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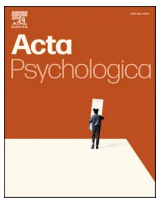

The relation between longing for touch and the implicit evaluation of images of touch

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ABSTRACT

Longing for touch (LFT) refers to the discrepancy between the amount of touch that is desired and received. Previous studies have suggested that LFT might influence the perception of touch, but the results are conflicting. These studies also have relied exclusively on subjective and explicit measures, which can be prone to several biases. To circumvent these biases, the current study uses a novel implicit association test (IAT) to assess how LFT is associated with the perception of touch. In this version of the IAT, target stimuli consisted of images of people touching and images of people that did not depict touch. Seventy-two people without neurological, psychological or skin-related disorders participated in the study. After completing the IAT, the explicit wanting and liking of the target stimuli was assessed. LFT was measured with two visual analogue scales. In line with our expectations, LFT was significantly and positively associated with the explicit evaluation of images of touch. However, there was no relation between LFT and performance on the IAT. It is possible that the current version of the IAT primarily assessed implicit liking, while deprivation of touch may be more strongly associated with (implicit) wanting. Additional research is needed to further investigate this. The implications of these results and other directions for future research are discussed.

1. Introduction

Interpersonal touch has been argued to be a fundamental human need (see e.g., Elkiss & Jerome, 2012; Montagu, 1971). Touch is the first sense to develop (Maurer & Maurer, 1988) and plays an important role in early development (Blackwell, 2000; Cascio et al., 2019). In addition, it has been found to have a positive effect on general wellbeing throughout the lifespan (Coan et al., 2006; Kidd et al., 2023; López-Solà et al., 2019). The importance of touch is further highlighted by the consequences of its absence. Touch deprivation, or longing for touch (LFT), is defined as a subjective discrepancy between the amount of touch one receives and the amount of touch one desires (Beßler et al., 2020). In children, deprivation of touch is associated with a variety of developmental delays (Field, 2010). In adults, LFT has been related to a lower quality of life (Hasenack et al., 2023), decreased general health and increased levels of psychopathological symptoms (Floyd, 2014).

Aside from these consequences for general wellbeing, LFT could also influence the way in which touch is perceived. In general, it is thought that deprivation induces the motivation to satiate the associated need (Veltkamp et al., 2008). This deprivation-induced motivation can subsequently influence cognitive, behavioural and perceptual processes that aid in achieving satiety (see e.g., Seibt et al., 2007; Veltkamp et al., 2008). According to the Reflective Impulsive Model (RIM), the influence of motivation on these processes is based on learned associations (Deutsch & Strack, 2007; Deutsch & Strack, 2020). When confronted with deprivation, behavioural schemata that have previously been proven to successfully fulfill the need are automatically activated (Deutsch & Strack, 2007; Deutsch & Strack, 2020). These schemata include, among others, information about the hedonic value of need-relevant stimuli. Activation of the behavioural schemata is therefore also thought to result in the enhanced appeal of these stimuli (Strack & Deutsch, 2004; Deutsch & Strack, 2007). This proposed association between deprivation and valence perception has repeatedly been observed in previous studies. For example, hunger and thirst have been found to increase the appeal of food (see e.g., Czyzewska et al., 2011; Seibt et al., 2007) and drink (Ferguson & Bargh, 2004), respectively. Given the importance of social touch (Elkiss & Jerome, 2012; Montagu, 1971), it is possible that similar perceptual changes could be observed in the context of LFT. Specifically, this would mean that the appeal of social touch would increase when individuals experience LFT. Investigating

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this is not only important to gain new insights into the potential consequences of LFT, but also to further understand which factors influence the general perception of social touch.

