

Research note

The influence of tactile input on the evaluation of retail product offerings

Bianca Grohmann^{a,*}, Eric R. Spangenberg^{b,1}, David E. Sprott^{b,2}

^a John Molson School of Business, Concordia University, 1455 de Maisonneuve Blvd. W., Montreal, Quebec H3G 1M8, Canada

^b College of Business, Washington State University, Pullman, WA 99164-4730, United States

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Abstract

Retailers can benefit from allowing customers to touch their products. The influence of tactile input on evaluation, however, remains undemonstrated in the literature. In four experiments, effects of tactile input were observed for product categories wherein tactile input was diagnostic, and depended on product quality. While this effect was moderated by individual differences in need for touch when there was no opportunity for multiple product comparisons, there was no support for a mediating role of affect. Implications for retailing theory and practice are discussed.

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When evaluating a retailers' product offering, consumers often substantially weight information obtained through tactile input (e.g., Holbrook 1983). Only recently, however, has research directly addressed the effects of tactile input with findings indicating that consumers differ with regard to their need to use touch during product evaluation (Peck and Childers 2003a) and that the opportunity to touch products affects choice in offline versus online retail environments (McCabe and Nowlis 2003). Further, the availability of tactile input has been shown to affect consumers' confidence in their evaluations, while disallowing touching of products results in high levels of frustration among consumers who rely on touch (Peck and Childers 2003b). Although this literature informs retailers that touch matters, existing research has not demonstrated that tactile input actually influences product evaluation. Further, research has not elucidated the theoretical mechanism(s) underlying observed effects of touch. While it has been suggested that the effects of tactile input are due to

the information extracted through touch (McCabe and Nowlis 2003; Peck and Childers 2003b), other viable explanations such as affective responses to touch have not been explored. The primary objective of this article is to examine the effects of tactile input on product evaluation. We also provide theoretical discussion regarding why such effects may occur and implications of these findings for retail practice.

How touching a retailer's product influences evaluation

Recent research shows that tactile input can play a role in product evaluation (Peck and Childers 2003b) and decision making (McCabe and Nowlis 2003). Consumers prefer to select products from retailers who allow their products to be touched (McCabe and Nowlis 2003), especially products for which tactile input is important for evaluation (e.g., clothing, portable electronics). More generally touch can be considered a form of approach behavior. Mehrabian (1981) noted that approach behavior can induce liking, preference, and a more positive attitude. Heslin and Alper (1983) proposed that "touching does, indeed, cause liking" (p. 63). Overall, the literature suggests that tactile input (vs. lack of tactile input) leads to positive consumer responses for any product of an

* Corresponding author. Tel.: +1 514 848 2424x4845.

E-mail addresses: bgrohmann@jmsb.concordia.ca (B. Grohmann), ers@wsu.edu (E.R. Spangenberg), dsprott@wsu.edu (D.E. Sprott).

¹ Tel.: +1 509 335 3596.

² Tel.: +1 509 335 6896.

acceptable quality level (i.e., we would not expect to see such a positive effect for products of extremely poor quality).

Tactile input is also essential in the evaluation of a product's substance properties, such as roughness, hardness, temperature and weight (Klatzky et al. 1991), because it provides unique information that cannot be obtained through visual inspection (Lindauer et al. 1986). Tactile input is thus of particular importance in the evaluation of retail offerings (e.g., textiles, cell phones) where substance properties are salient characteristics. For such products, tactile input is diagnostic (i.e., predictive of substance properties relevant to product performance). Extant literature suggests that allowing consumers to acquire diagnostic tactile information has predominantly positive effects on consumer responses by increasing confidence in product evaluations and decreasing frustration for consumers motivated to touch (Peck and Childers 2003b). This proposed relationship between tactile input and confidence is reexamined here to provide additional evidence relevant to the diagnostic value explanation.

H1. For products wherein tactile input is diagnostic, tactile input (vs. lack of tactile input) results in (a) more positive product evaluations, and (b) greater perceived accuracy and confidence in product evaluations.

Tactile input can also play a role in consumers' perception of product quality, such that touching of a product during evaluation can be an efficient means for consumers to assess intrinsic cues (attributes that are part of the physical product itself; Wheatley et al. 1981). Several studies (e.g., Sprott and Shimp 2004; Wheatley et al. 1981) have supported that intrinsic cues have a greater impact on quality perceptions than extrinsic cues (e.g., price, brand name) if they are more diagnostic in nature. Particularly relevant is Pincus and Waters' (1975) finding that a low-priced pen was perceived higher in quality when it was unpackaged and intrinsic cues were available than when placed in a package making intrinsic cues inaccessible. Although untested, a viable explanation for these effects is that more information is available to consumers who touch a product, resulting in more positive evaluations. If such a process exists, it is likely moderated by the nature of the product itself.

