Helping behaviour: a very touching subject

investigating the mediated Midas touch effect and confederate bias in social interaction

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Investigating the mediated Midas touch effect and confederate bias in social interaction

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Preface

This thesis represents the grand finale of my Master Human-Technology Interaction. For me, this is the end of another student era which I enjoyed very much. It had a nice balance between social happenings and interesting knowledge.

Now, when finishing my thesis, I can (still) say that I really like research and that my motivation to pursue a scientific career is even higher than when I finished my doctoral in Psychology. As Antal Haans and Wijnand IJsselsteijn once said to me: “I never promised that performing research was fun”, I experienced some sudden hills on my path. I would very much like to thank Antal Haans and Wijnand IJsselsteijn for telling me that it is normal that these hills suddenly arise out of nowhere, guiding me and making sure the top of those hills got visual again. Furthermore, I would like to say that it was a lot of fun to brainstorm with them about all kinds of (sometimes wild) ideas for all kinds of research purposes. A further thank you goes out to my ‘confederate’ Mariska Stokkermans, for all her work during the experiment, Shirley Elprama for finding me participants in the end. Martin Boschman, thank you for all the technical assistance, especially when the need was high. Furthermore, I would like to thank Koen Crommentuijn for making me feel at home in ‘our’ office and all other lunch buddies for making me part of the group.

Moreover I would like to thank my parents for supporting me, my brother Koen and my boyfriend’s parents. A special thanks goes out to my boyfriend Rick, who supported me during the process of graduation and who let me express my happiness as well as my frustration during my Master and Master thesis.

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1.1 Introduction

Touch is important in the life of a human being, even before birth. The skin is the largest of our sensing organs and touch is the first and most developed sense in the womb (Field, 2001). As such, a baby's emotional bonds are formed through communication via touch, which gives a basis for further development. Touch can provoke several emotional reactions, both positive and negative: The touch of a loved one or a mother holding her child, but also a demeaning pat on the back from your superior. Touch always occurs through contact with the body and touch in normal daily interaction will therefore always happen in someone's personal space. This could result in a personal space violation and anxiety.

Although touch can heighten anxiety (Wilhelm, Kochar, Roth ,& Gross, 2001) it can also reduce stress in patients before operations. In a study by Whitcher and Fisher (1979), patients who were in the hospital for elective surgery were informed about the upcoming surgery by a nurse, who either did or did not have physical contact with the patient. Participants who were touched felt more positive about surgery, especially with respect to their worries regarding complications.

Our physiology of touch is a complex system which is capable of the perception of roughness and smoothness, hardness and softness, warmth and cold, viscosity, elasticity, stickiness, and pain (see paragraph 1.2). A number of design explorations incorporate touch in long distance communication by means of tactile or kinesthetic feedback technology; also called mediated social touch (Haans & IJsselsteijn, 2006; see paragraph 1.3). These mediated social touch prototypes predominantly use simple tactile displays (such as vibrating motors) which are relatively poor in comparison to the rich touch perception that our somatosensory system allows.

Notwithstanding, designers of explorations in mediated touch presume that mediated and unmediated touch are comparable, however to date, little research has been done to substantiate this (Haans & IJsselsteijn, 2006). As Haans and IJsselsteijn (2006) conclude, it is important to examine the assumptions implicit in the designs of several touch artefacts. So far there is little evidence to validate these assumptions (see paragraph 1.4) and given the distinctions between mediated and unmediated social touch it is not trivial to establish an experimentally founded understanding of the presumed effects.

The well-documented Midas touch phenomenon is a sound candidate to test response similarities between mediated and unmediated touch (i.e. trying to replicate similar reactions in a mediated touch situation as in an unmediated touch situation). The Midas touch effect is the effect that a touch has on altruistic behaviour and compliance with a request. Touch for instance increased compliance to requests to sign a petition (Willis & Hamm, 1980), return a coin (Kleinke, 1973), or look after an excited dog (Gueguen & Fisher-Lokou, 2002) (see paragraph 1.5). There is to date not enough evidence to support a mediated Midas touch effect (see paragraph 1.6).

If, however, mediated social touch is indeed found to be perceived of in ways similar to unmediated touch, then it offers an interesting experimental paradigm for touch research. Most published research on the Midas touch in unmediated situations suffer from a weakness intrinsic to research on touch: The confederate knows (i.e., is not blind toward) whether a touch has taken place, which can potentially lead to *systematic* confounds in confederate behaviour (see paragraph 2.4). Mediated touch makes it possible to assess the Midas touch effect in a situation were the confederate does not know whether the participant will receive a touch or not. As a result, the behaviour of the confederate should be independent of the occurrence of a touch.

The two research questions we are going to address are therefore:

1. Is there a difference in helping behaviour when a mediated touch occurs than when no such touch occurs when we replicate other Midas touch research and thus have a knowledgeable confederate towards the occurrence of the touch?

2. Is there still a difference in helping behaviour when a mediated touch occurs than when no such touch occurs when the confederate does not know to which conditions the participant is assigned (i.e., whether the participant received a touch or not)?

1.2 Physiology of touch

A considerable part of what we call haptic perception, including touch, proprioception (position of body parts) and kinesthesis (movement of body parts), are handled by a person's somatosensory system (Mather, 2009). Touch receptors either respond to deformation of the skin (mechanoreceptors), temperature changes (thermoreceptors) or pain (nocireceptors).

When looking at the structure, we can identify four types of mechanoreceptors in the glabrous (hairless) skin: Meissner corpuscles , Merkell corpuscles, Pacinian corpuscles and Ruffini corpuscles. We can classify the receptors in four different response categories (Johansson & Valbo, 1983). Fourty-four percent of the receptor units are slow adapting, while 56% of the receptor units are fast adapting. A further devision of these two categories shows us that these units have either small and defined fields, while others have wider fields with more obscure borders. Receptor units are either slow adapting and small defined (SA I), slow adapting and wide obscure (SA II), fast adaptive and small defined (FA I) or fast adaptive and wide obscure (FA II). The SA I units are especially adept in identifying edge contours and are most likely of the Merkell type. The SA II units are not involved in detailed perception, but they respond to stretching of the skin. These units give detailed information of the direction and magnitude of the

stretched skin and are most likely of the Rufini type. The FA I units respond to the rate of skin indentation and are most likely of the Meissner type. The FA II units respond to brief mechanical stimulation and vibration. These units are most likely of the Pacinian type. With these four types of mechanoreceptors we have sufficient receptors to perceive the extent of roughness versus smoothness, hardness versus softness, viscosity, elasticity and stickiness.

As we can see the physiology of our somatosensory system is extensive, allowing for rich tactile perceptions. Although a number of design explorations have incorporated touch, the extent and fidelity of haptic stimulation is still marginal in comparison to the perception possibilities of our physiological system. Next, we will discuss the design explorations in the area of mediated social touch

1.3 Mediated social touch

One of the earliest mediated touch devices is the Telephonic Arm wrestling system made by White and Back in the eighties. This device allowed two people to arm wrestle over a phone line using robotic arms with motorized force-transmitting systems (Shanken, 2000). Although the system suffered from delays, it was said to give the impression of wrestling a real human. Since that time several other devices have been developed. One of these devices is the Intouch (Brave, Ishii ,& Dahley, 1998). The Intouch uses the principle of synchronized distributed physical objects to enable haptic interpersonal communication. This principle creates the illusion of manipulating a single object with another person that is geographically separated. The InTouch consists of three rollers on a base which is connected to another base with three rollers. When one person moves one of the rollers, the roller from the connected base synchronizes and moves to the same position, creating the illusion of a shared manipulation of one object. First user tests suggested that this object might be useful in long distance contact and communicating

emotions and sincerity, but extended tests were not performed to validate this.

