Assessing Individual Differences in the Use of Haptic Information Using a German Translation of the Need for Touch Scale

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Abstract. A German version of the Need for Touch scale (NFT) was developed and validated in two experiments. Study 1 examined moderator effects of NFT on the influence of product experience on confidence and frustration in product evaluations. As expected, only for high-NFT individuals, confidence increased and frustration decreased when haptic information was available. In Study 2, we explored the influence of NFT in a gambling task. Results showed that individuals with higher NFT more often chose gambling alternatives accompanied by a positive feeling of touch, while individuals with lower NFT did not integrate haptic information. Additionally, results confirmed the theoretically postulated two-dimensional structure of NFT, as well as its discriminant validity.

Keywords: Need for Touch, individual differences, haptic information

Introduction

The environment is full of impressions that can be experienced through multiple senses. Most information is acquired via vision, which dominates human experience and plays an important role in people’s daily activities and interpersonal contacts. Through vision people can quickly perceive obstacles and risks, colors, distances, shapes, etc. (Heller & Clark, 2008; Schifferstein, 2006). However, making judgments and decisions only on the basis of visual information may provide a biased sample of information, because vision is susceptible to illusions. Misperceptions can sometimes be reduced and corrected through the sense of touch, which scientists have named the “reality sense,” because touch is less susceptible to illusions than vision (Heller & Clark, 2008).

One field in which the sense of touch is of special importance is consumer psychology. The sense of touch is recognized as an important source of information for consumers, but has mostly been neglected by researchers of consumer psychology (Schifferstein, 2006). Observing children, who touch all objects, one can see the purest and most natural form of touching behavior. The purpose of touching is to gather information, impressions, experiences, and knowledge of the objects (e.g., products). Consumers literally have to “grasp” products. Actually, consumers touch products even if touching is not relevant, for example, many consumers caress and fondle book covers, which contain no relevant information about the content of the book (Underhill, 2000). By using haptic information, consumers are able to gain additional product information that is not available through vision (McCabe & Nowlis, 2003).

Peck and Childers (2007) distinguish three categories by which information gathered through touch can affect product choice. The first category is the difference in product attributes that encourage touch. Product choice can be affected by physical object properties such as texture, hardness, temperature, volume, weight, and shape (Lederman & Klatzy, 1987). For example, consumers may prefer a firm peach over a pulpy peach, which can be examined through touch. Therefore, depending on object properties products elicit different motivations to be touched (Peck & Childers, 2003a). The second category involves the situational influences encouraging touch, i.e., that product choice can be affected by the manner in which the product is presented. Peck and Childers (2006) manipulated the environmental encouragement of touch: Either the environmental salience of touch information was increased by posting a sign over a fruit display with the request “feel the freshness,” or the fruit display was not manipulated. Results showed that individuals were influenced by the in-
creased salience of touch information and made more impulsive purchases than individuals who were not requested to feel the freshness. Additionally, there was an effect of individual differences in touch constituting the third category of influences in product choice through touch (Peck & Childers, 2007).

Individuals differ in their motives to touch products (Peck & Childers, 2003a, 2003b). In Peck and Childers’ (2006) study, individuals who were more strongly motivated to touch the fruits made more impulsive purchases than individuals with low motivation to touch the fruits.

Individual differences in touching behavior are often neglected by research. Nonetheless, in recent years there has been an increasing interest in research on the individual differences in touch (i.e., Need for Touch (NFT) and Need for Tactile Input (NTI); Citrin, Stem, Spangenberg, & Clark, 2003; Grohmann, Spangenberg, & Sprott, 2007; Peck & Childers, 2003a, 2003b, 2006; Peck & Wiggins, 2006; Workman & Caldwell, 2007). The trait considered in the present study is the Need for Touch (Peck & Childers, 2003b).

Conceptual Definition of NFT

Individuals differ in their motivation and ability to use haptic information for decision making. A chronic accessibility of stored haptic information is assumed to be the basis of NFT, a multidimensional construct with two underlying factors, denoted as autotelic and instrumental NFT. Autotelic processing is spontaneous and automatic. Thus, autotelic NFT is characterized by fast access to haptic information. For instrumental NFT the processing is more controlled and conscious (Peck & Childers, 2003a, 2003b). Further differences between autotelic and instrumental NFT are elaborated in the following section.

Autotelic NFT

Autotelic NFT is associated with seeking sensory stimulation, fun, and enjoyment, and is intrinsically motivated. Touching objects is hedonically oriented and therefore mostly unintended, spontaneous, and automatic (Peck & Childers, 2003a, 2003b).

Instrumental NFT

Individuals high in instrumental NFT touch objects with an outcome-directed, goal-oriented, and self-attributed motivation. They touch products to get information about the object’s properties. Touch on this dimension focuses on the characteristics and utilization of an object (Peck & Childers, 2003a, 2003b).

Peck and Childers (2003a, 2003b; see also Peck & Wiggins, 2006) showed that NFT influences the persuasiveness of product-related information, the frustration during product evaluation, and the confidence in product evaluation, when no haptic information is available.

