



The creative touch: the influence of haptics on creativity

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Abstract

An increasing number of firms rely on consumers to develop new ideas for the marketplace. While many firms rely on online crowdsourcing communities, some have created facilities that encourage in-person ideation through which consumers can interact with product design materials. This research proposes that active touch engenders a positive effect on new product creativity and highlights the importance of touch during idea generation. We further suggest that interacting with an object via active touch increases positive mood, which enhances creative performance. Results from two studies provide support for these hypotheses. Study 1 demonstrates the positive effect of active touch on new product creativity. Study 2 replicates this effect in a different product development context and provides evidence that a positive mood mediates the active touch-creativity relationship.

Keywords Active touch · New product creativity · Mood · Innovation

1 Introduction

Creativity, the ability to produce novel ideas for the marketplace, is critical to organizational success (Zhou & Hoever, 2014). In both online and offline environments, companies engage employees and customers alike to gain insights, ideas, and solutions to fulfill the marketplace's needs and wants. This “crowdsourcing” enables companies to further build their creative capital, an arsenal of creative thinkers

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whose ideas can be harnessed to develop new and successful products, services, and ideas (Florida & Goodnight, 2005). In fact, many organizations proactively engage employees' and consumers' creativity through a variety of outlets. While many firms such as 3 M and Proctor & Gamble rely on online crowdsourcing communities, some have created facilities that encourage in-person ideation through which individuals—both consumers and employees—can interact with product design materials when brainstorming. Companies like Samsung, Sephora, Unilever, AT&T, Starbucks, Volkswagen, and even NASA hold in-person events and workshops in which consumers can develop creative ideas to be developed and brought to market. For example, at the Sephora Innovation Lab, employees can physically touch and interact with the products and materials that the company utilizes in the product lines as they generate new product ideas. While some companies have similar labs in-house, many hold in-person events (e.g., LEGO's Hackathons).

In-person ideation has always been more costly and challenging to implement than online crowdsourcing. And with restrictions and challenges related to COVID-19, companies maybe even more inclined to utilize online (vs. offline) product design crowdsourcing. As companies consider these shifts, one question arises: how does physical interaction with a product or design materials influence the creativity of new product ideas generated? Specifically, if consumers can explore the product with their hands, will they show more creative product designs or usage ideas? This is our focal research question.

The sense of touch is fundamental to everyday experience and provides an array of information, making it a useful and active perceptual system (Klatzky & Lederman, 2002). Thus, individuals often depend on haptic exploration when evaluating the things around them (Norman et al., 2004). Despite the importance of touch, however, creativity research largely ignores touch as an important sensory input, focusing more often on perceptions of sight (e.g., Dul et al., 2011; Mehta & Zhu, 2009) and sound (e.g., Mehta et al., 2012; Stokols et al., 2002). Rosa et al. (2014) examine how the richness of vision and touch inputs influences creativity; however, their study is limited because they define touch inputs as haptic information extracted via vision, overlooking the effect of physical touch.

The present research suggests that touch encourages individuals to interact with an object in a manner that improves new product creativity. In particular, we propose and demonstrate that active touch, having physical control over an object or objects that consumers intentionally explore and manipulate with their hands (Gibson, 1962), is conducive to improving new product creativity. We theorize that actively touching an object when developing creative new product ideas fosters a positive mood during the ideation process, consequently increasing outcome creativity. This research makes significant contributions to existing literature. It is among the first to theorize and demonstrate a previously underexplored effect: the positive impact of physical touch on creativity. By doing so, we add to the growing literature that considers various external factors that may aid in the creative process. Also, by providing evidence that touch facilitates new product creativity via positive mood, we further build a growing literature that finds that physical touch not only serves an

informational function but can also influence emotional responses and subsequent consumer behavior.

