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# Does Mediated Social Touch Successfully Approximate Natural Social Touch?

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**Abstract.** Mediated social touch (MST) devices are upcoming. To date, experiments aimed at demonstrating whether effects of naturalistic social touch can be replicated with MST provide mixed findings. A possible explanation could be a lack of realism of current haptic displays in combination with not sufficiently taking contextual factors of social touch into account. Using a qualitative approach, our study aims to gain more insight into the influence of contextual effects on the experience of an MST, by means of exploring female participants' experiences of receiving an MST from a male stranger versus their romantic partner. Our findings show that simultaneously feeling and seeing the touch act performed on a corporeal object can be beneficial for the MST experience. However, our findings also demonstrate that it is not self-evident to regard MST as phenomenologically equal to natural social touch, as it often fails to meet the expectations people have formed based on naturalistic social touch.

**Keywords.** Mediated social touch, affective haptics, interpersonal communication

## 1. Introduction

Social touch is essential for human development, social attachment, wellbeing and interpersonal communication [1]. However, there are circumstances where geographical distance impedes skin-to-skin contact—think of partners in a long distance relationship. Mediated Social Touch (MST) devices have been suggested for these and other purposes (e.g., remote clinical counselling [2]). MST refers to interpersonal touch over a distance through haptic display technology. The technical development of MST devices has gained increasing interest in the past years, exploring a variety of haptic technologies and functional designs. At the same time research has begun to test the efficacy of MST by attempting to replicate the effects of unmediated social touch in mediated settings. Results of these studies, however, have been mixed and, taken together, note very encouraging. [3, 4]. One possible explanation could be the lack of realism offered by current tactile displays. Despite increasingly sophisticated multimodal actuators, it remains challenging to replicate an accurate representation of natural social touch [5]. One approach to enhance realism of an MST could be to complement the tactile sensation by simultaneously seeing a similar touch act being performed on a corporeal (i.e., resembling the human body) input medium [6], thereby aiming to make the interface

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more transparent and creating an illusion of non-mediation. Previous work has shown this to be promising [6,7].

Another possible explanation is that contextual factors are not taken sufficiently into account in studies seeking to demonstrate response similarities between MST and interpersonal touch in natural circumstances. Social touch is more than a mere tactile stimulation of the skin. The tactile stimulation is accompanied by other verbal and non-verbal cues, and whom we touch, when, and in what manner is regulated through social and personal norms [3]. Previous research indicates that contextual factors such as gender [8] and visual expression [9] are found to significantly affect the meaning and experience of social touch.

Hence, the assumption that MST, as currently designed, offers social touch seems debatable. Clearly, we need to gain a more in-depth understanding of how people experience MST. It has been suggested that a qualitative approach could provide valuable input for research in the field of MST [10]. Whereas quantitative research allows us to test and validate theoretical assumptions, a qualitative approach would allow for a more in-depth descriptive understanding of people's experiences with MST [11]. It thus is essential that experimental work focussing on uncovering the possible response similarities between MST and unmediated social touch through quantitative assessment is complemented with more qualitative approaches aimed at investigating how people experience and interpret the MST in different social and perceptual settings.

In the present experiment we took such approach that complements quantitative analyses with qualitative data, while manipulating two contextual factors thought to be influencing touch experiences: the sender of the touch (spouse vs. stranger) and the form input medium on which the touch recipient can see the MST being performed (corporeal vs. non corporeal). We addressed the following research questions: (1) How do people experience MST? (2) How does MST experience depend on the form (i.e., corporeal or not) of the input medium on which the touch act is seen to be performed? (3) What are people's attitudes and interests towards MST and the use thereof in daily life? The experiment has been pre-registered using the Open Science Framework (<https://osf.io/w4zqs/>). The present paper will focus on the data, and the quantitative analyses will be reported elsewhere.

## **2. Method**

### *2.1. Participants*

Fifty-one female participants and their partners were recruited through the university database. Participants needed to be in a relationship for at least three months and be fluent in English. All were healthy adults between 18 and 65 years of age ( $M = 24$ ;  $SD = 7.9$ ) with no history of cardiovascular issues or related medication. One participant had to withdraw participation in the beginning of the session due to a health-related issue. Therefore, the final sample size was 50 participants. The participants received a compensation of 7.5 euros.

