HAO SHEN, MENG ZHANG, and ARADHNA KRISHNA*

People are able to order food using a variety of computer devices, such as desktops, laptops, and mobile phones. Even in restaurants, patrons can place orders on computer screens. Can the interface that consumers use affect their choice of food? The authors focus on the "direct-touch" aspect of touch interfaces, whereby users can touch the screen in an interactive manner. In a series of five studies, they show that a touch interface, such as that provided by an iPad, compared with a nontouch interface, such as that of a desktop computer with a mouse, facilitates the choice of an affect-laden alternative over a cognitively superior one—what the authors call the "direct-touch effect." The studies provide some mediational support that the direct-touch effect is driven by the enhanced mental simulation of product interaction with the more affective choice alternative on touch interfaces. The authors also test the moderator of this effect. Using multiple product pairs as stimuli, the authors obtain consistent results, which have rich theoretical and managerial implications.

Keywords: computer interfaces, mental simulation, sensory marketing, embodied cognition, food choice

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Computer Interfaces and the "Direct-Touch" Effect: Can iPads Increase the Choice of Hedonic Food?

The past few years have brought greater use of technology in the domain of food choice. When ordering food, consumers increasingly go online to the restaurant's website or use the restaurant's customized mobile application (app), if it has one. Pizza Hut, for example, has an online ordering website as well as a mobile app, so that consumers can place orders from virtually anywhere—for example, in their office on their desktop computer, in their car on their iPhone, or at home on their laptop or notebook. Similarly, the McDonald's app is designed to have an order ready for the customer to pick up by the time (s)he arrives at the restaurant. To reduce service staff and shorten the order-to-delivery time, many restaurants are now placing computerized touchscreen menus on the tables, and consumers can place their orders by touching pictures of their chosen foods. Restaurants that have implemented this technology include Chili's, Specialty's Café and Bakery, Applebee's, Uno Chicago Grill, Gordon Ramsay restaurants, and Sakae Sushi, to name a few.

As these examples show, food purchase decisions are now increasingly available on a variety of computer devices, from desktops to laptops to mobile devices. Can different computer interfaces lead to different food choices? Specifically, when consumers browse a pictorial menu online and can choose between a chocolate cake and a fruit salad either by touching the picture directly on an iPad or by using a mouse on a desktop, will the interface affect their choice? We focus on this question.

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We investigate the "direct-touch" aspect that many touch interfaces (e.g., iPad, iPhone, touchscreen in restaurants) provide, whereby consumers can directly touch the image of a product on the screen to indicate their choices. We examine whether and how such a touch response can influence consumer preferences and choices. We predict that interfaces that have direct touch (vs. those that do not) facilitate consumers' mental simulation of interacting with an affect-laden product (e.g., a chocolate cake) more than with a cognitively superior product (e.g., a fruit salad). This difference in "mental product interaction" then influences consumer choice in a way that favors the more affective option over the less affective one; that is, an interface with direct touch (vs. no direct touch) will result in a more affective choice. We call this phenomenon the "direct-touch" effect.

However, other explanations might also account for the proposed direct-touch effect. First, when consumers can directly touch what they want, this behavior is natural and may put people into an automatic mode in which they deliberate less and are more likely to choose the affective food (Shiv and Fedorikhin 1999). In contrast, choosing food by clicking a mouse seems less natural than pointing to food, which may put people into a more deliberative mode, such that their choices are more cognitively based (Shiv and Fedorikhin 1999). Note this explanation does not predict changes in mental simulation related to different interfaces. We call this the "amount-of-deliberation account."

Second, some inherent differences across interfaces could cause the direct-touch effect. For example, consumers may often use touch devices such as an iPad for fun but use a desktop computer for work. Therefore, those using an iPad might be more likely to choose the more affective food, consistent with the enjoyment goal activated by such devices.

In five studies, we find that making decisions on a touch interface (e.g., iPad) indeed results in consumers choosing more affective versus cognitively superior options when contrasted with decisions made on a nontouch interface (e.g., a desktop with a mouse). In two of these studies (Studies 2 and 5), we test whether mental product interaction mediates the direct-touch effect. We find support for this mediation. We also test a moderator of the direct-touch effect: the proximity of the choice button to the pictures of the choice products (Study 2).

We acknowledge that mediation provides correlational (and not causal) support and does not rule out the other explanations. As such, we also test for two additional explanations: the amount-of-deliberation account and the difference-in-interfaces account. First, if consumers spend more time deliberating when making a choice on a desktop than on an iPad, a cognitive load should increase the choice of the hedonic food on the desktop (more than on the iPad). As a result, the observed direct-touch effect should be mitigated. To test this assumption, in Study 3, we manipulated cognitive load. Our results do not support the amount-of-deliberation account. Second, to rule out the difference-in-interfaces account, we designed two studies: in Study 4, we included an iPad with a stylus; in Study 5, we used a touchscreen laptop attached to a mouse (i.e., the touch and nontouch modes coexisted on the same digital device). Neither study supported the difference-in-interfaces account. Taken together, the study results are more consistent with our mental simulation explanation than the amount-of-deliberation account or the difference-in-interfaces account. However, we acknowledge that we do not completely rule out these and other alternative explanations for the direct-touch effect.

In addition to shedding light on the effect of interfaces on consumer choice, our results also contribute to the scant literature on mental simulation and action affordance (Elder and Krishna 2012; Tucker and Ellis 1998) by showing how direct-touch interfaces can facilitate consumers' mental interaction with an affect-laden product and increase its choice share. Our research also adds to the increasing literature on choice between affective and cognitive options (Dhar and Wertenbroch 2000; Shiv and Fedorikhin 1999). In addition, our results have implications for health-conscious consumers, managers, and public policy officials.

The rest of the article is organized as follows. In the next section, we discuss prior literature and our conceptual framework. In the following section, we present our studies. We conclude with a discussion of our results and the implications of our findings.

PRIOR LITERATURE AND CONCEPTUAL FRAMEWORK

Three streams of literature are pertinent to our research: the effects of computer interfaces, embodied mental simulation, and affect versus cognition. We discuss these first and then build our conceptual framework.

Effects of Computer Interfaces on Consumer Response

Research on the effects of computer interfaces on human perceptions and reactions is recent and therefore scant. Such research has mainly been conducted in the field of human–computer interaction. For example, Kim et al. (2012) compare typing productivity and discomfort among participants using a virtual keyboard (touchscreen) and a conventional keyboard. The authors find lower productivity and higher discomfort (in the hand/wrist and neck/shoulders) with the virtual keyboard. Oviatt et al. (2012) investigate the effects of computer interfaces on human cognition such as idea generation. In one study, biology students had access to a digital writing implement with different means of input, including pen marking (using a stylus) and typing (using a keyboard). The results showed that these students expressed 56% more nonlinguistic representations (diagrams, symbols, and numbers) using pen marking, whereas they expressed 41% more linguistic content using keyboard typing. The active pen marking, in turn, was associated with more scientific ideation and improved problem solving.

