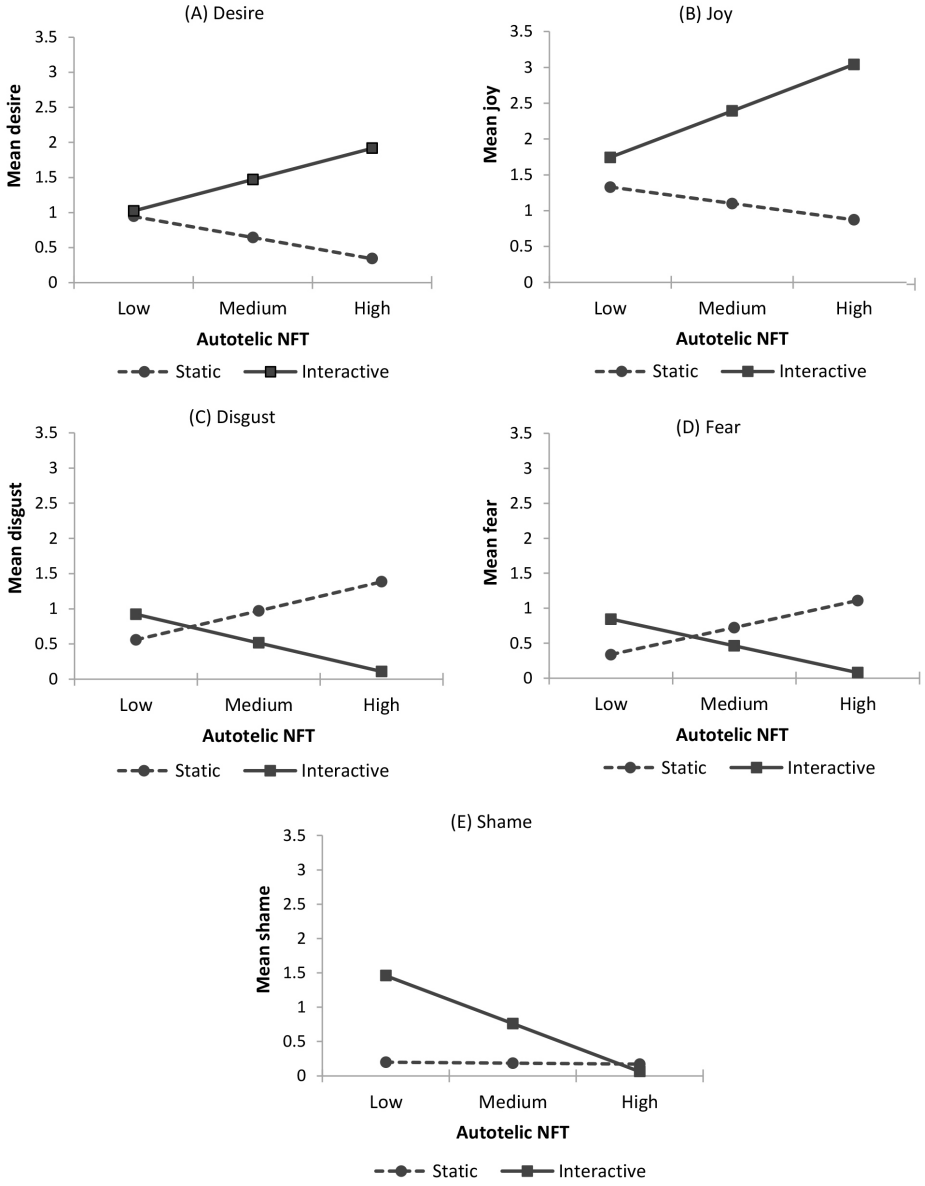


Figure 4. Spotlight analyses: interaction effect of autotelic NFT and product presentation format on emotional responses toward the scarf.

Note: Low autotelic NFT is -1SD', medium autotelic NFT is sample mean, high autotelic NFT is +1SD'.
Represented emotional responses: (A) Desire, (B) Joy, (C) Disgust, (D) Fear, (E) Shame.