Current research into the perceptual consequences of LFT is, however, limited and the results are conflicting. Some support has been found for the RIM and the aforementioned associations between deprivation and valence perception. For example, Meijer et al. (2022) observed that higher levels of LFT were associated with a more pleasant vicarious perception of social touch in a non-clinical sample. However, Sailer and Ackerley (2019) found the opposite, namely that physical touch was perceived to be less pleasant by people who reported a reduced touch frequency and expressed a desire to be touched more. The authors subsequently suggested that one might lose the ability to enjoy touch after a prolonged period of deprivation, akin to a "use it or lose it" mechanism. In addition, touch deprivation has also been observed in the context of negative attitudes towards touch. For example, touch deprivation has been observed in people with anorexia nervosa (Gupta et al., 1995), who also tend to report a more negative attitude towards touch (Bellard et al., 2022). Similarly, women who experienced interpersonal trauma were found to express a stronger desire for touch from their current partner, while simultaneously reporting more negative attitudes towards touch (Schellenger, 2015). These results seem to contrast with the RIM as well, as an increased need for touch is expected to be associated with the increased appeal of touch. Although observations in these populations cannot be directly compared to Meijer et al. (2022) and Sailer and Ackerley (2019), it is important to investigate if the relation between LFT and the perception of touch is indeed more complicated than the RIM would predict. Additional research is consequently needed to fully understand the association between LFT and touch perception and to understand to what extent the RIM can be applied to this relation.

It is important to note that the aforementioned studies have exclusively relied on subjective and explicit measures to assess the perception of touch (Meijer et al., 2022; Sailer & Ackerley, 2019). Although such measures can provide useful insights, they are also prone to certain biases. For example, self-report measures can be susceptible to desirability bias or self-ignorance bias (i.e., the person might have limited awareness of their attitude towards the topic; Gregg & Klymowsky, 2013). It is unclear to what extent the results of Meijer et al. (2022) and Sailer and Ackerley (2019) have been influenced by such biases. As such, the use of subjective and explicit measures further complicates the evaluation of their conflicting results regarding the relation between LFT and touch perception. In order to fully understand how LFT is related to the perception of touch, it is therefore important that future studies incorporate more implicit measures.

One technique that could be used to implicitly assess the perception of touch is the implicit association test (IAT; Greenwald et al., 1998). The IAT is a forced-choice task, in which a participant uses key responses to categorize target concepts and attributes (i.e., pleasant and unpleasant). Participants are expected to respond faster when the same key is used for highly associated variables than when the same response is required for variables that are less strongly associated. Reaction time is therefore used as a measure of association strength. Although the IAT was initially developed to assess implicit racial bias (Greenwald et al., 1998), it has also repeatedly been used to assess the evaluation of need-related stimuli in the context of hunger and thirst (see e.g., Koranyi et al., 2017; Richard et al., 2017; Seibt et al., 2007). In these versions of the IAT, images of need-related stimuli (e.g., food or drink) are often used as target concepts (Seibt et al., 2007; Richard et al., 2017; Koranyi et al., 2017). Whilst the validity of the IAT has been debated by some researchers (see e.g., Oswald et al., 2013; Schimmack, 2021), it has been argued that these criticisms do not influence the notion that the IAT can be used to assess the (automatic) association between variables (see Kurdi et al., 2021). In addition, it has been argued that implicit measures are still more suitable to assess automatic processes than explicit measures as responses are thought to be more difficult to control (see e.g., Hofmann et al., 2008; Roefs et al., 2006; Tibboel et al., 2015). As such, they may still be less prone to the biases that can influence explicit measures. In addition, several meta-analyses have demonstrated that the IAT can predict both explicit attitudes (Greenwald et al., 2009; Hofmann et al., 2005) and behavioural outcomes (Kurdi et al., 2019).

The aim of the current study is therefore to use a new version of the IAT to assess the relation between LFT and the implicit evaluation of touch. The overall set-up of this IAT was based on previous studies that investigated the relation between deprivation and need-related stimuli (see e.g., Seibt et al., 2007). A pilot study was conducted to select the target stimuli, which consisted of images depicting touch and images that did not depict touch. In the main experiment, the explicit wanting and liking of these target stimuli was assessed as well. Although explicit measures might be prone to biases (Gregg & Klymowsky, 2013), we included them to allow for a comparison with previous studies in which similar measures were used (Meijer et al., 2022; Sailer & Ackerley, 2019). In addition, we wanted to assess the relation between the implicit and explicit evaluation of images of touch. Previous studies have shown that, while the correlation between implicit and explicit measures is often weak, they are generally positively correlated (Hofmann et al., 2005). We therefore expect that there is a positive relation between IAT performance and the explicit evaluation of images of touch. Based on Meijer et al. (2022) and the RIM (Strack & Deutsch, 2004), we additionally hypothesize that that LFT is positively associated with both performance on the IAT and the explicit evaluation of images of touch.

