The Role of Social Priming on the Perception of Social Touch and Impression Formation

Beatrice Biancardi, Laurence Chaby

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Beatrice Biancardi
CESI LINEACT
Nanterre, France
0000-0002-6664-6117

Laurence Chaby
Université Paris Cité
Laboratoire Vision Action Cognition
Boulogne-Billancourt, France
0000-0002-2241-412X

***Abstract*—We present a perceptual study on the influence of social context on impression formation via the judgement of social touch videos. Using the Scrambled Sentence Task to induce a context with or without reference to touch (positive, negative or neutral valence), followed by the evaluation of social touch videos, we examine how priming modifies the perception of touch and impressions about the initiator of contact. Results confirm that the social priming affected the perception of the social touch stimuli, on both the valence and intensity of the touch, as well as the impression of the person initiating the touch. An interesting interaction between the manipulated variables emerged. This study marks the first step towards integrating social touch into the modelling of the first moments of an interaction between users and virtual agents.**

***Index Terms*—Social Touch, First Impressions, Social Priming**

I. Introduction

First impressions play a crucial role in social interactions, influencing events such as job interview success or the establishment of new relationships [1]. These impressions arise from a dynamic process where we perceive, organize, and integrate information to form coherent views of others [2]. In a matter of seconds, we are able to gather a variety of accurate information about personality [3] or interpersonal attitudes [4], influenced by key dimensions of social cognition, i.e., warmth and competence [5]. First impressions are based on visible characteristics in the other, such as their appearance [6]–[8], as well as non-verbal behaviours, including facial expressions and body language [7], [9]–[11].

Social touch, characterised by physical contact between individuals, facilitates the transmission of emotions and the strengthening of emotional bonds [12], strongly influencing social perception and the impression formation [13], [14]. Its intimate nature intensifies its emotional impact beyond that of other modalities such as face or voice [15]–[17].

A. Social Touch and First Impressions

Social touch has the ability to significantly affect first impressions and the outcome of our interactions, as demonstrated by the "Midas effect". Simple physical touches, such as a waitress touching a customer's hand to give change, can increase tips [15], and a light touch from a librarian can significantly improve visitors satisfaction [16].

In human-computer interactions, touch influences for example the perception of humanoid robots, improving or deteriorating initial impressions of them [14], [18]. In virtual reality, several studies showed that social touch improves the feeling of agency [19], the credibility of the interaction [20] and the feeling of co-presence [21], positively influencing the perception of virtual agents and reinforcing impressions and attributions of intentions thanks to the integration of haptic feedback [22], [23].

B. Effect of Social Context

While social touch influences impression formation, the effect of prior experience on touch appreciation remains underexplored. In other social contexts, research has shown that priming participants with happy faces, leads them to consume more fruit juice compared to priming with angry faces [24].

Furthermore, social priming, by inducing prosocial vs. antisocial attitudes via tasks such as the Scrambled Sentence Task (STT) [25], can significantly modify non-verbal behaviours and future interactions [26], [27]. The SST generally consists of a participant being presented with a set of 5 or 6 words and having to form a grammatically correct sentence as quickly as possible. The formed sentence can have a priming effect influencing the participant during a second task, impression formation for example [28].

C. The Present Study

Although interesting attempts have been made to study social touch, its precise impact on impression formation remains to be explored in more detail, particularly regarding the role of social context. This study aims to explore *how social priming can shape the perception and interpretation of social touch, and the impression of the person initiating the contact*, an issue little addressed to date. We first analyse this dynamic in human-human interactions before applying it to virtual environments and considering practical applications to improve the user experience in immersive technologies.

II. Methods

We conducted a perceptual study based on the principle that observing a touch can induce in the observer an emotional response similar to that felt by the person touched [29], [30]. Brain imaging studies confirm that observing social touch

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activates brain regions involved in somatosensory perception and the affective meaning of touch, and that this activation is linked to how touch is perceived in a social context [31], [32].