For products for which tactile input is diagnostic (i.e., predictive of substance properties relevant to product performance), touch enables consumers to make more accurate judgments and to discriminate between varying levels of product quality (i.e., the product's performance on substance properties). When consumers are unable to touch retailers' offerings, however, it is more difficult for them to discriminate between products of varying quality, especially when tactile input is important for evaluation. Consumers are thus forced to make inferences regarding a product's performance on relevant substance characteristics. Missing information is often replaced by an average value, or based on perceived covariation with known product information (Levin et al. 1984), and resulting evaluations are inaccurate. If the lack of tactile input

impedes the acquisition of diagnostic information regarding substance properties related to product quality, product evaluations in this setting should vary little across product quality levels. Thus, product evaluations are not only affected by tactile input, but also by the quality of the product in terms of substance properties.

H2. Tactile input leads to more favorable (unfavorable) evaluations for high (low) quality products for which tactile input is diagnostic.

Alternately, affective reactions to tactile input are plausible mediators for the tactile input–product evaluation relationship (Holbrook 1983; Peck and Childers 2003a). Affective reactions consist of pleasure and arousal – two situational mediators in the stimulus–organism–response (SOR) framework of consumer responses (e.g., Baker et al. 1992; Donovan and Rossiter 1982). It is expected that the basic tenets of Mehrabian and Russell's (1974) SOR model also apply to tactile input in a retail context: a stimulus (product via visual or visual/tactile input) evokes affective reactions (e.g., pleasure, arousal), which in turn impact consumer responses (product evaluations). While affective mediation is a viable explanation for the effect of tactile input on product evaluation, it has not been tested.

H3. The effect of tactile input on evaluations is mediated by affective responses.

Although touch matters to consumers during product evaluation, questions remain as to the nature of the effect and its theoretical underpinnings. In a series of experiments, we consider two explanations: affective mediation and diagnostic value. While these arise from separate streams of literature, we allow for the possibility that consumers are affected by both processes.

Experiment 1

In Experiment 1, we examine the impact of tactile input on evaluations (H1a) and explore two contexts wherein tactile input is not accessible: one where the product is physically present during evaluation, but consumers are not allowed to touch it, the other where the product is not present, but is pictured on the Internet. Although extant research has compared consumer choice of products in online and offline environments (McCabe and Nowlis 2003), our study is the first to investigate the effect of physical versus virtual product presentation on product evaluations.

Method

In a one-factor (touch, no touch, Internet) between-participants design, replicated across three products presented in rotated order (ballpoint pen, fleece headband, flashlight key chain), undergraduate students ($N = 260$; 55.1

percent male) participated at individual tables or computer stations where they could work simultaneously, but not observe others. The experimental products were selected to ensure variability in the haptic nature of the items. Written instructions asked participants to touch, not touch, or use images displayed on the computer screen during product evaluation. (Instructions used in all experiments and product descriptions used in Experiments 1 and 2 are available from the authors upon request.) In all conditions, participants were provided with identical written product information, either on the web page accompanying the product's picture (Internet condition), or an information board placed next to the product (touch, no touch conditions). Product evaluation was measured with a four-item, nine-point semantic differential scale of object evaluation (bad/good, undesirable/desirable; worthless/worthwhile, useless/useful; Barone et al. 1997; Cronbach's $\alpha = .89$).

Results

In a repeated measures ANOVA, treatment condition had an overall significant effect on product evaluations ($F_{2,257} = 15.08$; $p = .00$; partial $\eta^2 = .08$): Table 1 shows mean evaluations for all products. Evaluations in the touch conditions were more favorable than in the no touch condition for the ballpoint pen ($p < .05$), but not the flashlight key chain ($p < .06$) or the fleece headband ($p < .41$). A significant difference between product evaluations in the touch and Internet conditions emerged for all products ($ps < .01$). Thus, H1a was partially supported.

Discussion

Experiment 1 indicates that products are evaluated more favorably by consumers using their sense of touch (as compared to those who could not touch the products) during evaluation. While this difference was significant for the pen, it was not significant for the headband. Visual examination of the headband may have sufficiently captured its texture and softness. This deviates from McCabe and Nowlis's (2003) findings regarding choice with and without touching real products. Product evaluations are more positive for products

that are physically present (yet cannot be touched) than for products presented via the Internet. This difference was significant for the headband for which substance properties dominate, while it was only directional for the pen and key chain. The latter result replicates McCabe and Nowlis' (2003) findings. This pattern of effects was consistent for all the experimental products and suggests that both tactile and visual cues positively affected evaluations. The next experiment extends these findings by examining the effect of tactile input on confidence and accuracy in evaluations (H1b), and potential mechanisms underlying this effect: diagnostic value (H2) and affective mediation (H3).

Experiment 2

Pretests

Pretest 1: product selection

Because touching is of variable importance to consumers (McCabe and Nowlis 2003), a pretest was conducted to select products for which touch is likely to be critical across people. Undergraduate students ($N = 25$; 60.0 percent female) were asked to list product categories for which tactile input is important and unimportant in their evaluation processes. Categories for which touch is clearly important included (in descending frequency): clothing, shoes, fruits/vegetables, cars, books, furniture, bed linens, bread, blankets, pillows, bath towels, carpeting, toilet paper, and magazines. Categories for which touch is not important included: soda pop, detergent, shampoo, toothpaste, milk, pens/pencils, cereal, CDs, soap, and socks. After eliminating gender-specific product categories and those that could not be easily evaluated in the lab, we chose pillowcases and washcloths.