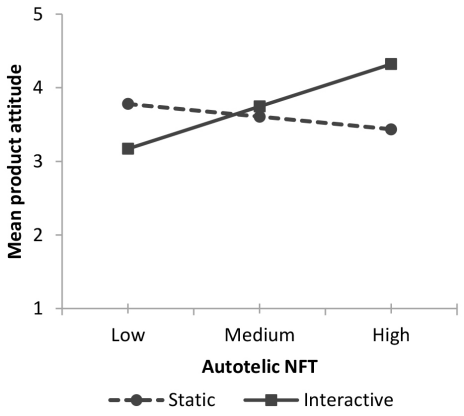


Figure 5. Spotlight analysis: interaction effect of autotelic NFT and product presentation format on attitude toward the scarf.

Discussion

The aim of this study was to investigate the relationship between online product presentation design elements that emphasize touch and emotional responses toward the product, considering the moderating role of consumer's level of hedonic urge to seek enjoyment and fun through touch (i.e., autotelic NFT). In the present study we proposed that interactive cues enhance the realism of tactile human-product interactions in mediated environments. With the help of ShoogleIt software we designed an interface using image interactivity to simulate stroking gestures in addition to an interface using static images to showcase the product. By varying product presentation format we endeavored to replicate prior research (comparing touch/no touch conditions) and extend it to the context of computer-mediated product experiences. Prior research (e.g., Peck & Wiggins, 2006) has revealed that tactile exploration of a material product may change consumers' emotional responses toward the product. This present study extends prior research not only by examining the process in an online context but also by exploring the individual differences that affect the process. The results reveal that interactive cues that give consumers the sensation that they could hold, move their fingers across, and feel the texture of the depicted product drive favorable emotional responses toward the product. More specifically, visually induced hedonic tactile experiences can intensify positive emotional responses toward the product and downplay painful experiences.

Furthermore, the current research implies some boundary conditions. We show that different presentation formats can lead to distinctively different emotional responses. Optimizing the way in which interactive cues tap into tactile perceptual information can create favorable emotional responses toward the product; however this effect is not generalizable to all people. The strength of emotional responses depends on the individual's level of autotelic NFT. Consumers vary in terms of preference for the extraction and utilization of information obtained through touch (Peck & Childers, 2003a). As a result, consumers who have higher levels of hedonic urge to seek enjoyment and fun through touch, that is, higher levels of autotelic NFT, are more likely to extract and utilize the hedonic information evoked during the online simulated tactile product exploration. They are more likely to be affected by the type of product presentation and form more positive and less negative emotional responses toward the product when interactive cues enhance the realism of tactile human-product interactions. In the same way, consumers who have higher levels of autotelic NFT also form a more favorable attitude toward the product. On the other hand, the results demonstrate that instrumental NFT (i.e., gathering relevant information of a product's performance) does not moderate the effect of presentation format on emotional responses and attitude toward the product. This result lends additional support to the bi-dimensional structure of the need for touch, and to the assertion that the favorable emotional responses toward the product are due to hedonic tactile information evoked by the stimuli rather than due to the instrumental tactile information.

Contrary to our expectations, consumers with low and moderate levels of autotelic NFT reported significantly more feelings of shame toward the product when sensory intrinsic product attributes were made salient using an interactive interface relative to a static interface. Pattison (2000) described shame as "often fueled by a degree of comparison with others or an ideal state" and "feelings of shame often goes along with feelings of powerlessness and inadequacy." Consumers with rather low levels of autotelic NFT are less inclined to extract and utilize the hedonic information through touch (Peck & Childers, 2003a) and tend to consider cognitive information (e.g., product packaging, advertising, recommendations of friends and family) more important (Citrin et al., 2003). Hence, consumers with low levels of autotelic NFT may consider themselves less able to make adequate inferences about the product's sensory intrinsic attributes and report feelings of shame toward the product in the presence of an interactive interface. However, such an explanation must remain exploratory pending further research.

Implications

The findings have several implications for retailers and designers who want to enhance consumers' emotional responses toward the product in an online context. First, the findings reveal that certain online design elements can be used to elicit favorable emotional responses toward the product and a positive product attitude. In the literature, emotional desires have been proposed to dominate functional motives in the choice of products (Hirschman & Holbrook, 1982). Interestingly, Desmet (2002) proposed desire as the emotional response toward a product that comes closest to a tendency to buy a product. In the present study, feelings of desire toward the product were affected by the way the product was presented in a mediated environment. In fact, in the static product presentation condition desire displayed the lowest mean of all positive emotional responses and was far less intense relative to the interactive condition. Frijda (1986) argued that the essence of desire is the "readiness to approach or bring about situations of satisfaction". According to Desmet (2002), in the case of products, this may very well implicate purchase. Therefore, feelings of desire toward the product, in particular, are very likely to be involved in the success of a product sold online. We are one of the first to show that feelings of desire can vary according to website design elements that appeal to the urge to touch the displayed product. This has significant implications for both designers and marketing managers alike. Every occasion that the consumer interacts with the product (indirectly and/or directly) may be used to create an emotional bond between consumers and their products.