A. Material

Social touch videos of human-human interactions were created for this study [33]. The touches included social contacts with no particular meaning, such as gently touching the hand, wrist, shoulder or torso, inspired by the Socio-Affective Touch Expression Database [34]. These videos were pre-tested to select the most neutral in terms of valence. The videos selected were rated with $m = 2.9$ ($sd = 1.1$) on a scale from 1 to 5.

The Scrambled Sentence Task (SST) was used to induce positive, negative or neutral **Valence** in a context of **Social Priming** with or without social touch. Participants had to construct a 5-word grammatically correct sentences from a set of six words (e.g., *his - glass - new - friend - kisses - her*). Six versions of the SST were developed: three primed a 'touch' context and three a 'no-touch' context. The target words for each condition were as follows:

- Touch context: positive *hugs, cuddles, kisses*; negative *pushes, hits, scratches*; neutral *touches, brushes, presses*.
- No-touch context: positive *succeeds, smiles, deserves*; negative*scams, criticises, deceives*; neutral *drinks, opens, takes*.

B. Protocol

The perceptual study was realised online and lasted around 30 minutes.

Participants first realised the SST. The SST sentences were grouped into 6 counterbalanced blocks, one per each experimental condition.

Then, after each block, participants watched 4 social touch videos and rated each of them on *Perceived Valence* (from 'very negative' to 'very positive') and *Perceived Intensity* (from 'not very intense' to 'very intense') of the touch using the Self-Assessment Manikin [35]. Then, they rated their *Impressions* on the person initiating the touchon several traits, used by [4]: attractiveness, likeability, competence, trustworthiness, aggressiveness. Judgements were collected using 9-point Likert scales, ranging from 1 (not at all) to 9 (extremely).

Finally, participants were asked to complete the Social Touch Questionnaire (*STQ*) [36], which assesses in 20 questions the extent to which individuals value touch (e.g., 'I consider myself to be a tactile person') and the fact of being touched in a social context (e.g., 'I feel uncomfortable when someone I don't know hugs me tightly') using Likert scales (0 = strongly disagree vs. 4 = strongly agree). The French version [37] of the questionnaire was used. A high score indicates a strong attitude of avoidance of social touch.

C. Hypotheses

We formulated the following hypotheses:

H1 - The social context induced by the Scrambled Sentence Task will influence the *perceived valence* and *perceived intensity* of touch videos. Touch videos will be perceived more positively and more intensely or more negatively and more intensely following positive versus negative priming, and this effect will be amplified in a social touch priming context.

H2 - Similarly, the social context induced by the Scrambled Sentence Task will influence the *impressions* of the person initiating the touch. The person initiating the touch will be perceived more positively or more negatively following positive versus negative priming, and this effect will be amplified in a social touch priming context.

TABLE I
MEAN ± STANDARD DEVIATION OF *Perceived Valence*, *Perceived Intensity* AND *Impressions* FOR EACH CONDITION.

Valence	Social Priming	Perc.Valence	Perc.Intensity	Impressions
positive	touch	5.68±1.25	5.59±1.34	5.17±1.24
neutral	touch	5.53±0.97	4.71±1.24	5.46±0.93
negative	touch	5.24±1.26	4.86±1.26	5.13±1.17
positive	no-touch	5.76±1.09	4.81±1.48	5.73±1.01
neutral	no-touch	5.64±1.04	5.21±1.46	5.47±0.97
negative	no-touch	4.15±0.98	5.54±1.22	4.17±1.11

III. ANALYSES AND RESULTS

We analysed data from participants who well completed the SST (at least 7 out of 8 correct answers for each block of sentences). They were 60 (30 females), aged between 18 and 26 ($m = 20.95$, $sd = 1.87$). All had at least a High School degree, with 72% being at Bachelor and 25% at Master level.

Analyses were run using r statix package [38]. All assumptions for running parametric tests were met. Descriptive statistics of the dependent variables for each experimental condition are reported in Table I.