Pretest 2: quality determination

Undergraduate students ($N = 122$; 53.3 percent male) rank ordered (according to perceived quality) seven pillowcases and seven washcloths after touching samples. Quality levels for the experiment were selected on the basis of significant

Table 1
Experiment 1: mean evaluations^a, mean differences and effect sizes

Product	Internet, $n = 95$	No touch, $n = 83$	Touch, $n = 82$	Comparison	t -value ^b	p -value ^c	Effect size
Ballpoint pen	5.91 (1.64)	6.17 (1.36)	6.68 (1.29)	Touch/internet	$t_{175} = 3.54$	$p = .001$	$r = .26$
				Touch/no touch	$t_{163} = 2.23$	$p = .040$	$r = .17$
				No touch/internet	$t_{176} = 1.24$	$p = .324$	$r = .09$
Headband	6.20 (1.59)	6.87 (1.51)	7.13 (1.43)	Touch/internet	$t_{175} = 4.10$	$p = .000$	$r = .30$
				Touch/no touch	$t_{163} = 1.10$	$p = .406$	$r = .09$
				No touch/internet	$t_{176} = 2.97$	$p = .005$	$r = .21$
Key chain	5.86 (1.54)	6.11 (1.58)	6.53 (1.66)	Touch/internet	$t_{175} = 3.22$	$p = .002$	$r = .24$
				Touch/no touch	$t_{163} = 2.08$	$p = .057$	$r = .16$
				No touch/internet	$t_{176} = 1.07$	$p = .427$	$r = .08$

^a Mean evaluations are based on average scores on the object evaluation scale (Barone et al. 1997), standard deviations in parentheses.

^b t -tests for difference in mean evaluations, i.e., averaged score on object evaluation scale (Barone et al. 1997).

^c Bonferroni adjustment for multiple comparisons, one-sided tests.

differences in these quality rankings, paralleling objective quality differences (e.g., thread count). Fabric of the pillowcases, for example, was 400 thread count in the high quality condition and 220 thread count in the low quality condition. For both categories, stimuli were the same color.

Method

Experiment 2 employed a 2 (touch, no touch) \times 2 (low quality, high quality) between-participants design, replicated with two products (pillowcase, washcloth). Randomly assigned undergraduates ($N = 270$; 49.8 percent female) par-

ticipated in groups of up to eight persons, working on the task individually. Participants evaluated a filler product (alkaline battery), a pillowcase, and a washcloth; the latter two varied by quality in terms of substance properties. Products were placed on information display boards containing six pieces of information. For example, washcloth information included: fictitious brand name Spa BasicsTM; 100 percent cotton; machine wash and dry; made in USA; oversized and standard towels available; sapphire blue, sage, beige, and chocolate. Display boards differed only in that boards in the touch condition included the statement “Please feel free to touch the sample during evaluation;” those in the no touch condition

Table 2
Experiments 2 and 3: mean evaluations^a

Product	Quality	Touch	Mean	SD	<i>n</i>		
Experiment 2							
Pillow case	High quality	Touch	7.07	1.45	62		
		No touch	6.56	1.53	72		
		Total	6.80	1.51	134		
	Low quality	Touch	6.71	1.37	64		
		No touch	6.70	1.48	71		
		Total	6.70	1.42	135		
	Total	Touch	6.89	1.41	126		
		No touch	6.63	1.50	143		
		Total	6.75	1.46	269		
Washcloth	High quality	Touch	7.51	1.18	62		
		No touch	6.78	1.57	72		
		Total	7.12	1.44	134		
	Low quality	Touch	6.93	1.33	64		
		No touch	6.75	1.51	71		
		Total	6.84	1.43	135		
	Total	Touch	7.22	1.29	126		
		No touch	6.77	1.53	143		
		Total	6.98	1.44	269		
Experiment 3							
Quality	Touch	NFT	Mean	SD	<i>n</i>		
			High quality	Low	6.68	1.33	30
			High	7.21	1.04	40	
		Total	6.98	1.19	70		
		No touch	Low	6.75	1.12	16	
			High	6.09	1.75	14	
			Total	6.44	1.46	30	
		Total	Low	6.70	1.25	46	
			High	6.92	1.34	54	
	Total		6.82	1.29	100		
	Low quality	Touch	Low	6.39	1.71	40	
			High	6.32	.94	27	
			Total	6.36	1.18	67	
		No touch	Low	6.08	1.61	15	
			High	6.60	1.05	14	
Total			6.33	1.39	29		
Total	Low	6.31	1.55	55			
	High	6.41	1.15	41			
	Total	6.35	1.37	96			

^a Mean evaluations are based on average scores of Barone et al. (1997).

stated “Please do not touch the sample during evaluation.” Observation insured that participants followed directions.