2 Theoretical background

2.1 Active touch enhances new product creativity through positive mood

Unlike other sensory experiences, touch is distinct because it requires physical contact to gather and perceive incoming information. Thus, tactile perception is inextricably linked to action: what we sense depends on whether and how we explore. Our research focuses on active touch, which is distinct from passive touch or being touched and consists of the intentional exploration of an object with the deliberate movement of a skin surface (Gibson, 1962). When engaging in active touch, individuals physically control an object—manipulating, squeezing, rubbing, and rotating it however they would like. We contend that active touch will lead to greater new product creativity by promoting a positive mood. Specifically, active touch enables individuals to experience an object in a more enjoyable manner than they might when experiencing the same object via their other senses (Klatzky et al., 1987; Peck, 2010). When touching relevant materials during a creative task, individuals are more likely to feel a greater sense of agency, which leads them to perceive the experience as fun and enjoyable (Csikszentmihalyi, 1990; Lambert, 2008). Broadly speaking, physical activity directed toward tangible outcomes activates particular regions of the brain that improve mood; this effect has been shown across many contexts, including those involving creativity (e.g., knitting and wood-working) (Lambert, 2008).

Creativity involves the ability to see connections in diverse elements that seem otherwise unrelated (Mednick, 1962). Those in a more (vs. less) positive mood are more likely to have richer associations with existing knowledge structures and consequently are likely to be more original and flexible in their thinking (Lyubomirsky et al., 2005). A number of studies have shown that a positive mood fosters creative problem solving across a broad range of settings (see Baas et al., 2008, for a review). For instance, a positive mood enhanced performance on problem-solving tasks (Fishbach & Labroo, 2007; Isen et al., 1987), increased the release of the neurotransmitter dopamine, a chemical that has been correlated with the development of novel ideas (Ashby et al., 1999) and increased individuals' willingness and ability to explore novel ideas (Isen, 1999). The positive mood has also been shown to increase analogical thinking, another measure of new product creativity (Dahl & Moreau, 2002; Jausovec, 1989; Lubart & Getz, 1997).

Given this prior research, we propose that active touch increases creativity and that this effect is driven by enhanced mood. We test the above hypotheses in two studies. The first study demonstrates that active touch (vs. no touch) increases new product creativity. Study 2 replicates this effect in a different product development context and provides evidence that a positive mood mediates the active touch – creativity relationship.

2.2 New product creativity

In marketing, creativity involves the development of new product ideas that differ from what already exists and can be effectively brought to market (Mehta & Zhu, 2016; Sellier & Dahl, 2011). Previous literature on new product creativity recognizes that creative products must reflect some level of practicality or appropriateness but stresses the importance of novelty in determining new product success (e.g., Cropley, 2006; Garfield et al., 2001). As such, we assess creativity through two orthogonal dimensions: novelty (i.e., originality and innovativeness) and appropriateness (i.e., effectiveness and practicality) (e.g., Burroughs et al., 2008; Herd and Mehta, 2019; Mehta et al., 2012, 2017). Consistent with this prior research, we expect that our independent variable increases the novelty of new product ideas but has no effect on idea appropriateness (Herd & Mehta, 2019; Lu et al., 2017; Mehta & Zhu, 2016; Moreau and Dahl, 2005; Sellier & Dahl, 2011). Specifically, we predict that while touch (vs. no touch) increases positive mood, which has been shown to increase individuals' ability to develop novel product ideas (Baas et al., 2008), individuals will be equally successful in developing appropriate ideas regardless of whether or not they engage in active touch. As such, we measure both dimensions in our studies but focus primarily on the novelty dimension of creativity in our predictions.

Furthermore, to enhance the robustness of our findings, we measure how active touch influences another established measure of creativity: analogical thinking. Analogical thinking captures individuals' ability to make connections between diverse concepts and is an essential underpinning in individuals' ability to generate new product ideas (Dahl & Moreau, 2002; Goel, 1997). When developing new product ideas, individuals first think about existent products and other information from memory and use that knowledge to generate a new idea (e.g., Dahl & Moreau, 2002; Finke et al., 1992). Such analogies can vary in their degree of conceptual distance such that when individuals are less creative, they focus on information that seems quite similar (i.e., near analogies); when individuals are more creative, they develop farther analogies, making connections that are less obvious (Dahl & Moreau, 2002; Gentner, 1989). Analogical thinking is thus fundamental to generating creative new product ideas and is often used as a tool by practitioners like IDEO when developing new products (Dahl & Moreau, 2002; Franke et al., 2014; Markman et al., 2009).