In consumer behavior, a recent article by Brasel and Gips (2014) presents some initial exploration of the effect of computer interfaces on product evaluations. It builds on Peck and Shu's (2009) findings that merely touching an object can make consumers perceive ownership of it. Brasel and Gips show that touchscreen interfaces (compared with a mouse) can also increase the sense of psychological ownership of the products presented and magnify the endowment effect. Their work provides insight concerning the role of different computer interfaces in shaping consumer decisions.

In this research, we examine a new process by which different computer interfaces may influence consumer behavior. This process involves embodied mental simulation and action affordance.

Embodied Mental Simulation and Action Affordance

Mental simulation as a reenactment of perceptual experiences. The theory of grounded cognition suggests that our bodily states, actions, and even mental simulations are used to generate our cognitive activity (Barsalou 2008). Mental simulation is perhaps the most radical approach to grounded cognition and suggests that all mental acts are acts of modality-specific sensory stimulation (e.g., Barsalou 1999; Barsalou et al. 2003). In this approach, mental simulation is the reenactment of perceptual experiences and is a more automatic form of mental imagery initiated by exposure to representations of objects. For example, when a person eats a piece of cake, the brain registers the various sensory perceptions involved with that cake (e.g., how it appears visually, what its texture feels like when one cuts it, how it smells, what it feels like in the mouth, what it tastes like). When this person is later exposed to a picture of the cake, (s)he mentally simulates earlier perceptions associated with that cake, resulting in many of the same sensory regions being activated in the brain that were active during actual perception. Several neuroimaging studies corroborate this proposition (e.g., Rolls 2005; Simmons, Martin, and Barsalou 2005; Zatorre and Halpern 2005).

Mental simulation and action affordance. One important aspect of mental simulation is that it helps people prepare for actual motor responses; that is, it increases action readiness or action affordance (Jeannerod 2001). For example, Tucker and Ellis (1998) show that visual depiction of objects can have an effect on people's mental interaction with the objects. The participants in their studies were presented with pictures of common household objects (e.g., frying pan, teapot) oriented either to the left or to the right and were asked to push a button with their left or right hand to categorize these objects as upright or inverted. Because people would spontaneously simulate holding the handle of the object when they saw it (Ping, Dhillon, and Beilock 2009), their instinct would be to simulate doing so with their right hand when the object was oriented to the right. A better fit between the simulated action and the action required (pushing the button) would facilitate mental product interaction and thus increase action readiness (action affordance). In line with this hypothesis, the authors found that when an object was oriented to the right, responses using the right hand were faster than those using the left hand.

Whereas Tucker and Ellis (1998) consider the effect of product depiction on readiness in responses, consumer behavior researchers have focused on preference (e.g., liking, purchase intention) for the pictured object (Elder and Krishna 2012; Shen and Sengupta 2012). Elder and Krishna (2012) find that a match (vs. mismatch) between the visual depiction of a product (e.g., a fork shown on the left or right side of a piece of cake) and handedness (left or right) increases consumers' purchase intention for the product. Importantly, they show that greater mental simulation of interacting with the product depicted in the matched (vs. unmatched) condition drives the observed effects.

However, prior research on mental simulation has primarily examined how the visual representation of an object (e.g., its orientation toward the right or left side, its visually presented size; Tucker and Ellis 2001) can influence mental simulation and result in other downstream effects. Herein, we examine whether the direct-touch aspect some computer interfaces now offer can lead to greater mental interaction with some (more affective) products presented in pictures than with (less affective, though cognitively superior) others and thereby can influence consumer choices and preferences. Next, we discuss the properties of affective versus cognitive products.

Affective Versus Cognitive Influences on Choice

Prior research has proposed several dual-system models to capture two kinds of external influences on human behavior: one is affective in nature, and the other is cognitive in nature. Researchers have given these dual-system models various names, such as experiential versus rational (Epstein 1994), associative versus rule-based (Sloman 1996), affect versus cognition (Shiv and Fedorikhin 1999), desire versus willpower (Hoch and Loewenstein 1991), feeling-based versus reason-based (Pham 2004; Shafir, Simonson, and Tversky 1993), and hot versus cool (Metcalfe and Mischel 1999) systems.

Although differences exist in the conceptualizations of these dual systems, studies have reached consensus on some key properties. First, all the dual-system theories seem to suggest that decision making happens in one of two ways: relatively fast, automatic, and easy versus relatively slow, controlled, and effortful. The two modes of decision making are also referred to as System 1 and System 2 processing (Kahneman 2003). In System 1 processing, affective influences tend to be dominant. These affective influences are rapid and automatically triggered; when activated, they drive people to seek immediate gratification (Metcalfe and Mischel 1999; Mischel 1974). In System 2 processing, cognitive influences tend to be dominant. They are more controlled and elaborated on and, as such, are more associated with delayed gratification (Metcalfe and Mischel 1999).

Second, affective responses are closely related to sensory-motor programs and thus are often accompanied by immediate physiological responses and are action oriented. Cognitive responses, in contrast, are closely related to higher-order processing such as reasoning and thinking and are more abstract and knowledge oriented (Shiv and Fedorikhin 1999). Prior researchers working on the interplay between affect and cognition have suggested that when people view a hedonic, affect-laden stimulus, an urge to physically act on their desire for it emerges, so that it is more likely to involve *grabbing* the product than *choosing* one (Rook 1987). Indeed, researchers have used the extent of the physical urge to grab a hedonic product as a measure of the intensity of the hedonic nature of a product (Shiv and Fedorikhin 1999). However, the representation of a cognition-based, utilitarian product does not include such an impulse to grab the product. Thus, when exposed to two food items—one hedonic and the other utilitarian—people spontaneously tend to reach toward the hedonic food because of their impulse to reach for it and grab it. Only when people have time or the motivation to deliberate more on their choice do they consider the utilitarian option (Shiv and Fedorikhin 1999).

Conceptual Framework

In this article, we focus on similar binary food choices (in Studies 1–3) as those widely examined by prior researchers, whereby one food elicits a strong positive affect and the other has strong positive cognitive benefits. We examine whether the computer interface on which consumers choose food influences their choices.

When consumers use a touch interface, such as an iPad or iPhone, they indicate their purchase by using their fingers to touch the image of the product (i.e., direct touch). When consumers use a computer interface without a touchscreen, such as a desktop, they typically choose a product by using a mouse to click the image of the product they want (i.e., they touch the mouse and not the image of the product they want—they do not have direct touch). An iPad and a desktop computer provide examples of the two kinds of interfaces, respectively. When consumers reach out to touch an option with their fingers on an iPad, this motor response is similar to the action they would spontaneously simulate in their mind when seeing two products (one hedonic and one less so)—that is, reaching out to grab the hedonic food (Shiv and Fedorikhin 1999). The congruence between their mentally simulated action and their real response on the iPad should then facilitate mental product interaction (as in Tucker and Ellis 1998 and Elder and Krishna 2012) and lead to greater choice of the hedonic option.

We hypothesize the following:

H_1: Touch (vs. nontouch) computer interfaces result in more hedonic (vs. utilitarian) choices (i.e., the direct-touch effect).

H_2: Mental product interaction with the hedonic product mediates the direct-touch effect.