Participants rated products one at a time on four evaluative items (Barone et al. 1997; $\alpha = .90$). They also indicated confidence in (“not at all confident/very confident”) and perceived accuracy of (“not at all accurate/very accurate”) their evaluations. Correlations between product evaluation and perceived accuracy ($r = .38$), product evaluation and confidence ($r = .32$), and accuracy and confidence ($r = .85$) were significant (all $ps < .05$). Affective reactions were assessed with twelve items measuring pleasure and arousal (Mehrabian and Russell 1974; Cronbach’s $\alpha = .93$ and $.88$, respectively). All measures employed nine-point scales.

Results

A mixed 2 (touch) \times 2 (quality) \times 2 (product) MANOVA with product evaluation, perceived accuracy and confidence in evaluation

serving as the dependent variables showed a significant multivariate main effect for touch ($F_{3,263} = 4.89, p < .01, \text{partial } \eta^2 = .05$).

Product evaluation

At the univariate level, there was a significant main effect of touch ($F_{1,265} = 5.19, p < .05; \text{partial } \eta^2 = .02$), such that evaluations were more favorable in the touch condition than in the no touch condition, thereby supporting H1a. No main effect of product quality emerged ($p > .19$). The touch \times quality level interaction was not significant at $F_{1,265} = 2.84, p = .09$ (partial $\eta^2 = .01$). Planned contrasts were conducted following Winer’s (1971) suggestion that regardless of the significance of an overall F -test, planned contrasts should be directly tested. Follow-up contrasts indicated that touch had no influence on evaluations in the low quality condition for the pillowcase ($t_{134} = .05, p = .99; r = .00$) and the washcloth ($t_{133} = .81, p = .47; r = .07$). There was partial support for the diagnostic explanation (H2): evaluations in the high quality condition were influenced by tactile input for the pillowcase ($t_{132} = 2.29, p < .05; r = .19$) and washcloth ($t_{132} = 3.02, p < .001; r = .27$). Table 2 and Fig. 1 show these effects.

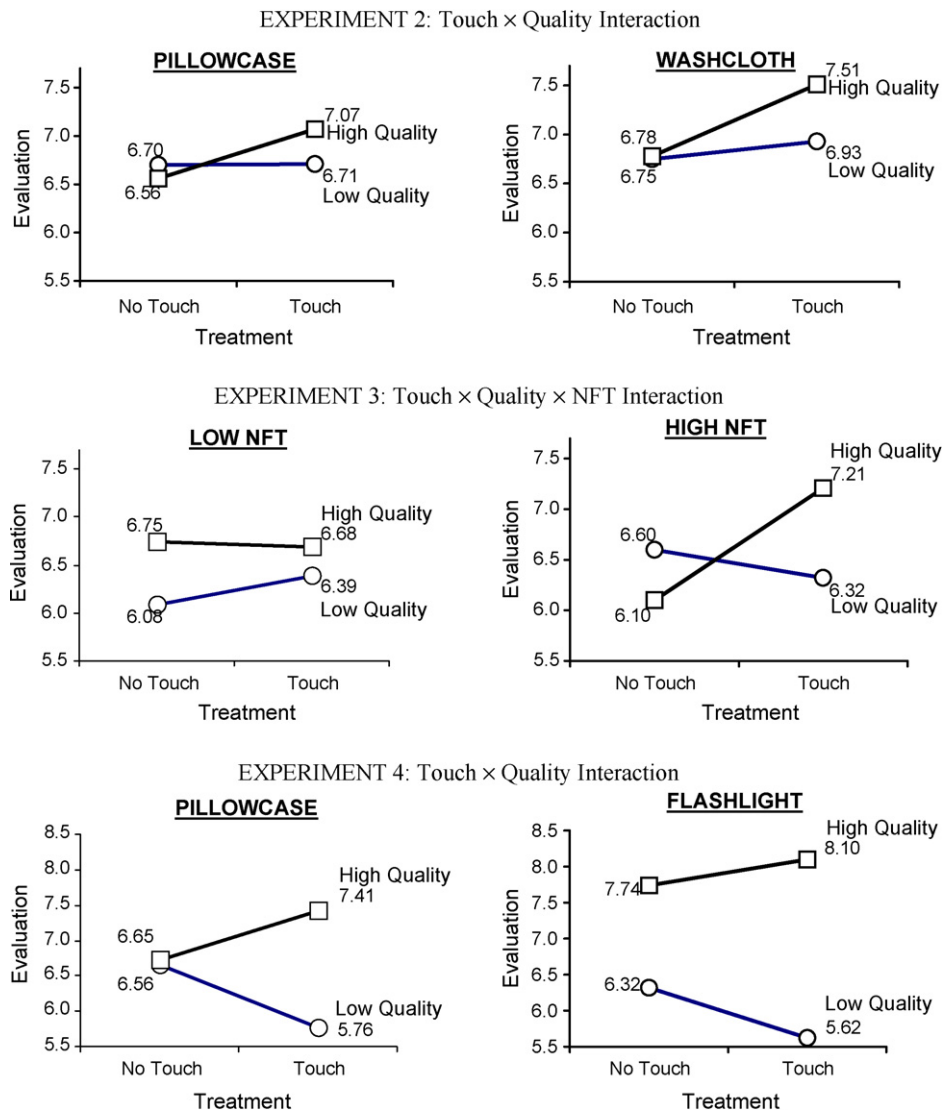


Fig. 1. Experiments 2–4: interaction effects.

