
Investigating Response Similarities between Real and Mediated Social Touch: A First Test

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Abstract

In this paper, we investigate whether the gender differences generally found in same and opposite sex social touch are also present in mediated situations. Participants were led to believe that a male or female stranger was remotely touching them by means of a vest equipped with vibrotactile actuators. Affective responses varied with the stimulated body location, but the effect of dyad composition was not significant. In sum, we found partial support for the assumption that mediated social touch is actually perceived of as a real touch. Possible improvements to haptic communication devices are discussed.

Keywords

Mediated social touch, physical contact, computer mediated communication, haptic feedback, human sex differences

ACM Classification

H.5.2 [Information Interfaces and Presentation (e.g., HCI)]: User Interfaces — haptic I/O, evaluation/methodology, prototyping; J.4 [Computer Applications]: Social and Behavioral Sciences — Psychology; General Terms: Experimentation.

Introduction

Touching is an important part of our social interaction repertoire. Even a short touch by another person can elicit strong emotional experiences; from experiencing comfort when being touched by one's spouse, to the experience of anxiety when touched by a stranger. Despite the significance of touch, current communication devices rely predominantly on vision and hearing. In recent years, however, several designers and researchers have developed prototypes that allow for mediated social touch—enabling people to touch each other over a distance by means of haptic and tactile feedback technology (e.g., inTouch [4], ComTouch [6], "Hug over a distance" [16], FootIO [17], or TapTap [3]). Designers of such systems generally conjecture that the addition of a haptic or tactile communication channel will enrich mediated interactions, often referring to the symbolic and intrinsic (e.g., recovery from stress) functions of social touch, as well as to the supposed intimate nature of addressing the skin (see [11]). Although these first studies have set the stage for future work on mediated social touch, the field has been lagging behind in providing empirical evidence that mediated social touch is actually perceived as being similar or comparable to real (i.e., unmediated) social touch.

Elsewhere [11], we argued that an empirical basis for the design of haptic communication devices can be provided by testing the extent to which people respond in a similar fashion to a mediated touch as to a real (i.e., unmediated) touch. Brave, Nass, and Sirinian [5], for example, investigated the effects of mediated social touch on feelings of power and liking in both a maze task and the prisoner's dilemma. Although their study shows that a haptic channel affects the social

interaction outcomes, it remains unclear whether this was because of the perceived similarity between real and virtual touch, or because of the demand characteristics of the experiment. It is difficult to predict how feelings of liking and power might be affected by touch, especially when people are engaged in a competitive (or cooperative) task. To investigate *response similarities* between real and virtual touch, we need an independent variable of which the effects are highly predictable in unmediated situations. The study of gender differences in same and opposite sex touch fits this requirement, yielding clear predictions for mediated social touch (see, e.g., [9]).

Aim of the Present Study

In the present study, we extend the research initiated by Brave et al. [5], and investigate whether computer mediated physical contact, can be experienced as a form of social touch. For this purpose we investigate whether the gender differences generally found in unmediated same and opposite sex social touch are also present in mediated situations. If mediated social touch is indeed perceived as real we expect to find (a) that both men and women evaluate opposite sex touch as more pleasant than same sex touch (e.g., [1,12,15]), and (b) that the effect of dyad composition (i.e., same vs. opposite sex) is larger for the male compared to the female sample (e.g., [8,9]). Several researchers conjecture that it is more likely for men to be seen as homosexual if they engage in same sex touch; therefore, the fear of being labeled as homosexual motivates men to avoid touching other men. Additionally, we investigate whether (c) people react less positively to a mediated touch on more private body parts (e.g., the stomach) than on more public parts (e.g., the upper arm; cf., [12-14]).