Level of Congruence Between Mental Simulation and Direct Touch: Distance of Choice Button from Product Image

Our process explanation argues that the congruence between the mental simulation of reaching out for the hedonic product and the response mode is what drives the direct-touch effect. Nontouch interface (e.g., desktop) versus touch interface (e.g., iPad) is one way this congruence may be achieved. To ensure that this congruence, and not other characteristics of the interface, is driving the direct-touch effect, we directly vary the level of congruence between mental simulation and the response mode, both on an iPad and on a desktop. We do so by changing the distance of the choice button from the picture of the object.

To elaborate, in online surveys, consumers typically indicate their choices by choosing symbols such as “A,” “B,” or “C,” or representative choice buttons. When a choice button on a touchscreen is close to the picture of the product, consumers are, in essence, reaching out for the product and grabbing it when they make their choice. In this case, because people typically use their fingers to touch the button on an iPad, as opposed to a mouse to click the button on a desktop, the former response is more congruent with the mental simulation of directly grabbing the hedonic product. This difference drives the direct-touch effect, as we have predicted. However, when a choice button on an iPad is far from the picture of the product, consumers’ fingers would move away from the product when they try to touch the button. In this case, even on a touchscreen, the consumers’ response (touching the choice button) becomes incongruent with the mental simulation of directly grabbing the product. Consequently, the direct-touch effect should be mitigated.

As such, we propose the following:

H_3: The direct-touch effect is more likely to occur if the choice button is presented close to (vs. far from) the product image.

Alternative Explanations

The amount-of-deliberation account. This account suggests that when people directly touch what they want to choose, this response mode is natural and similar to what consumers do in their daily lives, such as picking up food items in a supermarket, filling up a plate at a buffet, or pointing to dishes on a menu. As such, consumers may move into an automatic mode when their choice behavior on the computer mimics reality, such as when using an iPad. They will deliberate less, be more likely to rely on feelings, and thus be more inclined to choose the hedonic food (Shiv and Fedorikhin 1999).

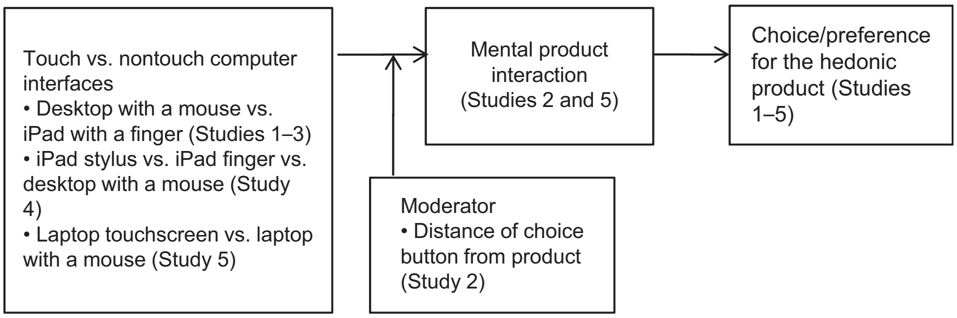
In contrast, nontouch devices require people to use other tools (e.g., a mouse) to choose the image of the food product. This action is less natural, and consumers may deliberate more when making such a choice. Consequently, they may rely more on cognition to make the decision and will be more likely to choose the utilitarian food on a desktop (Shiv and Fedorikhin 1999). Therefore, both sides of this amount-of-deliberation account support the proposed direct-touch effect.

Note that the amount-of-deliberation account is different from our mental simulation explanation in that it does not involve mental simulation of interacting with the depicted food. One way to examine this alternative explanation is to put people under a cognitive load to observe whether the direct-touch effect will be mitigated. If the amount-of-deliberation account is correct, a cognitive load should prevent people from deliberating on their decision, leading to an increase in hedonic food choice on a desktop. By contrast, because people deliberate less when choosing products on an iPad, imposing a cognitive load should have less of an influence on them.

Our mental simulation explanation, however, suggests that even when people do not think much about their food choice, they might still be more likely to spontaneously simulate interacting with the hedonic product when they see it on an iPad than when they see it on a desktop. Therefore, a cognitive load might not significantly mitigate the direct-touch effect.

The difference-in-interfaces account. Another alternative explanation for the direct-touch effect is that it is due to inherent differences between interfaces. For example, people might typically use an iPad for fun but use a desktop for work. This difference may result in iPads being considered more enjoyable than desktops, which could lead to choices on an iPad being more affect based than those on a desktop. Furthermore, people’s eyes might be closer to the screen when they use an iPad versus a desktop. If so, the pictures of the choice items on an iPad may be closer and more vivid, which benefits the hedonic (vs. utilitarian) product more because physical proximity and vividness of a tempting item intensify people’s affective responses toward it (Loewenstein 1996).

Figure 1
CONCEPTUAL FRAMEWORK



If this interface explanation is valid, food choices on an iPad should be similar when using a finger versus a stylus. By contrast, if our mental simulation account is correct, because direct touch (touching the product image with the hand) is more congruent with a finger, using a stylus to choose should be less likely to result in the direct-touch effect.

Similarly, if the same interface has a touch and a nontouch response mode (e.g., a touchscreen laptop with a mouse), choices should be similar between the two response modes due to the difference-in-interfaces explanation; however, they should be disparate with our mental simulation explanation.

OVERVIEW OF STUDIES

We summarize our conceptual framework in Figure 1. We conducted five studies to test the direct-touch effect, our proposed mental simulation explanation for why it occurs, alternative explanations, and a moderator of the effect. Similar to prior work on binary choice (e.g., Dhar and Wertenbroch 2000; Shiv and Fedorikhin 1999), in Studies 1–4, participants were exposed to a pair of products, one hedonic and one utilitarian, and were asked to make a choice. Three of these studies had participants choose between relatively healthy and relatively unhealthy foods. To lend greater credibility to our results, in Study 4, the choice was between a food and a nonfood item. In Studies 1–3, the touch interface was operationalized through an iPad, and the nontouch interface through a desktop with a mouse. In Study 4, we also included an iPad with a stylus. In Study 5, rather than using a binary-choice context, we presented participants with either the image of a hedonic food or that of a utilitarian food and asked them to report their preference for the given food.

Because we are interested in choice differences elicited by touch versus nontouch interfaces, the location of choice items on the screen does not matter (as long as the location is invariant across interfaces). Nonetheless, for generalizability, in three studies (Studies 1, 3, and 4), we presented the pair of products horizontally on the screen (the hedonic option was on the left in Studies 1 and 4 and on the right in Study 3). In Study 2, we presented the two products vertically on the screen and counterbalanced whether they were in the upper or the lower position on the screen.

STUDY 1: THE DIRECT-TOUCH EFFECT

Study 1 tests our basic prediction of the direct-touch effect: that consumers will be more likely to choose a hedonic food over a utilitarian one when they make their choice on a touch versus a nontouch interface (H_1). For the choice items, we chose a food pair similar to that used by Shiv and Fedorikhin (1999). Shiv and Fedorikhin used chocolate cake and fruit salad, whereas we used cheesecake and fruit salad. Thus, the study had a one-way, between-subjects design with interface at two levels: touch (iPad) and nontouch (desktop with a mouse).

