The EmojiGrid as a Rating Tool for the Affective Appraisal of Touch

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Abstract. We evaluated the convergent validity of the new language-independent EmojiGrid rating tool for the affective appraisal of perceived touch events. The EmojiGrid is a rectangular response grid, labeled with facial icons (emoji) that express different degrees of valence and arousal. We previously showed that participants can intuitively and reliably report their affective appraisal of different sensory stimuli (e.g., images, sounds, smells) by clicking on the EmojiGrid, without additional verbal instructions. However, because touch events can be bidirectional and are a dynamic expression of action, we cannot generalize previous results to the touch domain. In this study, participants (N = 65) used the EmojiGrid to report their own emotions when looking at video clips showing different touch events. The video clips were part of a validated database that provided corresponding normative ratings (obtained with a 9-point SAM scale) for each clip. The affective ratings for inter-human touch obtained with the EmojiGrid show excellent agreement with the data provided in the literature (intraclass correlations of .99 for valence and .79 for arousal). For object touch events, these values are .81 and .18, respectively. This may indicate that the EmojiGrid is more sensitive to perspective (sender versus receiver) than classic tools. Also, the relation between valence and arousal shows the classic U-shape at the group level. Thus, the EmojiGrid appears to be a valid graphical self-report instrument for the affective appraisal of perceived touch events, especially for inter-human touch.

Keywords: Affective touch · Valence · Arousal · Emotions · EmojiGrid · SAM

1 Introduction

Next to serving us to discriminate material and object properties, our sense of touch also has hedonic and arousing qualities [1]. For instance, soft and smooth materials (e.g., fabrics) are typically perceived as pleasant and soothing, while stiff, rough, or coarse materials are experienced as unpleasant and arousing [1]. This affective component of touch plays a significant role in social communication. Interpersonal or social touch has a strong emotional valence that can either be positive (when expressing support, reassurance, affection or attraction: [2]) or negative (conveying anger,

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frustration, disappointment: [3]). Affective touch can profoundly influence social interactions [4]. For example, touch can lead to more favorable evaluations of the toucher [5], can persuade [6], and can regulate our physical and emotional well-being [7]. Since it is always reciprocal, social touch not only emotionally affects the receiver [7] but also the touch giver [8]. Touch is the primary modality for conveying intimate emotions [7, 9]. Current technological advances like the embodiment of artificial entities, the development of advanced haptic and tactile display technologies also afford mediated social touch [10]. To study the emotional impact of touch and to design effective haptic social communication systems, validated and efficient affective self-report tools are needed.

In accordance with the circumplex model of affect [11], the affective responses elicited by tactile stimuli vary mainly over the two principal affective dimensions of valence and arousal [12]. Most studies on the emotional response to touch apply two individual one-dimensional Likert scales [13] or SAM (Self-assessment Mannikin: [14]) scales [15] to measure both affective dimensions separately. Although the SAM is a validated and widely used tool, it also has some practical drawbacks. People often fail to understand the emotions it depicts [16]. While the SAM's valence dimension is quite intuitive (a facial expression going from a frown to a smile), its arousal dimension (which looks like an 'explosion' in the figure's stomach) is often misunderstood [16], also in the context of affective touch [15]. Hence there is a need for new rating scales to measure the subjective quality of affective touch [17].

We developed a new intuitive and language-independent self-report instrument called the EmojiGrid (see Fig. 1): a rectangular response grid labeled with facial icons (emoji) expressing different levels of valence (e.g., angry face vs. smiling face) and arousal (e.g., sleepy face vs. excited face) [16]. We previously found that participants can intuitively and reliably report their affective response with a single click on the EmojiGrid, even without verbal instructions [16]. This suggested that the EmojiGrid might also be a general instrument to assess human affective responses.

In this study, we evaluated the convergent validity of the EmojiGrid as a self-report tool for the affective assessment of perceived touch events. We thereto used the EmojiGrid to measure perceived valence and arousal for various touch events in video clips from a validated affective image database, and we compared the results with the normative ratings that were obtained with a conventional validated affective rating tool (the SAM) and that are provided with this database. It appears that the brain activity patterns elicited by imagined, perceived and experienced (affective) touch are highly similar. To some extent, people experience the same touches as the ones they see: they have the ability to imagine how an observed touch would feel [18]. This affords the use video clips showing touch actions to study affective touch perception.