Second, a large and growing body of literature has put forward that touch is undoubtedly a powerful tool for persuasion in a brick-and-mortar retailing context (e.g., Citrin et al., 2003; Grohmann et al., 2007; Peck & Wiggins, 2006). On the contrary, the number of non-touch media formats is still on the rise. Hence, for retailers it is important to gain insight in product display design in order to optimize the online tactile product

experience. Our findings reveal that the importance of tactile input varies across individuals and provides an important base for segmentation and targeting. Consumers who have a higher need for affective touch are especially responsive to the consequences of an interface using image interactivity to simulate stroking gestures. Traditionally, it has been argued that there is a negative relationship between the need for tactile input and the use of the internet for product purchase (Citrin et al., 2003). Fockedey (2014) even posited that, at the moment, consumers who are looking for a hedonic shopping experience are highly underserved by the online marketplace. However, the more attention designers and marketers devote to emphasizing the feelings and experience of the product ("tactile" webdesign), the more likely it is that consumers who have a higher need for affective touch (will) take part in online shopping. Marketers may specifically target high autotelic NFT consumers to maximize the value created through designing for tactile impressions of the product in the online store without diminishing responses from consumers with low levels of autotelic NFT. Online retailers should aim to advertise this new tactile experience to high autotelic NFT consumers and convince this group to adopt the Internet as a shopping channel. Hence the pool of online consumers has considerable potential for expansion. A more compelling sensory shopping experience may appeal to a group of consumers that have previously been often characterized as being easily deterred from purchasing products on the Internet, at least those products requiring high tactile cues (Citrin et al., 2003; Peck & Wiggins, 2006).

Limitations and Future Research

It should be noted that the present study is subjected to several limitations. First, this study was restricted to products that have salient tactile attributes (i.e., a clothing item). Further research should address whether the results hold for other, more utilitarian product categories. Second, we acknowledge that our sample further constrains the generalizability of the results, as it was limited to young female participants. Nevertheless, the choice for young female participants was deemed appropriate for the present investigation because young women place greater emphasis on the emotional and psychological experiences linked to shopping (Hasan, 2010). Whereas men in general prefer online shopping because of its functional benefits, women tend (yet) to prefer conventional shopping over online shopping because of the lack of emotional experiences in online shopping (Dittmar, Long, & Meek, 2004). This finding seems in line with the belief that women are more likely than men to base their judgments on sensory perceptions (Schifferstein, 2006). Generally, women tend to attach considerable importance to sensory modalities in product evaluations, while men are less aware of their sensory processes and tend to consider cognitive rather than emotional information more important (Citrin et al., 2003). For this reason, women were found more likely to be unconvinced or skeptical about online shopping (Dittmar et al., 2004). Therefore, retailers aiming to attract more female online consumers need to focus their efforts on fostering more affective feelings, for example, toward the product to appeal to its target audience. The present study reveals that sensory enjoyment of the product by using an interactive interface can enhance the extent to which women experience products emotionally. Whether the same applies for men remains to be addressed empirically.

Further, although image interactivity itself is not a novel technology, the way it is applied in our study might have surprised the participants, which might have translated into more positive and fewer negative emotional responses. However, our finding that the effects of an interface using image interactivity to simulate stroking gestures depend on the individual differences in autotelic NFT argues against this alternative interpretation. That is, individuals with low levels of autotelic NFT did not report more positive emotional responses toward the product when using an interactive interface rather than a static interface. From this result we infer that novelty did not play a dominant role because otherwise individuals with low levels of autotelic NFT would also have reported more favorable emotional responses toward the product in the interactive interface condition solely because of the innovative nature of the product presentation format. In addition, the fact that participants in the interactive condition reported more frequently that they actually had the sensation that they could hold, move their fingers across, and examine the texture of the depicted scarf adds to the argument that spontaneous tactile impressions of the product lie at the origin of the variances found in emotional responses toward the product. Nevertheless, future research should consider familiarity with the presentation format as a control factor.