3 Study 1: the main effect of active touch on new product creativity

Study 1 examined the effect of active touch on new product creativity. In this study, we measured new product creativity in two ways. First, we measured outcome creativity (i.e., novelty and appropriateness) as assessed by a set of trained raters, all blind to condition (Amabile, 1982). Next, as analogical thinking during new product ideation has been used to measure creativity, we also captured individuals' analogical thinking when developing new product ideas (Dahl &

Moreau, 2002; Markman et al., 2009). We expect that touch will increase new product creativity, as both reflected in the novelty of generated ideas and in participants' analogical thinking during new product ideation.

3.1 Method

Ninety-four undergraduate students (45% female, $M_{\text{age}}=20$) at a US university participated in the study in exchange for course credit. Participants were randomly assigned to one of two conditions (active touch vs. no touch) in a between-participants design. Following prior research (Sellier & Dahl, 2011), all participants were given a selection of shapes provided as components and told to express their creativity to the best of their ability as they drew a design for a Christmas tree ornament. Participants were provided with the same components across conditions (see Web Appendix A), drawing paper, and a pen. In the active (no) touch condition, participants were told to touch (observe) the pieces as long as they wanted and to complete the new product creativity task (see Web Appendix B). Participants then engaged in the creativity task (see Web Appendix B).

3.2 Results and discussion

3.2.1 New product creativity—outcome evaluation

As noted earlier, when evaluating outcomes, creativity is typically captured with two orthogonal dimensions (Amabile, 1996). Hence, we captured both dimensions; we expected that active touch would enhance novelty and have no impact on appropriateness. Following previous research (Mehta & Zhu, 2016) and using Amabile's (1982) consensual assessment technique, 14 paid raters were recruited using Amazon's Mechanical Turk (64% female, $M_{\text{age}}=39$) and rated the novelty of the designs using the three 6-point scales (not at all original/very original; not at all innovative/very innovative; not at all novel/very novel; inter-rater $\alpha=0.85$; Moreau & Dahl, 2005; see Web Appendix C for details). Consistent with prior research, raters were blind to conditions, and the designs were presented in a randomized order. Supporting our prediction, a one-way ANOVA on novelty scores showed that novelty of the new product ideas was higher in the active touch than in the no-touch condition ($M_{\text{Touch}}=3.12$, $SD=0.86$, $M_{\text{No touch}}=2.71$, $SD=0.64$; $F(1, 92)=7.00$, $p=0.010$).

We recruited 12 paid raters using Amazon's Mechanical Turk (8% female, $M_{\text{age}}=30$) to rate the appropriateness of the designs using three 6-point scales (not at all useful/very useful; not at all practical/very practical; not at all effective/very effective; inter-rater $\alpha=0.71$; Moreau & Dahl, 2005; see Web Appendix C for details). As predicted, a one-way ANOVA on appropriateness scores demonstrated that participants created equally appropriate new product designs across the two conditions ($M_{\text{Touch}}=3.63$, $SD=0.49$, $M_{\text{No touch}}=3.70$, $SD=0.44$; $F(1, 92)=0.52$, $p=0.472$).

3.2.2 New product creativity—analogue thinking

Five trained research assistants with expertise in marketing and psychology (80% female, $M_{\text{age}}=24$) rated the degree of creativity reflected in participants' new product idea-related analogies. Using an established coding scheme, they indicated the degree to which the generated analogies reflected less versus more creativity ($M=2.32$; inter-rater $\alpha=0.87$; see Web Appendix C for details). For example, in the context of analogies generated during the Christmas ornament task, some participants presented a "near" analogy such as "snowflake" or a "far" analogy such as "bridge." Discovering far analogies requires a deeper level of cognitive exploration and more creativity (Dahl & Moreau, 2002; Gentner, 1989). Thus, near analogies indicate that participants may likely think of ornaments they have seen in the past, thereby suggesting low creativity. Conversely, far analogies indicate few obvious or common "surface-level" attributes between the two concepts, thus suggesting high creativity. Supporting our prediction, a one-way ANOVA on analogue thinking showed that creativity was significantly higher in the active touch than in the no-touch condition ($M_{\text{Touch}}=2.62$, $SD=1.45$, $M_{\text{No touch}}=2.05$, $SD=1.14$; $F(1, 92)=4.49$, $p=0.037$).

3.2.3 Discussion

The results in this study support our theorization and show that participants who actively touch objects generate more creative outcomes and engage in more creative analogue thinking than those who do not touch the objects.