Method

Eighty-five undergraduate students from a large university in Hong Kong participated in this study for extra course credit. On arrival, participants were assigned to finish the study using either an iPad (N = 40) or a desktop computer (N = 45). The study was conducted online and was described as a pretest for what reward to give people for participating in future studies.

Under this guise, participants were exposed to a pair of food pictures on the computer screen—a piece of cheesecake and a bowl of fruit salad (see Figure 2)—and were asked to choose one.[1] These two products were pretested to be affectively superior (enjoyable/tempting) and cognitively superior (better for health/more benefits), respectively (seven-point scales; *p*s < .001) (for details of the pretests for all studies, see the Web Appendix).

Results

Participants’ choices were consistent with H_1, such that participants were more likely to choose the cheesecake over the fruit salad when they made their choice on the iPad (95%)

[1]As Figure 2 shows, participants made a product choice by touching or clicking a button. In Studies 1–4, the choice button was placed very close to the picture (except in one condition in Study 2 in which we explicitly tested for the effect of a distant button). Because buttons could interact in a variety of ways with product pictures (and might not be seen in some pictures), we did not place the button inside the picture. Nonetheless, to touch the button, participants would reach out toward the product picture; when they touched the button, part of their finger touched the picture as well. Our tests are thus a bit conservative, because a choice button is not directly in the center of the product picture.

Figure 2
STIMULI USED IN STUDY 1

versus the desktop (73%; $\chi^2 = 7.23$, $p < .01$). Table 1 summarizes results of all studies.

STUDY 2: DISTANCE OF CHOICE BUTTON FROM PRODUCT IMAGE

In this study, we test H_3, our proposal that suggests that it is the congruence between the evoked mental simulation and the response mode that drives the direct-touch effect rather than the computer interface. If this hypothesis is correct, varying the distance between the choice button and the product picture (i.e., changing the level of congruency) should influence the direct-touch effect.

Specifically, in one condition, the product picture and its representative choice button were located close together, whereas in a second condition, they were not. We predicted that the direct-touch effect would be stronger in the close (vs. distant) condition. We also measured participants' mental product interaction to directly examine its mediating role in the direct-touch effect when the buttons were close together (H_2).

Method

The study had a 2 (distance of choice button from picture: close vs. distant) × 2 (interface: touch [iPad] vs. nontouch [desktop]) between-subjects design. Two hundred twenty-eight

Table 1
SUMMARY OF RESULTS

Studies	*Dependent Variables*	*Moderator*	*iPad (Finger)*	*Desktop (Mouse)*	*iPad (Stylus)*	*Laptop*
Study 1	Choice of the hedonic product		95%	73%		
Study 2	Choice of the hedonic product	Close	83%	66%		
		Distant	63%	73%		
	Relative preference for the hedonic product	Close	1.35 (1.61)	.67 (1.97)		
		Distant	.59 (2.00)	.79 (1.71)		
	Mental product interaction for the hedonic product	Close (hot chocolate)	4.96 (1.45)	4.48 (1.63)		
		Distant (hot chocolate)	4.08 (1.86)	4.48 (1.69)		
	Mental product interaction for the utilitarian product	Close (red tea)	3.12 (1.37)	3.58 (1.58)		
		Distant (red tea)	3.80 (1.78)	3.47 (1.51)		
Study 3	Choice of the hedonic product	Low cognitive load	53%	36%		
		High cognitive load	59%	38%		
Study 4	Choice of the hedonic product		80%	62%	58%	
Study 5	Intention to buy the hedonic product	Response mode (finger)				3.82 (1.52)
		Response mode (mouse)				3.14 (1.58)
	Intention to buy the utilitarian product	Response mode (finger)				3.40 (1.54)
		Response mode (mouse)				3.56 (1.41)
	Mental product interaction for the hedonic product	Response mode (finger)				3.29 (1.42)
		Response mode (mouse)				2.60 (1.34)
	Mental product interaction for the utilitarian product	Response mode (finger)				2.71 (1.25)
		Response mode (mouse)				2.88 (1.33)

Notes: Standard deviations are in parentheses.

Figure 3
STIMULI USED IN STUDY 2

Hong Kong undergraduate students participated for a payment of approximately US$1.30.

As Figure 3 shows, participants were presented with the pictures of two products—namely, a cup of hot chocolate and a cup of red tea—and were asked to choose between them. Pretests showed that hot chocolate was affectively superior (enjoyable/tempting) and that red tea was cognitively superior (better for health/more benefits) in the product pair (seven-point scales; ps < .001). The two products were positioned vertically, so that one was in the upper position and the other in the lower position of the screen. We counterbalanced the relative location of the two products. Location had neither a main effect nor an impact on the direct-touch effect; thus, we do not consider it further (ps > .30).

All participants chose their favored drink using its representative choice button. After they made the choice, we also measured their relative preference for the two drinks (−3 = “definitely prefer red tea,” and +3 = “definitely prefer hot chocolate”) and the extent of their mental product interaction with each drink. Specifically, participants were asked to indicate their agreement with two statements: (1) “I imagined myself enjoying this drink,” and (2) “I imagined myself grabbing this drink.” Both questions were assessed on seven-point scales (1 = “disagree,” and 7 = “agree”) and were measured separately for hot chocolate and for red tea (hot chocolate: r = .71; red tea: r = .75). The average of the two items for hot chocolate and for red tea yields a mental product interaction score for hot chocolate and another score for red tea. The difference between these two scores (hot chocolate − red tea) served as participants’ relative mental product interaction.

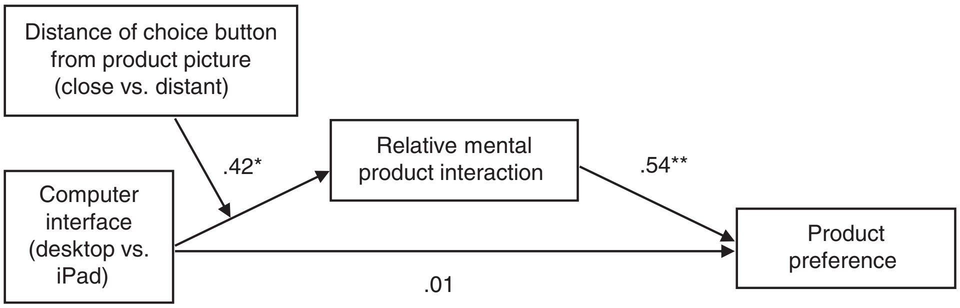
Results

Twenty-one of the 228 participants were excluded for either giving inconsistent answers (e.g., choosing hot chocolate but preferring red tea) or failing to answer all the questions. Thus, we used 207 remaining data points.

Choice and preference. A logistic regression with the button’s distance from the picture, the interface, and their interaction as independent variables and choice as the dependent variable revealed no main effects (ps > .30) but a significant interaction (Wald $\chi^2 = 4.64$, $p = .03$). In the close condition, in which the choice button was presented near the picture of the drink, participants were more likely to choose hot chocolate if they made their choice on an iPad (83%) versus a desktop (66%; $\chi^2 = 4.17$, $p < .05$). This finding replicates the direct-touch effect and supports H_1. By contrast, the difference in choice shares between the two interfaces was not significant in the distant condition when the choice button was farther away from the picture (63% vs. 73%; $\chi^2 = 1.04$, $p > .30$). Thus, H_3 is supported.