Method

Experimental Design

A two (participant's gender) by two (gender of the interaction partner) by two (presentation order of the mediated touches) between-subjects design was used in the experiment. Participants were led to believe that the study was about the evaluation of a haptic communication system, and that another unknown participant (i.e., from a different department) was remotely touching them from a remote location. In other words, participants were either remotely touched by a *fictional* opposite or a same sex *stranger*. Ten different mediated touches were presented to five different locations of the participant's body. In the presentation of the stimuli, two different orders were used. After each stimulus, the participant's affective response to that particular mediated touch was assessed.

Participants

Sixty students (30 men and 30 women) participated in the experiment. Each participant was assigned to one of the six experimental conditions. Three participants were either not heterosexually orientated or chose not to indicate their sexual orientation. To avoid that sexual orientation would confound with the experimental effects, these participants were excluded from the analyses. All remaining 57 participants were of Dutch nationality, and 28 were men. Participants' mean age was 24.7 ($SD = 4.3$; range 19 to 52 years). All participants received a standard compensation of € 7.00 for their participation.

Apparatus

Tactile stimulation was provided through a neoprene vest and two arm straps, which were equipped with

vibrotactile actuators of type 1E110 (see Figure 1). The position of the actuators can be seen in Figure 1. The hardware and software used for controlling the vest and arm straps were similar to that used by Rovers and Van Essen [17,18]. Two stimulus patterns were used for each of the five body locations. The first consisted of the actuation of a single motor (resembling a poke) and the second pattern consisted of the actuation of a sequence of motors with overlapping intervals (resembling a stroke). Consequently, each participant received ten different tactile stimuli (5 body locations by 2 tactile patterns). In the presentation of the stimuli, two different orders were used.



figure 1. Tactile vest and arm straps. Left picture © Bram Saeys. Letters indicate the actuators for the stomach (a), lower (b) and upper back (c), upper arm (d) and wrist (e).

Procedure and Cover Story

Participants were instructed to evaluate a prototype of a haptic instant messaging system (i.e., with the chat function not implemented yet) together with another participant located at another building. Participants were told that they were going to receive a series of

remote touches by the other person. The participants were instructed to answer five questions after each received stimulus. The instructions stated that the other person would transmit the touches with an interval of approximately one minute (i.e., about the time required for the fictive person to fill in his or her questionnaire). The experimenter explicitly told the participants the name (e.g., William or Julia; and thus by inference the gender) of their interaction partner, and that he was going to instruct the interaction partner to begin with the evaluation session. From a PC in the control room, the experimenter administered the first stimulus and observed the participant. Either after about one minute, or after the participant completed the questionnaire, the next stimulus was administered.

Measures

A participant's affective response to each stimulus was assessed by means of a single self-report item. In order to obscure the intent of the experiment from the participants, the self-report item was presented in the context of four bogus questions concerning the interface. The affect question read "How pleasant or unpleasant did you find it to receive this mediated touch from the other person?" Participants could respond on a 5-point bipolar response format, ranging from -2 (very unpleasant), through 0 (neither unpleasant, nor pleasant), to 2 (very pleasant).

Results and Discussion

Written and verbal comments from participants indicated that the experimental setup and the "cover story" produced the belief that was necessary for the experiment. Male participants made comments like "The wrist is private, William should keep off" and "William should keep off my stomach".

We performed a repeated measures ANOVA on the self-reported affective responses. As within-subject factors, we tested the effects of (a) the location (wrist, upper arm, upper back, lower back, or stomach) and (b) the type ("poke" vs. "stroke") of the stimulus. As between-subject factors, we tested the effects of (a) the gender of the participant, (b) the gender of the fictional interaction partner, and (c) the order of the stimuli. We found a significant effect of location ($F(4,208) = 9.7$, $p < .01$, $\eta^2 = 9.0\%$) and a marginally significant effect of type of touch ($F(1,52) = 3.6$, $p = .06$, $\eta^2 = 0.4$). Participants generally experienced poke-like touches as less pleasant than stroke-like touches. Touches on the stomach, arm and wrist were significantly less pleasant than touches on the upper and lower back regions ($F(1,52) \geq 7.1$, $p \leq .01$). Also, a touch on the stomach was experienced as less pleasant than a touch on the upper arm ($F(1,52) = 3.8$, $p = .05$). Encouragingly, this provides evidence that mediated social touch is perceived in ways similar to unmediated touch. According to a study by Jourard [14], the stomach is the least frequently used body part in physical contact even between friends (also [13]). In another study [12], men rated touches on the stomach by a stranger as least pleasant, even when the stranger was of the opposite-sex. In addition, we found a significant effect of order ($F(1,52) = 5.1$, $p = .03$, $\eta^2 = 8.9\%$), indicating that the order in which the stimuli were administered affected participants' affective responses—that the participants, apparently, used their response to the first stimulus as an anchor for their subsequent scorings.