Perceived accuracy and confidence

At the univariate level, the main effect of touch was significant for both perceived accuracy ($F_{1,265} = 6.07, p < .05$; partial $\eta^2 = .02$) and confidence in evaluation ($F_{1,265} = 11.02, p < .001$; partial $\eta^2 = .04$). Participants reported significantly higher perceived accuracy in their evaluations when tactile input was available (pillowcase: $M_{\text{touch}} = 7.40, M_{\text{no touch}} = 7.06; t_{268} = 2.21, p < .02, r = .13$; washcloth: $M_{\text{touch}} = 7.56, M_{\text{no touch}} = 7.20; t_{267} = 2.31, p < .04, r = .18$). Participants also indicated that they had more confidence in their product evaluations when tactile input was available (pillowcase: $M_{\text{touch}} = 7.53, M_{\text{no touch}} = 7.06; t_{268} = 2.92, p < .001, r = .14$; washcloth: $M_{\text{touch}} = 7.71, M_{\text{no touch}} = 7.24; t_{267} = 3.08, p < .001, r = .19$). These results support H1b. For both accuracy and confidence, there was no significant quality main effect ($ps > .18$) or touch \times quality interaction ($ps > .29$).

Mediation analyses

The affective mediation hypothesis (H3) was examined in a series of ANOVA and ANCOVA models. For the washcloth, in a touch by quality ANOVA, there was a main effect of tactile input on product evaluation ($F_{1,265} = 6.95, p < .001$; partial $\eta^2 = .03$), with no other significant effects. In a MANOVA, touch had a significant effect on pleasure ($F_{1,265} = 6.82, p < .01$; partial $\eta^2 = .03$; $M_{\text{touch}} = 5.88, M_{\text{no touch}} = 5.43$), but not arousal ($p > .25$). No other main or interaction effects reached significance. In an ANCOVA with touch and quality as independent variables and product evaluation as dependent variable, the effect of tactile input on product evaluation was non-significant ($p > .48$; partial $\eta^2 = .01$) when pleasure was included as a significant covariate ($F_{9,44} = 6.80, p < .001$; partial $\eta^2 = .97$). The percentage of reduction in the effect size (η^2) of the effect of touch on product evaluations due to the covariate was considerable (46 percent). Pleasure thus mediated the effect of tactile input on product evaluations for the washcloth. For the pillowcase, affective mediation was not established (all $ps > .13$). Thus, we found only partial support for affective mediation as proposed in H3.

Discussion

In Experiment 2, tactile input resulted in more favorable evaluations, for high quality products for which tactile input is important in evaluation. Tactile input did not, however, result in less favorable evaluations for low quality products. Further analyses suggest that tactile input increased confidence and perceived accuracy of evaluations and we find mixed support for a mediating effect of pleasure and arousal.

Experiment 3

In addition to replicating Experiment 2, this study considers the impact of consumers' need for touch (i.e., a preference for the extraction and use of information obtained through the sense of touch; Peck and Childers 2003a) on product evaluation. Although research indicates that consumers differ with respect to their use of tactile input during product evaluation (Peck and Childers 2003a), it has not examined how such differences may affect evaluations. Tactile input

is most likely to affect evaluations of tactile-diagnostic products for consumers high in need for touch since these people are more strongly motivated to use information garnered through touch during evaluation of products (i.e., instrumental aspect) or to engage in exploratory behavior using touch (i.e., indiscriminate acquisition of tactile information for hedonic reasons; autotelic aspect). Further, high need for touch consumers should be more sensitive to differences in a product's tactile qualities because of greater reliance on tactile information. Thus,

H4. Tactile input leads to more favorable product evaluations for high quality retail offerings in categories wherein tactile information is diagnostic, and for those consumers who are high regarding use of tactile cues.

We also again consider affective mediation of the effect of tactile input.

Method

Experiment 3 employed a 2 (touch, no touch) \times 2 (low, high quality) \times 2 (low, high need for touch) between-participants design. Need for touch (stratified α NFT = .93; autotelic dimension, $\alpha = .91$; instrumental dimension, $\alpha = .85$; Peck and Childers 2003a) was blocked based on a median split (median = 6.25; $M_{\text{high NFT}} = 7.31, M_{\text{low NFT}} = 4.92; t_{195} = 19.39, p < .001$). Undergraduate students ($N = 197$; 47.7 percent male) participated in groups of up to six. Procedures and manipulations followed Experiment 2, except that washcloths were the sole experimental stimulus. In the no touch condition, products were covered by acrylic display cases to prevent touching. The experimental product always appeared first in a series of three products (a pencil and alkaline battery served as filler items). No additional product information and instructions regarding the use of tactile input during evaluation were provided. Measures were identical to those of Experiment 2: product evaluation ($\alpha = .82$; Barone et al. 1997), perceived accuracy and confidence, pleasure and arousal ($\alpha = .84$ and $.82$, respectively; Mehrabian and Russell 1974). Correlations between evaluation and perceived accuracy ($r = .24$), evaluation and confidence ($r = .30$), and accuracy and confidence ($r = .58$) were significant ($ps < .05$).