The white stone (Tollmar, Junestrand & Torgny, 2000) is a device that receives touch and communicates this touch via warmth. Other devices use vibrotactile stimulation as a form of touch a person receives. Two of those systems are the Vibrobod and 'What's shaking', which were developed by Dobson, Boyd, Ju, Donath and Ishii (2001). The Vibrobod is a device made from rubber. It has force sensitive resisters that capture hand position and pressure. This input from one person's Vibrobod is then translated in warmth and vibration patterns. These patterns will be received by their conversation partner (holding their own Vibrobod). The 'what's shaking' is a glove which communicates information from newsgroups, such as how many posts a particular user has made, through vibration and warmth patterns. The authors claim that vibration and temperature can be used successfully in communicating emotional and social content over long distance. Preliminary user studies suggest that participants were able to understand different meanings (emotions and information) through this device. The ComTouch is a device that also relies on vibrotactile stimulation on the receiving end (Chang, O'Modhrain, Jacob, Gunther & Ishii, 2002). The ComTouch is a sleeve that you can put over your mobile phone. When you touch the phone it measures the duration and strength of the touch. It then translates this input into vibro-tactile outputs, which can be received by the person on the other end of the conversation if he or she also uses a ComTouch. Sending and receiving of the in- and outputs can happen at the same time. The authors claim that first studies suggest an enrichment of audio communication by using touch for emphasizing, mimicry, and turn-taking.

Another technique is used in 'the hug over a distance' (Mueller, Vetere, Gibbs, Kjeldskov, Pedell ,& Howard, 2005). This system aims to simulate a hug by means of an inflatable vest. The hug can be initiated by rubbing the belly of a stuffed koala bear. This koala

bear contains a standard personal digital assistant (PDA) with a touch screen which can communicate with the receiver on the vest. The wireless receiver in the vest is connected to a compressor which, when activated, fills the compartments in the vest quickly with air as to wrap itself around the wearer's body with a light pressure, thereby simulating a hug. After a few seconds the air releases. User studies showed that participants missed the reciprocity of a real hug, and that the noise of inflating the vest was a disturbing factor. In a preliminary user study participants indicated that they would not use this product in everyday life, but that they liked the idea of exchanging hugs over a distance.

A system that combines several of the outputs mentioned above is the iFeel_IM system (Tsetserukou, Neviarouskaya, Prendinger, Kawakami, Ishizuka & Tachi, 2009a; 2009b). This system adds mediated touch to an instant messenger. Text is converted into emotions which are then represented through a set of 4 different haptic interfaces. The HaptiHeart imitates a heartbeat appropriate to the intended emotion. The HaptiTemper sends out thermal signals to simulate a chill upon a persons spine through cold by means of a fan and the cold side of a peltier element or simulate a friendly feeling through warmth on a persons skin. The HaptiShiver uses vibration motors to simulate shivers up a persons spine. The HaptiTickler uses vibrations to evoke a joyous affect by tickling the ribs. Finally, they designed the HaptiHug which uses pressure to simulate an emotion appropriate hug. Although the system still requires formal user testing and there is no substantiating evidence, the authors claim that the messenger can translate emotions at the same level as humans can.

These design explorations presume that mediated and unmediated touch are comparable, however little research is done to substantiate this (Haans & IJsselsteijn, 2006). As Haans and IJsselsteijn (2006) conclude, it is important to examine the assumptions made by the designers of

mediated touch systems. It is not trivial to establish an experimentally founded understanding of the presumed effects, given the great number of distinctions between mediated and unmediated social touch

1.4 Mediated versus unmediated social touch

Mediated social touch is different from unmediated social touch in several ways. First, the feel of the touch is different. Simulation of the richness of a human touch is difficult and expensive and in accordance to this, haptic devices mostly use simple means of simulating touch, such as electromechanical actuators. Second, these devices have a limited number of channels (e.g., leaving out visual, auditory or smell information), thereby precluding many (non)verbal social cues (such as intonation, gaze or facial expressions) that provide the necessary context in which a touch act should be interpreted. Furthermore, mediated touch does not usually occur with the person touching within the personal space and sometimes there is even a delay between sending and receiving. The question, therefore, is whether mediated touch is indeed comparable to real (unmediated) touch.

Only a few studies compare mediated and unmediated touch. Brave, Nass and Sirinian (2001) looked at the effects of visual and haptic feedback in a cooperative or competitive maze tasks. In the cooperative condition the participant was told that another participant would give instructions to help him go through the maze more successfully, while in the competitive condition the participant was told that another person would make it more difficult for the participant to complete the maze task. In the visual conditions, participants received information on the route to take from another participant, which in reality was a computer, in the form of arrows. In the haptic condition this information was given through directional forces on a joystick. When the participants in the haptic condition received competitive feedback they

experienced more power and more positive feelings, while the opposite was true for cooperative feedback. The authors suggest that this might be due to the need to overcome the other participant by force in the competitive condition, which always worked since the suggestions were less powerful than the force needed to correct the suggestions. This overcoming of the other was unnecessary for the cooperative condition. The authors suggest that overcoming the other might be a mediating effect on positive feelings and feelings of power. There is however no knowledge of how people respond to these circumstances in unmediated settings. It is therefore very important to use a well researched phenomenon to compare mediated and unmediated touch.

Another study that looked at the comparison of mediated and unmediated touch was conducted by Haans, de Nood and IJsselsteijn (2007). They investigated whether responses on touches to different body locations were the same for unmediated and mediated touch. In addition to this, they also investigated whether the gender differences consistently found in unmediated touch research also occur in mediated touch situations. In their experiment participants were made to belief that they were touched on different locations of the body by a stranger at a distant location. Haans and colleagues (2007) found that the effect of location on the body was significant and that the results were comparable to perceived touch in unmediated circumstances. Although the effect was not significant, the gender differences were in the same direction as they are generally found in unmediated touch research: Same sex touch is generally considered as less pleasant, with men having a higher aversion to this than women (cf. Floyd, 2000). Haans and IJsselsteijn (2009) subsequently continued the response similarity paradigm, by looking at another well-established effect of social touching: the Midas touch effect.

1.5 Midas Touch effect

The Midas touch effect, as the phenomenon was labelled by Crusco and Wetzel (1984), is the effect that a touch has on altruistic behaviour and compliance with a request. In a study performed by Kleinke (1973), persons were asked to return a coin left by the previous user of a phone booth. Persons who were touched while the request was made were more likely to return the coin than persons who had no physical contact with the requester. In a study by Willis and Hamm (1980) persons were asked to either sign a petition in favour of the renovation of a railroad station or to participate in a survey. Persons who were touched were more willing to comply to the requests made than persons who were not touched. In a study by Patterson, Powell, and Lenihan (1986) participants were asked, after they completed a questionnaire themselves, to help the experimenter with scoring questionnaires. Participants who were touched on the shoulder during the request invested more time in scoring the questionnaires than participants who were not touched. Interestingly, they found that those persons that complied more persistently also rated the experimenter as more sensitive and more flexible.

Touch also has a significant effect on compliance when the request was big. Nannberg and Hansen (1994) demonstrate that such a Midas touch effect also occurs for very personal and provocative questionnaires. Persons who were touched completed more of these questions than persons who were not touched. Another example is the study by Gueguen and Fisher-Lokou (2002) in which a request was made to look after a very big and excited dog for ten minutes with the excuse that the dog could not go into the pharmacy with the confederate. Fifty-five percent of the people who where touched compared to 35% of the people who were not touched complied with this request.

Other researchers have investigated the joint effects of touch and other nonverbal cues.

Hornik and Ellis (1989) for instance performed a study in which they looked at the combination of touch and gaze. They asked participants to fill in a survey and either gazed at and touched the person or did neither. More of the participants, shoppers in a mall, complied with the request to participate in an interview after being touched and gazed at, with an even higher compliance to female interviewers. Goldman and Fordyce (1983) also looked at the combination of gaze and touch. During a survey participants were either gazed at or not gazed at. Furthermore, participants did or did not receive a touch after completing the survey. When the confederate afterwards 'accidentally' dropped survey forms, he or she observed whether the participant assisted with picking up the forms. They found that when the combination 'eye contact'-'no touch' and the combination 'no eye contact'-'touch' occurred that persons were more likely to help with picking up the forms. They did not find a significant effect of touching on helping behaviour in their experiment.