### *2.2. Design and procedure*

We conducted a 2 (MST from romantic partner vs. stranger) x 2 (seeing the touch performed on a corporeal—hand-shaped—vs. non-corporeal object—touchpad) within-

subject experiment. The MSTs were provided in four blocks, where each block consists of 4 touches with the same input medium. Within each block, two consecutive touches were from the spouse and two from the stranger, the order in which was counterbalanced between participants and blocks. Data was gathered through semi-structured interviews. All interviews were audio recorded and later transcribed verbatim. An overview of the procedure of the experiment can be found in figure 1, and more details can be found in the pre-registration.

### 2.3. Apparatus and stimuli

The tactile stimulus consisted of a caress applied to the left forearm at a speed of 3.1 cm/s with duration of 3.9s, applied by a fingertip-shaped soft polyurethane foam. Past research has shown that providing a caress with such a speed is associated with pleasantly perceived touch [12]. The MST was generated by a computer and initiated by the experimenter. In order to match the visual feedback with the tactile stimulation, the male spouses and stranger were trained to synchronize their caress with the MST using a visual indicator of the speed and duration. The movement of the hand of the male interaction partner over the input medium, as well as the middle part of his torso were recorded and shown real-time on a computer screen to the participant.

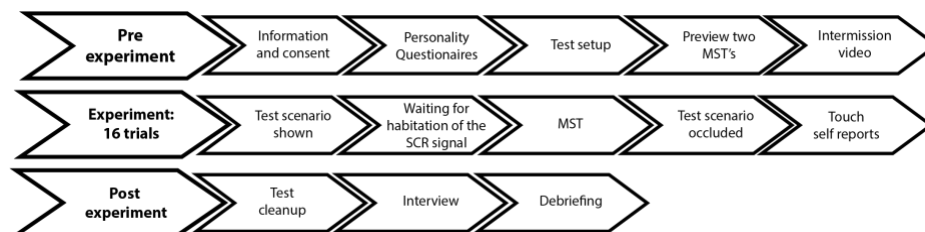


Figure 1. Procedure of the experiment.

## 3. Results

The data was analysed by means of a thematic analysis [13]. This resulted in three main themes, theme 1: The MSTs were often perceived to differ from a natural social touch in various ways, theme 2: The MST concept was often perceived as being valuable but the right application area and improvements to the quality of the MST device are essential and theme 3 People's experiences of receiving an MST through a corporeal input medium. The three themes will be discussed below.

### 3.1. The MSTs were often perceived to differ from a natural social touch in various ways.

The analysis revealed large differences in our participants' experiences of the MST. Some described it as pleasant "I found it quite pleasant, it was a very soft and subtle touch, not an unpleasant one (P1)", others as neutral "I also found it quite neutral, yeah, not necessarily very pleasant, but also certainly not unpleasant (P12)" and some as uncomfortable "Because like the vibration and uhm and you also hear this sound it's not

*very comfortable (P24)*". Although some stated that the MST resembled a real touch "*not very different per se from real contact (P6)*", for most it did not. In fact, we identified three ways in which the MST differed from a real touch, the first was that the tactile sensation did not resemble the feel of a natural touch. Participants provided several reasons for this; participant 15 explained, "*Actually it all feels mechanic.*", whereas P13 stated, "*It felt a bit like yeah a brush or something like that, not like skin-to-skin contact*". Participant 9 explained, "*uhm I think because it is just too different, because what I immediately thought was also like it is not warm.*" The second related, not to the feel of the MST, but to the type of touch (i.e., the stroke on the upper arm) not being regarded as representative for naturalistic touch interactions. Participants reported, "*if we [she and her boyfriend] would sit like this, then this would not be something [such a touch type] that you would typically do exactly like this (P10)*" and "*not often actually that people touch you like that at all (P2)*". The third was that, in contrast to natural touch, the MST did not provide a sense of being touched directly by the other person. That is, the MST device did not evoke a perceptual illusion of non-mediation: "*I didn't feel like my friend or the other person really touched me, I was like okay he touches a device and that device then touches me (P26)*".

*3.2. The MST concept was often perceived as being valuable but the right application area and improvements to the quality of the MST device are essential.*