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Appendix

Table A.1 Items and corresponding descriptives.

Measurement items	*Cronbach's α*	*Mean*	*SD*	*Range*
Perceived feelings of touch	.76			
When evaluating the scarf…				
1. I felt that I could examine the texture of the scarf.		5.00	1.48	1-7
2. I could imagine moving my fingers on the scarf.		4.33	1.81	1-7
3. I felt as if the scarf was in my hands.		3.47	1.70	1-7
4. I felt as though I could handle the scarf.		4.30	2.17	1-7
Attitude toward the product	.93			
1. I dislike the product / I like the product.		3.93	0.83	1-5
2. I feel negative toward the product / I feel positive toward the product.		3.81	0.88	1-5
3. The product is awful / the product is nice.		3.72	0.96	1-5
4. The product is unpleasant / the product is pleasant.		3.84	0.97	1-5
5. The product is unattractive / the product is attractive.		3.58	1.10	1-5
6. I disapprove of the product / I approve of the product.		4.05	0.87	1-5
Positive emotional responses toward the scarf	.86			
1. Pride		1.02	1.04	0-3
2. Desire		1.21	1.17	0-4
3. Joy		1.93	1.33	0-4
4. Fascination		2.47	1.28	0-4
5. Satisfaction		2.00	1.16	0-4
6. Hope		1.16	1.02	0-3
Negative emotional responses toward the scarf	.76			
1. Boredom		1.09	1.09	0-4
2. Disgust		0.58	1.07	0-4
3. Dissatisfaction		0.53	0.86	0-3
4. Fear		0.44	0.98	0-4
5. Sadness		0.07	0.34	0-2
6. Shame		0.35	0.75	0-3
Autotelic NFT	.89			
1. When walking through stores, I can't help touching all kinds of products.		5.74	1.22	3-7
2. Touching products can be fun.		5.56	1.20	3-7
3. When browsing in stores, it is important for me to handle all kinds of products.		6.02	.89	3-7
4. I like to touch products even if I have no intention of buying them.		5.40	1.51	1-7
5. When browsing in stores, I like to touch lots of products.		5.47	1.30	2-7
6. I found myself touching all kinds of products in stores.		5.72	1.22	2-7
Instrumental NFT	.81			
1. I place more trust in products that can be touched before purchase.		6.09	0.97	3-7
2. I feel more comfortable purchasing a product after physically examining it.		6.16	0.81	4-7
3. If I can't touch a product in the store, I am reluctant to purchase the product.		5.35	1.43	2-7
4. I feel more confident making a purchase after touching a product.		5.84	1.02	3-7
5. The only way to make sure a product is worth buying is to actually touch it.		4.79	1.63	1-7
6. There are many products that I would only buy if I could handle them before purchase.		5.40	1.43	2-7

Table B.1 Conditional effects of product presentation format.

Emotional response	*Autotelic NFT level*	*b*	*t*	*p*	*95% bias-corrected bootstrap confidence interval*
Desire	Low	0.078	0.125	0.901	- 1.175 to 1.330
	Medium	0.826	2.267	0.029	0.089 to 1.562
	High	1.573	3.198	0.003	0.578 to 2.569
Joy	Low	0.415	0.652	0.518	- 0.873 to 1.704
	Medium	1.293	3.449	0.001	0.535 to 2.051
	High	2.170	4.285	0.000	1.146 to 3.194
Fear	Low	0.509	0.935	0.356	- 0.592 to 1.610
	Medium	-0.262	-0.817	0.419	- 0.909 to 0.386
	High	-1.032	-2.386	0.022	- 1.907 to - 0.157
Disgust	Low	0.363	0.618	0.540	- 0.825 to 1.551
	Medium	-0.456	-1.319	0.195	- 1.155 to 0.243
	High	-1.274	-2.730	0.010	- 2.219 to - 0.330
Shame	Low	1.260	3.148	0.003	0.450 to 2.069
	Medium	0.576	2.448	0.019	0.100 to 1.052
	High	-0.107	-0.338	0.738	- 0.751 to 0.536
Attitude	Low	- 0.608	- 1.380	0.175	- 1.498 to 0.283
	Medium	0.140	0.540	0.592	- 0.384 to 0.664
	High	0.887	2.536	0.015	0.180 to 1.595

Note: NFT = need for touch, model 1 in PROCESS (Hayes, 2013), 5000 bootstrap samples.