For the Midas touch to be effective, it is not necessary that a person is aware of being touched. In a study by Gueguen (2002), participants were requested to complete a survey accompanied by either a touch or no touch. As expected, touch had a significant positive effect on helping behaviour: 67.1% of the persons who were touched complied against 43.1% of the persons who were not touched. Interestingly, persons who did not notice being touched did not significantly differ in compliance from those who did recollect being touched.

Another important finding was made in a study by Goldman, Kiyohara and Pfannensteil (1985). They found higher compliance for touch even when the touch was not made by the requester. In their study they had a confederate who, while asking for directions, either touched or did not touch the participant. A second confederate asked for a big favour (two hours of their time to help in a phone panel for a charity). More people who were touched agreed to help with

the big favour than people who were not touched. Furthermore, a study by Vaidis and Halimi-Falkowicz (2008) pointed out that people were more willing to comply with filling in a questionnaire when given two touches rather than one touch.

These are but a few of the examples of studies demonstrating the Midas touch effect for several kinds of compliance in different circumstances, a further description is however beyond the scope of this study (An extensive review of studies before 1993 can be found in Segrin, 1993). All in all, the research mentioned here suggests that touch in unmediated settings has a positive effect on compliance. Haans and IJsselsteijn (2009) performed their study to compare the responses towards mediated and unmediated touch.

1.6 Mediated Midas Touch

In the study done by Haans and IJsselsteijn (2009), 63 males were asked to review a haptic messenger system through a question and answer sequence with another participant (a female confederate of the experimenter). This haptic communication system allowed for one person being touched by means of an arm strap fitted with vibrotactile actuators. The participant was always assigned to the role of interviewer and receiver of the mediated touches. Questions and answers were provided by the experimenter, but the participant was asked to formulate the text in their own wording. At two predefined moments in the conversation the confederate applied the touches. In the touch condition these touches were received by the participant, while in two no-touch conditions the touches were not received. The two no-touch conditions differed from each other in the explanation regarding why no touch had occurred: Either the system failed or the other participant did not apply any touches. The confederate was blind to the condition the participant was in (touch/no touch). After the question and answer sequence a bogus questionnaire was given, and when finished the participant was asked to provide his email

address and signature to receive the reward. While doing this, the confederate would walk past the participant, and would accidently scatter coins across the floor while making an utterance appropriate for this action. The confederate observed whether the participant helped with picking up the coins or not. Because there was no difference in willingness to help between the two no-touch conditions, these were treated as a single condition. Results showed that 45,0% of the participants in the no-touch condition helped in picking up the coins while 60,9% of the participants in the touch condition helped picking up the coins. This difference, however, was not found to be statistically significant. The effect size of the result of the experiment conducted by Haans and IJsselsteijn (2009) (effect size of 15,9) is comparable to studies where the dropping of item paradigm is used (pooled weighed average effect size was 15,9; see Figure 1). A more detailed report can be found in Appendix A.

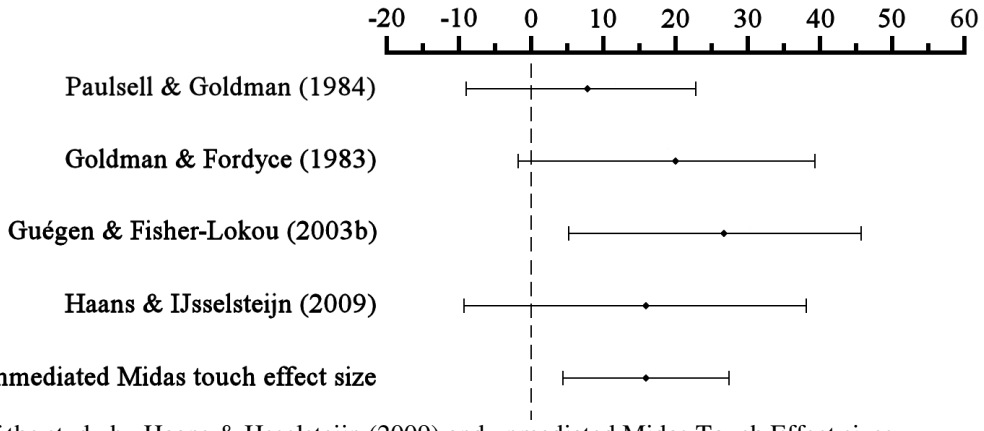

Figure 1. Effect Size of the study by Haans & IJsselsteijn (2009) and unmediated Midas Touch Effect sizes (estimated by taking the differences of absolute percentages helping in the touch and no-touch condition) and their 95 percent Confidence Intervals (calculated with the Newcombe-Wilson method without continuity correction); pooled weighed averages of the unmediated Midas touch effect size (Haans & IJsselsteijn, 2009); a more detailed report of the three unmediated studies can be found in Appendix A.

2. Study 1

2.1 Aim

In this first study, we aim to demonstrate that the Midas touch effect is also operative in mediated situations in which the touch act is replaced by vibrating motors. In other words we

aim to replicate published studies on the Midas touch effect under mediated conditions. In contrast to Haans and IJsselsteijn (2009) our confederate thus will not be blind (an intrinsic weakness of unmediated touch research). Hypothesis 1 is that helping behaviour will be higher in the touch condition, than in the no-touch condition. In a second experiment, following this first, we examine the mediated Midas touch effect under blind conditions.

2.2 Method

2.2.1 Participants

Our sample of participants was drawn from students and employees at Eindhoven University of Technology. Sixty persons, all male, participated in this study. Their mean age was 24,0 years old (SD = 5,1; range = 18 to 55). Participants had a chance to win an Apple iPad which was awarded to one participant by means of a raffle

2.2.2 Experimental design

Participants were randomly assigned to either the 'touch' or the 'no-touch' condition. Participants in the 'touch' condition received two mediated touches to the upper arm through electromechanical actuators attached to the inside of an arm strap. Participants in the 'no touch condition' received no such tactile stimulation.

2.2.3 Apparatus

Touches were initiated through a neoprene arm strap with 4 electromechanical actuators. These actuators were programmed to resemble a stroke/hold like feeling. The arm strap was worn on the upper left arm. Programming and controlling was done with the FootIO software (as used by Haans & IJsselsteijn; 2009; designed by Rovers & van Essen, 2005; 2006).

The room in which the experiment was held was a typical laboratory room. The participant and confederate were to be seated on opposite sides with a screen separating both.

The room had a small cabinet close to the participant on which the participant and confederate could leave their belongings, see Figure 2.