A. Perceived Valence

A two-way within-subjects ANCOVA was performed to examine the effects of **Valence** and **Social Priming** on *Perceived Valence* after controlling for *STQ* scores.

Results show that, after adjustment for *STQ*, there was a statistically significant *interaction* between **Valence** and **Social Priming**: $F(2, 116) = 21.186, p < 0.001, \eta^2 = 0.064$, as well as a *main effect* of **Valence**: $F(2, 116) = 53.1, p < 0.001, \eta^2 = 0.155$ (medium effect size [39]) and **Social Priming**: $F(1, 58) = 9.341, p = 0.003, \eta^2 = 0.02$.

The *two-way interaction* between **Valence** and **Social Priming** can be seen in Figure 1-a. After controlling for *STQ* scores, the effect of **Valence** was statistically significant in the no-touch condition ($p-adj < 0.001$), but not in the touch condition ($p-adj = 0.132$). That means, only in the no-touch condition, *Perceived Valence* after negative priming ($m = 4.15, sd = 0.98$) was statistically lower than after both neutral ($m = 5.64, sd = 1.04, t(353) = -7.51, p-adj < 0.001$) and positive priming ($m = 5.76, sd = 1.09, t(353) = -8.14, p < 0.001$), while in touch condition there were no significant differences. **H1** for *Perceived Valence* is thus only partially validated as it seems that touch-related content reduced the influence of negative priming.

B. Perceived Intensity

A two-way within-subjects ANCOVA was performed to examine the effects of **Valence** and **Social Priming** on *Perceived Intensity* after controlling for *STQ* scores.

Since no significant effect of *STQ* was found ($F(1, 58) = 0.083, p = 0.774$), we removed it from the analyses and run a two-way within-subjects ANOVA.

Results show a significant *interaction* between **Valence** and **Social Priming**: $F(2, 118) = 28.409, p < 0.001, \eta^2 = 0.056$, and a *main effect* of **Valence**: $F(2, 118) = 3.599, p = 0.03, \eta^2 = 0.007$. No main effect of **Social Priming** was found: $F(1, 59) = 2.044, p = 0.158, \eta^2 = 0.002$).

The *two-way interaction* between **Valence** and **Social Priming** can be seen in Figure 1-b. *Perceived Intensity* was higher after positive priming with touch-related content and after negative priming with no-touch-related content. **H1** for *Perceived Intensity* is thus only partially validated as it seems that touch-related priming reduced the effect of negative priming also on intensity perception.

C. Impressions

We reversed the scores of *aggressivity* item. The Cronbach alphas of the 5 items, for each condition, were all > 0.7 ($m = 0.74$), indicating acceptable reliability [40]. We thus merged the items into one construct *Impressions*.

A two-way within-subjects ANCOVA was performed to examine the effects of **Valence** and **Social Priming** on *Impressions* after controlling for *STQ* scores.

Since no significant effect of *STQ* was found ($F(1, 58) = 2.439, p = 0.124$), we removed it from the analyses and run a two-way within-subjects ANOVA.

A significant *interaction* between **Valence** and **Social Priming** was found: $F(2, 118) = 28.927, p < 0.001, \eta^2 = 0.08$, as well as a *main effect* of **Valence**: $F(1.42, 83.85) = 22.954, p < 0.001, \eta^2 = 0.113$. No main effect of **Social Priming** was found: $F(1, 59) = 2.004, p = 0.162, \eta^2 = 0.004$).