The results from the 2 × 2 analysis of variance (ANOVA) for participants’ relative preference for the two drinks were similar to the results for choice. Specifically, we observed no main effects (ps > .20), but we did observe a marginal interaction effect ($F(1, 203) = 2.92$, $p < .10$, $\eta_p^2 = .01$). As we predicted, in the close-button condition, participants preferred

Figure 4
MODERATED MEDIATION ANALYSIS IN STUDY 2



*$p < .05$.
**$p < .01$.
Notes: Numbers indicate significance.

hot chocolate more when they worked on an iPad versus a desktop (M = 1.35 vs. M = .67; $F(1, 203) = 3.71$, $p = .06$, $\eta_p^2 = .02$). This difference was not significant in the distant-button condition (M = .59 vs. M = .79, n.s.), again in support of H_3.

Relative mental product interaction. We performed a 2 × 2 ANOVA between the button's distance from the picture and the interface on participants' relative mental product interaction (for hot chocolate over red tea). We observed a main effect of distance such that participants reported greater relative mental product interaction in the close-button condition (M = 1.34) than in the distant-button condition (M = .65; $F(1, 203) = 3.79$, $p = .05$, $\eta_p^2 = .02$). More importantly, we also observed a significant interaction ($F(1, 203) = 5.08$, $p < .05$, $\eta_p^2 = .03$) in the predicted direction. In the close-button condition, participants reported marginally significantly greater relative mental product interaction (for hot chocolate over red tea) when they used an iPad (M = 1.84) compared with a desktop (M = .90; $F(1, 203) = 3.45$, $p = .06$, $\eta_p^2 = .02$). The difference in the distant-button condition was not significant ($M_{iPad} = .28$, $M_{desktop} = 1.01$; $F(1, 203) = 1.82$, $p > .15$).

Note that in the distant-button condition, the direction of the differences, though not significant, seems to be the opposite of what we would expect for choice, preference, and relative mental product interaction. When participants needed to indicate their choice on a touch interface, and the choice button was far from the product picture, the response mode (of touching) might have impeded their mental product interaction for the hedonic product more than for the utilitarian product. This process might then have influenced their preference and choice. This pattern of results is worthy of further research.

Moderated mediation analysis. We then tested H_3 using the moderated mediation model (Hayes 2013; Preacher, Rucker, and Hayes 2007). We used interface as the independent variable, the button's distance from the product picture as the moderator, relative mental product interaction as the mediator, and product preference as the dependent variable. As Figure 4 shows, the button's distance and the interface had a significant interaction on relative mental product interaction (b = .42, t = 2.25, $p < .05$). The first stage of the mediation model (interface → mental product interaction) was moderated. When we controlled for the interaction between interface and distance, relative mental product interaction had a significant effect on preference (relative mental product interaction → preference; b = .54, t = 18.43, $p < .001$). When we controlled for relative mental product interaction, the direct effect of the interaction between interface and distance on preference was no longer significant (b = .01, t < 1, $p > .80$). Finally, a 95% bias-corrected bootstrap (based on 5,000 samples) confidence interval (CI) revealed that the indirect effect of the interaction between interface and distance on preference through relative mental product interaction was significant (point estimate = .22, 95% CI = [.03, .42]). More specifically, the indirect effect of interface on preference through relative mental product interaction was significant only when the buttons were located close to the food pictures (point estimate = .53, 95% CI = [.03, 1.05]), but not in the condition in which the buttons were far from the food pictures (point estimate = −.39, 95% CI = [−93, .23]), thus supporting our hypothesis that mental product interaction mediates the direct-touch effect (H_2).

Discussion

Study 2 provides further evidence for our predictions. The results show that the direct-touch effect is more likely to be observed when greater congruence exists between the spontaneous mental simulation of reaching out for the hedonic product and the response mode of touching it. Therefore, the direct-touch effect could be "turned on" or "turned off" by making the choice button close to or distant from the product picture, respectively. Furthermore, we show that relative mental product interaction mediates the direct-touch effect. By directly manipulating the level of congruence on interfaces, we also demonstrate that the results obtained in Study 1 are not due to other possible differences between interfaces but are attributable to the proposed differences in congruence.

Although the results of this study are consistent with our proposed conceptualization, the distant-button condition might be unfamiliar or distracting, which may have contributed to some of the differences. In addition, the size of the screen might matter. If the touch interface were an iPhone, which has a smaller screen size, would the differences between the close- and distant-button conditions be mitigated, suggesting that the iPhone would drive more hedonic choices in both conditions? This would be a worthwhile question for further research to explore.

STUDY 3: THE EFFECT OF COGNITIVE LOAD

Study 3 aims to test the alternative amount-of-deliberation account, which predicts that, when choosing food, consumers deliberate less on an iPad versus a desktop. In this study, we manipulated participants to be under a high or low cognitive load when making a food choice. If the direct-touch effect is due to a different amount of deliberation on touch versus nontouch interfaces, the effect should become mitigated with a high cognitive load because participants using both desktops and iPads should be more likely to choose the hedonic option. Our proposed mental simulation account does not predict an effect of cognitive load on the direct-touch effect.

Method

The study used a 2 (cognitive load: low vs. high) × 2 (interface: touch [iPad] vs. nontouch [desktop]) between-subjects design. One hundred twenty-four undergraduate students from a large university in Hong Kong participated in the study for a payment of approximately US$1.30.

Participants finished this study using either an iPad or a desktop computer. Participants were told we were interested in their memory ability. On this pretext, we gave them a number and told them they would need to recall that number after a filler task. We asked participants in the low cognitive load condition to memorize a 2-digit number (12) and asked those in the high cognitive load condition to memorize a 12-digit number (382910527186). Prior research has widely used similar procedures to manipulate cognitive load (Gilbert et al. 1988; Gilbert, Giesler, and Morris 1995; Shiv and Fedorikhin 1999; Swann et al. 1990). We then asked the participants to finish a filler task in which they viewed pictures of two foods (along a horizontal dimension)—namely, a bowl of blueberries and a cupcake—and were asked to choose between them. A pretest revealed that the cupcake was judged to be affectively superior (more tasty), whereas the blueberries were judged to be cognitively superior (more healthy) (seven-point scales; *p*s $< .05$). After participants made their choices, we asked them to recall the number given to them to memorize. Finally, we asked them to indicate how difficult the memory task was on a two-item, seven-point scale (1 = “not difficult at all, I exerted little effort on it,” and 7 = “very difficult, I exerted a lot of effort on it”; correlation of the two items: r = .77, $p < .001$).

Results

Manipulation check. As we expected, participants indicated the memory task to be more difficult if they were asked to memorize a 12-digit number (M = 4.14) versus a 2-digit number (M = 1.71; $F(1, 120) = 124.32$, $p < .001$, $\eta_p^2 = .52$).

