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ORIGINAL MANUSCRIPT

The Validated Touch-Video Database

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Abstract

Visually observing a touch quickly reveals who is being touched, how it might feel, and the broader social or emotional context, shaping our interpretation of such interactions. Investigating these dimensions is essential for understanding how tactile experiences are processed individually and how we empathise with observed sensations in others. Here, we expand available resources for studying visually perceived touch by providing a wide-ranging set of dynamic interactions that specifically focus on the sensory qualities of touch. The Validated Touch-Video Database (VTD) consists of a set of 90 videos depicting tactile interactions with a stationary left hand, viewed from a first-person perspective. In each video, a second hand makes contact either directly (e.g., with fingers or an open palm) or using an object (e.g., a soft brush or scissors), with variations across dimensions such as hedonic qualities, arousal, threat, touch type, and the object used. Validation by 350 participants (283 women, 66 men, 1 non-binary) involved categorising the videos as 'neutral', 'pleasant', 'unpleasant', or 'painful' and rating arousal and threat levels. Our findings reveal high inter-subject agreement, with painful touch videos eliciting the highest arousal and threat ratings, while neutral touch videos serve as a baseline. Exploratory analyses indicate that women rated the videos as more threatening and painful than men, suggesting potential gender differences in the visual perception of negatively valenced touch stimuli. The VTD provides a comprehensive resource for researchers investigating the sensory and emotional dimensions of observed touch.

Keywords Visually perceived touch · Tactile interactions · Sensory qualities · Threat perception · Arousal · Gender differences · Dynamic touch stimuli · Videos

Introduction

Visually perceiving touch allows us to quickly gather important information about who is being touched (whether oneself or another person), the sensory qualities of the touch, and the broader emotional or social context (Smit, Ramírez-Haro, et al., 2024; Masson & Isik, 2023; Hertenstein et al., 2006). Much of the research on visual touch perception has focused on vicarious touch, where individuals report feeling tactile sensations in their own body simply by observing touch in others (for reviews see Gillmeister et al., 2017; Bufalari & Ionta, 2013; Peled-Avron & Woolley, 2022). This phenomenon is linked to the activation of the observer's somatosensory cortex (Blakemore et al., 2005; Bolognini et al., 2011, 2013; Bufalari et al., 2007; Rigato et al., 2019), suggesting that we may simulate observed touch as though we are experiencing it ourselves (Decety & Jackson, 2004; Gallese et al., 2004; Keysers & Gazzola, 2009; Smit et al., 2023). Given the importance of visual touch perception in interpreting sensory and emotional experiences in ourselves and others, we need to fully understand how we process detailed sensory qualities of observed touch, as well as emotional-affective dimensions like arousal and threat.

Different aspects have been shown to influence how observed touch is perceived and processed. For instance, stimuli depicting more threatening or painful experiences elicit stronger vicarious responses compared to neutral or non-threatening touch (Holle et al., 2011; Ward et al., 2018; Li & Ward, 2022; Smit, Crossley, et al., 2024). Physical factors, such as the body part touched, congruent posture, viewing

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perspective, and the realism of the stimuli, also play an important role in these processes (Holle et al., 2011; Medina & DePasquale, 2017). However, because visual touch stimuli often differ across multiple dimensions simultaneously, it is difficult to isolate the specific influence of these factors. Research using controlled stimuli would enhance the potential for systematic investigations into how elements like arousal, threat, and hedonic quality shape responses to observed touch.

Research on visual touch perception has greatly enriched our understanding of somatosensory processes (Adler et al., 2016; Bolognini et al., 2011; Bufalari et al., 2007; Rigato et al., 2019; Smit et al., 2019, 2023; Walker et al., 2017; Ward et al., 2018). To date, however, relatively little attention has been given to the dynamic and detailed sensory qualities of touch. Although excellent databases such as the Social Touch Picture Set (SToPS) (Schirmer et al., 2015) and the Socio-Affective Touch Expression Database (SATED) (Masson & Beeck, 2018) have advanced our understanding of the social aspects of observed touch, few resources offer such systematically controlled and validated sensory-focused stimuli. To address this gap, we introduce the Validated Touch-Video Database (VTD), a standardised set of 90 videos capturing a wide range of close-up tactile interactions. These videos vary in key dimensions—hedonic quality, arousal, and threat—while ensuring consistency in factors such as the body parts involved (e.g., a right hand interacting with a left hand from a first-person perspective) and the visual context. The VTD provides a robust resource for advancing our exploration of the neural and psychological mechanisms underlying complex and dynamic visual touch processing.

To validate the VTD, 350 participants categorised each video as neutral, pleasant, unpleasant, or painful and rated the strength of the hedonic quality. Participants also assessed perceived levels of arousal and threat for each video. These dimensions were chosen based on their fundamental role in shaping touch perception. Hedonic quality is a key determinant of affective responses to touch and has been shown to influence both neural and behavioural reactions (McGlone et al., 2014; Olausson et al., 2016). It reflects the degree of pleasantness or unpleasantness associated with a touch experience, encompassing both rewarding and aversive aspects. Pain, as an intensely aversive sensation, lies at the negative end of the hedonic spectrum, while pleasant gentle caresses or soft strokes lie at the positive end (McGlone et al., 2014). Subjective arousal reflects the perceived intensity of the sensory and emotional response to touch, and threat perception plays a crucial role in distinguishing between safe and potentially harmful touch, both affecting attentional engagement and physiological reactivity (Abra et al., 2024; Koster et al., 2004; Poliakoff et al., 2007; Vogt et al., 2008). By systematically varying and validating these dimensions, the VTD provides a unique resource for fine-grained investigation of how people visually perceive touch, enabling researchers to explore the interplay between sensory details and emotional-affective processing.

As gender differences in vicarious sensory perception have been observed, particularly in neural responses to observed pain (Grice-Jackson et al., 2017; Singer et al., 2006; Li & Ward, 2022; Yang et al., 2009; Smit, Crossley, et al., 2024), we included an exploratory analysis to test whether men and women evaluated the observed touch itself differently. While a previous study found no gender differences in how valence, arousal, and naturalness were rated for observed touch in broader social contexts (Masson & Beeck, 2018), such differences may emerge when assessing the perception of more detailed sensory qualities, particularly in painful touch contexts. Examining how men and women rate various dimensions of detailed visual touch stimuli could reveal differences at the initial stage of stimulus evaluation.

Our analysis demonstrated very strong consistency in subjective arousal and threat ratings between participants, with substantial agreement in categorising the hedonic qualities of the videos. When comparing genders, men were more likely to categorise the observed touch as 'neutral', while women more often classified the touch as 'painful' and rated painful videos as more intense. Additionally, women rated the videos as more threatening overall, though no gender differences were observed in arousal ratings. These findings suggest that women may exhibit heightened sensitivity to touch stimuli with negative valence, which aligns with prior research on vicarious responses to pain. All videos, along with validation data, are freely accessible online, providing an open resource for future research on the sensory and emotional dimensions of touch.

Materials and methods

Data, code, and video availability

OSF: Videos, analysis code, and validation data https://osf.io/jvkqa/
YouTube: Video playlist https://bit.ly/YouTubeVTD
GitHub: Supplementary materials https://sophiesmit1.github.io/VTD/

Creation of the videos

The aim of this study was to create and validate a set of close-up touch videos that capture a wide range of tactile interactions to a hand, varying systematically across the dimensions of hedonic quality, arousal, and threat. We produced 90 short videos, each featuring a Caucasian female hand placed on a dark background, with the hand always viewed from a first-person perspective, palm facing down (see Fig. 1). The videos varied in duration from 1.4 to 11.8 s ($M = 3.8$ s).