We found neither a significant difference between male and female participants nor a significant effect of the interaction partner's gender. This is what would be expected: Peoples' affective responses cannot be

predicted from their gender or from the gender of their interaction partner alone. Instead, it is the interaction between the two (i.e., the same or opposite sex dyad composition), that determines the amount of touching one would expect and the affective responses one predictably observes in men and women (e.g., [9]). However, although both male and female participants had the tendency to report on same sex touch as less pleasant, the interaction effect (i.e., the effect of dyad composition) was not significant ($F(1,52) = 1.8$, $p = .19$, $\eta^2 = 3.0\%$). Additional simple effect analyses revealed that, although the effects were not significant, dyad composition had a larger effect on our male sample ($F(1,52) = 2.1$, $p = .16$) than on our female sample ($F(1,52) = 0.2$, $p = .67$), explaining, respectively, 3.8% compared to 0.4% of the variance in the total sample. In separate ANOVAs for the male and female sample, the effect of dyad composition, again, did not reach significance, with $F(1,25) = 2.8$, $p = .11$, $\eta^2 = 9.9\%$, and $F(1,26) = .1$, $p = .73$, $\eta^2 = .1\%$ respectively. Although the effects of dyad composition were in the direction we would predict based on the assumption that mediated social touch is indeed perceived in ways similar to real touch, the effects did not reach statistical significance. Even our male participants did not find same sex touch statistically less pleasant than opposite sex touch.

With significant effects of body location, but not dyad composition, the results provide partial support for the often made claim that mediated social touch is actually perceived of as real touch. How, then, can the design of haptic communication devices be improved? First of all, we specifically isolated touch from other verbal and non-verbal cues, which might have considerably reduced the effects of physical contact. During the

course of the experiment, our participants, for example, did not have access to any information that could verify or reinforce their beliefs about the interaction partner's gender. Interestingly, few existing prototypes (e.g., [6,17,18]) provide such multimodal interactions. Secondly, most actuators, especially solenoids and vibration motors, are a very poor substitute for real physical contact (i.e., in terms of the qualitative experience or "feel"). Interesting future research would be to compare qualitatively poor and rich devices in their ability to evoke strong response similarities between real and virtual touch. Thirdly, touch is more than mere tactile stimulation of the skin alone. In comparison to visual or auditory interaction, physical contact requires people to be in very close proximity of each other. Moreover, touch is reciprocal: If we touch another person, then that person is inevitably touching us as well [2]. The biggest challenge for the design of haptic communication devices is to provide users with this experience of reciprocity and close proximity. One solution might be to provide users with the illusion of interacting through a shared object (e.g., [4]). Others researchers have stressed the importance of combining haptic stimulation with visual feedback about the interaction partner's actions (see [11]). Clearly, research into mediated social touch is in a very early phase of development. We strongly believe the domain can benefit from a more fundamental understanding of behavior in situations of unmediated social touch, where the gender effects discussed in this paper are but one example in a range of possible research directions. Future research might focus on, for example, increased compliance to a request (e.g., [10]), or investigate whether a person can be persuaded by a mediated touch (i.e., a virtual Midas touch; cf., [7]).

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