2. Methods

2.1. Participants

Data was collected between January and June 2024. A total of 72 people completed the main experiment (M_{age} = 22.28, SD_{age} = 2.89; 77.8 % women). Participants had to be 18 or older and not been diagnosed with a psychological, neurological or skin-related disorder. Thirty-one participants did not indicate where they were from. Other participants were from the Netherlands (n = 35; 48.6 %), other European countries (n = 3; 4.2 %) or countries outside of Europe (n = 3; 4.2 %).

2.2. Assessment of stimuli

The interpretation of target and attribute stimuli was first assessed in a pilot study. Target stimuli consisted of 10 images of people, and 10 images of people touching (see Fig. 1 for examples). All pictograms were derived from Freepik (Freepik Company S.L.). On all images, two people were depicted. Attribute stimuli consisted of 10 pleasant (e.g. "Freedom") and 10 unpleasant words (e.g. "Rotten"), which had been used in a previous IAT study (Richard et al., 2018). The full stimulus sets can be found in the Supplementary Materials. Twenty participants completed the pilot (M_{age} = 25.95, SD_{age} = 3.27; 80 % women). The target stimuli were first presented in a randomized order. For each stimulus, participants choose the description that they believed fit the image best ("*people*", "*people touching*" or "*neither/I don't know*"). Participants also rated the extent to which the people in the image were socially interacting with each other on a visual analogue scale (VAS) ranging from 0 ("*not at all*") to 100 ("*very much*"). They subsequently also rated the pleasantness of the attribute words on a VAS ranging from 0 ("*very unpleasant*") to 100 ("*very pleasant*"). The pleasant words were rated as significantly more pleasant (M = 86.02, SD = 6.15) than the unpleasant words (M = 12.85, SD = 6.77), t(19) = 28.30, $p < .001$, d = 6.33. Images of people were perceived as displaying significantly less social interaction (M = 37.13, SD = 9.43) than images of people touching (M = 91.35, SD = 7.06), t(19) = 21.45, $p < .001$, d = 4.80. In addition, all target stimuli were largely correctly categorized by participants (accuracy rate $\geq$ 90 % for all stimuli).

2.3. IAT

The IAT was constructed with the iatgen tool (Carpenter et al., 2019). Participants were instructed to look at a fixation cross in the middle of the screen, where the target and attribute stimuli would appear (see Fig. 1 for an example). These stimuli had to be subsequently categorized using left- and right-key responses. There were four possible starting configurations for these response keys: 1) the left-key response was used for target A (images of people touching) and pleasant words, 2) the right-key response was used for target A and unpleasant words, 3) the left-key response was used for target A and unpleasant words, and 4) the right-key response was used for target A and pleasant words. These configurations were counterbalanced between participants. Participants were told to categorize the stimuli as quickly and correctly as possible. When an incorrect response was given, a red cross was briefly shown. All trials were separated by a 250 millisecond break.

In accordance with the standard protocol (Greenwald et al., 2003), the IAT consisted of seven blocks. In block 1 (B1), participants practiced with the categorization of the target stimuli. In block 2 (B2), they did the same for the attribute stimuli. Both blocks consisted of 20 trials, meaning that each stimulus was presented once. The order of B1 and B2 was not randomized between participants. Block 3 (B3) also consisted of 20 trials, which participants used to practice with the simultaneous categorization of the target and attribute stimuli. This was followed by a test in block 4 (B4), which contained 80 trials. This means that each attribute and target stimulus was presented twice in the test block. Block 5 (B5) was a repetition of B1, but with the reversed response key assignment for the target stimuli. For example, if a left-response key was previously used to categorize images of people touching, the right-response key was now used for this. Block 6 (B6) and block 7 (B7) were similar to B3 and B4, but with the same sorting rules for the target stimuli as used in B5. In all blocks, stimuli were presented in a randomized order.

$$\frac{\left(\frac{B6-B3}{Pooled\ SD\ (B6\ and\ B3)}\right)+\left(\frac{B7-B4}{Pooled\ SD\ (B7\ and\ B4)}\right)}{2} \quad (1)$$

D600 scores were calculated for each participant, using the average response time in B3, B4, B6 and B7 (see Eq. (1); Greenwald et al., 2003). In accordance with Greenwald et al. (2003), the response time for incorrect trials was replaced with the block average for correct trials, with an additional error penalty of 600 milliseconds. Positive D600 scores reflect a stronger implicit association between images of people touching and pleasant words, and negative scores indicate a stronger implicit association between these images and unpleasant words.