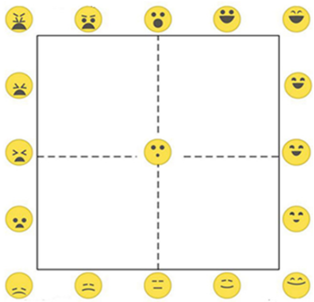

Fig. 1. The EmojiGrid. The facial expressions of the emoji along the horizontal (valence) axis gradually change from unpleasant via neutral to pleasant, while the intensity of the facial expressions gradually increases in the vertical (arousal) direction.

2 Methods and Procedure

2.1 Stimuli

The stimuli used in this study are all 75 video clips from the validated Socio-Affective Touch Expression Database (SATED: [15]). These clips represent 25 different dynamic touch events varying widely in valence and arousal. The interpersonal socio-affective touch events (N = 13) show people hugging, patting, punching, pushing, shaking hands or nudging each other's arm (e.g., Fig. 2, left). The object-based (non-social) touch events (N = 12) represent human-object interactions with motions that match those involved in the corresponding social touch events, and show people touching, grabbing, carrying, shaking or pushing objects like bottles, boxes, baskets, or doors (e.g., Fig. 2, right). Each touch movement is performed three times (i.e., by three different actors or actor pairs) and for about three seconds, resulting in a total of 75 video clips. All video clips had a resolution of 640 × 360 pixels.

Fig. 2. Screenshots showing an interpersonal (socio-affective) touch event (left) and a corresponding object-based touch event (right).

2.2 Participants

English speaking participants were recruited via the Prolific database (https://prolific.ac). A total of 65 participants (43 females, 22 males) aged between 18 and 35 (M = 25.7; SD = 5.0) participated in this study. The experimental protocol was reviewed and approved by the TNO Ethics Committee (Ethical Approval Ref: 2017–011) and was in accordance with the Helsinki Declaration of 1975, as revised in 2013 [19]. Participation was voluntary. After completing the study, all participants received a small financial compensation for their participation.

2.3 Measures

Demographics. Participants reported their age, gender, and nationality.

Valence and Arousal. Valence and arousal were measured with the EmojiGrid (see Fig. 1; this tool was first introduced in [16]. The EmojiGrid is a square grid that is labeled with emoji showing different facial expressions. Each side of the grid is labeled with five emoji, and there is one (neutral) emoji located in its center. The facial expressions of the emoji along a horizontal (valence) axis vary from disliking (unpleasant) via neutral to liking (pleasant), and their expression gradually increases in intensity along the vertical (arousal) axis. Users can report their affective state by placing a checkmark at the appropriate location on the grid.

2.4 Procedure

The experiment was performed as an (anonymous) online survey created with the Gorilla experiment builder [20]. The participants viewed 75 brief video clips showing a different touch event and rated for each video how the touch would feel. First, the participants signed an informed consent and reported their demographic variables. Next, they were introduced to the EmojiGrid response tool and were told how they could use this tool to report their affective rating for each perceived touch event. The instructions stated: "*Click on a point inside the grid that best matches how you think the touch event feels*". No further explanation was given. Then they performed two practice trials to familiarize themselves with the EmojiGrid and its use. The actual experiment started directly after these practice trials. The video clips were presented in random order. The rating task was self-paced without imposing a time-limit. After seeing each video clip, the participants responded by clicking on the EmojiGrid (see Fig. 1). Immediately after responding the next video clip appeared. On average the experiment lasted about 10 min.

Data Analysis

IBM SPSS Statistics 25 (www.ibm.com) for Windows was used to perform all statistical analyses. Intraclass correlation coefficient (ICC) estimates and their 95% confident intervals were based on a mean-rating (k = 3), absolute agreement, 2-way mixed-effects model [21]. ICC values less than .5 are indicative of poor reliability, values between .5 and .75 indicate moderate reliability, values between .75 and .9

indicate good reliability, while values greater than .9 indicate excellent reliability [21]. For all other analyses, a probability level of $p < .05$ was considered to be statistically significant.

For each of the 25 touch scenarios, we computed the mean valence and arousal responses over all three of its representations and over all participants. We used Matlab 2019a (www.mathworks.com) to investigate the relation between the (mean) valence and arousal ratings and to plot the data. The Curve Fitting Toolbox (version 3.5.7) in Matlab was used to compute a least-squares fit of a quadratic function to the data points.

3 Results

For each touch-scenario, the mean and standard deviation response for valence and arousal was computed over each of its three representations and over all participants.

To quantify the agreement between the ratings obtained with the EmojiGrid (present study) and with the 9-point SAM scales [15] we computed Intraclass Correlation Coefficient (ICC) estimates with their 95% confidence intervals for the mean valence and arousal ratings between both studies, both for all touch events, and for social and non-social events separately (see Table 1). For all touch events, and for social touch events in particular, the valence ratings show excellent reliability and the arousal ratings show good reliability. For object-based touch events, the valence ratings also show good reliability, but the arousal ratings show poor reliability.