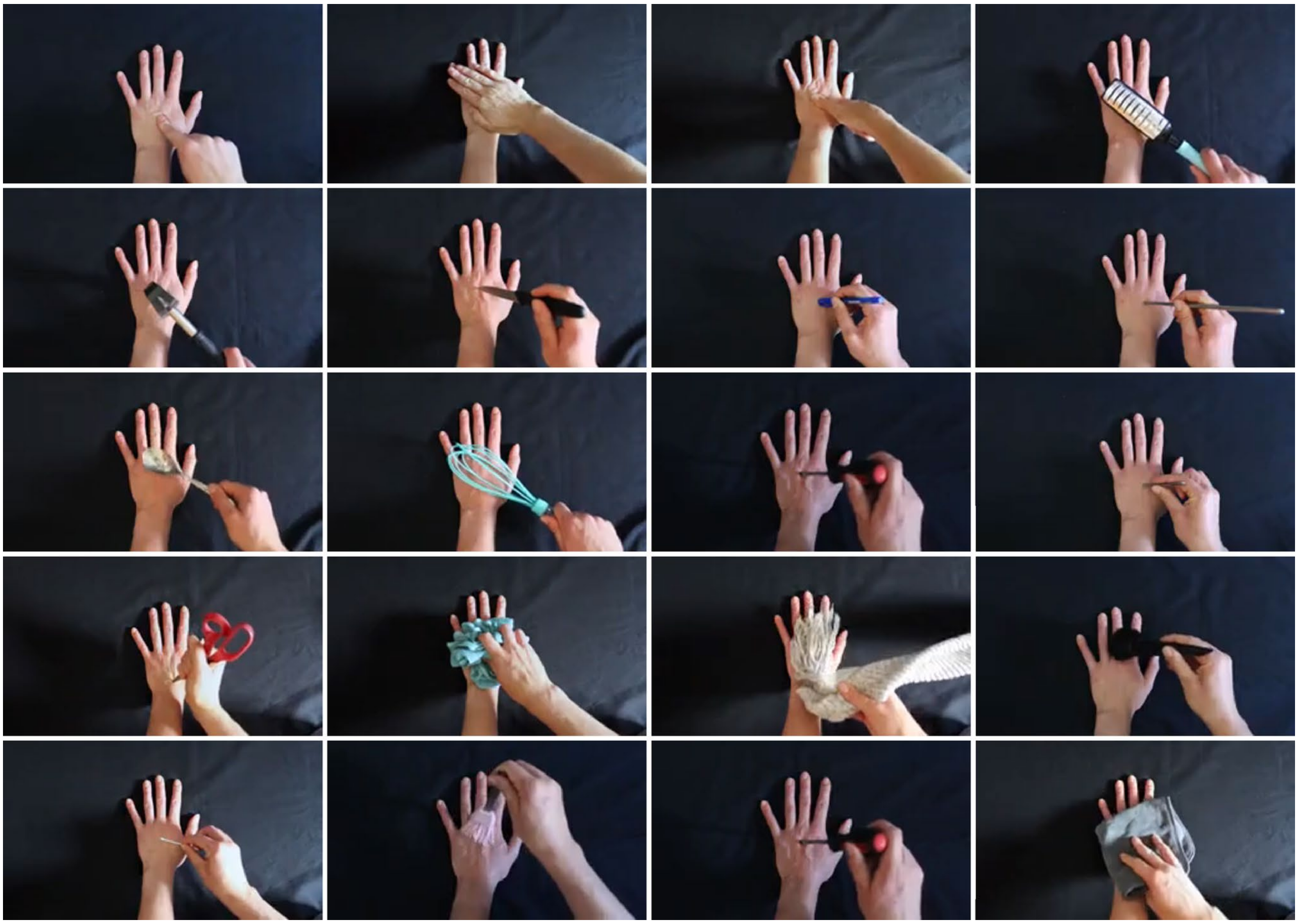

Fig. 1 Still frames for a subset of videos from the Validated Touch-Video Database. These frames illustrate a variety of touch interactions captured from a first-person perspective, depicting different hedonic qualities including neutral, pleasant, unpleasant, and painful touch. The database includes 90 systematically controlled videos that vary across dimensions such as arousal, threat, and touch type, providing a comprehensive resource for investigating the emotional and sensory dimensions of observed touch

In each video, a second hand touches the stationary hand, either directly (e.g., using fingers or a flat hand) or using an object (e.g., a soft brush, scissors). To create neutral videos, we depict gentle touches with minimal pressure using non-threatening objects or direct skin contact with another hand. The pleasant videos show slow, stroking movements across the hand using either a soft brush or fingers, aiming to evoke a positive, comforting sensation. Unpleasant and painful videos show aversive interactions, such as touching the hand with a syringe or pinching the skin with tweezers. These interactions appear realistic enough to suggest discomfort or pain without causing any actual harm or distress to the model. We carefully constructed each video to represent a distinct tactile experience while maintaining consistency in presentation. The dark background and consistent camera angle help focus attention on the tactile interactions, minimising external distractions.

Validation of the videos

Participants

Participants were recruited via the Macquarie University subject pools and consisted of undergraduate students naïve to the purpose of the study ($N=350$; 283 women, 66 men, 1 non-binary; $M=24$ years, $SD=8.66$ years, range = 17–63 years). As only one non-binary participant was included, we excluded their data from gender-based analyses.

We asked participants to evaluate the videos based on hedonic qualities, perceived arousal, and threat. Due to the large number of videos, some of which were unpleasant to watch, we set up two separate questionnaires with 45 videos, each questionnaire comprising an equal number of neutral, pleasant, unpleasant, and painful videos. One questionnaire took approximately 15 minutes to complete. Participants were free to decide whether they wanted to participate in one or both questionnaires and received course credit accordingly. The study was approved by the Macquarie University Human Research Ethics committee, and participants provided written consent.

Experimental procedure

Participants completed the questionnaire remotely via the Qualtrics online platform. Participants were instructed to complete the study on a desktop or laptop to ensure proper video presentation and avoid display size variability. The videos were presented in a random order and auto-play was disabled to ensure participant readiness and engagement. Each video began with a white screen displaying the instruction, ‘Press play to start video’, requiring participants to actively initiate the onset. After watching each video, participants categorised the touch based on its hedonic quality, then rated the strength of the chosen category, perceived threat, and arousal, all on a 1–10 scale (from not at all to extremely). The following four questions were presented after each video:

- **Q1**: How would you categorise the touch in this video? [Options: neutral, pleasant, unpleasant, painful]
- **Q2**: How [pleasant/unpleasant/painful] (based on the previous response) was the touch?
- **Q3**: How threatening was the touch?
- **Q4**: How arousing was this video? (Arousal in terms of a feeling, emotion, or response)

Analyses

In this study, we used Bayesian statistical methods for all analyses, including *t*-tests, ANOVAs, correlation assessments, and contingency tables. The analyses were conducted using the R programming environment (R Core Team, 2023), with the Bayes Factor R package (Morey et al., 2018) to calculate Bayes factors (BF). We adopted a default prior based on a Cauchy distribution centred at zero with a scale parameter of $r = 0.707$, allowing for a range of possible effect sizes. Bayes factors quantify the relative strength of evidence for the alternative hypothesis compared to the null hypothesis, or vice versa. For instance, a Bayes factor of 3 indicates that the evidence from our data is three times stronger for the alternative hypothesis than for the null hypothesis. Generally, a Bayes factor greater than 1 indicates support for the alternative hypothesis, while a factor less than 1 favours the null hypothesis, and values between 1 and 3 are considered insufficient for making a definitive conclusion (Dienes, 2011; Jeffreys & Jeffreys, 1998; Morey et al., 2016; Rouder et al., 2009).