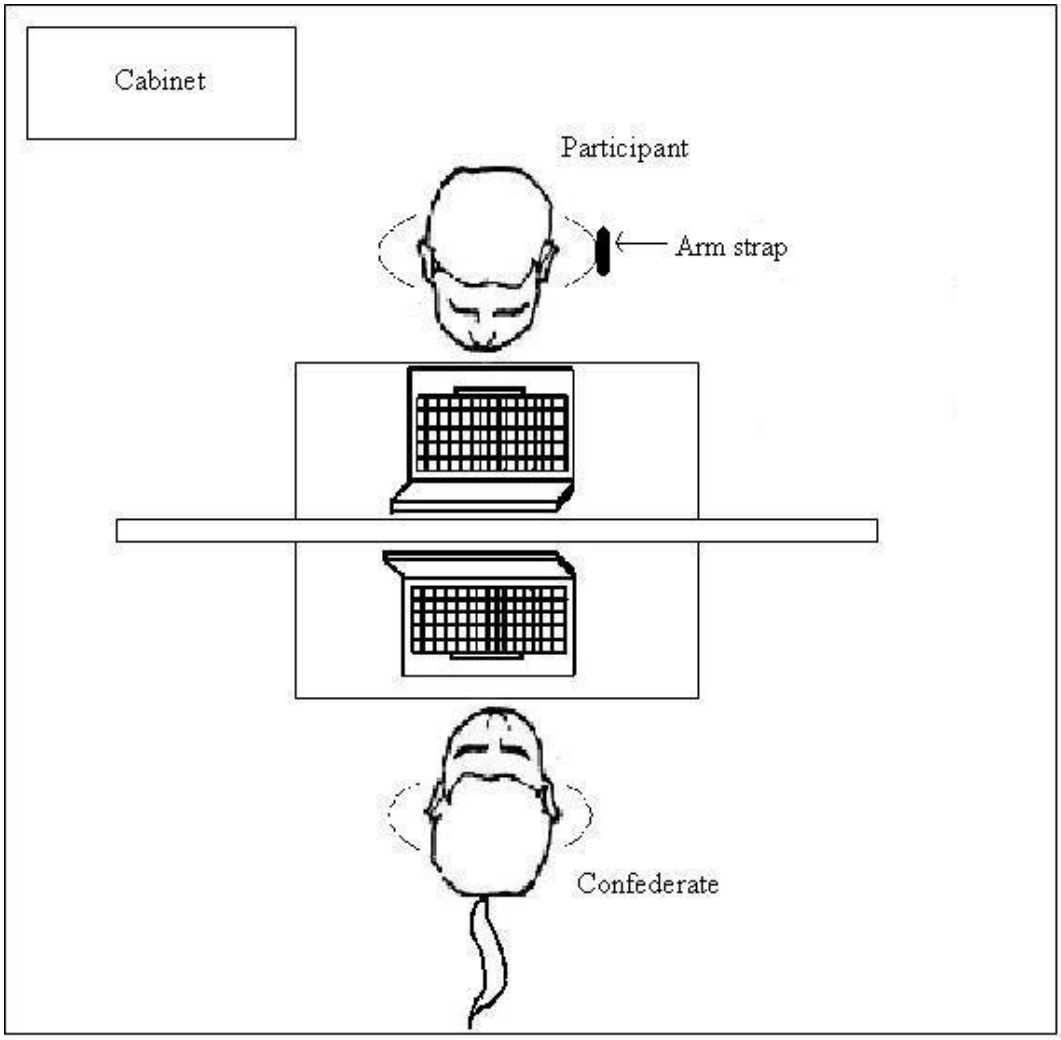

Figure 2. Map of the experimental setup in which the participant and confederate were separated by a screen. A cabinet was placed on which the belongings of the female confederate (pencil case) and the male participant were placed.

2.2.4 Procedure and measures

Participants were invited to participate in what they thought would be an evaluative study of a haptic messenger program together with another person (i.e. our female confederate). When the participant entered, the experimenter asked him to leave his belongings on a small cabinet. The confederate was already sitting in the lab and her belongings were already on the cabinet.

Next, the experimenter asked the participant to sit down and read the instructions. When the participant was given the instructions, the confederate was seated and asked to read through the instructions. After this the experimenter stayed out of sight of the participant.

The instructions stated that the participant was going to test an instant messaging system with a haptic feedback arm strap. Being a prototype, the instructions read, only one person could receive and one person could send the signal. The instructions informed the participant about the purpose of the experiment: Investigating when mediated touches would naturally occur in an MSN interaction. To test this, the participant was asked to work through a pre-defined set of questions (similar questions to the ones used in the experiment by Haans and IJsselsteijn, 2009; see table 1). The participant was instructed explicitly to formulate the questions in his own words, but to neither deviate from the content, nor to engage in other interactions with the confederate. The participant was always assigned to be the interviewer and receiver of the signal and the confederate was always assigned to answer the questions (predefined answers) and initiate the touches. The two mediated touches were initiated at predefined moments in the conversation (see Appendix B for the instructions and table 1 for the questions and answers).

After the question and answer session the participant filled in a nine-item bogus questionnaire to distract the participant from the true purpose of the experiment (similar to Haans & IJsselsteijn, 2009). When ready, the experimenter asked the participant to fill in his student ID and email address necessary to contact him in case he would win the raffle. Next the experimenter walked towards the other side of the room, behind the screen. The confederate waited until the participant, who was ready filling in the form, was about to stand up. Then she would walk towards the cabinet (see Figure 2) to pick up a pencil case with such a swoop that the content (i.e., pens and pencils; 11 in total) would fly out, thereby scattering it on the floor.

While doing this, the confederate expressed herself verbally in an appropriate way. She would then pick up the items one at a time with a speed of approximately one piece per second.

Observations were made to see if the participant would help the confederate with picking up the fallen pieces. When the participant did assist the confederate, she counted how many pieces he picked up.

Table 1. *Questions and answers and timing of the mediated social touch.*

1. Ask where he/she goes to school
- At the TU/e*
2. Ask which educational program he/she is enrolled in
- Human Technology Interaction
3. Ask what kind of Music he/she listens to
- All kinds of Music, except classical Music, Dutch-language songs and hip hop.
4. Ask what his/her favourite movie is.
- All Romantic movies **(mediated social touch)**
5. Ask where he or she lives.
- The central part of Eindhoven (the most beautiful part).
6. Ask if he/she does any sports
- Tennis and squash
7. If yes, ask him/her what he/she likes about these sports.
- Winning! **(mediated social touch)**
8. Ask whether he/she has any holiday plans.
- Finish Master's thesis first

**(TU/e is the abbreviation for the Eindhoven University of Technology)*

2.3 Results

2.3.1 Mediated Midas touch

First, we investigated whether the Midas touch effect found in literature exists in a mediated setting by looking at the difference in helping behaviour between the touch and no-touch conditions. In the touch condition 76,6 percent of the persons assisted the confederate in picking up the items, while 50 percent of the participants in the no-touch condition helped the confederate. Thus, helping behaviour in the touch condition was higher than helping behaviour in the no-touch condition. A one-sided Fisher exact test with Touch and Helping behaviour as variables showed that this difference is significant, with $p < .05$.

Table 2. *Percentage of helping behaviour and numbers of participants helping the confederate in the Touch conditions (touch, no-touch) with a non-blind (Study 1) and a blind confederate (Study 2)*

	Helping behaviour					
	Not Blind (Study 1)			Blind (Study 2)		
	Yes	No	% helping	Yes	No	% helping
Touch	23	7	76,7%	14	16	46,7%
No Touch	15	15	50,0%	11	19	36,7%

The number of picked up items in the touch condition (M = 3.10, SD = 2.16) was not significantly different from the number of picked up items in the no-touch condition (M = 2.53, SD = 2.90) with t (58) = .859, p = .394.

2.3.2 Meta-analytical comparison

To see what the relation of the found effect is to the effects obtained in other studies investigating the Midas touch effect with a dropping-of-items paradigm, a meta-analytical comparison is performed. To estimate the effect size we calculated the absolute risk difference in percentage of helping behaviour between the touch and no-touch condition. To estimate the 95% confidence interval the Newcombe-Wilson method without continuity correction was used. The effect size is 26,7 percent with a CI between 2,3 percent and 47,1 percent. Although the effect found was somewhat higher than the pooled weighed average effect size of the three unmediated Midas touch studies (15,9 percent) as well as higher than the mediated Midas touch effect size found by Haans and IJsselsteijn (15,9 percent), the effect and CI still overlaps with all the studies and their pooled weighed averages (see Figure 3).

2.4 Discussion

As was expected from the unmediated Midas touch effect found in literature and consistent with our hypothesis (helping behaviour is higher after a mediated touch than when no touch occurs), the Mediated Midas touch effect was found to be statistically significant. Moreover, a meta-analytical comparison showed that the effect size of the mediated Midas touch

effect was comparable to that found in published studies on the non-mediated Midas touch effect. In other words, the mediated Midas touch effect is not only significant but also comparable to earlier studies in unmediated situations. This indicates that people can respond to mediated touch in the same manner than to unmediated touch. This is empirical evidence for the assumptions (that mediated and unmediated touch are similar in response) made by the design rationale of mediated touch on social interaction.