In the present paper, we present a German version of Peck and Childers’ (2003b) NFT scale, which serves to promote further progress in the research on individual differences in NFT. Study 1 tests the validity of the translated scale; this study aims to replicate the findings of Peck and Childers (2003b), who showed that higher NFT individuals were more confident and less frustrated in product evaluation when they were able to touch products. For lower NFT individuals, the opportunity to touch products is not expected to influence confidence or the level of frustration. We additionally explore the latent structure of the NFT scale and examine its discriminant validity. Study 2 addresses the question whether haptic information influences judgment and decision making in a spontaneous manner. Results from Peck and Wiggins (2006) showed that affective reactions, elicited by touching stimuli with different haptic information, affects attitudes toward an organization and the willingness to spend time or money for it. For higher autotelic NFT individuals, integrating a pleasant or unpleasant touch element into a pamphlet of an arboretum (Study 1) or a fictional charity (Study 2) enhanced attitude and likelihood of donating money or time. Peck and Wiggins argued that for higher NFT individuals touching is an affective tool that can exert influence on attitudes and behavior even under absence of relevant information. Grohmann et al. (2007) suggested examining whether haptic cues are employed in decision making even when haptic information is irrelevant (nondiagnostic). For instance, this could be important if higher NFT people were to use the feel of a container to judge the product inside. In Study 2, we examine a situation in which haptic information is nondiagnostic for a judgment task. Following the idea of a spontaneous influence even of irrelevant haptic information, we expect an influence of the opportunity to touch a product only for higher autotelic NFT individuals.

Study 1

Study 1 explores the effect of NFT on confidence and frustration in a product-evaluation task. Three products (i.e., a toothbrush, a pen, and a computer mouse) are evaluated. Members of one group of participants were allowed to explore the products through touch, whereas members of a second group were given no such opportunity. For higher
NFT individuals, this manipulation is expected to affect confidence in product evaluation and their level of frustration. Individuals with higher NFT are expected to be more confident and less frustrated if they are able to touch the product, while for lower NFT individuals no differences were expected (Peck & Childers, 2003b). In this study, the same effects are predicted for autotelic and instrumental NFT. Therefore, we do not differentiate between those two subscales.

Method

Participants

60 undergraduate students (42 female; age \( M = 25.18, SD = 6.25 \)) of the University of Freiburg participated in Study 1. The data of 2 participants were discarded because of missing data. Participants were compensated with 3.50 € or credit for their research participation requirement.

Design

The design of Study 1 comprised two between-subject factors. The first factor was Product Experience (touch vs. no-touch). The second factor was NFT (higher vs. lower NFT), assessed using the adapted German version of the NFT scale (see Materials for details).

Materials

Products

Three products (a toothbrush, a pen, and a computer mouse) with relevant haptic properties (i.e., ergonomic attributes) were selected (Schifferstein, 2006). In a pretest, 15 participants rated the attractiveness of touching these products with a 15-item scale using semantic differentials with 5-point rating scales (e.g., repulsive – ugly). Products did not differ regarding the reported attractiveness (toothbrush \( M = 3.05, SD = 0.62 \); pen \( M = 3.26, SD = 0.78 \); computer mouse \( M = 3.42, SD = 0.55 \); \( F[2, 28] = 1.53, p = .24, \eta^2 = .10 \)). We also assessed the importance of touching for making an adequate product evaluation with the item “Would it be possible for you to adequately assess product 1 (2, 3) without touching it?” on a 5-point scale. There was no difference between products regarding the importance of touch (toothbrush \( M = 2.64, SD = 1.28 \); pen \( M = 2.14, SD = 0.77 \); computer mouse \( M = 2.64, SD = 1.39 \); \( F[2, 26] = 1.07, p = .35, \eta^2 = .08 \)).

For each product, a short written description was used to inform the participants of relevant product characteristics. The information was gathered from the official websites of the respective manufacturers.

Plexiglas Boxes

In accordance with Peck and Childers (2003b) we used plexiglas boxes (approximately 20 × 40 × 20 cm) for the no-touch condition. In this condition, the products were placed under the plexiglas boxes so that they were completely visible but could not be touched.

NFT Scale

The individual preference for haptic information was assessed using the translated German version of Peck and Childers’ (2003b) NFT scale. Originally, the NFT scale comprised 50 items, which Peck and Childers reduced to a 12-item version. For the German version of the NFT scale, we translated 14 items of an earlier version of the NFT scale (Peck, 1999; Peck & Childers, 2003b). The NFT scale measures the two dimensions autotelic NFT (7 items, \( \alpha = .92 \)) and instrumental NFT (7 items, \( \alpha = .93 \)). Table 1 shows all items of the two dimensions. The correlation between autotelic and instrumental NFT was \( r = .76, p < .001 \).

NFCC and NTE Scale

To assess discriminant validity, we included two additional measures: First, a German version of the Need for Cognitive Closure scale (NFCC; Collani, 2007b; Webster & Kruglanski, 1994) was employed. The NFCC scale (total 25 items, \( \alpha = .78 \)) entails two subscales, denoted as Personal Need for Structure and Predictability (PNSP; 18 items, \( \alpha = .83 \)) and Decisiveness (7 items, \( \alpha = .82 \)). The second scale used to evaluate discriminant validity was the Need to Evaluate scale (NTE; Collani, 2007a). The reliability of the one-dimensional2 16-items NTE scale was \( \alpha = .77 \).