We assessed the consistency of participant ratings for arousal and threat across the 90 videos in our database using the intraclass correlation coefficient (ICC). Specifically, we used a two-way mixed-effects model (ICC3k) to calculate the mean rating consistency, providing a robust measure of agreement (Koo & Li, 2016). ICC estimates were computed along with 95% confidence intervals using the R package Psych (Revelle, 2024). A high ICC value indicates strong inter-rater reliability, confirming consistency in participant ratings across videos.

We used Fleiss’ kappa (Landis & Koch, 1977) to assess the consistency of participants’ categorisation of the videos into four distinct hedonic categories: neutral, pleasant, unpleasant, and painful. For each of the 90 videos, we calculated the proportion of participants who classified the video into each of the four categories. Fleiss’ kappa values range from –1 to 1 and provide a scale for interpreting the strength of agreement among participants. Negative values suggest a lower level of agreement than expected by chance, 0 indicates chance-level agreement, and positive values indicate better agreement than chance. Fleiss’ kappa values can be interpreted as follows: < 0 poor; 0–0.20 slight; 0.21–0.40 fair; 0.41–0.60 moderate; 0.61–0.80 substantial; 0.81–1 almost perfect agreement (Landis & Koch, 1977).

Recognising potential overlap in hedonic categorisation—where some videos may be classified as unpleasant by certain participants and painful by others—we also conducted a focused analysis on a subset comprising the top 10 videos from each category (40 videos total). This subset was selected to provide clear distinctions between hedonic categories, ensuring that the hedonic quality of touch is well defined for subsequent research. We also examined the arousal and threat ratings for this clearly categorised subset to gain a deeper understanding of how these dimensions vary across different hedonic qualities.

To explore potential gender-specific differences in the assessment of our video stimuli, we examined the dimensions of arousal, threat, and hedonic qualities stratified by participant gender. While unbalanced samples can present challenges for some frequentist approaches, Bayesian methods offer a flexible alternative by comparing models based on the evidence provided by the data, naturally incorporating uncertainty arising from unequal group sizes (Dienes, 2011; Kruschke, 2013; Morey et al., 2016; Rouder et al., 2009).

Results

High agreement across participants for arousal and threat ratings

The ICC analysis yielded high values for both arousal (ICC = 0.98, 95% CI: 0.98–0.99) and threat ratings (ICC = 0.99, 95% CI: 0.99–1.00), suggesting a strong level of agreement among participants (values greater than 0.81 indicate almost perfect agreement; Koo & Li, 2016).

Overall, women provided higher threat ratings ($M = 3.50$) than men ($M = 2.99$; $BF > 1000$), whereas arousal ratings did not differ between genders (women: $M = 3.83$, men: $M = 3.76$; $BF = 0.05$; see Fig. 2).

Fair agreement across participants for hedonic categorisation

Most videos were categorised by participants as neutral (35%), followed by unpleasant (33%), pleasant (17%), and painful (14%). We assessed the inter-rater reliability for categorising the 90 videos into four hedonic categories: neutral, pleasant, unpleasant, or painful. The Fleiss' kappa value for the full set of videos was 0.274, indicating 'fair' agreement. The lower reliability reflects overlap in categorisation, with some videos being classified as equally neutral/pleasant or unpleasant/painful (see supplementary materials: https://sophiesmit1.github.io/VTD/). A Bayesian contingency table showed an overall difference in how the genders categorised the videos ($BF > 1000$), with a higher percentage of men categorising videos as neutral ($BF = 884.9$) and a higher percentage of women categorising videos as painful ($BF > 1000$) (see Fig. 3).

To provide researchers with a subset of videos that clearly depict one of the hedonic categories, we selected the top 10 videos from each category—those with the highest percentage of participants agreeing on their categorisation—creating a 40-video subset. Agreement levels were as follows: neutral videos (70% to 85%), pleasant videos (63% to 91%), unpleasant videos (58% to 70%), and painful videos (45% to 83%) (see Table 1). For example, in the neutral category, the most clearly categorised video had 85% agreement, while the 10th video had 70% agreement. This indicates consistent categorisation and clear distinctions in hedonic qualities within this subset of 40 videos, with only some of the painful videos also being categorised as unpleasant. For this subset, the Fleiss' kappa value increased to 0.387.

Strength of hedonic quality

For the subset of 40 videos based on the highest hedonic categorisation, we assessed how intense participants perceived the hedonics of the touch to be (see Fig. 4). We focused on non-neutral touch videos (pleasant, unpleasant, or painful) and asked participants, 'How pleasant/unpleasant/painful was the touch?'. A Bayesian ANOVA showed a difference in ratings across categories ($BF > 1000$), with the highest ratings for pleasant videos ($M = 4.38$), followed by painful videos ($M = 4.20$) and unpleasant videos ($M = 3.10$). Bayes factors indicated strong evidence for a difference in intensity between unpleasant and both pleasant ($BF > 1000$) and painful videos ($BF > 1000$). However, there was moderate evidence suggesting no difference in intensity between pleasant and painful videos ($BF = 0.12$), indicating that they were perceived as similarly intense. Women rated the painful videos overall as more painful than men ($BF = 12.36$) (see Fig. 5).

Correlation between hedonic qualities and arousal and threat ratings

Our goal was to create a database of videos that depict touch with varying hedonic qualities and substantial variety in arousal levels. Ideally this would allow for a selection of

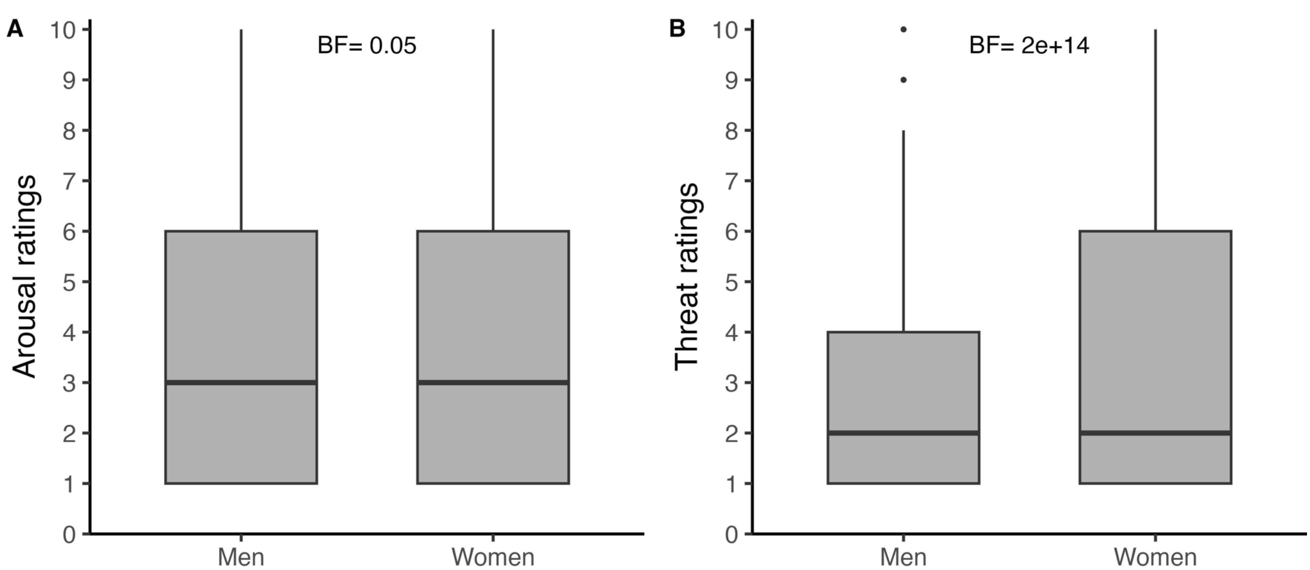

Fig. 2 Arousal and threat ratings by gender. The box plots display the median ratings for (**A**) arousal and (**B**) threat across all 90 videos, separated by gender. Participants rated the touch on a scale from 1 (not at all) to 10 (extremely), with a total of 283 women and 66 men