Interestingly, the present study appears to suggest that electromechanical stimulation of a person's skin is sufficient to increase that person's pro-social behaviour. In other words, replacing touch by a human hand with stimulation through a tactile display will still elicit the Midas touch effect. This is particularly remarking, since in the process of doing so the touch act in our experiment was separated from other nonverbal cues (such as gaze) with which a touch act is naturally confounded in non-mediated situations. However, being a replication of published Midas touch experiments, the present study suffered from the same weakness intrinsic to unmediated touch research: The confederate was not blind, and thus knew whether or not the touch was received by the participant. Although the present study suggests that stimulation of the skin is sufficient for the Midas effect to occur, it might alternatively be explained by a confederate bias. In field based (non-mediated) experiments there can be no full control over possible visual, auditory, and behavioural confounds. Lewis, Derlega, Shankar, Cochard, and Finkel (1997), for example, investigated the nonverbal behaviours that are confounded with touch. Several confederates were observed in their interaction with participants. During this interaction they either touched or did not touch a participant. Results indicate that in the touch condition the confederates used less expressive gestures and more nervous gestures than in the no-touch condition, in spite of instructions before hand to keep nonverbal behaviour the same.

More importantly, this confederate who initiates the touch act can never be totally blind to the whether or not the person received the touch, as it is a bi-directional process: to touch is to be touched. This potentially leads to *systematic* confounds in confederate behaviour (e.g., a confederate could unwillingly adjust towards the expected hypothesis and show differences in nonverbal behaviours like eye contact, smiling, interpersonal distance, etc.). It is thus possible that our confederate adjusted her nonverbal behaviour in line with the hypothesis. Although the hypothesis was not made explicit, we cannot assume that the confederate did not herself construct this hypothesis from the research procedure.

The research discussed above suggests that experiments that are not conducted with blind participants and confederates are at risk of making Type I errors. This is the case especially for research that relies heavily on social interaction, such as Midas touch research. Mediated social touch allows a blind testing procedure in which the confederate is uninformed about the experimental condition a participant is in. As a result, the confederate's behaviour toward the participant would be independent of the touch condition. In a second experiment, we test whether the mediated Midas touch effect still occurs when the confederate is blind with respect to the touch manipulation.

3. Study 2

3.1 Aim

Because of the possible confounds of non-blind testing in study 1 and the possibility of blind testing in mediated situations we want to replicate study 1 in a setting were the confederate is blind. In this second study we investigate whether the Midas touch effect still exists with a blind confederate (a possibility with mediated social touch) instead of an informed confederate (a weakness intrinsic to unmediated touch research). Hypothesis 2, based on the literature that

suggests that the Midas touch effect is the effect of touch alone, is that helping behaviour when the confederate is blind will be higher in the touch condition, than in the no-touch condition.

3.2 Method

3.2.1 Participants

Our sample of participants was drawn from students and employees at Eindhoven University of Technology. Sixty persons, all male, participated in this study. Their mean age was 22,3 years old (SD = 2,5; range = 18 to 29). Participants had a chance to win an Apple iPad which was awarded to one participant by means of a raffle

3.2.2 Experimental design, apparatus, procedure, and measures

The experimental design and apparatus were equal to study 1. The procedures and measures were the same as in study 1 with the following additions. In the blind condition the experimenter used a switch which controlled the signal between the software and the arm strap to assign participants to the touch condition (the touch that was initiated was also produced) and the no-touch condition (the touch that was initiated was not produced). Furthermore, additional measures were taken to make sure that the confederate would not find out to which condition the participant was assigned. First, the confederate wore a head phone, playing music, to mask sounds from the actuators and conversations between the experimenter and the participant. Second, the confederate always initiated the mediated touches, but only in the touch condition were these touches felt by the participant. This made sure that during the confederate blind condition the confederate did not know whether or not the touches she performed were received by the participant. The experimenter, thus, was the only person who was informed about the real purpose of the experiment.

3.3 Results

3.3.1 Mediated Midas touch

First, we examined whether there is a mediated Midas touch effect in a situation were the confederate is blind by looking at the difference in helping behaviour between the touch and no-touch condition. Persons who were touched assisted the confederate in 46,7% of the times, while 36,7% of the persons who were not touched assisted the confederate. A one-sided Fisher exact test with Touch and Helping behaviour as variables showed that when the confederate is blind the effect for touch was not significant with $p = .30$. As in Study 1, the number of picked up items in the touch condition (M = 1.33, SD = 1.92) was not significantly different from the number of picked up items in the no-touch condition (M = 1.37, SD = 2.09) with $t\ (58) = -.064$, $p = .949$

3.3.2 Further analysis

When we look at table 2, it appears that helping behaviour is overall lower when the confederate was blind (Study 2) than when she was not blind (Study 1). A one-sided Fisher exact test showed that there is indeed a main effect for Blind with $p = .014$. This indicates that helping behaviour is not the same in blind conditions as in not-blind conditions. Further analysis show that there was no significant difference in helping behaviour between the blind (36,7%) and the not-blind (50%) condition when no touch occurred with $p = .22$. However there is a significant difference in helping behaviour between the blind (46,7%) and the not-blind (76,7%) condition when a touch did occur with $p = .02$. Blindness significantly affected the effect of a touch in that helping behaviour was higher when the confederate was informed rather than blind towards the touch manipulation.

3.3.3 Meta-analytical comparison

A meta-analytical comparison with other studies investigating the Midas touch with the dropping-of-items paradigm was done to see how plausible it is that Hypothesis 2 can still be supported. To estimate the effect size we calculated the absolute risk difference in percentage of helping behaviour between the touch and no-touch condition. To estimate the 95% confidence interval the Newcombe-Wilson method without continuity correction was used. The effect size for Study 2 is 10 percent with a CI between -14,2 percent and 32,7 percent. The effect found was comparable to the pooled unmediated Midas touch effect size (15,9 percent) as well as the mediated Midas touch effect size found by Haans and IJsselsteijn (15,9 percent; see Figure 3).

The pooled weighed average of the studies investigating the Midas touch effect in a blind setting, the study of Haans and IJsselsteijn and study 2, is estimated by means of the Mantel-Haenszel procedure. This effect size was estimated at 12,9 percent with a 95 percent CI of -5.1 percent to 30.9 percent. This effect size is comparable to the pooled weighed average of the unmediated non-blind Midas touch effect (15,9 percent), see Figure 3.

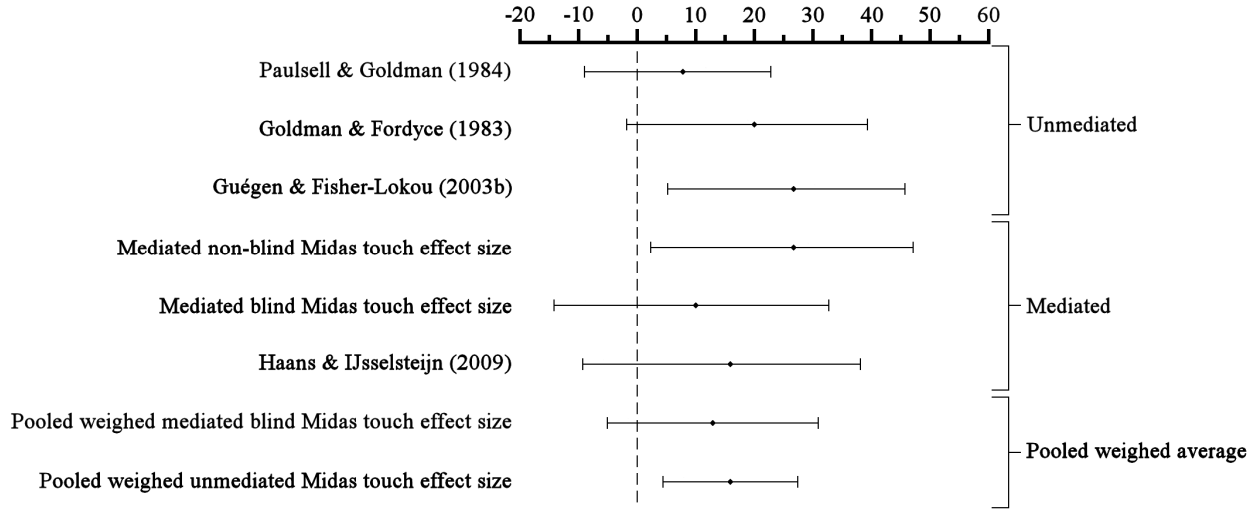

Figure 3. Effect Size of mediated and unmediated Midas Touch Effect sizes (estimated by taking the differences of absolute percentages helping in the touch and no-touch condition) and their 95 percent Confidence Intervals (calculated with the Newcombe-Wilson method without continuity correction); pooled weighed averages of the unmediated Midas touch effect size and of the mediated blind Midas touch effect (estimated by means of the Mantel-Haenszel procedure); a more detailed report of the three unmediated studies can be found in Appendix A.