Choice. A logistic regression analysis with cognitive load, interface, and their interaction as independent variables and choice as the dependent variable revealed only a main effect ($\chi^2 = 4.77$, $p < .05$), but no interaction ($p > .80$). In particular, participants were more likely to choose the cupcake if they made the choice on an iPad (56%) versus a desktop (37%; $\chi^2 = 4.77$, $p < .05$). We obtained this (direct-touch) effect regardless of whether participants were under a low cognitive load (53% vs. 36%) or a high cognitive load (59% vs. 38%). The main effect of cognitive load was small and nonsignificant ($p > .80$). These results suggest that the direct-touch effect may not be due to the different amount of deliberation made on these interfaces.

Discussion

This study tested the amount-of-deliberation account. The results showed that cognitive load did not have any significant influence on the observed direct-touch effect. Thus, the results do not support this alternative account. Rather, they are more consistent with our mental simulation explanation, which suggests that even when people do not think much about their food choice, they may still be more likely to spontaneously simulate interacting with the hedonic product when they see it on an iPad rather than a desktop. Therefore, cognitive load may not significantly influence the direct-touch effect. In Study 5 as well, we provide evidence that people will (more readily) mentally simulate interacting with the hedonic food on the touch device, even when they are not deliberating (at all) on food choice.

Another aspect of this study worth discussing is that, consistent with our load manipulation, participants reported the high cognitive load task as being moderately difficult (M = 4.14 out of 7), and significantly more so than memorizing the two-digit number (M = 1.71; $F(1, 120) = 124.32$, $p < .001$). Furthermore, in both high-load and low-load conditions, the difficulty score was not correlated with the likelihood of choosing the cupcake (r = .01, $p > .90$ in both conditions). Again, these results do not seem consistent with the amount-of-deliberation account. However, we need to acknowledge that we cannot draw any definite conclusion from the null effect of cognitive load.

STUDY 4: USING A STYLUS VERSUS A FINGER TO TOUCH

Study 4 has three objectives. First, we want to further examine whether the effects observed in Studies 1–3 are due to the hypothesized process or to other confounding features of interfaces. The results of Study 2 have provided the initial evidence that different interfaces, per se, cannot account for the observed effects. In Study 4, we again rule out the alternative explanation based on inherent differences between touch versus nontouch interfaces. This study has three conditions: desktop, iPad with a finger (direct touch), and iPad with a stylus (nondirect touch).

Second, the iPad stylus condition provides more evidence for our predicted mechanism of increased mental product interaction (action affordance). When consumers use a stylus to make decisions on an iPad, their actual motor behavior does not fit with their natural tendency to reach toward the hedonic option (i.e., they typically use their hand to directly reach for and grab the hedonic option they want). Therefore, the predicted direct-touch effect should be mitigated.

Third, this study extends the domain beyond food choice. Participants in this study chose between a food (ice cream) and a nonfood item (USB flash drive).

Method

One hundred thirty-two undergraduate students from a large university in Hong Kong participated in the study, which contained three conditions. In the desktop condition, participants were asked to use a mouse to make their choice on a desktop. In the iPad finger condition, they were asked to make their choice using their fingers to touch an iPad. In the iPad stylus condition, they were asked to make their choice using an iPad stylus.

Similar to the setting of Study 1, participants were asked to choose between a bowl of ice cream and an 8GB USB flash drive as the reward for people who participate in future studies. They were informed that both options had a value of approximately $10 (which was true in the city where the study was conducted). A pretest revealed that the ice cream was judged to be affectively superior (more tempting/more positive feelings), whereas the USB was judged to be cognitively superior (more useful/more benefits), respectively (seven-point scales; *p*s < .001).

Results and Discussion

Participants made different choices in the three conditions ($\chi^2 = 4.77$, $p = .09$). The differences in choice between the desktop and iPad stylus conditions were small and not significant (62% vs. 58%, $p > .60$), so we combined these two non–direct touch conditions and compared them with the iPad finger (direct-touch) condition. As we predicted, participants were significantly more likely to choose the ice cream over the USB drive in the iPad finger condition (80%), as compared with the pooled non–direct touch conditions (60%; $\chi^2 = 4.54$, $p < .05$). These results, together with the findings of Study 2, provide converging evidence that the observed direct-touch effect is not an artifact attributable to differences between iPads and desktops. Instead, it is indeed related to whether direct touch is the response mode.

STUDY 5: A LAPTOP WITH TWO RESPONSE MODES

Study 5 differs from the prior studies in two important respects. First, all participants used the same laptop, which had a touchscreen and a mouse. Participants used one of two response modes to indicate their reactions toward a product: their finger to touch its picture on the screen, or the mouse to click on the picture. Such a study setting minimizes any differences between different computer interfaces. Second, in Studies 1–4, we asked participants to make a binary choice between a hedonic and a utilitarian option. In this study, participants were randomly assigned to seeing either a hedonic food (cheesecake) or a utilitarian food (fruit salad). We predicted that on seeing the picture of the hedonic food, when the response mode was to use their fingers to "directly touch," participants would spontaneously simulate the action of reaching for and grabbing it. They might be less likely to do so when the response mode was to use a mouse to click on it or when seeing the picture of the utilitarian food. As such, we expected an interaction effect of response mode (finger, mouse) and food type (cheesecake, fruit salad) on purchase intention driven by the level of mental product interaction generated by response mode.

Method

We recruited 202 undergraduate students at a large university in Hong Kong to participate in this study for a payment of approximately US$1.30. Participants were scheduled one at a time, and all participants completed the task on the same laptop, which had a touchscreen as well as an attached mouse, thus allowing participants to either directly touch the screen or click the mouse.

The study used a 2 (food type: cheesecake vs. fruit salad) × 2 (response mode: direct touch vs. mouse) between-subjects design. On arrival, participants were told that we were interested in their memory ability and would show them several pictures that they would be tested on later. Then, they were shown four pictures, one at a time (a stapler, a mug, a ball, and a bag), and were asked to memorize them. They were then told that they would complete a memory test for those pictures and received instructions for the test. The instructions we gave participants depended on the experimental condition. We told half the participants that if they had seen a picture in the memory test earlier (i.e., one of the four pictures), they should use their finger to touch it; if not, they should use the mouse to click it. We told the other half of the participants the opposite: if they had seen a picture earlier, they should use the mouse to click it; if not, they should use their finger to touch it.

Participants then viewed some practice examples to ensure that they understood the instructions and got used to the procedure. In the practice, they viewed three pictures, one at a time (a bag, a clock, and a stapler). Note that the bag and the stapler were among the four pictures they had seen earlier, whereas the clock was not. Participants gave their response to each picture using either the mouse or their finger.

After these practice examples, participants completed the real memory task, in which they saw four pictures (one at a time). The first three pictures were of a lamp, a mug, and a ball; the fourth picture was the target food image, which varied according to experimental condition (either a cheesecake or a fruit salad—the same as the stimuli used in Study 1). Note that the mug and the ball were among the four pictures participants were asked to memorize, whereas the lamp and the food picture were not. Participants again gave their response to each picture using the mouse or their finger.