4 Study 2: active touch drives creativity through mood

Study 2 extended our investigation in two important ways. First, we utilized a different new product creativity task, which was developed from a real crowdsourcing campaign (Malhotra et al., 2021), and we included a financial incentive. Also, we directly measured the positive mood that participants felt during the idea generation task and ruled out several alternative explanations. This study was preregistered at [aspredicted.org \(#79230\)](https://aspredicted.org/#79230).

4.1 Method

Two hundred and sixteen undergraduate students (46% female, $M_{\text{age}}=20$) at a US university participated in the study in exchange for course credit. In line with our preregistration, thirteen participants were excluded from the dataset as they failed the touch manipulation. Participants were randomly assigned to one of two conditions (active touch vs. no touch) in a between-participants design. All participants received a toothbrush and were told to develop a creative new travel toothbrush for busy college students, one that could actually be produced, and a marketing slogan for the new toothbrush. Furthermore, as financial incentives are often used in

real-world crowdsourcing and have been shown to influence creativity (Mehta et al., 2017), all participants were informed that participants with the top two ideas would be selected and receive a \$20 Amazon gift card. In the active (no) touch condition, participants were asked to touch and explore (look at) the toothbrush as much as they would like. Subsequently, they were asked to describe their idea within three minutes (see Web Appendix D). Unlike study 1, and following prior literature, we imposed time limits on the creativity task (e.g., Mehta & Zhu, 2009). We vary this across studies to ensure that our effect holds whether or not time constraints are imposed. Next, all participants reported their mood when generating the idea using two 7-point scales (“While generating my idea, I was...” 1 = very unhappy, 7 = very happy; “While generating my idea, I felt...” 1 = extremely negative, 7 = extremely positive; $r=0.89$; Kray et al., 2006) and answered questions regarding potential alternative processes (see Web Appendix F for details).

4.2 Results and discussion

4.2.1 Creativity

Four trained research assistants (50% female, $M_{\text{age}}=20$) rated the novelty levels of the ideas using three 6-point scales (not at all original/very original; not at all innovative/very innovative; not at all novel/very novel; inter-rater $\alpha=0.81$; Moreau & Dahl, 2005; see Web Appendix E for details). Consistent with prior research, raters were blind to conditions, and the ideas were presented in randomized order. Supporting our prediction, a one-way ANOVA on novelty scores showed that novelty was higher in the active touch than in the no-touch condition ($M_{\text{Touch}}=2.51$, $SD=1.31$, $M_{\text{No touch}}=2.12$, $SD=1.15$; $F(1, 201)=5.09$, $p=0.025$).

A different set of trained research assistants (50% female, $M_{\text{age}}=20$) rated appropriateness levels of the ideas using three 6-point scales (not at all useful/very useful; not at all practical/very practical; not at all effective/very effective; inter-rater $\alpha=0.67$; Moreau & Dahl, 2005; see Web Appendix E for details). As predicted, a one-way ANOVA on appropriateness scores demonstrated that participants across the two conditions created equally and highly appropriate ideas ($M_{\text{Touch}}=4.49$, $SD=0.67$, $M_{\text{No touch}}=4.47$, $SD=0.71$; $F(1, 201)=0.04$, $p=0.840$).

4.2.2 Mood

Supporting our prediction, a one-way ANOVA showed that during the idea generation task, participants in the active touch condition experienced more positive mood than those in the no touch condition ($M_{\text{Touch}}=5.05$, $SD=1.06$, $M_{\text{No touch}}=4.74$, $SD=1.06$; $F(1, 201)=4.44$, $p=0.036$).

4.2.3 Mediation analyses

We performed separate mediation analyses using the PROCESS model 4 (Hayes, 2022). First, we used touch (0=no touch, 1=active touch) as the independent variable, mood as the mediator, and novelty as the dependent variable. This procedure yielded a significant indirect effect of active touch on novelty through mood ($B=0.07$, $SE=0.04$, 95% $CI=0.0048$, 0.1784). Next, we performed the same analysis using appropriateness as the dependent variable. As predicted, the result indicated a nonsignificant indirect effect ($B=0.01$, $SE=0.01$, 95% $CI= -0.0237$, 0.0542).

4.2.4 Discussion

The results in this study support our theorization and show that participants who actively touch objects during the ideation process experience more positive moods than those who do not touch the objects and that this increase in mood leads to more creative new product ideas. In doing so, we rule out other potential alternative explanations (see Web Appendix F). Importantly, this study also includes an incentive for all participants and shows that this incentive does not impact the main effect of touch on mood.