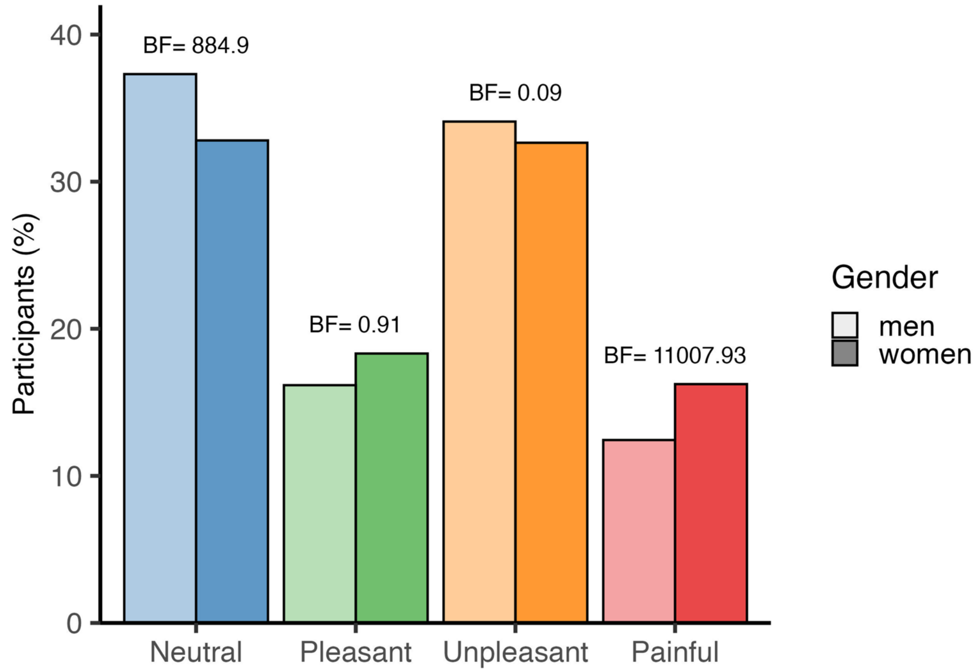

Fig. 3 Hedonic categorisation of touch videos by gender. The bar graphs display the categorisation of all 90 videos into one of four hedonics categories, separated by gender

videos that differ in whether they are pleasant or unpleasant while being matched on arousal. We also aimed to include videos with a range of threat levels, as this remains an underexplored dimension of visual touch perception. Although arousal and threat are often correlated, pleasant videos would likely be rated as highly arousing yet low in threat. Additionally, we aimed to include videos perceived as truly neutral—neither pleasant, unpleasant, nor painful—while also being low in arousal and threat. To evaluate whether we achieved this, we examined the interplay between the hedonic qualities of touch and participants' ratings for arousal and threat (see Fig. 6, including Bayes factors for pairwise comparisons). Bayesian ANOVAs confirmed differences in arousal ($BF > 1000$) and threat ratings ($BF > 1000$) across the hedonic categories. Pleasant and unpleasant videos were rated similarly in arousal ($M = 4.06$ vs. $M = 4.09$), whereas painful videos received the highest arousal ratings ($M = 5.50$). Painful videos were also most threatening ($M = 6.35$), followed by unpleasant videos ($M = 4.29$), both with substantial variability within the hedonic categories (unpleasant range = 2.45–6.58; painful range = 4.54–7.93). Neutral videos had the lowest arousal ratings ($M = 2.06$), and both neutral and pleasant videos were rated similarly low in threat ($M = 1.53$ vs $M = 1.39$).

Videos and validation data

To facilitate the use of this database for research, we compiled a summary table that includes a description of each video alongside its corresponding YouTube link (https://sophiesmit1.github.io/VTD/). Within this table, users can sort the collection of 90 videos based on key metrics—such as hedonic quality, threat, and arousal—either ascending or descending (see Fig. 7). It also allows users to find videos that align with specific keywords or criteria. The table is downloadable in multiple formats, including CSV, Excel, and PDF. This feature allows users to efficiently filter and select videos based on specific characteristics of interest.

Discussion

The aim of this study was to create a systematically defined database of videos depicting a diverse range of tactile interactions to a hand, enabling researchers to investigate the nuances of visual touch perception while controlling for specific dimensions. High inter-subject agreement confirmed that the videos effectively captured varying levels of subjective arousal and threat. A subset of 40 videos was reliably categorised into neutral, pleasant, unpleasant, and painful touch, with differences observed in perceived arousal and threat levels across these categories. Videos depicting painful or pleasant touch were associated with the highest arousal ratings, reflecting the previously documented relationship between valence and arousal (Bradley & Lang, 1994; Masson & Beeck, 2018). The inclusion of a neutral category in the database allows researchers to draw meaningful comparisons between emotionally charged touch interactions and neutral touch.

Table 1 Percentage of sample agreement in categorising top 10 videos by hedonic quality, with corresponding mean arousal and threat ratings for these videos; 1–10 scale (not at all to extremely)

Top 10	Description (neutral videos)	Neutral (%)	Pleasant (%)	Unpleasant (%)	Painful (%)	Threat (1–10)	Arousal (1–10)
1	Single touch with finger	**85**	6	8	1	1.4	1.8
2	Single touch with pen	**79**	4	17	0	4.2	3.6
3	Single push with a spoon	**79**	7	14	0	3.2	3.7
4	Single touch with cotton bud	**78**	19	2	1	1.3	4.5
5	Repeated tap with finger	**77**	11	12	0	2.6	3.0
6	Single touch with flat hand	**75**	14	11	0	5.2	4.0
7	Single touch with plastic brush	**75**	23	2	0	1.3	4.2
8	Repeated touch with cotton bud	**73**	20	6	1	1.4	2.7
9	Single push with a plastic whisk	**71**	10	19	1	6.5	5.3
10	Repeated touch with finger	**70**	6	24	0	1.8	2.2
Top 10	**Description (pleasant videos)**	**Neutral**	**Pleasant**	**Unpleasant**	**Painful**	**Threat**	**Arousal**
1	Long stroke with soft brush all over the hand	6	**91**	3	0	1.5	3.0
2	Single stroke top to bottom with soft brush	8	**88**	4	0	3.5	3.7
3	Stroke top to bottom with shawl	12	**81**	4	2	2.6	2.8
4	Single stroke top to bottom with plastic brush	17	**81**	2	0	1.4	3.4
5	Stroke with soft sock	11	**79**	10	0	3.5	3.8
6	Repeated stroke with plastic brush	15	**79**	5	1	1.2	2.2
7	Single stroke top to bottom with cotton pad	26	**73**	1	1	1.4	3.8
8	(Long) stroke with multiple fingers all over the hand	18	**71**	10	1	6.6	5.6
9	Stroke top to bottom with sponge	33	**63**	3	1	2.6	4.0
10	Touch top to bottom with fabric	33	**63**	3	1	1.3	2.1
Top 10	**Description (unpleasant videos)**	**Neutral**	**Pleasant**	**Unpleasant**	**Painful**	**Threat**	**Arousal**
1	Touch top to bottom with scissors	6	6	**70**	18	4.8	4.2
2	Repeated touch with pencil	22	1	**67**	10	4.7	4.7
3	Touch top to bottom with hammer	30	4	**63**	3	3.3	3.1
4	Hand grabbing wrist	12	6	**61**	21	3.5	3.3
5	Repeated touch with metal chopstick	23	5	**59**	12	2.4	2.6
6	Scratching with fingernails	18	17	**59**	6	1.8	3.2
7	Stroke top to bottom with Stanley knife	6	3	**59**	32	4.5	5.0
8	Repeated touch with rolling pin	20	2	**58**	20	8.0	6.7
9	Single touch with screwdriver	11	0	**58**	31	2.5	2.7
10	Touch top to bottom with nail file	8	6	**58**	28	1.4	2.6
Top 10	**Description (painful videos)**	**Neutral**	**Pleasant**	**Unpleasant**	**Painful**	**Threat**	**Arousal**
1	Single stab with nail file	2	1	14	**83**	1.2	4.7
2	Single stab with scissors	1	2	14	**83**	2.9	3.6
3	Scratch top to bottom with scissors	3	1	31	**65**	1.5	4.1
4	Single pinch with tweezers	2	2	33	**63**	6.0	4.9
5	Repeated touch with nail file	2	1	36	**61**	1.4	2.4
6	Single injection with sharp needle	3	0	38	**59**	5.2	4.7
7	Repeated touch with nail file	5	1	46	**49**	5.9	4.6
8	Repeated punch with hand	8	3	42	**46**	1.5	3.3
9	Single punch with hand	10	1	44	**45**	1.5	4.0
10	Repeated touch with hammer	9	0	46	**45**	5.1	4.3