After participants finished the memory task, we told them they needed to wait for the experimenter to assess their performance on the memory task. During that period, we asked them to complete a filler task in which they answered some questions about the food picture they had seen. These questions measured their intention to buy the food depicted in the picture along a scale from 1 ("not at all") to 7 ("very much"). We also measured their extent of mental product interaction with statements similar to those used in Study 2—specifically, (1) "I imagined myself enjoying this food," and (2) "I imagined myself grabbing this food." The students responded to the two statements using seven-point scales (1 = "disagree," and 7 = "agree").

Note that we postulated that exposure to hedonic food would lead people to mentally simulate reaching for and grabbing it. Thus, when the response mode was to touch the cheesecake image, participants' mental product interaction should have been facilitated. However, when the response mode was to use the mouse to click the cheesecake picture, which was inconsistent with participants' natural tendency to directly reach for and grab the cheesecake and thus with their spontaneously activated mental simulation of reaching for it, their mental product interaction should not have been enhanced. The difference in the level of mental product interaction should, in turn, have influenced participants' intention to buy the cheesecake (H_2). However, this effect of response mode should not be significant for the fruit salad condition, because participants would not be as likely to spontaneously simulate the action of reaching for and grabbing it. As such, we expected an interaction effect of response mode and food type both for mental product interaction and for purchase intention.

One might wonder why we used a memory task (i.e., whether the picture was shown before) in which participants either touched or clicked the food image but did not ask the participants to indicate whether they liked/disliked the food by touching or clicking the food image. We used our approach because the latter approach would be highly correlated with the key dependent variable (i.e., intention to buy the food), pushing the result in favor of the direct-touch effect. We deliberately made the task unrelated to the dependent variables measured later. The design of this study thus provides a more conservative test of our prediction; that is, when people can directly touch the food pictures (even when they are not asked to make a choice), a hedonic food picture may change people’s mental simulation of reaching for it and, consequently, their intention to have the food.

After they completed this filler task, we informed participants whether they had completed the memory test correctly (all of them had done so except for those who did not follow the instructions or did not complete the task). At the end of the experiment, the experimenter also recorded the cases in which each participant failed to follow the instructions or to complete the task during the study. Nine of 202 participants failed to complete the task or did not follow instructions, so we excluded them from further analysis. We analyzed 193 valid responses.

Results

Intention to buy the food. As we predicted, a 2 × 2 ANOVA with food type, response mode, and their interaction as independent variables and intention to buy as the dependent variable revealed no significant main effects (ps > .20) but showed a marginally significant interaction ($F(1, 189) = 3.61$, $p = .06$, $\eta_p^2 = .02$). In particular, when participants were exposed to the cheesecake picture, they had a higher intention to buy it if they used their finger to touch it ($M = 3.82$) than if they used a mouse to click on it ($M = 3.14$; $F(1, 189) = 5.04$, $p < .05$, $\eta_p^2 = .03$). We observed no significant difference when participants were exposed to the fruit salad picture ($M = 3.40$ vs. $M = 3.56$; $F < 1$).

Mental product interaction. The results of mental product interaction were similar to those of intention to buy. The 2 × 2 ANOVA on mental product interaction showed no significant main effects (ps > .15) but revealed a significant interaction ($F(1, 189) = 4.96$, $p < .05$, $\eta_p^2 = .03$). In particular, when participants were exposed to the cheesecake picture, they reported a greater mental product interaction if their response mode was to use their finger to touch it ($M = 3.29$) compared with using the mouse to click on it ($M = 2.60$; $F(1, 189) = 6.79$, $p < .01$, $\eta_p^2 = .04$). However, when they were exposed to the fruit salad picture, the difference was not significant ($M = 2.71$ vs. $M = 2.88$; $F < 1$).

Moderated mediation analysis. We predicted that mental product interaction would mediate the effect of response mode on the intention to buy the cheesecake but not the fruit salad. To examine this possibility, we conducted mediation analysis using the moderated mediation model (Hayes 2013; Preacher, Rucker, and Hayes 2007). We found that the interaction between food type and response mode influenced mental product interaction ($b = .22$, $t = 2.23$, $p < .05$). In addition, mental product interaction had a significant effect on intention to buy the food ($b = .62$, $t = 9.13$, $p < .001$). When we included it as a covariate in a regression predicting intention to buy the food, the effect of mental product interaction was significant ($b = .61$, $t = 8.87$, $p < .001$), but the interaction between response mode and food type was no longer significant ($b = .08$, $t < 1$, $p > .30$). Finally, 95% bias-corrected bootstrap (based on 5,000 samples) CIs revealed that the indirect effect of the interaction between food type and response mode on intention to buy the food through mental product interaction was significant (point estimate = .13, 95% CI = [.02, .26]). More specifically, the indirect effect of response mode on intention to buy the food through mental product interaction was significant only when participants were exposed to the picture of cheesecake (point estimate = .40, 95% CI = [.08, .79]), but not when they were exposed to the picture of fruit salad (point estimate = −.10, 95% CI = [−.43, .24]).

Discussion

In Study 5, we found direct evidence that people indeed generated greater mental product interaction for the hedonic food when their response mode was direct touch versus not. Moreover, mental product interaction mediated the effect of response mode on intention to buy the hedonic food. Note that we found these results in a between-food-type setting, rather than in a binary-choice context. In addition, this study used the same interface with two kinds of response modes, further showing that we cannot attribute the predicted effects to interfaces.

The results of Study 5 cannot be due to the difference-in-interfaces account, because all participants in this study used the same laptop. Moreover, the amount-of-deliberation account cannot explain our results. To elaborate, in this study, participants’ goal was not to judge whether they wanted to buy the food but to identify whether they had seen the picture before. Therefore, whether they felt naturally inclined to interact with the picture of food should not have affected the level of deliberation in their choice of food. Indeed, because the focal task was the memory task and the choice task was a filler task, participants might have focused on only whether they had seen the picture before and given little deliberation to their choice of food. Therefore, the amount of deliberation cannot account for the results of this study.

GENERAL DISCUSSION

In the past few years, consumers have increasingly been ordering food on restaurants’ websites by using their desktops, laptops, and mobile phones—a gamut of devices and computer interfaces. Restaurants now also have touchscreen menus, encouraging consumers to place their own orders, thereby reducing service costs.

Will the advent of such changes in ordering affect what consumers choose? Our research provides one possible answer for why this effect may have happened—namely, that direct touch increases the choice of hedonic options. Specifically, we propose that the interfaces that offer touchscreen ordering (vs. not) facilitate consumers’ mental simulation of interacting with the objects, increase action affordance (reaching out and grabbing the object), and shift choice toward an affect-laden product (e.g., a chocolate cake) versus a cognitively superior one (e.g., a fruit salad). We tested our proposed direct-touch effect in a series of five studies.