3.4 Discussion

With the confederate blind with respect to the experimental conditions to which a particpant was assigned (i.e., whether he received a touch or not), the expected Mediated Midas touch effect was not found to be statistically significant. In other words, there is not enough evidence to support our second hypothesis stating that helping behaviour will be higher after a mediated touch than when no such touch occurs when the confederate is uniformed about the experimental manipulation. Had we done the first experiment with a blind confederate we might have drawn a different conclusion in that we would not have had sufficient evidence in support for a mediated Midas touch effect.

Despite the statistically non-significant Midas touch effect in study 2, how likely is it that even in blind conditions there will be a positive effect of touch on helping behaviour? First, the blind mediated touch effect was in the expected direction: More people demonstrated helping behaviour when they were touched remotely through the tactile display. Second, the effect size of the mediated Midas touch effect found in the present study was similar to that found in previous studies on the Midas touch effect under mediated but blind situations (Haans and IJsselsteijn, 2009), and non-mediated, and thus non- blind, situations (see Figure 3). In other words, it is likely that a mediated Midas touch effect exist even when the confederate is uninformed about the touch manipulation, but that the present study lacked sufficient power to detect such an effect.

There was one notable limitation to this present study. We told the confederate before the start of the experiment that she might bias the results, even unconsciously so, when being informed about the condition to which participants were assigned (note that the same confederate was used in both studies), and that we therefore decided to repeat Study 1 under blind conditions.

This might have changed the confederate's behaviour toward the participants in unintended ways. Although the confederate indicated, during debriefing, that she did not consciously behaved different in the blind (i.e., Study 2) than in the not blind setting (Study 1), we found that there was, overall significantly less helping behaviour in Study 2 (when the confederate was blind towards the touch manipulation) compared to Study 1 (when the confederate was not blind). However, this difference between the two studies was most prominent in those experimental conditions in which the participant was actually touched. Although we cannot rule out the possibility that the confederate's behaviour was generally not more restrictive in study 2 as compared to study 1, this finding at least indicates that the confederate was less collaborative towards the hypothesis in Study 2, when she could not know the experimental condition to which participants were assigned, as compared to Study 1 in which she did have this information.

This is an indication that the Midas touch effect in non-blind unmediated situations gets affected by confederate behaviour and therefore that studies in these circumstances are at risk of making Type I errors. It similarly suggests that the effect of touch in social interaction research is, at least for the Midas touch, probably overestimated.

4. General Discussion

The first study showed a significant mediated Midas touch effect when the confederate is not blind to whether or not the touch is received. As expected, helping behaviour was significantly higher when participants were touched than when they were not touched (confirming hypothesis 1). The size of the effect is comparable to earlier studies in unmediated situations (see Figure 3). In the second study we found no significant difference in helping behaviour between participants who were touched and participants who did not receive a touch (contrary to hypothesis 2). Although not significant, this effect was in the same direction and

comparable to unmediated studies, making it plausible that even when the confederate is uninformed about the touch manipulation a mediated Midas touch effect exists, and can thus be demonstrated in a study with sufficient power.

An interesting possibility for future research would be to look at the existence of the Midas touch effect in VR. Bailenson and Yee (2008) for instance argue that VR might be a valuable way of investigating social interaction because social touch interaction can be altered and tailored to the preferences of the receiver. Similar, Blascovich, Loomis, Beal, Swinth, Hoyt, and Bailenson (2002) argue that psychologists may be able to engineer social (touch) interaction within immersive virtual environments and build up or strip away certain aspects of the interaction to determine the value each aspect has or adds to other aspects in the interaction. Allowing for a blind testing procedure is but one of the promises that applications using mediated social touch have for touch research.

Several interesting questions present themselves. Seeing that electromechanical motors appear to give the same response as 'normal' touch it would be interesting to look at the exact mechanisms behind the effect of touch. Would there still be an effect of touch when the person performing the touch act is removed (i.e. being touched by a computer)? And if the mechanism behind the effect of touch is not the effect of another person touching, but another mechanism, like skin indentation, would it then be possible to interchange touch with another stimulus with the same mechanism? Or would a more similar-to-real touch device have a higher impact on compliance? Furthermore, it is also interesting to investigate responses to touch in multi-modal situations, such as combinations with visual or auditory stimulation (see, e.g., Haans & IJsselsteijn, 2010).

There are several limitations to this study. First, the experimenter, unlike the confederate in Study 2, was not blind to the condition the participant was in, which could lead to an experimenter bias (Orne, 1962). However, in this study the experimenter was nowhere near the participant when the items were dropped and picked up and thus could not influence the participant immediately. Furthermore, we used only one confederate in this experiment. There is a possibility that another confederate would behave somewhat different, perhaps leading to different results. To study the specifics of the verbal and non-verbal variables influencing the Midas touch effect, it would be advisable to compare the behaviour of several confederates in a single study.

Despite these limitations, this study demonstrates that the Mediated Midas touch effect exists when the confederate is knowledgeable towards the touch manipulation. Moreover, this study indicates a methodological issue concerning confederate variables in unmediated social interaction research. This implies that unmediated touch research can be suffering from type I errors. At the same time, the present study makes plausible that even when the confederate is blind the mediated Midas touch effect might still occur. Allowing for a blind testing procedure is but one of the many interesting research opportunities that mediated social touch, which provides a highly controlled environment, has to offer to current touch research.

5. References

Bailenson, J. N., & Yee, N. (2008). Virtual interpersonal touch: Haptic interaction and copressence in collaborative virtual environments. *Multimedia Tools and Applications, 37*, 5-14.

Brave, S., Ishii, H., & Dahley, A. (1998). Tangible interfaces for remote collaboration and communication. In: *Proceedings of CSCW '98*. Seattle, WA.

Brave, S., Nass, C., & Sirinian, E. (2001). Force-Feedback in Computer-Mediated Communication. In: D. Stephanidis (ed.), *Universal Acces in HCI: Towards an Information Society for All* (pp. 145-149).

Chang, A., O'Modhrain, S., Jacob, R., Gunther, E. & Ishii, H. (2002) ComTouch: Design of a Vibrotactile Communication Device. In: *Proceedings of DIS 2002,* ACM press, NY.

Crusco, A. H., & Wetzel, C. G. (1984). The Midas touch: The effects of interpersonal touch on restaurant tipping. *Personality and Social Psychology Bulletin*, *10*, 512-517.

Dobson, K., Boyd, D., Ju, W., Donat, J., & Ishii, H. (2001). Creating visceral personal and social interactions in mediated spaces. In: *Extended abstracts of CHI 2001*. ACM Press, NY.

Field, T. (2001). *Touch.* Cambridge, MA: MIT Press.

Floyd, K. (2000). Affectionate same-sex touch: The influence of homophobia on observers ' perceptions. *Journal of Social Psychology, 140,* 774-788.

Goldman, M., & Fordyce, J. (1983). Prosocial Behavior as affected by Eye Contact, Touch, and Voice Expression. *Journal of Social Psychology*, *121*, 125-129.

Goldman, M., Kiyohara, O., & Pfannensteil, D. A. (1985) Interpersonal touch, social labeling, and the foot-in-the-door effect. *Journal of Social Psychology*, *125*, 143-147.