Results

In a 2 (touch) \times 2 (quality) \times 2 (need for touch) MANOVA, with product evaluation, confidence in evaluation and perceived accuracy of evaluation serving as dependent variables, there was a multivariate main effect of touch ($F_{3,186} = 3.57, p < .05$; partial $\eta^2 = .05$) and a significant touch \times quality \times NFT interaction ($F_{3,186} = 3.38, p < .05$; partial $\eta^2 = .05$). The interaction effect involving need for touch (including that reported at the univariate level) held for the instrumental as well as the autotelic dimension of the scale; the pattern of means was consistent across both dimensions of the NFT

scale. (A table of mean evaluations at the NFT component level is available from the authors upon request.)

Product evaluation

At the univariate level, a significant three-way (touch \times quality \times NFT) interaction manifested ($F_{1,188} = 4.56$, $p = .03$; partial $\eta^2 = .02$); follow-up contrasts showed that the effect of touch was significant only for the high quality washcloth evaluated by persons high in NFT ($t_{54} = 2.34$, $p = .02$; $r = .30$), and non-significant for the three remaining contrasts (all $ps \geq .10$). This interaction supports H4, and is depicted in Fig. 1.

Perceived accuracy and confidence

For both perceived accuracy ($F_{1,188} = 10.47$, $p < .01$; partial $\eta^2 = .05$) and confidence ($F_{1,188} = 3.10$, $p < .10$; partial $\eta^2 = .02$), there was a main effect of touch at the univariate level. Perceived accuracy was significantly higher when tactile input was available ($M_{\text{touch}} = 7.08$, $M_{\text{no touch}} = 6.44$; $t_{195} = 3.31$, $p < .01$, $r = .23$). Participants also held more confidence in their product evaluations when tactile input was available ($M_{\text{touch}} = 7.28$, $M_{\text{no touch}} = 6.88$; $t_{194} = 1.66$, $p < .05$ one-tailed test, $r = .12$). These results again support H1b. In addition, there was a main effect of quality on confidence in evaluations ($M_{\text{high quality}} = 7.44$, $M_{\text{low quality}} = 6.84$; $F_{1,188} = 5.14$, $p < .05$; partial $\eta^2 = .03$). There were no other significant main or interaction effects.

Mediation analyses

In a 2 (touch) \times 2 (quality) \times 2 (need for touch) ANOVA, the only significant effect on product evaluation was the three-way (touch \times quality \times NFT) interaction described earlier ($F_{1,189} = 4.08$, $p = .05$; partial $\eta^2 = .02$). To examine the mediation hypothesis, a MANOVA was conducted with pleasure and arousal as dependent variables: touch, quality, need for touch, or any of their interaction terms did not significantly affect either of the hypothesized mediators (pleasure, arousal; all $ps > .27$). There was no support for affective mediation through pleasure or arousal (H3).

Discussion

Consistent with expectations derived from the existing literature, we found evidence for the moderating effects of need for touch—the first empirical demonstration that need for touch influences product evaluations per se. Tactile input enabled consumers higher in need for touch to better discriminate high quality levels, resulting in more favorable evaluations. Tactile input did not, however, negatively affect evaluation of the low quality product. Of further importance, tactile input did not affect evaluations via pleasure or arousal, but did increase consumers' confidence and perceived accuracy.

Experiment 4

In Experiments 2 and 3, participants evaluated products in isolation, perhaps eliciting the asymmetrical effect of tactile input on evaluation of high but not low quality products. In retail stores, however, consumers often touch products

to compare multiple items in a single category (that often vary in terms of quality), possibly because touching multiple items provide consumers with reference points for the assessment of relative quality. Experiment 4 addresses this issue by considering a situation where multiple versions of the same product are available during evaluation. We also included a non-textile focal product for which weight rather than texture and softness is an important substance property.

Method

Undergraduates ($N = 115$; 49.6 percent female) participated in an experiment with a 2 (touch, no touch) \times 2 (low, high quality) \times 2 (low, high need for touch) mixed-participants design replicated across two products (pillowcase, flashlight). Quality was a within-participants factor. Need for touch (stratified α NFT = .97; autotelic dimension, $\alpha = .96$; instrumental dimension, $\alpha = .92$; Peck and Childers 2003a) was blocked based on a median split (median = 5.58; $M_{\text{high NFT}} = 6.94$, $M_{\text{low NFT}} = 3.51$; $t_{110} = 16.65$, $p < .001$). Participants evaluated the two focal (and three unrelated filler) products in rotated order, and completed the following measures: product evaluation ($\alpha = .87$; Barone et al. 1997), perceived accuracy, confidence, and a quality manipulation check, which indicated that quality level was perceived as intended (flashlight: $M_{\text{high}} = 7.81$, $M_{\text{low}} = 4.77$; $t_{114} = 14.05$, $p < .001$; pillowcase: $M_{\text{high}} = 6.70$, $M_{\text{low}} = 5.46$; $t_{114} = 4.89$, $p < .001$).