Like NFT, NFCC and NTE tap into motives related to information acquisition (Collani, 2007a, 2007b; Peck & Childers, 2003b). However, in contrast to NFT, NFCC is the need to get a clear and definite answer through information processing and judgment in a social context (Collani, 2007b). NTE represents a need to evaluate attitude objects (Collani, 2007a). Thus, we expected that NFCC and NTE do not highly correlate with NFT.

Measures of Confidence and Frustration

Following Peck and Childers (2003a, 2003b), we assessed confidence in judgments with two items (“How confident are you in your product evaluation?”, “How certain do you feel regarding your product evaluation?”). Frustration while evaluating was assessed with one item (“How frustrated did you feel during the product evaluation?”). Items

2 Because we were not able to replicate the factor structure postulated by Collani (2007a), we stick to the one-dimensional structure originally assumed by Jarvis and Petty (1996).

Table 1. Items of the Need for Touch Questionnaire

<table>
<thead>
<tr>
<th>Original item</th>
<th>Translated item</th>
<th>Dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. When walking through stores, I can’t help touching all kinds of products.</td>
<td>Wenn ich einkaufen gehe, muss ich alle möglichen Artikel anfassen.</td>
<td>A</td>
</tr>
<tr>
<td>2. Touching products can be fun.</td>
<td>Es macht Spaß, alle möglichen Artikel anzufassen.</td>
<td>A</td>
</tr>
<tr>
<td>3. I place more trust in products that can be touched before purchase.</td>
<td>Ich vertraue stärker auf Artikel, die man vor dem Kauf anfassen kann.</td>
<td>I</td>
</tr>
<tr>
<td>4. I feel more comfortable purchasing a product after physically examining it</td>
<td>Beim Kauf eines Artikels fühle mich wohler, wenn ich diesen vorher durch Anfassen eingehend geprüft habe.</td>
<td>I</td>
</tr>
<tr>
<td>5. When browsing in stores, it is important for me to handle all kinds of products.</td>
<td>Wenn ich mich in Geschäften umsehe, ist es wichtig für mich, alle möglichen Artikel in die Hand zu nehmen.</td>
<td>A</td>
</tr>
<tr>
<td>6. It is very difficult for me to refrain from touching products in stores.</td>
<td>Es fällt mir schwer davon abzulassen, in Geschäften alle möglichen Artikel anzufassen.</td>
<td>A</td>
</tr>
<tr>
<td>7. If I can’t touch a product in the store, I am reluctant to purchase it.</td>
<td>Wenn ich einen Artikel im Geschäft nicht anfassen kann, möchte ich diesen nur ungern kaufen.</td>
<td>I</td>
</tr>
<tr>
<td>8. I like to touch products even if I have no intention of buying them.</td>
<td>Auch wenn ich einen Artikel nicht unbedingt kaufen will, mag ich es ihn anzufassen.</td>
<td>A</td>
</tr>
<tr>
<td>9. I feel more confident purchasing a product I have touched first because I can determine its quality.</td>
<td>Beim Kauf eines Artikels fühle ich mich sicherer, wenn ich diesen zuvor anfassen konnte, weil ich dadurch etwas über die Qualität des Artikels erfahren kann.</td>
<td>I</td>
</tr>
<tr>
<td>10. When browsing in stores, I like to touch lots of products.</td>
<td>Beim Stöbern in Geschäften mag ich es einfach alle möglichen Artikel anzufassen.</td>
<td>A</td>
</tr>
<tr>
<td>11. The only way to make sure a product is worth buying is to actually touch it.</td>
<td>Um herauszufinden, ob es sich lohnt einen Artikel zu kaufen, muss man diesen angefasst haben.</td>
<td>I</td>
</tr>
<tr>
<td>12. There are many products that I would only buy if I could handle them before purchase.</td>
<td>Es gibt eine Vielzahl von Artikeln, die ich nur kaufen würde, wenn ich sie zuvor auch in die Hand nehmen kann.</td>
<td>I</td>
</tr>
<tr>
<td>13. I find myself touching all kinds of products in stores.</td>
<td>Beim Einkaufen ertappe ich mich immer wieder dabei, dass ich alle möglichen Artikel anfasse.</td>
<td>A</td>
</tr>
<tr>
<td>14. I rarely buy items that I haven’t touched first. (R)</td>
<td>Ich kaufe nur selten Artikel, die ich vor dem Kauf nicht anfassen konnte. (R)</td>
<td>I</td>
</tr>
</tbody>
</table>

Note. The source of the wordings for the original items is Peck (1999). Answers were scored on a 7-point scale and ranged from 3 (not at all true) to +3 (exactly true). R = removed item; A = autotelic scale; I = instrumental scale.

were measured on 7-point rating scales (7 = not at all to 1 = very). Additionally, we assessed product evaluations with 8 items (e.g., “The product appeals to me,” “From my perspective, the product is very wieldy,” “I would buy this product”) using 7-point rating scales (7 = not at all true to 1 = exactly true). The reliability for the product-evaluation scale was $\alpha = .88$ for the toothbrush, $\alpha = .89$ for the pen, and $\alpha = .92$ for the computer mouse.