The *two-way interaction* between **Valence** and **Social Priming** can be seen in Figure 1-c. The effect of **Valence** on *Impressions* was significant only in no-touch condition, where *Impressions* score were lower after negative priming ($m = 4.17, sd = 1.11$) than after both neutral ($m = 5.47, sd = 0.97, t(59) = -7.96, p - adj < 0.001$) and positive priming ($m = 5.73, sd = 1.01, t(59) = -7.27, p < 0.001$). In addition, *Impressions* scores in no-touch condition were lower than in touch condition when priming was negative ($m_{social-touch,neg} = 5.13, sd = 1.17, t(59) = -5.6, p - adj < 0.001$), while this difference was reversed when priming was positive ($m_{social-touch,pos} = 5.17, sd = 1.24, t(59) = 3.9, 0 < 0.001$). Again, it seems that touch-related priming reduced the effect of negative priming also on impression formation, thus **H2** is partially validated.

D. Avoidance of Social Touch

Results from ANCOVAs reported in the previous sections indicate that participants' avoidance of social touch, measured through the *STQ* questionnaire, moderated the effect of the priming on *Perceived Valence* of the stimuli, but not on *Perceived Intensity* nor *Impressions*. Further analyses including regression models need to be run to better understand this effect. We will investigate it in our future work.

IV. Conclusion

We presented an experimental study aiming to investigate how social priming can shape the perception and interpretation of social touch and impression formation of the person initiating the touch. Social priming was realised through the Scrumbled Sentence Task, manipulating the valence and the touch-related content of the sentences. Results confirm that the priming affected the perception of the social touch stimuli, on both the valence and intensity of the touch, as well as the impression of the person initiating the touch. Interestingly, priming including touch-related content seemed to have reduced the impact of positive and negative priming. This could be useful in contexts where the valence of the stimuli cannot be controlled; including touch could help maintaining the positive perception of the context.

Ethical Impact Statement

The present study was conducted according to guidelines laid down in the Declaration of Helsinki. The perceptual study presented in this paper was conducted online and did not collect any sensitive data (only age, gender and education level were collected). Only the participants who gave informed consent were allowed to complete the study. The anonymity of the data was ensured.

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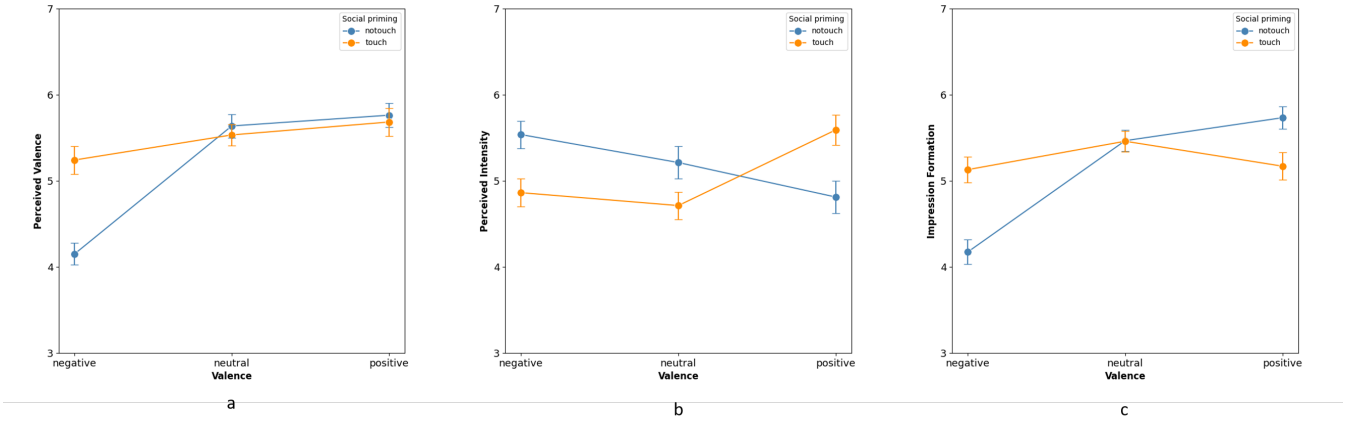

Fig. 1. Interaction effects between **Valence** and **Social Priming** on a-*Perceived Valence*, b-*Perceived Intensity* and c-*Impressions*.

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