5 General discussion

This research examined the effects of active touch on new product creativity. Our findings show that when individuals actively touched an object, they produced more creative ideas. We examined the underlying mechanism and found that active touch increased positive mood, facilitating creative thinking. Furthermore, touch increased the novelty of the new product ideas without impacting the appropriateness of the ideas.

Creativity plays a central role in an organization's success, particularly when the environment is unpredictable (Lu et al., 2017). In a recent survey conducted by McKinsey & Company with more than 200 firms, most executives reported that they expect COVID-19 to fundamentally change how they do business over the next 5 years (Am et al., 2020). Our findings are particularly relevant post-pandemic as companies look to seize innovation opportunities and grow their businesses in an uncertain environment (Reeves & Fuller, 2020). Although touch became taboo during the pandemic to prevent the community's spread of the virus, our research suggests that, when possible, organizations should take advantage of in-person ideation as it enhances creativity through physical touch.

Our research has a core message for managers: while gathering individuals' creative ideas online is convenient and efficient, such practices may not enable companies to best build and utilize their creative capital—whether it comes from employees or consumers. Thus, in order to gain more creative responses from individuals, firms need to let their employees and consumers explore and engage by actively touching an object. Our findings suggest that a lack of active touch during

the brainstorming process may dampen creativity. This insight is particularly meaningful as technology enables consumers to share ideas remotely via online message boards and communities where touch may be restricted (Bayus, 2013). Thus, while enabling touch may be more costly and complicated, it may be beneficial for firms that seek new product ideas from consumers. While many companies rely on online crowdsourcing, some companies like Verizon, Coca-Cola, and Volkswagen have created facilities that enable in-person ideation (Watson, 2015). If creating costly facilities is unrealistic or companies are unable to bring individuals to a physical location because of the pandemic, companies could send materials via mail and encourage individuals to touch and interact with these materials while they ideate. Alternatively, companies could perhaps encourage consumers to touch relevant objects they already own (e.g., suggesting consumers touch LEGO blocks when generating ideas for a new LEGO set). Additionally, the current research shows that active touch enables individuals to develop more creative (i.e., far vs. near) analogies. The ability to use analogical thinking is fundamental to generating creative ideas and is often central to innovators' success (Franke et al., 2014; Kittur et al., 2019). Given the importance of analogical thinking, our findings suggest that firms aiming to foster more original product ideas should encourage their employees to actively touch product materials to better utilize information from a more disparate knowledge base when developing new product ideas.

Our research offers important theoretical contributions to several literatures. First, we contribute to the creativity literature by showing how active touch influences consumers' ability to generate novel ideas. Our findings suggest that enabling active touch during the brainstorming process may enhance creativity. In doing so, we add to the growing literature that examines contextual factors that enhance new product creativity (e.g., Burroughs & Mick, 2004; Mehta & Zhu, 2009; Mehta et al., 2012; Moreau & Dahl, 2005). Second, by examining the mediating role of mood, this work explains the relationship between active touch and new product creativity. A number of studies have shown how touch influences consumers' emotional responses and subsequent consumer behavior (e.g., Chen et al., 2009; Peck & Wiggins, 2006). By showing that active touch fosters a positive mood during the new product development process and consequently leads to more creative new product ideas, our research identifies another important consumer context (i.e., new product development) that can leverage the positive emotions stemming from tactile experience. While our research highlights the positive effects of touch on mood, there may be other benefits of active touch, such as perceived ownership (Peck & Shu, 2009), which could be considered in future research. Future research may also examine how active touch compares to other positive mood manipulations (e.g., watching a funny video) to understand if any one has a greater impact on new product creativity. Additionally, future research could examine the effect of different types of touch (including non-active touch) on creativity. We expect that the focal effect occurs because consumers mindfully touch an object on which they then deliberate while brainstorming. Future research could consider boundary conditions such as how active touch is prompted (with more or less specific guidance) or the types of object, and how these moderate the effect of active touch on new product creativity.

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Data availability The data will not be deposited, but the authors are happy to share it upon request.

Code availability Not applicable.

Declarations

Conflict of interest The authors declare no competing interests.

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