Procedure

Participants agreed to participate in two ostensibly unrelated studies. For the first study, they filled out the NFCC, NFT, and NTE scales. Thereafter, participants worked on a short version of Raven’s Progressive Matrices test (Raven, Raven, & Court, 2003), which was used as a filler task and lasted 2 minutes. Then participants were told that the first study was finished, and they were brought to another room for a product-evaluation study.

The product-evaluation task was guided by instructions on the computer screen. The three products were arranged on a nearby table, initially hidden from sight by a cover. First, participants had to lift the cover from the first product. They were informed whether they were allowed to touch (not touch) the product. They could explore the product as long as they desired. However, there was a minimum of 2 minutes, before the evaluation procedure could be started on the computer. For this procedure, the eight evaluation items, the two confidence items, and the frustration item were presented on the computer screen, and ratings were entered using the number keys. The same procedure followed for the other two products. The order in which the products were presented was counterbalanced across participants.

Results

Moderator Regression Analysis

The influence of NFT on the effect of the availability of haptic information on confidence and frustration was analyzed with separate moderator analyses. For these analyses, the $z$-standardized values of NFT and for product experience ($0 = \text{no haptic information available}; 1 = \text{haptic information available}$) as well as the product of both scores were entered as predictors in multiple regression analyses.
For the first moderator analysis, we used mean confidence in judgment (across the three products) as the dependent variable. The regression model accounted for a significant amount of variance in the ratings, $F(3, 54) = 2.72, p = .05, R^2 = .13$. An examination of the beta weights showed a marginal influence of product experience ($\beta = .23, p = .08$) and a significant influence of the product term ($\beta = .27, p = .04$), but no main effect of NFT ($\beta = .16, ns$). Thus, the availability of haptic information interacted with NFT in determining confidence ratings as shown in Figure 1. The positive beta weights indicate that confidence in judgment increases with the possibility of haptic product experience, and that the effect of experience is stronger for higher NFT participants.

In a second analysis, we examined the moderator effects of NFT on the relationship between product experience and frustration. Participants’ frustration while evaluating was calculated as the mean of the frustration ratings across the three products. Again, the regression model accounted for a significant amount of variance, $F(3, 53) = 4.39, p < .01, R^2 = .20$. As in the first analysis, product experience ($\beta = -.33, p = .01$) and the interaction term ($\beta = -.27, p = .03$) contributed significantly to the prediction of frustration, while the effect of NFT alone ($\beta = .09, ns$) did not reach significance. As expected, frustration while evaluating was high for participants who could not touch the products and this effect was stronger for higher NFT participants (see Figure 2).

Additionally, we computed a moderator regression analysis for product evaluation of the three products toothbrush, pen, and computer mouse. As predictors we entered the z-transformed values of NFT, Product Experience, and the interaction term NFT $\times$ product experience. The regression model did not account for a significant amount of variance in product evaluation, $F(3, 54) = .49, ns, R^2 = .03$.

### Structural Equation Model

To analyze the internal structure of the German NFT scale, the 14-item NFT scale was entered in an exploratory factor analysis using a principal component analysis with oblimin rotation. Two factors with eigenvalues larger than 1 emerged. As expected, the items of the autotelic NFT scale loaded strongly on the first factor whereas the items of the instrumental NFT scale loaded primarily on the second factor (see Peck & Childers, 2003b).

In a next step, we performed a confirmatory factor analysis (CFA) to test Peck and Childers’ (2003b) model for our data. Using AMOS 17.0 (Arbuckle, 2008) we modeled a structural equation model based on the covariance matrix. Gaussian distribution was violated for some items, but values for skewness were smaller than 2 and values for kurtosis were smaller than 7 indicating acceptable distributions (West, Finch, & Curran, 1995). To compensate for the violation of distributional assumptions, we performed a Bollen-Stine bootstrap (Bollen & Stine, 1992) using 1000 bootstrap samples. Data from Study 1 were used (group 1: $N = 60$) and enlarged for cross validation by the data of a pretest (group 2: $N = 80$).

Results suggested a need for scale purification (see Peck & Childers, 2003b). First, one item of the autotelic scale...
and one item of the instrumental scale were removed (see Table 1).\footnote{Results of the moderator regression analysis for the confidence in judgment and the frustration while evaluating using the reduced 12-item German NFT scale revealed the same significant effects as reported for the translated 14-item NFT scale.} The remaining 12 items are identical to the 12 items of Peck and Childers’ NFT scale. Then, we allowed for some error correlations which considerably improved model fit (error correlations were also allowed in Peck & Childers’ two-factor model).