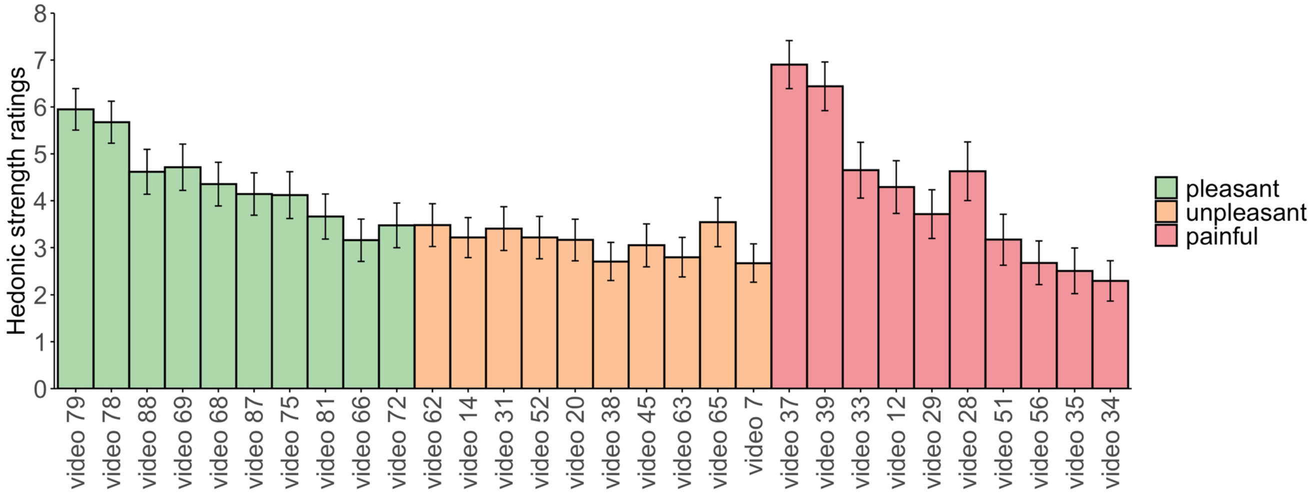

Fig. 4 Hedonic strength ratings for the top 10 videos in each category. Each bar graph displays the average hedonic strength ratings for the entire sample, accompanied by 95% confidence intervals. Participants rated the touch on a scale from 1 (not at all) to 10 (extremely). The top 10 most distinctly categorised videos are organised from left to right, with pleasant (green), unpleasant (orange), and painful (red)

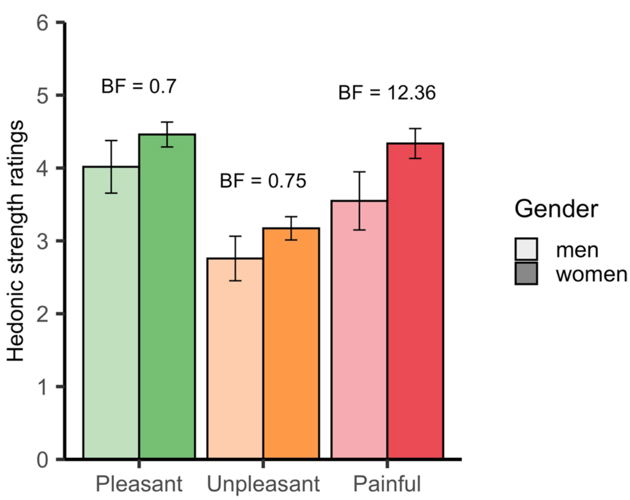

Fig. 5 Hedonic strength ratings for each category divided by gender. Each bar shows the average hedonic strength ratings for a subset of videos (top 10 per category), differentiated by gender (light bars for men and dark bars for women) with 95% confidence intervals. Videos are categorised as pleasant (green), unpleasant (orange), and painful (red)

Our findings reveal gender-related differences in how tactile interactions are perceived. Although both genders provided similar arousal ratings, women rated the videos as more threatening and were more likely to classify them as painful, while men tended to categorise them more often as neutral. Women also reported higher intensity ratings for painful videos. These findings suggest that women may exhibit greater sensitivity to negatively valenced visual touch stimuli, consistent with prior research on vicarious responses to pain (Grice-Jackson et al., 2017; Singer et al., 2006; Li & Ward, 2022; Yang et al., 2009; Smit, Crossley, et al., 2024). Notably, an earlier study reported no gender differences in ratings for valence, arousal, and naturalness of observed touch in broader social contexts (Masson & Beeck, 2018), though the sample size was small. In contrast, our study, with a large sample size, reveals that gender differences emerge when participants assess detailed touch videos, particularly in negative contexts. These results suggest it may be useful to consider gender as a factor when evaluating responses to visually perceived touch and pain stimuli.

The VTD includes a broad range of tactile interactions, providing a valuable tool for examining how different types of touch affect individuals prone to vicarious tactile sensations. Most research on vicarious sensory perception has focused on reactions to observed neutral or threatening touch and pain (Giummarra et al., 2015; Grice-Jackson et al., 2017; Osborn & Derbyshire, 2010; Vandenbroucke et al., 2013; Ward et al., 2018; Li & Ward, 2022), with relatively little attention to pleasant touch. While functional magnetic resonance imaging (fMRI) studies have deepened our understanding of the neural correlates of empathy for pleasant and unpleasant sensations (Ebisch et al., 2011; Lamm et al., 2015; Morrison et al., 2011; Riva et al., 2018), there remains a need to explore subjective experiences associated with observing touch across different hedonic qualities (e.g., Smit, Crossley, et al., 2024). A recent review identified soft materials and slow, gentle stroking as key factors eliciting pleasurable sensations during direct touch (Taneja et al., 2021). Here, we incorporated such elements to create pleasant visual touch stimuli, which can be used