2.4. Explicit measures

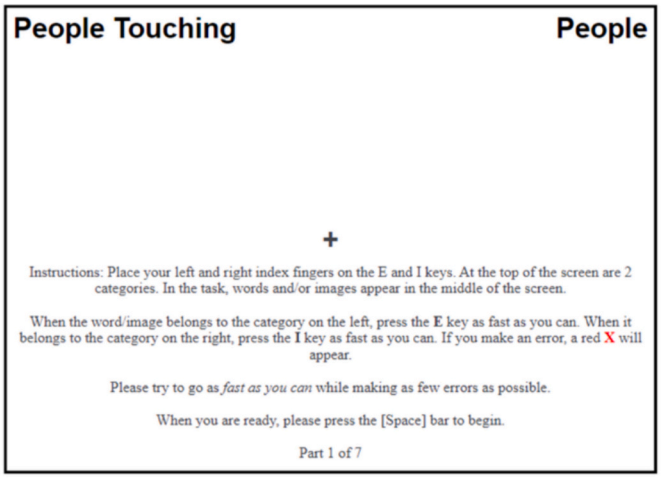
A VAS ("*How would you rate this image?*") was used to assess the explicit liking of the target stimuli. This VAS ranged from 0 ("*very unpleasant*") to 100 ("*very pleasant*"). For the images of people touching, an additional VAS was used to measure explicit wanting ("*How much would you like to be touched like this right now?*"). This VAS ranged from 0 ("*not at all*") to 100 ("*very much*").

2.5. LFT VAS

LFT was measured using a 2-item questionnaire, which will hereafter be referred to as the LFT VAS. This questionnaire has been used in previous research (Hasenack et al., 2023; Meijer et al., 2022). In addition, it is comparable to the items that have been used to assess the level of deprivation in other IAT studies (see e.g., Stafford & Scheffler, 2008). Participants indicate on the LFT VAS how much they would currently like to touch others and how much they would currently like to be touched by others. They respond to these two items on a VAS which ranges from 0 ("less") to 100 ("more"). Responses to these two items are subsequently averaged into an LFT score, with higher scores indicating a stronger LFT. The reliability of the scale was good (Cronbach's $\alpha = 0.862$). The average LFT score in the current sample was 58.44 ($SD = 16.49$).

2.6. Procedure

Data was collected online with Qualtrics. At the start of the experiment, all participants provided informed consent. They were told that the aim of the study was to assess how well they could categorize images and words, and how individual differences could play a role in this. Participants first filled out demographic questions about their gender, age and nationality. They subsequently completed the IAT. Participants were able to take breaks between blocks and could continue with the next block whenever they were ready. After the IAT, participants explicitly evaluated the target stimuli. The target stimuli were presented in a randomized order. At the end of the experiment, participants filled out the LFT VAS. Students from Utrecht University received credits after completing the experiment. Other participants did not receive any form of compensation. The study was approved by and executed in accordance with the regulations of the ethical review board of the Faculty of Social and Behavioural Sciences at Utrecht University (23-0320).



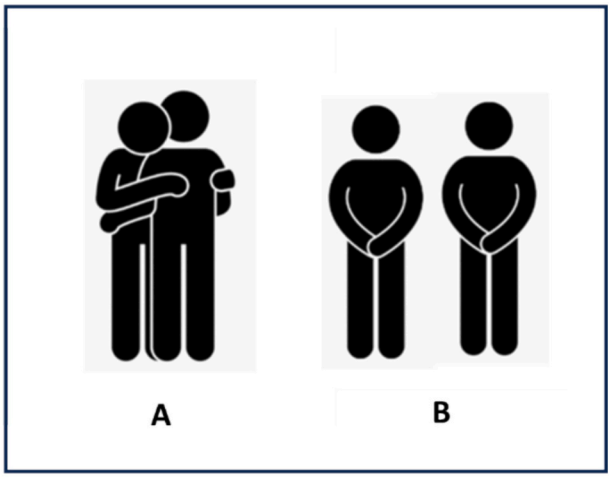


Fig. 1. Example of IAT instructions and target stimuli.
Note. Image A is an example target stimulus from the category *People Touching* and image B is an example from the category *People*.