The resulting model fit the data well. Model fit was best when parameters were constrained to be equal between both groups (Study 1 and pretest), indicating that the structure did not differ between both groups. Therefore, we report the fit indices for the “constraint” model, that is, a model in which all path coefficients are constricted to be identical between groups. The \( \chi^2 \) test for this model was nonsignificant, \( \chi^2 (126, N = 120) = 149.04, p = .08, \) and \( \chi^2/df = 1.18. \) The fit values of GFI = .86 and AGFI = .83 were low but acceptable, TLI = .98, CFI = .98 and RMSEA = .04 indicated an overall good fit. Bollen-Stine bootstrap results also supported the postulated model. In 567 out of 1000 bootstrap samples the model fit well, indicating that the data do not depart significantly from the tested model.\footnote{Because there is no equivalent German instrument that assesses the need for haptic information, we were unable to examine convergent validity. Discriminant validity of the NFT scale was tested by comparing the NFT scales with the NFCC and NTE scales. As expected, correlations were generally low (see Table 2). The only construct that correlated significantly with NFT was the decisiveness dimension of NFCC,which was negatively related to the complete NFT scale (\( r = .42 \), to autotelic NFT (\( r = .38 \)), and to instrumental NFT (\( r = -.39 \)). Such negative relations may be considered plausible, because people who do not trust their decisions may search for additional (e.g., haptic) information (Peck & Childers, 2003a, 2003b).

Using confirmatory factor analysis we tested in an exploratory way the discriminant validity with the Fornell-Larcker ratio. The Fornell-Larcker ratio implies that the amount of variance captured by a construct in relation to the variance due to random measurement error (average variance extracted, AVE) of a factor should be higher than every squared correlation of this factor with another factor. Reported results for the Fornell-Larcker ratio in Table 3 are based on the highest intercorrelation of the scales. Discriminant validity is supported if the Fornell-Larcker ratio is smaller than 1, indicating that a factor shared more AVE with associated items than other factors (Fornell & Larcker, 1981). As expected the Fornell-Larcker ratio for the autotelic and instrumental scale is larger than 1, because they are highly correlated. Thus, we also reported the Fornell-Larcker ratio for the autotelic and instrumental NFT scale using the second highest intercorrelation of the scales (Table 3 values in parentheses).

Comparing the NFT scales with the NFCC and NTE scales, results from Tables 2 and 3 supported discriminant validity.

## Discussion

Study 1 tested the German version of Peck and Childers’ (2003b) NFT scale. The 14-item NFT scale can be divided into two highly reliable subscales, that is, autotelic and instrumental NFT. Results from two moderator analyses confirm the construct validity: As expected, NFT moderated the effect of presence versus absence of haptic information on confidence and frustration in product evaluation. Individuals higher in NFT felt more confident and were less frustrated when they could integrate haptic information in

### Discriminant Validity

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### Table 2. Correlations of Need for Touch (NFT) with Need for Cognitive Closure (NFCC) and Need to Evaluate (NTE) (data from Study 1)

<table>
<thead>
<tr>
<th></th>
<th>NFCC</th>
<th>NFCC_pers</th>
<th>NFCC_decision</th>
<th>NFCC</th>
<th>NTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>NFT_auto</td>
<td>-.06</td>
<td>-.38**</td>
<td>.13</td>
<td>-.06</td>
<td>.06</td>
</tr>
<tr>
<td>NFT_in</td>
<td>-.02</td>
<td>-.39**</td>
<td>.17</td>
<td>-.06</td>
<td>.06</td>
</tr>
<tr>
<td>NFT</td>
<td>-.03</td>
<td>-.42**</td>
<td>.18</td>
<td>-.02</td>
<td>.02</td>
</tr>
</tbody>
</table>

*Note. PNSP = personal need for structure and predictability. **p < .01.*
the process of product evaluation. No effects relating to the opportunity of touch were found using the product evaluation as dependent measure. Grohmann et al.'s (2007) findings suggest that product evaluations differed with respect to opportunity to touch and level of product quality. In these studies significant effects of NFT on product evaluations resulted, when the level of product quality was integrated into the analysis. Our products do not differ regarding product quality, so that measures of confidence and frustration seem more appropriate indicators of differences in NFT than product evaluations. Additionally, Grohmann et al. found no significant effects on product evaluations in a multiple product comparison. Similarly, we found no significant effects resulting from regression analysis for the three products using product evaluations as the dependent variable, indicating a robust finding.

Additionally, we analyzed the structure of the NFT scale in exploratory and confirmatory factor analyses. We were able to replicate the factor structure of NFT reported by Peck and Childers (2003b). Like Peck and Childers’ structural equation model, our model also fitted best after reducing the scale from 14 items to 12 items and allowing for error correlations. Because sample size for the performance of the CFA was small (group 1: \( N = 60 \), group 2: \( N = 80 \)) and the assumption of Gaussian distribution was violated, a replication with a larger sample is desirable to confirm the two-factor model with correlated dimensions and error correlations.

Discriminant validity was assessed comparing the correlations of the German version of the NFT, NFCC, and NTE scales (Collani, 2007a, 2007b). Results confirm that NFT is clearly separable from other motives related to cognitive and evaluative styles. The stricter test with the Fornell-Larcker ratio also supported discriminant validity, but results are only exploratory and limited, because data for the CFA was very low (\( N = 60 \)).