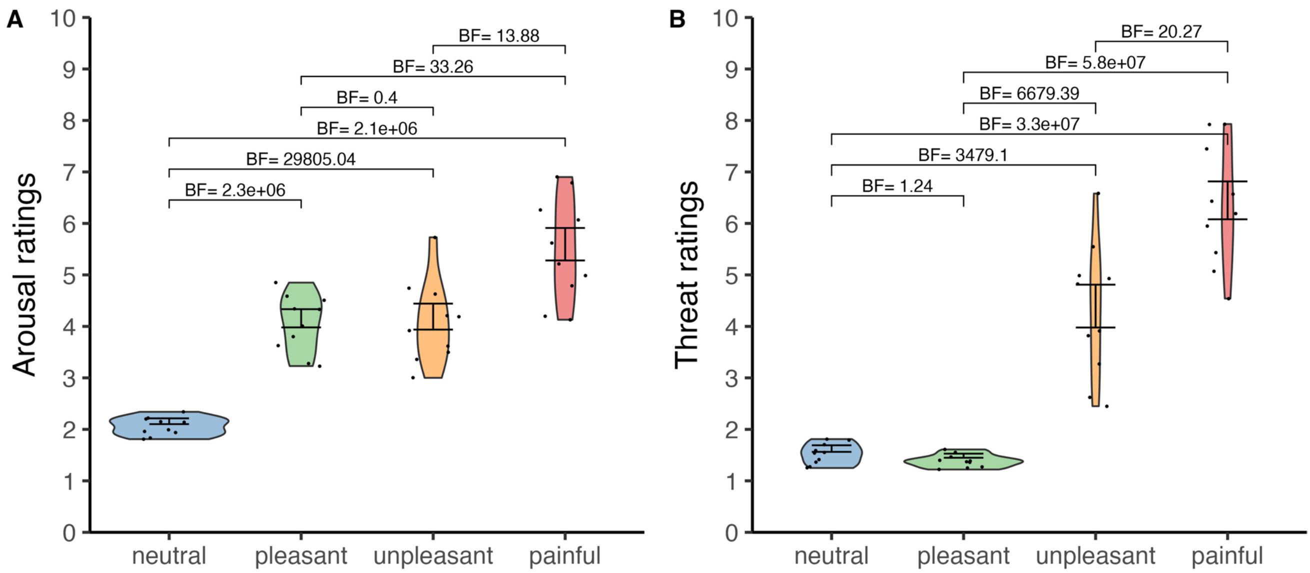

Fig. 6 Average ratings for arousal (**A**) and threat (**B**) across the top 10 videos in each hedonic category. Participants rated each video on a scale from 1 (not at all) to 10 (extremely). Scatter plots within the violins represent mean scores for individual videos

Copy CSV Excel PDF Search:

YouTube video	Description of touch	Link to YouTube	Neutral % pts	Pleasant % pts	Unpleasant % pts	Painful % pts	Mean Threat	Mean Arousal
1	repeated touch with finger (fast)	mvZ-J93FhB8	70	8	22	0	1.8	2.0
2	single touch with finger	DGrxS_mWwDg	85	8	8	0	1.4	1.7
3	single push with finger	X7TYV3JlDGg	61	4	34	1	2.2	2.4
4	repeated tap with finger (slow)	4LCl3lFTI5A	76	12	11	0	1.5	1.9
5	repeated tap with finger moving from top to bottom	VGk7DAEMUqY	61	31	6	1	1.4	2.5
6	single touch with flat hand	hZUtrE-RKm4	76	14	10	0	1.6	2.2
7	repeated touch with hairbrush	jj9cYYLwz3c	34	9	54	4	2.6	2.7
8	single touch with hairbrush	lK5uo4vyk4o	51	8	40	1	2.0	2.3
9	single touch with hammer	UihTe8un04c	34	2	50	14	5.1	3.8

Fig. 7 Overview of the videos along with their validation data. Preview of the overview table which can be found on GitHub (https://sophiesmit1.github.io/VTD/). The 90 videos in this table can be arranged based on the highest or lowest values for each index, such as hedonic quality (percentage of participants), threat, and arousal (1 = not at all, 10 = extremely)

in research settings ranging from therapeutic applications of vicarious touch (Giummarra et al., 2016; Makary et al., 2018; Ramachandran & Altschuler, 2009; Ramachandran & Rodgers-Ramachandran, 1996) to digital marketing and virtual environments (Luangrath et al., 2022). Access to a collection of video stimuli showing diverse touch interactions, including both pleasant and unpleasant touch, allows for a fuller understanding of vicarious tactile experiences.

Videos in the database differ in duration, with pleasant videos often featuring slower, longer strokes, while neutral videos display brief, simple touches. Researchers may wish to modify these videos in terms of duration, presentation size, or orientation to suit their study's needs. For instance, in studies examining time-locked responses to observed touch using electroencephalography (EEG), it may be beneficial to standardise the video length. Some studies may also require the hand to be presented from a first- or third-person perspective to suggest touch to oneself or another. In a separate study (Smit, Ramírez-Haro, et al., 2024), we shortened and standardised the videos to 600 ms, presented them in a smaller size, and varied the orientation (flipped horizontally, vertically, or both). Results from an independent participant sample revealed strong correlations between ratings for the original and modified videos across valence, arousal, and threat (mean across modifications: $r = 0.89$), indicating that ratings remain robust even when stimuli are adapted. Both the original and adapted videos are available online (https://osf.io/jvkqa/).

Our participant pool consisted primarily of psychology undergraduate students, which may limit the generalisability of the validation data to some extent. The sample included an unequal although substantial number of women (283) and men (66). However, using Bayesian statistics helps reduce concerns about unbalanced sample sizes in gender comparisons, as it accounts for the associated uncertainty (Dienes, 2011; Kruschke, 2013; Morey et al., 2016; Rouder et al., 2009). Nevertheless, the higher proportion of women may have influenced overall group-level responses, particularly given the observed gender differences. Future research could benefit from a more diverse participant pool to enhance the broader applicability of these findings across different demographics.

In this study, we aimed to create standardised videos depicting tactile interactions that varied in their hedonic qualities, levels of threat, and perceived arousal. Painful interactions, such as a stab with scissors, were designed to evoke discomfort in the observer (without causing actual harm to the model), while pleasant videos feature gentle, non-threatening touches, such as stroking with a brush. Some neutral scenarios (e.g., a push with a spoon or whisk) may be less naturalistic than other interactions, potentially impacting arousal and threat ratings. We did not collect naturalness ratings, such as those used in the validation of the Socio-Affective Touch Expression Database (SATED; Masson & Beeck, 2018), but these could provide additional insights into how contextual relevance shapes touch perception.

In conclusion, the VTD provides a comprehensive resource for investigating how visually presented touch is perceived and processed. By providing a systematically controlled and dynamic database, the VTD facilitates research on both the emotional-affective and sensory dimensions of observed touch, advancing our understanding of visual touch perception.

Authors' contributions **Sophie Smit:** Conceptualisation, Methodology, Project administration, Data curation, Formal analysis, Visualisation, Writing – original draft, Writing – review & editing. **Anina N. Rich:** Conceptualisation, Methodology, Writing – review & editing, Supervision.

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Data Availability All video stimuli, analysis scripts, and data can be found online https://osf.io/jvkqa/.

Declarations

Ethics approval The study was approved by the Macquarie University Human Research Ethics committee (reference number: 52020925922588) and all methods were performed in accordance with the relevant guidelines and regulations of the Macquarie University ethics committee and the Declaration of Helsinki.

Consent to participate All participants provided informed consent to participate, as outlined in the methods section.

Consent for publication All participants provided consent for their data to be used for research purposes.

Conflicts of interest/Competing interests The authors declare no competing interests.

Open practices statement All anonymised data, analysis code, and materials are available at https://osf.io/jvkqa/.