Regarding the anticipated value of MST in participants' daily live, our analysis showed a variation of opinions. Whereas some participants reported no need for such a device "*Don't think so, would not know what for (P32)*", others showed interest or saw potential in using MST. We identified two factors contributing to participants' interests in MST. The first is that they had to recognize a useful application area for MST. The majority of participants reported MST to be useful for circumstances where distance prevents physical contact. Either as a substitute for real touch "*Yeah I think it would be nice to have that physical contact because it's not always possible to visit them face to face (P44)*" or as enrichment of current communication "*Yes maybe if you, just to let someone know that you are thinking them instead of sending a message, it is nice to do something like that (P20)*". Specifically, MST was found to be most valuable for long distance relationships "*Someone is gone for half a year so that is a pity and such and I would quit like it to occasionally feel something or so from someone at unexpected moments (P3)*" Several participants also reported MST could be useful when family members are abroad "*In my own personal life I do have family who live far away, and I do think that maybe it could be a nice application (P34)*". A second factor contributing to people's interest was the promise of improvement of the MST device in the future. Many participants reported no interest in using MST in the current form, and found the device lacked variability in touch type: "*Depends very much on the technique I, I think purely something like this indeed that only provides a line over your arm, I don't know if that would add so much (P12)*". But also, improvement in sensation was reported as important: "*Uh well I think it's it can just be more soft and smooth and without that sound noise, a bit more like human feeling or even animals, if it feels more like a pet yeah (P24)*". Moreover, the addition of other cues such as sound or the facial expression of the touch sender were also proposed as beneficial "*Well I think if I had seen my husband completely, meaning with his face and if I had heard him talk and like I'm gonna touch you now, then it was, but now it was too artificial (P18)*".

### 3.3. People's experiences of receiving an MST through a corporeal input medium.

The analysis also revealed a range of different opinions regarding the two input formats (hand-like vs. button). Several participants indicated no preferences or experiencing no difference between the two input media *"Yeah not a lot of difference for me, uh I can imagine that other people experience it differently but for me it does not matter very much it all feels the same (P31)"*. Many however were positive towards the corporeal input medium and described an enhanced MST experience *"Yes the hand I found better indeed, or at least I noticed a difference yes (P3)"*. As reasons participants stated that the corporeal input medium helped the imagining the touch act *"Oh yes I could have a lot more imagined the situation happening when the hand was there compared to the wood; I could imagine but the hand helped a lot (P11)"*. Furthermore, for some participants the corporeal input medium gave the impression that the hand was theirs *"Because of that I can yeah it looks quit realistic seems really and because it is also, you see it happening live so it gives the impression that it is your arm their (P22)"*. For others the experience became more real *"I thought it felt a lot more real with the hand (P35)"*, which some participants stated was caused by stronger identification with the corporeal input medium *"Yes, yes you if there was such a hand lying there, then yes I don't know then I identified more with that hand and then it was more like someone was actually stroking (P17)"*. However, our analysis also showed that the use of the corporeal input medium had its limitations. Several participants indicated not perceiving the corporeal input medium being their hand *"Because you cannot really move your hand, you still do not really have the idea that it is your hand (P10)"*. Furthermore, the analysis showed that for some participants the use of a corporeal input medium could result in discomfort. Reasons for this were participants not perceiving the hand as being theirs *"I thought it was strange because it was artificial and I noticed that very much, so yes so it made me more uncomfortable than comfortable, to sum it up (P9)"*. Moreover, several participants indicated experiencing discomfort when being touched by a stranger through the corporeal input medium *"Uh yes more unpleasant with the arm and the stranger than with the picture yes (P13)"*.

## 4. Discussion

To date research in the field of MST has not convincingly demonstrated the efficacy of MST in replicating the effects of a natural, unmediated social touch. Our findings revealed that most participants did not perceive of the MST as resembling a naturalistic touch. This corresponds to previous observations [5]. The lack of realism was caused by several factors: the quality of the tactile stimulation, the type of touch used and the fact participants did not perceive the touch to be originating directly from a human. In line with previous findings [6,7] our results suggest that, for some participants, seeing the MST being initiated on a corporeal input medium (i.e., one that resembles to body part being touched) can enhance MST experience. However, it appeared to deteriorate the affective experience for others (e.g., increased discomfort). A possible explanation could be the lack of perceived body ownership over the hand-shaped object. There exist large individual indifferences in the extent to which people can transfer body ownership to external objects [14], and so combining touch with congruent visual feedback may only work for some. Nevertheless, many participants were positive as to the value MST in daily life, mainly for situations where real touch is not possible. However, for MST to

be useful changes need to be made to the tactile display in terms of sensation and touch type.

Taken together, these and other findings, suggest that we as researchers should be careful with framing an MST as social touch. Such framing may create a bias for participants when they set a standard for the MST in comparison to their experiences of naturalistic touch—a standard difficult to live up to with current tactile and haptic displays. Response similarities between MST and natural unmediated touch, or lack thereof, seem to result from a complex set of factors, including tactile qualities and the social context of touch. Before exploring whether we can achieve beneficial health effects of MST or use MST in a clinical context, we should first most obtain a better understanding of what the essential characteristics are that turns tactile stimulation into a social touch.

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