Study 1 highlights the importance of NFT in the context of consumer psychology. The German version of the NFT scale provides the opportunity to gain further insights in the effects of product design and related topics.

Study 2

Study 2 investigated whether NFT has spontaneous, non-instrumental influence. For this purpose, we examined the autotelic component of NFT which is associated with unintended, spontaneous, and automatic processing of haptic information (Peck & Childers, 2003a, 2003b), and we used a task for which haptic information should be irrelevant.

Furthermore, we wanted to examine this influence in a broader research context outside the domain of consumer psychology, because NFT is considered as a general “preference for the extraction and utilization of information obtained through the haptic system” (Peck & Childers, 2003b, p. 435), which results from a chronic or long-term accessibility of haptic information (Peck & Childers, 2003b).

From this perspective, NFT is not only important in terms of touching products, but also might affect human behavior in everyday decision making. In order to examine the influence of NFT on decision making, a traditional paradigm of decision making research was used in Study 2, that is, the gambling paradigm, which consists of lotteries with fixed options. The task is to choose from two gambling alternatives the one with the higher anticipated gain (Goldstein & Weber, 1997; Jungermann, Pfister, & Fischer, 2005). Lotteries in Study 2 were designed so that participants in general should be indifferent to the two gambling alternatives. However, the alternative options were presented in cotton bags differing in haptic pleasantness. We expected that higher autotelic NFT individuals would automatically use haptic information for their choice and would decide more often in favor of the gambling alternative wrapped in the bag that was pleasant to touch. Lower autotelic NFT individuals should not be affected by haptic information and should overall be indifferent in their choice of the gambling alternatives.

Method

Participants

80 undergraduate students (68 female; age \( M = 21.51, SD = 2.56 \)) of the University of Erfurt, Germany, participated in this experiment. The data of one participant had to be excluded because he failed to record his choices.

Material

Cotton Bags

In each trial of the experiment, participants had to decide which of two gambles was more attractive to them (see below). Information about the two gambles (probability and value of winning) were presented on separate sheets of paper which were given to the participants inside two cotton bags labeled with “A” and “B,” respectively. Additionally, the amount of money that could be won was inside the bags in form of toy money. Half of the cotton bags were soiled with wax.

A pretest (\( N = 20 \)) using six different pairs of packages (i.e., cotton bags, parchment envelopes, wooden boxes, plastic balls, aluminum boxes, and satin bags) was employed to assess the appropriateness of the packages for this study. For each pair, one package was presented in an unmodified manner (positive-touch condition). The other package of each pair was modified by scratching, damaging or sprinkling with honey or wax, so that a negative affective reaction emerged when the package was touched. Participants rated their feeling of touch on a 15-item scale using 7-point semantic differentials. The means for the six pairs of unmodified and modified packages were: cotton bags \( M = 4.09, SD = 0.37 \) and \( M \).
Parchment envelopes showed consistent performance with wooden boxes and plastic balls: $	ext{M} = 3.98$, $\text{SD} = 0.40$; plastic balls had the lowest score: $	ext{M} = 3.43$, $\text{SD} = 0.47$; and wooden boxes: $	ext{M} = 3.58$, $\text{SD} = 0.45$. Satin bags had the highest score: $	ext{M} = 4.27$, $\text{SD} = 0.41$; followed by aluminum boxes: $	ext{M} = 4.01$, $\text{SD} = 0.47$. Data analysis revealed that the unmodified and modified packages reached maximum $F$-values with $F(1, 19) = 24.89$, $p < .001$, $\eta^2 = .57$. These results showed that the unwaxed cotton bags were pleasant to touch, while the waxed cotton bags provoked a more negative touch experience.

To disguise the aims of the present study, participants were told that the cotton bags had been used in another study for which some of them were stained with wax. Additionally, it was stressed that the appearance of the cotton bags was of no importance for participants' choices.