Guéguen, N. (2002). Touch, awareness of touch, and compliance with a request. *Perceptual and Motor Skills, 95*, 355-360.

Guéguen, N. (2004). Nonverbal encouragement of participation in a course: the effect of touching. *Social Psychology of Education, 7*, 89-98.

Guéguen, N., Jacob, C., & Boulbry, G. (2007). The effect of touch on compliance with a restaurant's employee suggestion. *Hospitality Management, 26,* 1019-1023.

Guéguen, N., & Fischer-Lokou, J. (2002). An evaluation of touch on a large request: A field setting. *Psychological Reports*, *90*, 267-269.

Guéguen, N., Fischer-Lokou, J. (2003a). Another evaluation of touch and helping behaviour. *Psychological Reports 92,* 62–64.

Guéguen, N., & Fisher-Lokou, J. (2003b). Tactile contact and spontaneous help: An evaluation in a natural setting. *Journal of Social Psychology, 143*, 785-787.

Haans, A., de Nood, C., & IJsselsteijn, W.A. (2007). Investigating response similarities between real and mediated social touch: A first test. In: B. Begole, S. Payne, E. Churchill, R.S. Amant, D. Golmore, & M.B. Rosson (ed.), *Extended Abstracts of CHI 2007* (pp. 2405-1410). New York: ACM Press.

Haans, A., & IJsselsteijn, W. A. (2006). Mediated social touch: A review of current research and future directions. *Virtual Reality, 9,* 149-159.

Haans, A., & IJsselsteijn, W. A. (2009). The virtual midas touch: helping behavior after a mediated social touch. *IEEE Transaction on Haptics, 2*, 136-140.

Hornik, J., & Ellis, S. (1989). Strategies to secure compliance for a mall intercept interview. *Public Opinion Quarterly, 54*, 539 -551.

Hubbard, A. S. E., Tsuji, A., Williams, C., & Seatriz, V. (2003). Effects of touch on gratuities received in same-gender and cross-gender dyads. *Journal of Applied Social Psychology*, *33*, 2427–2438.

Johansson, R. S., & Valbo, A. B. (1983). Tactile sensory coding in the glabrous skin of the human hand. *Trends in Neurosciences, 6,* 27-32.

Kaufman, D., & Mahoney, J. M. (1999). The effect of waitresses' touch on alcohol consumption in dyads. *Journal of Social Psychology*, *139*, 261 – 267.

Kleinke, C. L. (1977). Compliance to requests made by gazing and touching experimenters in field settings. *Journal of Experimental Social Psychology, 13,* 218-223.

Kortum, P. (Ed.). (2008). *HCI beyond the GUI: Design for haptic, speech, olfactory, and other nontraditional interfaces*. San Fransisco, CA: Elsevier.

Lewis, R. J., Derlega, V. J., Shankar, A., Cochard, E., & Finkel, L. (1997). Nonverbal correlates of confederates' touch. *Journal of Social Behaviour and Personality*, *12*, 821-830.

Mather, G. (2009). *Foundation of sensation and perception* (2nd ed.). Sussex, UK: Psychology Press.

Mueller, F., Vetere, F., Gibbs, M. R., Kjeldskov, J., Pedell, S., & Howard, S. (2005). Hug over a distance. In: *Extended abstracts of CHI 2005*. ACM Press, NY.

Nannberg, J., & Hansen, C. (1994). Post-compliance touch: An incentive for task performance. *Journal of Social Psychology, 134,* 301-307.

Orne, M. T. (1962). On the social psychology of the psychological experiment: With particular reference to the demand characteristics and their implications. *American Psychologist, 17*, 776-783.

Patterson, M. L., Powell, J. L., & Linhan, M. G. (1986). Touch, compliance and interpersonal affect. *Journal of Nonverbal Behavior*, *10*, 41- 50.

Paulsell, S., & Goldman, M. (1984). The effect of touching different body areas on prosocial behavior. *Journal of Social Psychology, 122*, 269-273.

Rosenthal, R. (1967). Covert communication in the psychological experiment. *Psychological bulletin*, *67*, 356-367.

Rovers, A.F., & van Essen. (2005). FootIO: Design and evaluation of a device to enable foot interaction over a computer network. In: *Proceedings Worldhaptics 2005*, 521-222.

Rovers, A.F., & van Essen. (2006). Guidelines for haptic interpersonal communication applications: An exploration of foot interaction styles. *Virtual Reality, 9,* 177-191.

Segrin, C. (1993). The effects of nonverbal behaviour on outcomes of compliance gaining attempts. *Communication studies, 44,* 169-187.

Shanken, E. A. (2000) Tele-agency: Telematics, telerobotics, and the art of meaning. *Art Journal, 59* (2), 64–77.

Smith, D. E., Gier, J. A., & Willis, F. N. (1982). Interpersonal touch and compliance with a marketing request. *Basic and Applied Psychology, 3*, 35-38.

Stephen, R., & Zweigenhaft, R. L. (1986). The effect on tipping of a waitress touching male and female customers, *Journal of Social Psychology, 126*, 141-142.

Tollmar, K., Junestrand, S., & Torgny, O. (2000).Virtually living together. In: *Proceedings of DIS 2000*, Brooklyn, NY, ACM Press.

Tsetserukou, D., Neviarouskaya, A., Prendinger, H., Kawakami, N., Ishizuka, M., & Tachi, S. (2009a).Affective haptics in emotional communication. In: *Proceedings of International Conference on Affective Computing and Intelligent Interaction (ACII'09)*, 181-186.

Tsetserukou, D., Neviarouskaya, A., Prendinger, H., Kawakami, N., Ishizuka, M., & Tachi, S. (2009b). iFeel_IM! Emotion enhancing garment for communication in affect sensitive instant messenger. In: *Proceedings of HCI International 2009, Human Interface, Part 1,* 628-637.

Vaidis, D. C., Halimi-Falkowicz, S.G. (2008). Increasing compliance with a request: Two touches are more effective than one. *Psychological Reports, 103*, 88-92.

Wilhelm, F. H., Kochar, A. S., Roth, W. T., & Gross, J. J. (2001). Social anxiety and response to touch: Incongruence between self-evaluative and physiological reactions. *Biological Psychology, 58*, 181-202.

Willis, F. N., & Hamm, H. K. (1980). The use of interpersonal touch in securing compliance. *Journal of Nonverbal Behavior, 5*, 49-55.

Whitcher, S. J., & Fisher, J. D. (1979). Multidimensional reaction to therapeutic touch in a hospital setting. *Journal of Personality and Social Psychology*, *37*, 87-96.

6. Summary

Several design explorations have incorporated touch in long distance communication by means of tactile or kinesthetic feedback technology (i.e. so called mediated social touch; Haans & IJsselstein, 2006). These design explorations in mediated touch presume that mediated and unmediated touch are comparable, however to date, little research has been done to substantiate this (Haans & IJsselsteijn, 2006). The well-documented Midas touch phenomenon is a sound candidate to test response similarities between mediated and unmediated touch. The Midas touch effect is the effect that a touch has on altruistic behaviour and compliance with a request.

In the first study, we aim to demonstrate that the Midas touch effect is also operative in mediated situations in which the touch act is replaced by vibrating motors. In other words we aim to replicate published studies on the Midas touch effect under mediated conditions. In contrast to Haans and IJsselsteijn (2009) our confederate thus will not be blind (an intrinsic weakness of unmediated touch research). Hypothesis 1 is that helping behaviour will be higher when a touch occurs, than when no touch occurs.

Sixty male participants were randomly assigned to either the 'touch' (2 touches) or the 'no-touch' condition. These touches occurred during a messenger interaction between the participant and another person (which was actually our female confederate). Afterwards, the confederate would walk past the participant and she would 'accidentally' drop the contents of a pencil case. Observed was if the participant would help picking up the contents or not.

Helping behaviour in the touch condition was significantly higher than helping behaviour in the no-touch condition ($p<.05$). The effect found (26,7%, CI = 2,3-47,1%) was higher than the pooled weighed average (15,9%) of three unmediated Midas touch effects found in earlier studies. However the effect and CI still overlaps with all the studies and their pooled weighed averages.