2.7. Data analysis

D600 scores were calculated in accordance with Greenwald et al. (2003) in RStudio. This scoring algorithm requires trials with latencies above 10.000 milliseconds to be excluded, as well as participants for whom more than 10 % of trials had a latency less than 300 milliseconds. No trials and participants had to be excluded because of these criteria. SPSS 28.0.1.1 was used for the preliminary and primary analyses. A paired *t*-test was used to compare the explicit evaluation of images of people touching and images of people. A linear regression analysis was used to assess the relation between LFT and D600 scores. Order of blocks was added as a binary covariate, as previous studies have shown that block order can influence the IAT-effect (Klauer & Mierke, 2005). Two additional linear regression analyses were used to assess the relation between LFT and the explicit wanting and liking of images of people touching, with a third exploratory linear regression analysis being used to assess the relation between LFT and the explicit liking of images of people. For the explicit wanting and liking of images of people touching, visual inspection of residual plots raised questions about heteroscedasticity. Spearman correlations between the absolute standardized residuals and standardized predicted values were conducted to further test this. As the correlation was insignificant for both liking ($r_s = -0.160$, $p = .178$) and wanting ($r_s = 0.080$, $p = .505$), homoscedasticity was assumed. For the explicit wanting of images of people touching, and the explicit liking of images of people, the assumption of normality was violated. Two extreme outliers were detected in the data for the explicit wanting of images of people touching (<3SD) and one for the explicit liking of images of people (>3SD). These were therefore removed from analyses involving these variables. Given the number of parameters and current sample size, further robustness of the linear regression (Schmidt & Finan, 2018) and correlation analyses (Havlicek & Peterson, 1976) was assumed. Correlation analyses were used to assess the association between D600 scores and the explicit wanting and liking of images of people touching. For all analyses, $\alpha = 0.05$ (two-tailed).

3. Results

3.1. Preliminary analyses

Participants rated the images of people touching ($M = 74.20$, $SD = 9.67$) as significantly more pleasant than images of people ($M = 47.31$, $SD = 8.44$), $t(70) = -17.81$, $p < .001$, $d = -2.11$. The average score for the IAT was 0.30 ($SD = 0.54$) and found to be significantly different from 0 (i.e., no preference towards specific target stimuli), $t(71) = 4.66$, $p < .001$, $d = 0.55$. This indicates that, on average, participants responded faster when images of people touching were paired with pleasant words than when they were paired with unpleasant words. The split-half reliability of the IAT was excellent (0.92).

3.2. Main analyses

D600 scores were positively and significantly correlated with the explicit liking of images of people touching ($r = 0.378$, $p = .001$), but not with explicit wanting ($r = 0.215$, $p = .073$). To test our hypothesis that LFT is associated with the implicit evaluation of images of people touching, a linear regression analysis was conducted. The overall model was significant $F(2, 69) = 14.94$, $p < .001$, $R^2 = 0.30$. Block order was significantly associated with D600 scores, $\beta = -0.554$, $p < .001$, which is in line with previous observations (Klauer & Mierke, 2005). However, in contrast to our hypothesis, there was no significant association with the LFT VAS, $\beta = 0.154$, $p = .135$. We ran two additional regression analyses to assess the relation between LFT and the explicit evaluation of the images of people touching. LFT scores were significantly associated with both the explicit wanting ($\beta = 0.277$, $F(1,68) = 5.67$, $p = .020$, $R^2 = 0.08$) and liking ($\beta = 0.247$, $F(1,70) = 4.56$, $p = .036$, $R^2 = 0.06$) of these images. These results are in line with our expectation that LFT would be positively associated with the explicit evaluation of images of touch. An exploratory linear regression analysis revealed that LFT was also significantly associated with the explicit liking of images of people, $\beta = -0.241$, $F(1,69) = 4.24$, $p = .043$, $R^2 = 0.06$. This indicates that participants with higher levels of LFT perceived these images as more unpleasant. Scatterplots for the assocation between LFT and the explicit and implicit evaluation of the target stimuli can be found in the Supplementary Materials.