### Table 4. Gamble pairs from Study 2

<table>
<thead>
<tr>
<th>Source</th>
<th>Gamble alternative A</th>
<th>Gamble alternative B</th>
<th>Source</th>
<th>Gamble alternative A</th>
<th>Gamble alternative B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gain</td>
<td>Gain</td>
<td>p</td>
<td>EV</td>
<td>p</td>
</tr>
<tr>
<td>1. Jungermann, Pfister, and Fischer (2005, p. 221)</td>
<td>100 EUR</td>
<td>.50</td>
<td>50.00</td>
<td>101 EUR</td>
<td>.49</td>
</tr>
<tr>
<td>2. Birnbaum (2007, p. 391)</td>
<td>55 EUR</td>
<td>.50</td>
<td>50.00</td>
<td>100 EUR</td>
<td>.50</td>
</tr>
<tr>
<td>3. Birnbaum and Martin (2003, p. 91)</td>
<td>45 EUR</td>
<td>.50</td>
<td>47.50</td>
<td>100 EUR</td>
<td>.50</td>
</tr>
<tr>
<td>4. Birnbaum and Martin (2003, p. 91)</td>
<td>100 EUR</td>
<td>.50</td>
<td>50.00</td>
<td>35 EUR</td>
<td>.50</td>
</tr>
<tr>
<td>5. Jungermann et al. (2005, p. 221)</td>
<td>4000 EUR</td>
<td>.80</td>
<td>3200.00</td>
<td>3000 EUR</td>
<td>1.0</td>
</tr>
<tr>
<td>6. Kahneman and Tversky (2000, p. 6)</td>
<td>1000 EUR</td>
<td>.25</td>
<td>250.00</td>
<td>240 EUR</td>
<td>1.0</td>
</tr>
<tr>
<td>7. Kahneman and Tversky (1979, p. 264)</td>
<td>1000 EUR</td>
<td>.50</td>
<td>500.00</td>
<td>450 EUR</td>
<td>1.0</td>
</tr>
<tr>
<td>8. Kahneman and Tversky (1979, p. 265)</td>
<td>2500 EUR</td>
<td>.33</td>
<td>2409.00</td>
<td>2400 EUR</td>
<td>1.0</td>
</tr>
<tr>
<td>10. Tversky et al. (1990, p. 208)</td>
<td>100 EUR</td>
<td>.89</td>
<td>89.00</td>
<td>1000 EUR</td>
<td>.11</td>
</tr>
<tr>
<td>11. Tversky et al. (1990, p. 208)</td>
<td>100 EUR</td>
<td>.97</td>
<td>97.00</td>
<td>400 EUR</td>
<td>.31</td>
</tr>
<tr>
<td>12. Tversky et al. (1990, p. 208)</td>
<td>50 EUR</td>
<td>.81</td>
<td>40.50</td>
<td>225 EUR</td>
<td>.19</td>
</tr>
<tr>
<td>13. Birnbaum and Martin (2003, p. 91)</td>
<td>6 EUR</td>
<td>.03</td>
<td>93.33</td>
<td>6 EUR</td>
<td>.06</td>
</tr>
<tr>
<td>14. Birnbaum and Martin (2003, p. 91)</td>
<td>12 EUR</td>
<td>.05</td>
<td>87.70</td>
<td>12 EUR</td>
<td>.10</td>
</tr>
<tr>
<td>15. Birnbaum and Martin (2003, p. 91)</td>
<td>44 EUR</td>
<td>.05</td>
<td>100.05</td>
<td>10 EUR</td>
<td>.05</td>
</tr>
<tr>
<td>16. Birnbaum and Martin (2003, p. 91)</td>
<td>40 EUR</td>
<td>.10</td>
<td>96.40</td>
<td>10 EUR</td>
<td>.10</td>
</tr>
</tbody>
</table>

**Note.** Probability; EV = expectancy value; p (A) = Percentage of participants choosing option “A” (Data from Study 2).
Gambles

We adopted 16 pairs of gambles from different studies (see Table 4). Pairs were chosen so that both gambles had similar subjective attractiveness. Gambles consisted of different types: First, we used gambles of two alternatives with one secure event ($p = 1$; e.g., a 100% chance to get 3000 €) and one insecure event ($p < 1$; e.g., an 80% chance to get 4000 € and a 20% chance to get 0 €). The second type of gambles had only insecure events, one alternative had a small probability and a high gain and the second alternative had a high probability but a small gain. Third, we included gambles of two alternatives with three insecure events. The fourth type consisted of an alternative with a 50:50 chance to gain a lot of money or nothing and another alternative with a 50:50 chance to gain roughly similar but small amounts of money.

Equivalent expectancy values (EV) do not guarantee subjective indifference (e.g., Allais, 1953; Ellsberg, 1961; Kahneman & Tversky, 2000). Therefore, we estimated subjective attractiveness using the election probability stated by the authors of the 16 gamble paradigms (see Table 4). Gamble alternatives with higher and lower election probabilities were counterbalanced across the pleasant and unpleasant bags.

Autotelic NFT Scale

Autotelic NFT was measured using the autotelic subscale of the German NFT scale (see Table 1). Cronbach’s $\alpha$ for the autotelic NFT scale was .94.

Design

The present study applies a correlational approach with autotelic NFT as independent variable and percentage of choosing the pleasantly wrapped lottery ticket as dependent variable. The order of presentation of gambles was counterbalanced across four groups of participants. Additionally, it was counterbalanced which gambles were presented in stained versus unstained bags. In 8 out of 16 pairs, one alternative was presented in an unstained (pleasant) bag and the other in a stained (unpleasant) bag. Only these trials were analyzed. For four pairs the more attractive gamble was inside the unstained bag and for four pairs the more attractive gamble was in the stained bag, with attractiveness determined by the choice probabilities in the original studies from which the gambles were taken (see Table 4). Of the eight remaining filler trials, four used two unstained bags and four used two stained bags.

Procedure

In each trial of Study 2, participants had to decide which of two gambles they preferred. Written information about the values and probabilities of the alternate gambles were presented in two cotton bags labeled “A” and “B.” Additionally, the maximal amount of money at stake in each game was inside the bag in form of toy money.

Participants were instructed to open the bags and take out the lottery ticket (i.e., written descriptions) and the toy money, to look at it, and to hold the toy money in their hand, imagining it to be real money they could win. Thus, we assured that the cotton bags were touched.