References

Abra, Y., Mirams, L. and Fairhurst, M. T. (2024). The Space between Us: The Effect of Perceived Threat on Discomfort Distance and Perceived Pleasantness of Interpersonal Vicarious Touch. *Heliyon 10*(16). https://doi.org/10.1016/j.heliyon.2024.e36487

Adler, J., Schabinger, N., Michal, M., Beutel, M. E., & Gillmeister, H. (2016). Is That Me in the Mirror? Depersonalisation Modulates Tactile Mirroring Mechanisms. *Neuropsychologia, 85*(May), 148–158. https://doi.org/10.1016/j.neuropsychologia.2016.03.009

Blakemore, S.-J., Bristow, D., Bird, G., Frith, C., & Ward, J. (2005). Somatosensory Activations during the Observation of Touch and a Case of Vision-Touch Synaesthesia. *Brain, 128*(7), 1571–1583. https://doi.org/10.1093/brain/awh500

Bolognini, N., Rossetti, A., Convento, S., & Vallar, G. (2013). Understanding Others' Feelings: The Role of the Right Primary Somatosensory Cortex in Encoding the Affective Valence of Others' Touch. *The Journal of Neuroscience, 33*(9), 4201–4205. https://doi.org/10.1523/JNEUROSCI.4498-12.2013

Bolognini, N., Rossetti, A., Maravita, A., & Miniussi, C. (2011). Seeing Touch in the Somatosensory Cortex: A TMS Study of the Visual Perception of Touch. *Human Brain Mapping, 32*(12), 2104–2114. https://doi.org/10.1002/hbm.21172

Bradley, M. M., & Lang, P. J. (1994) Measuring Emotion: The Self-Assessment Manikin and the Semantic Differential. *Journal of Behavior Therapy and Experimental Psychiatry 25*(1): 49–59. https://doi.org/10.1016/0005-7916(94)90063-9

Bufalari, I., Aprile, T., Avenanti, A., Di Russo, F., & Aglioti, S. M. (2007). Empathy for Pain and Touch in the Human Somatosensory Cortex. *Cerebral Cortex, 17*(11), 2553–2561. https://doi.org/10.1093/cercor/bhl161

Bufalari, I., & Ionta, S. (2013). The Social and Personality Neuroscience of Empathy for Pain and Touch. *Frontiers in Human Neuroscience 7*. https://doi.org/10.3389/fnhum.2013.00393

Decety, J., & Jackson, P. (2004). The Functional Architecture of Human Empathy. *Behavioral and Cognitive Neuroscience Reviews, 3*(June), 71–100. https://doi.org/10.1177/1534582304267187

Dienes, Z. (2011). Bayesian Versus Orthodox Statistics: Which Side Are You On? *Perspectives on Psychological Science, 6*(3), 274–290. https://doi.org/10.1177/1745691611406920

Ebisch, S. J. H., Ferri, F., Salone, A., Perrucci, M. G., D'Amico, L., Ferro, F. M., Romani, G. L., & Gallese, V. (2011). Differential involvement of somatosensory and interoceptive cortices during the observation of affective touch. *Journal of Cognitive Neuroscience, 23*(7), 1808–22. https://doi.org/10.1162/jocn.2010.21551

Gallese, V., Keysers, C., & Rizzolatti, G. (2004). A Unifying View of the Basis of Social Cognition. *Trends in Cognitive Sciences, 8*(9), 396–403. https://doi.org/10.1016/j.tics.2004.07.002

Gillmeister, H., Bowling, N., Rigato, S., & Banissy, M. J. (2017). Inter-Individual Differences in Vicarious Tactile Perception: A View across the Lifespan in Typical and Atypical Populations. *Multisensory Research, 30*(6), 485–508. https://doi.org/10.1163/22134808-00002543

Giummarra, M. J., Fitzgibbon, B. M., Georgiou-Karistianis, N., Beukelman, M., Verdejo-Garcia, A., Blumberg, Z., Chou, M., & Gibson, S. J. (2015). Affective, sensory and empathic sharing of another's pain: The empathy for pain scale. *European Journal of Pain, 19*(6), 807–16. https://doi.org/10.1002/ejp.607

Giummarra, M. J., Tracy, L. M., Young, K. A., spsampsps Fitzgibbon, B. M. (2016). *"The social side of pain: What does it mean to feel another's pain?" In Meanings of Pain, edited by Simon van Rysewyk, 355–73*. Cham: Springer International Publishing. https://doi.org/10.1007/978-3-319-49022-9_21

Grice-Jackson, T., Critchley, H. D., Banissy, M. J., & Ward, J. (2017). Common and Distinct Neural Mechanisms Associated with the Conscious Experience of Vicarious Pain. *Cortex, 94*(September), 152–163. https://doi.org/10.1016/j.cortex.2017.06.015

Hertenstein, M. J., Keltner, D., App, B., Bulleit, B. A., & Jaskolka, A. R. (2006). Touch Communicates Distinct Emotions. *Emotion, 6*(3), 528–533. https://doi.org/10.1037/1528-3542.6.3.528

Holle, H., Banissy, M., Wright, T., Bowling, N., & Ward, J. (2011). 'That's Not a Real Body': Identifying Stimulus Qualities That Modulate Synaesthetic Experiences of Touch. *Consciousness and Cognition, 20*(3), 720–726. https://doi.org/10.1016/j.concog.2010.12.002

Jeffreys, S. H., spsampsps Jeffreys, S. H. (1998). *The Theory of Probability*. Third Edition, Third Edition. Oxford Classic Texts in the Physical Sciences. Oxford, New York: Oxford University Press.

Keysers, C., & Gazzola, V. (2009). Expanding the Mirror: Vicarious Activity for Actions, Emotions, and Sensations. *Current Opinion in Neurobiology*, *Motor Systems • Neurology of Behaviour*, *19*(6): 666–71. https://doi.org/10.1016/j.conb.2009.10.006

Koo, T. K., & Li, M. Y. (2016). A Guideline of Selecting and Reporting Intraclass Correlation Coefficients for Reliability Research. *Journal of Chiropractic Medicine, 15*(2), 155–163. https://doi.org/10.1016/j.jcm.2016.02.012

Koster, E. H. W., Crombez, G., Van Damme, S., Verschuere, B., & De Houwer, J. (2004). Does Imminent Threat Capture and Hold Attention? *Emotion, 4*(3), 312–317. https://doi.org/10.1037/1528-3542.4.3.312

Kruschke, J. K. (2013). Bayesian Estimation Supersedes the t Test. *Journal of Experimental Psychology: General, 142*(2), 573–603. https://doi.org/10.1037/a0029146

Lamm, C., Silani, G., & Singer, T. (2015). Distinct neural networks underlying empathy for pleasant and unpleasant touch. *Cortex, Special issue: Neuro-cognitive mechanisms of social interaction, 70*, 79–89. https://doi.org/10.1016/j.cortex.2015.01.021

Landis, J. R., & Koch, G. G. (1977). An Application of Hierarchical Kappa-Type Statistics in the Assessment of Majority Agreement among Multiple Observers. *Biometrics, 33*(2), 363–374. https://doi.org/10.2307/2529786

Li, M., & Ward, J. (2022). The Vicarious Experiences Questionnaire(s): Online Tools for Measuring Mirror-Touch and Vicarious Pain. https://doi.org/10.31234/osf.io/ae6x4

Luangrath, Andrea Webb, Peck, Joann, Hedgcock, William, & Yixiang, Xu. (2022). Observing product touch: The vicarious haptic effect in digital marketing and virtual reality. *Journal of Marketing Research, 59*(2), 306–326. https://doi.org/10.1177/00222437211059540

Makary, M. M., Lee, J., Lee, E., Eun, S., Kim, J., Jahng, G., Kim, K., Youn, Y., Lee, J., & Park, K. (2018). Phantom acupuncture induces placebo credibility and vicarious sensations: A parallel fMRI study of low back pain patients. *Scientific Reports, 8*(1), 930. https://doi.org/10.1038/s41598-017-18870-1