In Study 1, participants used either the touch or nontouch interface to choose between two items that were pictorially presented on the screen. This initial study demonstrates our basic effect (H_1). Study 2 then showed the moderator of this effect. Specifically, Study 2's findings suggest that the effect is less likely when the choice button is farther from (vs. closer to) the product picture (H_3). Study 2 also shows that mental product interaction with the products mediates the direct-touch effect. In Study 3, we tested the alternative explanation that people deliberate to different extents when making food choices on an iPad versus a desktop. Our results show that the direct-touch effect is independent of cognitive load. As such, the results do not support the amount-of-deliberation account. In Study 4, we introduced a new condition in which participants used a stylus to touch the iPad (giving us three computer interface conditions). The findings reveal that we did not obtain the direct-touch effect when participants used a stylus rather than a finger to indicate their decisions on a touch interface. In Study 5, we again show that touching a hedonic product (vs. clicking it with a mouse) on a laptop results in greater mental product interaction and subsequently higher purchase intention. Study 5 also demonstrates that the mere act of reaching toward and touching the choice button (for a purpose unrelated to food choice) can increase mental product interaction and, thus, purchase intention. All five studies support our hypotheses.

Some differences might exist between the two interfaces that might drive our effect (e.g., distance from the screen, the purpose of using the interface). We tried to rule out the differences between computer interfaces as an alternative explanation in two other studies. In Study 4, we introduced an iPad with a stylus as a third computer interface. A comparison of the iPad finger and iPad stylus conditions controls for factors that vary between interfaces (e.g., distance from the screen, whether the interface is used for fun or for work). In Study 5, we compared responses on the same touchscreen laptop—those with a finger touch and those with a mouse click—again controlling for such factors.

One might still argue that our effect may be related to the ease and familiarity associated with using different interfaces. That is, people might believe that making a choice on an iPad is easier than on a desktop. To test this assumption, we conducted a posttest ($N = 20$) in which we asked participants what their reactions would be to the respective interfaces when using either an iPad or a desktop computer to make a product choice. Specifically, we asked participants to indicate on a seven-point scale (−3 = "definitely iPad," and +3 = "definitely desktop"; $\alpha = .96$) which interface was (1) easier to use, (2) more familiar to use, and (3) more comfortable to use. The difference between the two interfaces was small and not significant ($M = -.04$, which is not significantly different from zero, $p > .90$).

Theoretical Contributions

Our research contributes to three areas of research. First, we add to the small but increasing literature on mental simulation and action affordance by showing that, similar to visual orientation, direct touch might be another factor that enhances mental simulation and object affordance, and that this aspect has important downstream consequences on consumer choice. Second, our research extends the stream of work on sensory marketing, in particular, on the effect of touch on consumer behavior. For example, previous research has found that touch can increase affective response toward an object and as well as impulsive buying behavior (Peck and Childers 2006; Peck and Wiggins 2006). The results from our five studies are consistent with these findings and have gone a step further to show that simply asking consumers to consider touching the hedonic food image might be sufficient to increase their mental simulation of grabbing the food and increasing its choice share. Third, we add to the vast literature on the factors that influence consumers' choice between a hedonic and a utilitarian product (Dhar and Wertenbroch 2000; Hoch and Loewenstein 1991; Shiv and Fedorikhin 1999).

Managerial Implications

Our findings have important marketing and public policy implications. Because our studies suggest that touch interfaces encourage more hedonic choices at the expense of more utilitarian ones, marketers or public policy officials, depending on what alternative they are trying to encourage the consumer to choose, may want to use different computer interfaces for consumer choice.

If computer interfaces can influence food choices, consumers and public policy officials should be aware of this effect. Restaurants will increasingly be using computer interfaces, because an online presence, apps, and touchscreen menus increase efficiency and have become the business trend. However, consumers and public policy officials can adopt some simple strategies to facilitate the choice of healthy food. For example, restaurants can be encouraged to provide a stylus for consumers to use; alternatively, when ordering food online, consumers may choose to use a desktop or to bring a stylus on the go.

Our research has implications for preference measurement. Marketers often use online surveys to solicit consumers' opinions about their products. We suggest that consumers might report their preference for hedonic foods differently when the survey is conducted on touchscreen devices versus nontouch devices. Although we are not sure which devices better reflect consumers' "true" preferences, surveys conducted on touch devices might show a higher preference for hedonic foods compared with surveys conducted on nontouch devices. Marketers should pay attention to this possibility when collecting data using online surveys.

Our research also provides implications for food choices made by different forms of preference expression. A recent article by Klesse, Levav, and Goukens (2015) examines the effect of different preference-expression modalities (i.e., oral vs. manual) on food choice. It shows that compared with manual preference expression (e.g., pressing a button on a vending machine), ordering food orally makes people focus more on emotions (rather than cognitions) and makes them more likely to choose unhealthy food. Whereas Klesse, Levav, and Goukens examine consumer choice in the context of vending machines and restaurants, our research compares choices made on different computer interfaces. We find that different response modes (directly touching the image of an option vs. using a mouse to click the option) can affect food choice. Future studies could compare the phenomenon of ordering food by phone call (i.e., orally) with that of ordering food online using an iPad. It would be useful to examine which mode of ordering food leads to a greater preference for the hedonic option.

Future research should also examine the direct-touch effect in an offline shopping environment; for example, it could investigate whether serving oneself from an array of foods facilitates the choice of hedonic food compared with receiving food from a server. We speculate that different factors might need to be considered. For example, although seeing a hedonic food might trigger the urge to grab it, serving oneself might involve multiple steps (e.g., walking toward the option, reaching out a hand to take it, putting the item in the shopping basket). Therefore, taking food oneself might give people more time for deliberation, decreasing the likelihood of choosing the hedonic food. Investigating when and how the direct-touch effect emerges in the offline shopping context would be a fruitful research avenue.

Limitations and Future Research

First, although our data seem to provide some support for our proposed mental simulation account and less support for the two alternative explanations we considered (amount of deliberation and difference in interfaces), we cannot claim to have completely ruled out those explanations. As we mentioned in Study 3, we could not draw a definite conclusion from the null effect of cognitive load. Future studies could further examine these alternative explanations.

Second, although we have collected a compelling set of evidence to support the mental simulation account, we acknowledge the limitations of such evidence. First, we used standard mediation tests to examine the underlying mechanism. Scholars should use caution in making any causal interpretation through mediation tests. For example, in Studies 2 and 5, we measured the mediator after the choice. Participants might have inferred their mental simulation from the choice (or preference) they had just reported. In addition, an endogeneity bias might exist if other unobserved variables affect both mental simulation and choice in the same direction (Bullock, Green, and Ha 2010), leading to correlation between the error terms of the mediator and dependent variable. Second, we used the self-reports to measure participants’ mental simulation of product interaction. Because of the spontaneous nature of people’s mentally simulated tendency to grab the hedonic food, self-reports might not be an ideal way to capture the process. Further research should explore some ways to measure this process more directly. For example, researchers could ask consumers to describe anything associated with a bowl of ice cream after they directly touch the picture or use the mouse to click it. Those who have touched the picture might be more likely to generate descriptions related to consuming the food (e.g., the taste, the smell, the motivation to eat). Future studies could examine this possibility.

Nonetheless, we hope our results have evoked an interest in the effect of computer interfaces on consumer choice. We also hope that future studies further explore the direct-touch effect. Although our five studies suggest that it is quite robust, it could be tested further with different products and in different contexts.

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