After inspecting the two alternatives, participants recorded their preference (“A” or “B”) in writing. This procedure was repeated for 16 pairs of gambles. After the gambling task was completed, participants filled out a short questionnaire assessing sociodemographic data and completed the autotelic NFT scale. Afterward, participants were asked whether they had realized that the manipulation of the cotton bags was part of the experiment. Finally, participants were fully debriefed.

Results

To determine the influence of autotelic NFT on decision making, we calculated a regression analysis with the percentage of “pleasant” choices as dependent variable and autotelic NFT as independent variable. Three data points were identified as bivariate outliers (standardized residuals > 2) and excluded from further analysis.

As expected, the findings of the regression analysis indicate that higher autotelic NFT individuals prefer more often gamble alternatives packed in pleasant cotton bags (see Figure 3), $F(1, 74) = 6.36, p = .01, \beta = .28; R^2 = .08$.

Discussion

Results confirmed our hypotheses that touching an unstained (pleasant) or stained (unpleasant) cotton bag prior to choosing of a gamble alternative influences decision making in a gambling paradigm. Higher autotelic NFT was
related to an increased probability to choose the gambling alternative that came in a cotton bag which evoked a positive feeling through touch. Lower autotelic NFT individuals were not guided by feeling of touch.

These results can be taken as new evidence for the external validity of the autotelic NFT scale. Findings demonstrate the importance of NFT and show the influence of this disposition in domains where it a priori might not be expected.

**General Discussion**

The validity of the German version of the NFT scale was supported by the two experiments. Study 1 tested the NFT scale in the context of consumer psychology and showed that the influence of haptic information on confidence and frustration in product evaluation is moderated by individual differences in touch (NFT). In Study 2, we examined the automatic influence of autotelic NFT on judgment and decision making. Findings indicated that higher autotelic NFT individuals are guided by the feelings of touch even when haptic information was irrelevant for decision making.

The German version of the NFT scale also possessed the hypothesized two-factor structure. Moreover, the discriminant validity of the German version of the NFT scale was demonstrated by low correlations with other cognitive constructs like NFCC and NTE. The only significant correlation we found concerned the NFT subscales and the decisiveness subscale of the NFCC. With respect to NFT, this negative correlation might indicate that higher NFT individuals were motivated to search for additional information when feeling uncertain in decision making.

**Conclusion and Implications for Further Research**

Overall Study 1 and 2 highlight the importance of allowing decisionmakers to touch the products in retail environments and to recognize the effects caused by using haptic information.

In consumer psychology, the influence of NFT was mostly explored with respect to the confidence and the level of frustration in product evaluation. For the first time Grohmann et al. (2007) explored the effect of NFT and perceived product quality on product evaluation, but significant effects of the opportunity to touch products on NFT were only found for one out of three evaluated products or in interaction with the level of product quality. In Study 1, we found no significant effects of NFT on product evaluation. It is possible that product evaluation depends on additional factors, like the need to own the product or the perception of product quality (e.g., brand name, price). Integrating these aspects in further research might shed light on the effects of NFT on product evaluation.

The results of Study 1 showed that frustration during product evaluation increased if higher NFT participants were not allowed to touch the products. Possibly, the manipulation in the no-touch condition artificially increased frustration of higher NFT participants, because for a minimum of 2 minutes they were forced to explore the product visually and read the product description before the product-evaluation procedure could be started on the computer. Also, confidence ratings for higher NFT participants might be influenced by the opportunity to explore haptic information of the product in the touch condition for 2 minutes or more.

Implications from this paper may also be drawn for designing internet sites. Today, the internet is becoming increasingly essential to our lives (Zhou, Dai, & Zhang, 2007). The internet is more than just a source of data exchange. Because of limited time resources, people increasingly use the internet as a shopping mall (Burke, 1997; Peterson, Balasubramanian, & Bronnenberg, 1997). Aside from advantages, internet shopping entails the disadvantage that products cannot be touched like in real shopping centers, possibly affecting brand judgments and choice preferences (Hoffman & Novak, 2009; McCabe & Nowlis, 2003; Peck & Childers, 2003a, 2003b). Motivated by research on individual differences in NFT, the lack of haptic information might be compensated through the application of interactive 3D models using 3D animation and virtual showrooms (Zhou et al., 2007).

Much more research surveying the importance of the use of haptic information is needed and should not only be limited to consumer research. In both studies we used student’s samples. A further limitation might be the high portion of female participants. Whereas Peck (1999), Peck and Childers (2003a, 2003b, 2006, 2007), and Peck and Wiggins (2006) did not indicate gender differences, Citrin et al. (2003) showed that the need for haptic information is higher for female than for male participants. Although analysis of gender differences for Study 1 and Study 2 showed no significant gender effects, for further studies it would be desirable to use a more balanced sample.

Particularly with Study 2 were we able to point out that the motivation to use haptic information can impact decisions, even when haptic information is not relevant. Research on individual differences in need for touch is in its infancy, and we hope that the present paper will be useful in facilitating such research.

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