Results

Due to small and non-significant correlations ($rs < .13$) between both perceived accuracy and confidence and product evaluations, separate repeated measures analyses were conducted for product evaluations, and accuracy and confidence measures ($rs > .85$).

Product evaluation

In a 2 (touch) \times 2 (quality) \times 2 (NFT) \times 2 (product) repeated measures ANOVA, there was a significant main effect of product ($F_{1,108} = 9.82$, $p < .001$; partial $\eta^2 = .08$) due to a more favorable evaluation of the flashlight, and quality ($F_{1,108} = 219.50$, $p < .001$; partial $\eta^2 = .55$) due to a more favorable evaluation of high quality products. In addition, there was a significant touch \times quality interaction ($F_{1,108} = 49.17$, $p < .001$; partial $\eta^2 = .21$) such that high (low) quality was evaluated more (less) favorably in the touch compared to the no touch condition, and a significant product \times quality interaction ($F_{1,108} = 26.97$, $p < .001$; partial $\eta^2 = .20$), such that the high quality flashlight was evaluated more favorably than the high quality pillowcase, with no differences at low quality levels. All other main and interaction effects were not significant ($ps > .16$). (All analyses were also conducted at the component level of NFT. The results did not change.) Means for the overall scale are reported in Table 3.

Follow-up contrasts for the touch \times quality interactions conducted separately for the two products showed that at high quality levels, tactile input (compared to no tactile input) resulted in more positive product evaluations for the pillowcase ($M_{\text{touch}} = 7.41$, $M_{\text{no touch}} = 6.73$; $t_{113} = 2.76$, $p < .01$; $r = .25$) and the flashlight ($M_{\text{touch}} = 8.10$, $M_{\text{no touch}} = 7.74$; $t_{113} = 2.02$, $p < .05$;

Table 3
Experiment 4: mean evaluations^a

Product	Quality	Touch	Mean	SD	n
Pillow case	High quality	Touch	7.41	1.10	56
		No touch	6.73	1.48	59
		Total	7.06	1.35	115
	Low quality	Touch	5.76	1.40	56
		No touch	6.65	1.55	59
		Total	6.22	1.54	115
	Total	Touch	6.58	1.50	56
		No touch	6.69	1.51	59
		Total	6.64	1.51	115
Flashlight	High quality	Touch	8.10	.92	56
		No touch	7.74	.99	59
		Total	7.91	.97	115
	Low quality	Touch	5.62	1.78	56
		No touch	6.32	1.41	59
		Total	5.98	1.63	115
	Total	Touch	6.86	1.88	56
		No touch	7.03	1.41	59
		Total	6.94	1.65	115

^a Mean evaluations are based on average scores of Barone et al. (1997).

$r = .19$). At low quality levels, however, tactile input resulted in significantly lower product evaluations for the pillowcase ($M_{\text{touch}} = 5.76$, $M_{\text{no touch}} = 6.65$; $t_{113} = 3.23$, $p < .01$; $r = .29$) and the flashlight ($M_{\text{touch}} = 5.62$, $M_{\text{no touch}} = 6.32$; $t_{113} = 2.35$, $p < .05$; $r = .22$). These results support H2 and are illustrated in Fig. 1.

Perceived accuracy and confidence

In a 2 (touch) \times 2 (quality) \times 2 (NFT) \times 2 (product) repeated measures MANOVA, there was a main effect for touch ($F_{2,107} = 5.99$, $p < .01$; partial $\eta^2 = .10$), such that participants felt more confident ($M_{\text{touch}} = 7.43$, $M_{\text{no touch}} = 6.59$; $F_{1,108} = 11.06$, $p < .01$; partial $\eta^2 = .09$) and accurate ($M_{\text{touch}} = 7.41$, $M_{\text{no touch}} = 6.73$; $F_{1,108} = 7.07$, $p < .01$; partial $\eta^2 = .06$), when tactile input was available. These results support H1b. In addition, there was a main effect of quality ($F_{2,107} = 15.02$, $p < .001$; partial $\eta^2 = .22$) on both confidence in evaluations ($M_{\text{high quality}} = 7.18$, $M_{\text{low quality}} = 6.84$; $F_{1,108} = 29.81$, $p < .001$; partial $\eta^2 = .21$) and accuracy ($M_{\text{high quality}} = 7.21$, $M_{\text{low quality}} = 6.93$; $F_{1,108} = 17.16$, $p < .001$; partial $\eta^2 = .14$), and a main effect of product ($F_{2,107} = 9.49$, $p < .001$; partial $\eta^2 = .15$) on both confidence ($M_{\text{pillowcase}} = 6.71$, $M_{\text{flashlight}} = 7.31$; $F_{1,108} = 17.69$, $p < .001$; partial $\eta^2 = .14$) and accuracy ($M_{\text{pillowcase}} = 6.75$, $M_{\text{flashlight}} = 7.39$; $F_{1,108} = 18.55$, $p < .001$; partial $\eta^2 = .14$), with no other significant main or interaction effect.