4. Discussion

The aim of this study was to assess the relation between LFT and the explicit and implicit evaluation of images of touch. Based on the Reflective Impulsive Model (RIM: Strack & Deutsch, 2004) and Meijer et al. (2022), we expected to that LFT would be positively associated with both IAT performance and the explicit evaluation of images of touch. While LFT was indeed found to positively correlate with the explicit evaluation these images, no significant relation with IAT performance was found. Interestingly, IAT d-scores were positively associated with the explicit liking of images of touch, but not with explicit wanting. This finding is partially in line with our expectations, as well as the observation that implicit and explicit measures tend to be positively correlated (Hofmann et al., 2005).

This is the first study to use the IAT to assess the implicit evaluation of images of touch. Although the IAT has previously been used to study the relation between deprivation and the perception of need-related stimuli, these studies have primarily focused on hunger and thirst (see e.g., Seibt et al., 2007; Richard et al., 2017; Koranyi et al., 2017). As such, there is no previous literature to which the results from the current study can be directly compared. However, the current results seem to be compatible with general findings about interpersonal touch. Given the well-documented benefits of social touch (Coan et al., 2006; Kidd et al., 2023; López-Solà et al., 2019), it could be expected that the general perception of touch and related stimuli is positive. Although few studies have directly investigated the latter, previous research has shown that affective interpersonal touch is generally perceived to be pleasant (see e.g., McGlone et al., 2014). An explicit preference towards touch-related stimuli was also observed in the current study, with participants rating images of touch to be more pleasant than images that did not depict touch. Interestingly, the current results are the first to suggest that there might also be an implicit preference for touch-related stimuli. Specifically, the overall IAT-effect indicates that there was a slight positive evaluation of images of touch on average. In other words, people generally responded faster when images of touch were paired with pleasant words. These results extend on previous findings and provide an interesting starting point to future research. For example, it would be interesting to investigate if similar patterns can be observed in clinical populations. Several clinical groups tend to report a more negative explicit attitude towards touch (Bellard et al., 2022; Lapp & Croy, 2021; Triscoli et al., 2019) and a reduced perceived pleasantness of tactile stimuli (Croy et al., 2016; Crucianelli et al., 2016), such as people with depression (Triscoli et al., 2019) or anorexia nervosa (Bellard et al., 2022; Crucianelli et al., 2016). Future studies should investigate if these differences can be observed implicitly as well. This would provide new insights into how touch is perceived in clinical populations and to what extent this differs from non-clinical groups.

The positive association between LFT and the explicit liking of images of touch is in line with previous observations. According to the RIM, the valence of need-related stimuli is enhanced following deprivation-driven motivation (Strack & Deutsch, 2004; Deutsch & Strack, 2007). This has repeatedly been observed in the context of hunger and thirst (see e.g., Czyzewska et al., 2011; Ferguson & Bargh, 2004; Seibt et al., 2007). Although research into the perceptual consequences of LFT is scarce, Meijer et al. (2022) found a positive relation between LFT and the explicit evaluation of videos of interpersonal touch. The current study extends on these findings by demonstrating that a similar

association can also be observed for simplistic images of social touch. Interestingly, a negative relation was observed between LFT and the perception of images that did not depict touch. Comparable findings have been reported in the context of hunger, with hungry people perceiving non-food stimuli more negatively than those who were satiated (Lozano et al., 1999). The RIM does not specifically address responses to task-irrelevant stimuli, so these results cannot be directly interpreted in the context of this model. However, in order to resolve a state of deprivation, it is possible that irrelevant stimuli are perceived to be less pleasant or interesting in order to maintain a focus on stimuli that are need-relevant. This remains to be investigated in future studies.

It is, however, important to note that the strength of this association was weak. Despite being compatible with the RIM, it should therefore also be questioned how meaningful this relation is in practice. One explanation for the weak association is that previous studies have shown that the perception of touch can be influenced by a variety of other factors that were not included in the current study. Some examples are attitudes towards touch (Butti et al., 2024), attachment style (Krahé et al., 2018) and the presence of trauma (Stevens et al., 2024). LFT may therefore only explain part of the individual variability in the perception of touch-related stimuli, which would be in line with the weak association. In order to fully understand the role of LFT in touch perception, and how this compares to the influence of other factors, future studies should therefore include measures to assess these factors. Another explanation is that the images were only perceived to be limitedly relevant for resolving touch-related needs. We used simplistic images in the current study, as we expected that realistic stimuli could lead participants to differentially identify with the images and subsequently increase variability in their responses. Such simplistic images could, however, hold less hedonic value than realistic images and actual physical touch. They may also be less strongly associated with behavioural schemata that are used to fulfill touch-related needs, resulting in weaker associations with LFT. To further investigate this, future studies should assess the relation between LFT and a variety of simplistic and more realistic touch-related stimuli.