As was consistent with our hypothesis, the Mediated Midas touch effect was found to be statistically significant. A meta-analytical comparison showed that the mediated Midas touch effect was comparable with the pooled weighed average of comparable unmediated studies. Therefore the mediated Midas touch effect is not only significant but also comparable to earlier studies in unmediated situations.

This study has, as does the research we aim to replicate, a possible confounding variable in that the confederate was not blind, as in she knew whether or not the touch was received. It is possible that our confederate adjusted her nonverbal behaviour in line with the hypothesis. Mediated touch, when using a blind testing procedure, can avoid a confound due to the non-blindness of the confederate. Because of the possible confounds of non-blind testing and the possibility of blind testing in mediated situations we want to replicate study 1 in a setting were the confederate is blind. In this second study we investigate whether the Midas touch effect still exists with a blind confederate (a possibility with mediated social touch) instead of an informed confederate (a weakness intrinsic to unmediated touch research). Hypothesis 2, based on the literature that suggests that the Midas touch effect is the effect of touch alone, is that helping behaviour when the confederate is blind will be higher in the touch condition, than in the no-touch condition.

The method of study 2 is the same as study 1 except for some adjustments. First, the sounds of the vibrating motors were masked by means of a headphone. Second, the confederate always initiated the mediated touches, but only in the touch condition were these touches felt by the participant. This made sure that the confederate did not know whether or not the touches she performed were received by the participant.

Helping behaviour in the touch condition was not significantly different from helping behaviour in the no-touch condition (p>.10). When the confederate was blind to whether or not the touch was received, the Mediated Midas touch effect was not significant. There is not enough evidence to support our second hypothesis. A meta-analytical comparison showed that the mediated blind effect size (10%) is comparable to the weighed average of mediated blind (12,9%) and unmediated studies (15,9%). Although not significant, this effect was in the same direction and comparable to unmediated studies, making it plausible that even when the confederate is uninformed about the touch manipulation a mediated Midas touch effect exists, and can thus be demonstrated in a study with sufficient power.

There was one notable limitation to this present study. We told the confederate before the start of the experiment that she might bias the results, even unconsciously so, when being informed about the condition to which participants were assigned (note that the same confederate was used in both studies), and that we therefore decided to repeat Study 1 under blind conditions. This might have changed the confederate's behaviour toward the participants in unintended ways. Further analysis showed that overall there was significantly less helping behaviour in Study 2 (when the confederate was blind towards the touch manipulation) compared to Study 1 (when the confederate was not blind), with p =.014. However, this difference between the two studies was most prominent in those experimental conditions in which the participant was actually touched (p = .02). Although we cannot rule out the possibility that the confederate's behaviour was generally not more restrictive in study 2 as compared to study 1, this finding at least indicates that the confederate was less collaborative towards the hypothesis in Study 2, when she could not know the experimental condition to which participants were assigned, as compared to Study 1 in which she did have this information. This is an indication that the Midas

touch effect in non-blind unmediated situations gets affected by confederate behaviour and therefore that studies in these circumstances are at risk of making Type I errors. It similarly suggests that the effect of touch in social interaction research is, at least for the Midas touch, probably overestimated.

In summary, this study demonstrates that the Mediated Midas touch effect exists when the confederate is knowledgeable towards the touch manipulation. Moreover, this study indicates a methodological issue concerning confederate variables in unmediated social interaction research. This implies that unmediated touch research can be suffering from type I errors. At the same time, the present study makes plausible that even when the confederate is blind the mediated Midas touch effect might still occur. Allowing for a blind testing procedure is but one of the many interesting research opportunities that mediated social touch, which provides a highly controlled environment, has to offer to current touch research.

Appendix A

Comparison with unmediated dropping of items paradigm

Three studies investigated unmediated touch: the studies from Paulsell and Goldman (1984), Goldman and Fordyce (1983) and Guégen and Fisher-Lokou (2003b). The other study which was from Haans and IJsselsteijn (2009) investigated mediated touch.

In the study by Paulsell and Goldman (1984), shoppers who participated in a survey were touched either on the shoulder, upper arm, lower arm, or hand, or were not touched at all, just before the confederate dropped ten survey forms. Touching the participant had no significant effect on helping behaviour. Female confederates received more help than male confederates and they were helped more by male participants than by female participants. In general, the only place where helping behaviour was significantly higher in the touch condition than in the control condition was the upper arm. To estimate the effect sizes of all studies Haans and IJsselsteijn (2009) calculated the absolute risk difference in percentage of helping behaviour between the touch and no-touch condition. To estimate the 95% confidence interval the Newcombe-Wilson method without continuity correction was used. This study shows an unmediated Midas touch effect size of 7.8 percent with a 95 percent confidence interval (CI) of –9.0 percent to 22.8 percent.

In the study of Goldman and Fordyce (1983) participants received a touch after completing a survey. When the confederate 'accidentally' dropped survey forms, participants either helped pick up the forms or not. They found no significant effect of touching on helping behaviour in their experiment while using the dropping of items paradigm. This study shows an unmediated Midas touch effect size of 20.0 percent with a 95 percent CI of –1.8 percent to 39.3 percent (Haans & IJsselsteijn, 2009).

Guégen and Fisher-Lokou (2003b) did find a positive effect of touch on altruistic helping behaviour. In their study 60 persons were asked for directions and where touched or not touched when thanked for their help. When the confederate was two metres in the given direction he dropped floppy disks on the ground. More persons in the touch condition (90%) than persons who were in the no touch condition (63,3%) helped to pick up the floppy disks. The unmediated Midas touch effect size of this study was estimated to be 26.7 percent with a 95 percent CI of 5.2 percent to 45.7 percent (Haans & IJsselsteijn, 2009).

Haans and IJsselsteijn (2009) compared the size of the virtual Midas touch effect with those from these three studies (only for experimental conditions similar to their own). First, they found that, although the effect was not significant in two of the three studies, the collective weighted average effect size (estimated with the Mantel-Haenszel procedure) was significantly above 0% in unmediated situations, namely 15.9% with a 95 percent CI of 4.4 percent to 27.4 percent. This provides evidence that the weighed Midas touch effect is statistically significant in unmediated situations. Second, they found that the effect size of the mediated Midas touch effect (15,9 percent) was comparable to the effect size in the unmediated Midas touch effect results (15,9 percent). This makes the mediated Midas touch possible and thus opens up the possibility for touch research.

Appendix B

Evaluation Haptical MSN

The number of ways to communicate at a distance is grown over the past years. Most of the applications use speech and images. In our daily lives however *touch* also plays an important role We call the transfer of information through touch *haptic* communication. When we touch over distance we call this mediated touch; the touch is after all not direct, but it is transferred from person to person trough means of a medium.

In this study a prototype of a haptic communication system will be tested. The system is made of an arm-strap with vibrating motors that is managed through Microsoft MSN. At this moment only one arm-strap can be used at a time. This means that one person can send mediated touches while the other person can receive the mediated touches. In the final program both persons can wear an arm strap and send messages.

The evaluation of the system will consist of a *question and answer sequence* and a short questionnaire. Underneath you can find your instructions for the question and answer sequence.

Instructions Question and Answer Sequence

During the question and answer sequence you will be having the role of *interviewer*. This means that you will ask the questions and the other person will give you the answers. On top of that you will wear the arm-strap and the other person will send the mediated touches. Because we want to know when people use mediated touches during an MSN conversation, it is important that you will ask a by us *predefined list* of questions. You will get this list with questions at the beginning of the sequence.

Important:

- To make sure the question and answer sequence will occur in a natural way we only predefined the content of the questions. Of course you can decide how you phrase the questions.
- Nevertheless *only* ask the questions on the list, even when another question seems more appropriate.

Did you read the instructions carefully? Then you can put on the arm-strap on your left upper arm. The experimenter will tell you when you can start asking the questions.

Good luck!