Discussion

Experiment 4 examined the effect of tactile input in a multiple product evaluation context. In this situation, touch was diagnostic for evaluations of products that were high, as well as low, in quality. These results differ from the asymmetric effect of touch in Experiments 2 and 3, in which quality was a between-participants factor. The asymmetry of touch and quality in these two studies was likely due to the fact that visual inspection of the low quality product was a relatively good indicator of what the product would feel like when

touched (with this facet of the evaluation being enhanced since only one product was being viewed at a time). Therefore, a difference in evaluations across the touch versus no touch conditions did not manifest at a low quality level. At a high quality level, however, visual inspection may not have truly captured the positive tactile product aspects (e.g., softness of pillowcase, weight of flashlight); these were only revealed upon touching the product. Contrary to Experiment 3, need for touch did not affect product evaluations in a multiple product evaluation context.

General discussion

Our research clearly demonstrates that tactile input influences product evaluations. In addition, Experiments 2 and 3 show that tactile input has a positive effect on the evaluation of products with characteristics best explored by touch (e.g., softness, texture), particularly for high quality levels. When consumers evaluate both high and low quality levels at the same time (as in Experiment 4), tactile input also has a negative effect on product evaluations for low quality products. This pattern of results suggests that the effects of tactile input are best explained by an information-processing mechanism (and not an affective-based process that received limited support in our experiments). Another contribution of our research is the finding that need for touch impacted product evaluations when tactile input was available in single, but not multiple, product evaluations.

While our experiments focus on products wherein tactile input is diagnostic, it may be informative for future research to consider whether tactile input may also affect the evaluation of products for which tactile input is non-diagnostic (i.e., touch is not critical to the evaluation of a product like laundry detergent). If tactile input does not provide diagnostic information about a product, we would expect that (1) consumers are less likely to touch a tactile-non-diagnostic product (compared to a tactile-diagnostic product) in the evaluation process, and that (2) neither tactile input nor need for touch affect product evaluations, perceived evaluation accuracy and confidence in judgments. An avenue for future exploration of these issues would be to study multiple products where tactile input is required but differentially diagnostic. Another area of future research is to examine how other cues (e.g., brand name, price) and consumer level variables (e.g., knowledge; Grewal, Krishnan, Baker, and Borin 1998) moderate the effects of tactile input on product evaluations for products varying with regard to the diagnosticity of tactile input for respective categories.

On a practical level, retailers are advised to allow consumers to touch products in retail environments, since such a strategy results in more favorable consumer responses. In addition to the increased likelihood of choice of tactilely-diagnostic products in physical retail environments (McCabe and Nowlis 2003), and increased consumer confidence in evaluations (Peck and Childers 2003b) resulting from tactile

input, we established here that evaluations are positively affected, particularly if product quality levels are high. Although retailers may be inclined to prevent consumers from touching high quality merchandise in particular (e.g., due to concerns regarding theft or damage of merchandise or increased costs of keeping touchable items in good condition), our findings show that in order to positively impact consumers' product evaluations at the point of purchase, it is especially important to provide tactile information for high quality merchandise. Thus, retailers providing consumers the opportunity to touch their high quality merchandise would seem to have an advantage over those who are unable (e.g., Internet retailers) or unwilling to allow consumers to obtain tactile input. Retailers able, but hesitant, to allow consumers touching privileges are advised to reconsider this position, perhaps using samples for touching and smart-tag technologies to prevent theft. Some retailers, for example, provide testers not only for perfumes, but also for hand or body lotions, thereby facilitating consumers' use of tactile input during product evaluation. For retailers with a web presence, the challenge remains as to whether they can overcome the inherent inability to provide tactile input within this distribution channel. Ultimately, our results suggest that the suitability of the Internet for consumer marketing may depend on the role tactile input plays in product evaluation such that the most appropriate goods to offer in "no-touch" retail contexts are those for which tactile input is non-diagnostic.

Limitations of the current research are twofold: First, there may have been a potential bias against finding evidence for an affective explanation. Specifically, in evaluation task in Experiment 3 product characteristics were described as instrumental (e.g., "machine washable," "100 percent cotton") rather than hedonic; such a situation may have not been conducive to generating affective reactions to tactile input. Although this limitation was addressed by not providing product descriptions in Experiment 3 with results failing to support an affective explanation, additional research would more convincingly rule out this process. Relatedly, future research should consider also utilizing alternative conceptual and methodological approaches to assessing affect. Second, the effect sizes for our experiments (similar to much experimental consumer research) were small to medium in size (Cohen 1988). Nonetheless, effects of this magnitude have practical significance for high sales volume product categories (e.g., clothing, fruit, vegetables, portable electronics) where tactile input is diagnostic. Although our work is suggestive of important effects and explanations regarding tactile input to product evaluation, further research is required to determine whether these findings generalize across varying product categories, retail markets and consumers.

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