Despite these limitations, it is still unexpected that LFT was not similarly associated with IAT performance. This could possibly be explained by the design of the IAT and the processes that were involved in task performance. In paritcular, it is important to consider the potential involvement of implicit wanting and liking. Although these processes are related (Nguyen et al., 2021), they are also considered to be psychologically and physiologically distinct (see e.g., Berridge & Kringelbach, 2008). While wanting reflects a motivational tendency, liking encapsulates the hedonic response to a stimulus (Berridge et al., 2009). It has previously been argued that these processes can be differentially targeted by using different attribute categories in the IAT (see e.g., Koranyi et al., 2017; Tibboel et al., 2015). The attributes that were used in the current study ("*Pleasant*" and "*Unpleasant*") are similar to versions of the IAT that were specifically designed to assess implicit liking (Kraus & Piqueras-Fiszman, 2016; Tibboel et al., 2015). These differ from the categories that are used to assess implicit wanting (i.e., "*I want*" and "*I do not want*"; Koranyi et al., 2017). It is therefore possible that the current IAT d-scores primarily reflect the implicit liking of touch, rather than the implicit wanting of touch. This would also be compatible with the observation that D600 scores were correlated with explicit liking but not with explicit wanting. However, as will be discussed in the following paragraph, the interpretation of these explicit results should be done with some caution.

It is important to understand to what extent wanting and liking are involved in the IAT, as it has been debated if these processes are differentially affected by deprivation. Specifically, it has previously been hypothesized that (need-driven) motivation is more strongly associated with implicit wanting (Koranyi et al., 2017). This could then explain why no significant association was observed between LFT and IAT task performance. However, results from actual experimental studies are mixed. While some studies found that deprivation indeed only affected motivational tendencies (Epstein et al., 2003), others observed that it was solely associated with the hedonic liking of a need-relevant stimulus (Tibboel et al., 2011). In the current study, LFT was similarly associated with both the explicit wanting and liking of images of touch. These correlations should, however, be interpreted with caution. Koranyi et al. (2017) argued that differences between wanting and liking might be masked on explicit measures because people might conceptualize them similarly. The current results do therefore not necessarily have to indicate that LFT is equally associated with wanting and liking. Taken together, additional research is needed to understand if these processes are indeed differentially affected by deprivation and, subsequently, if this can explain the current insignificant findings. To this end, future studies should aim to compare the current IAT to a version that incorporates want-specific attribute categories (see e.g., Koranyi et al., 2017).

The current results could also have been influenced by an additional methodological limitation. Although the current target stimuli were carefully selected, it is possible that they did not exclusively assess the implicit and explicit evaluation of touch. In the pilot study, participants indicated that the images of touch displayed significantly more social interaction than the non-touch images. This could not be adjusted for, as the simplistic style of the stimuli made it difficult to design images that displayed different types of non-tactile social interaction. It is therefore possible that performance on the IAT and responses to the explicit measures were partially influenced by attitudes towards social interaction. This could similarly influence the interpretation of the association between LFT and the explicit evaluation of the images, as it could indicate that participants with LFT respond more positively to social interaction in general, rather than specifically to social touch. To avoid this limitation in future studies, a different set of non-touch target stimuli should be designed. These stimuli should clearly display social interaction, without including a tactile component (e.g., an image of two people talking). This might require the use of a more complex illustration style.

In conclusion, the current study is the first to use an IAT to assess the implicit evaluation of images of touch. The results demonstrate that images of touch are positively evaluated, and that this can be observed both explicitly and implicitly. Although performance on the IAT significantly correlated with the explicit liking of images of touch, no relation with LFT was found. Future studies are needed to disentangle the implicit processes that may influence IAT performance and to assess how responses vary in different populations. It is important to conduct these studies, as implicit measures could continue to provide valuable insights into how touch is perceived and experienced.

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CRediT authorship contribution statement

B. Hasenack: Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **H.C. Dijkerman:** Supervision, Methodology, Conceptualization. **A. Keizer:** Supervision, Methodology, Conceptualization.

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Declaration of competing interest

The authors declare no competing interests.

Data availability

Data will be made available on request.

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