Masson, H. L., & Isik, L. (2023). Rapid Processing of Observed Touch through Social Perceptual Brain Regions: An EEG-fMRI Fusion Study. *The Journal of Neuroscience, 43*(45), 7700–7711. https://doi.org/10.1523/JNEUROSCI.0995-23.2023

Masson, H. L., & Op de Beeck, H. (2018). Socio-Affective Touch Expression Database. *PLoS ONE, 13*(1), e0190921. https://doi.org/10.1371/journal.pone.0190921

McGlone, F., Wessberg, J., & Olausson, H. (2014). Discriminative and Affective Touch: Sensing and Feeling. *Neuron, 82*(4), 737–755. https://doi.org/10.1016/j.neuron.2014.05.001

Medina, J., & DePasquale, C. (2017). Influence of the Body Schema on Mirror-Touch Synesthesia. *Cortex, 88*(March), 53–65. https://doi.org/10.1016/j.cortex.2016.12.013

Morey, R. D., Romeijn, J.-W., & Rouder, J. N. (2016). The Philosophy of Bayes Factors and the Quantification of Statistical Evidence. *Journal of Mathematical Psychology, Bayes Factors for Testing*

Hypotheses in Psychological Research: Practical Relevance and New Developments, 72(June), 6–18. https://doi.org/10.1016/j.jmp.2015.11.001
Morey, R. D., Rouder, J. N. , & Jamil, T. (2018). BayesFactor: Computation of Bayes Factors for Common Designs.
Morrison, I., Björnsdotter, M., & Olausson, H. (2011). Vicarious responses to social touch in posterior insular cortex are tuned to pleasant caressing speeds. *Journal of Neuroscience, 31*(26), 9554–9562.
Olausson, H., Wessberg, J., Morrison, I., & McGlone, F. (Eds.). (2016). *Affective Touch and the Neurophysiology of CT Afferents*. Springer.
Osborn, Jody, & Derbyshire, Stuart W. G. (2010). Pain sensation evoked by observing injury in others. *PAIN, 148*(2), 268–74. https://doi.org/10.1016/j.pain.2009.11.007
Peled-Avron, L., & Woolley, J. D. (2022). Understanding Others through Observed Touch: Neural Correlates, Developmental Aspects, and Psychopathology. *Current Opinion in Behavioral Sciences, 43*(February), 152–158. https://doi.org/10.1016/j.cobeha.2021.10.002
Poliakoff, E., Miles, E., Li, X., & Blanchette, I. (2007). The Effect of Visual Threat on Spatial Attention to Touch. *Cognition, 102*(3), 405–414. https://doi.org/10.1016/j.cognition.2006.01.006
Ramachandran, V. S., & Altschuler, E. L. (2009). The use of visual feedback, in particular mirror visual feedback, in restoring brain function. *Brain, 132*(7), 1693–1710. https://doi.org/10.1093/brain/awp135
Ramachandran, V. S., & Rogers-Ramachandran, D. (1996). Synaesthesia in phantom limbs induced with mirrors. *Proceedings: Biological Sciences, 263*(1369), 377–86.
R Core Team (2023) R: A Language and Environment for Statistical Computing. https://www.R-project.org/
Revelle, W. (2024). Psych: Procedures for Psychological, Psychometric, and Personality Research. https://cran.r-project.org/web/packages/psych/index.html
Rigato, S., Bremner, A. J., Gillmeister, H., & Banissy, M. J. (2019). Interpersonal Representations of Touch in Somatosensory Cortex Are Modulated by Perspective. *Biological Psychology, 146*(September), 107719. https://doi.org/10.1016/j.biopsycho.2019.107719
Riva, F., Tschernegg, M., Chiesa, P., Wagner, I., Kronbichler, M., Lamm, C., & Silani, G. (2018). Age-related differences in the neural correlates of empathy for pleasant and unpleasant touch in a female sample. *Neurobiology of Aging, 65*, 7–17. https://doi.org/10.1016/j.neurobiolaging.2017.12.028
Rouder, J. N., Speckman, P. L., Sun, D., Morey, R. D., & Iverson, G. (2009). Bayesian t Tests for Accepting and Rejecting the Null Hypothesis. *Psychonomic Bulletin & Review, 16*(2), 225–237. https://doi.org/10.3758/PBR.16.2.225
Schirmer, A., Reece, C., Zhao, C., Ng, E., Esther, Wu., & Yen, S.-C. (2015). Reach out to One and You Reach out to Many: Social Touch Affects Third-Party Observers. *British Journal of Psychology, 106*(1), 107–132. https://doi.org/10.1111/bjop.12068
Singer, T., Seymour, B., O'Doherty, J. P., Stephan, K. E., Dolan, R. J., & Frith, C. D. (2006). Empathic Neural Responses Are Modulated by the Perceived Fairness of Others. *Nature, 439*(7075), 466–469. https://doi.org/10.1038/nature04271
Smit, S., Crossley, M. J., Zopf, R., & Rich, A. N. (2024). Characteristics of vicarious touch reports in a general population. bioRxiv. https://doi.org/10.1101/2024.01.30.577948
Smit, S., Moerel, D., Zopf, R., & Rich, A. N. (2023). Vicarious Touch: Overlapping Neural Patterns between Seeing and Feeling Touch. *NeuroImage, 278*(September), 120269. https://doi.org/10.1016/j.neuroimage.2023.120269
Smit, S., Ramírez-Haro, A., Quek, G. L., Varlet, M., Moerel, D., & Grootswagers, T. (2024). Rapid visual engagement in neural processing of detailed touch interactions. https://doi.org/10.1101/2024.08.29.610402
Smit, S., Rich, A. N., & Zopf, R. (2019). Visual Body Form and Orientation Cues Do Not Modulate Visuo-Tactile Temporal Integration. *PLoS ONE, 14*(12), e0224174. https://doi.org/10.1371/journal.pone.0224174
Taneja, P., Olausson, H., Trulsson, M., Svensson, P., & Baad-Hansen, L. (2021). Defining pleasant touch stimuli: A systematic review and meta-analysis. *Psychological Research, 85*(1), 20–35. https://doi.org/10.1007/s00426-019-01253-8
Vandenbroucke, S., Crombez, G., Ryckeghem, D., Brass, M., Van Damme, S., & Goubert, L. (2013). Vicarious pain while observing another in pain: An experimental approach. *Frontiers in Human Neuroscience, 7*, 265. https://doi.org/10.3389/fnhum.2013.00265
Vogt, J., De Houwer, J., Koster, E., Van Damme, S., & Crombez, G. (2008). Allocation of Spatial Attention to Emotional Stimuli Depends upon Arousal and Not Valence. *Emotion, 8*(December), 880–885. https://doi.org/10.1037/a0013981
Walker, S. C., Trotter, P. D., Woods, A., & McGlone, F. (2017). Vicarious Ratings of Social Touch Reflect the Anatomical Distribution & Velocity Tuning of C-Tactile Afferents: A Hedonic Homunculus? *Behavioural Brain Research, 320*(March), 91–96. https://doi.org/10.1016/j.bbr.2016.11.046
Ward, J., Schnakenberg, P., & Banissy, M. J. (2018). The Relationship between Mirror-Touch Synaesthesia and Empathy: New Evidence and a New Screening Tool. *Cognitive Neuropsychology, 35*(5–6), 314–332. https://doi.org/10.1080/02643294.2018.1457017
Yang, C.-Y., Decety, J., Lee, S., Chen, C., & Cheng, Y. (2009). Gender Differences in the Mu Rhythm during Empathy for Pain: An Electroencephalographic Study. *Brain Research, 1251*(January), 176–184. https://doi.org/10.1016/j.brainres.2008.11.062