Figure 3 shows the correlation plots between the mean valence and arousal ratings obtained with the EmojiGrid in this study and those obtained with the SAM in [15]. This figure shows that the mean valence ratings for all touch events closely agree between both studies: the original classification [15] into positive, negative and neutral scenarios also holds in this result. A Mann-Whitney U test revealed that mean valence was indeed significantly higher for the positive scenarios (Mdn = 7.27, MAD = .31, n = 6) than for the negative ones (Mdn = 2.77, MAD = .35, n = 6), U = 0, z = −2.88, p = .004, r = .58 (large effect size). Additionally, mean valence differed significantly between positive social touch scenarios and object-based touch scenarios (Mdn = 5.13 MAD = .35, n = 12), U = 0, z = −3.37, p = 0.001) and between negative social touch scenarios and object-based touch scenarios, U = 0, z = −3.42, p = 0.001, r = .68 (large effect size).

Whereas the mean valence ratings closely agree between both studies for all touch events, the arousal ratings only agree for the social touch events, but not for the object-based touch events. The mean arousal ratings for object-based touch events are consistently higher with the EmojiGrid than with the SAM. We also compared mean arousal between social touch and object touch. The results revealed that social touch was rated as more arousing (Mdn = 5.35, MAD = 0.89) than object-based (non-social) touch (Mdn = 4.10, MAD = 0.37, U = 27.0, z = −2.77, $p \leq 0.009$, r = .55 (large effect size). Social touch is more arousing than object-based (non-social) touch. This agrees with Masson & Op de Beeck's conclusion that completely un-arousing social touch does not seem to exist [15].

Figure 4 shows the relation between the mean valence and arousal ratings for all 25 different SATED scenarios, as measured with the EmojiGrid in this study and with a 9-point SAM scale in [15]. The curves represent least-squares quadratic fits to the data points. The adjusted R-squared values are respectively .75 and .90, indicating good fits. This figure shows that the relation between the mean valence and arousal ratings provided by both self-assessment methods is closely described by a quadratic (U-shaped) relation at the nomothetic (group) level.

All results are available at the OSF repository with https://doi.org/10.17605/osf.io/d8sc3.

Table 1. Intraclass correlation coefficients with their 95% confidence intervals for mean valence and arousal ratings obtained with the SAM and with the EmojiGrid (this study), for video clips from the SATED database [15].

Stimuli	N	ICC valence	ICC arousal
All touch events	25	.99 [.97 − 1.0]	.71 [.33 − .87]
Social touch events	13	1.0 [.99 − 1.0]	.79 [.32 − .94]
Object touch events	12	.81 [.32 − .95]	.18 [−.04 − .59]

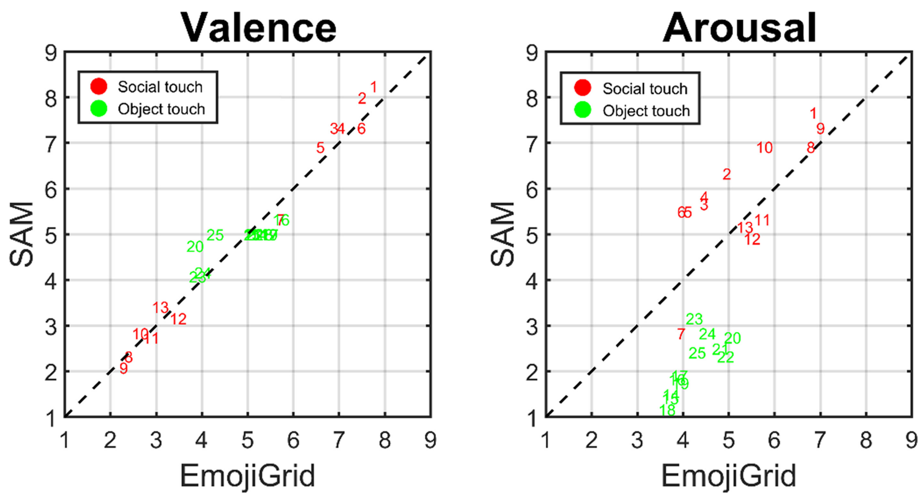

Fig. 3. Correlation plots illustrating the relationship between the valence (left) and arousal (right) ratings provided with a 9-point SAM scale in [15] and those obtained with the EmojiGrid in the present study. The numbers correspond to the original scenario identifiers in the SATED database. Scenarios 1–6 were originally classified as positive, scenarios 8–13 as negative, and scenarios 7 and 14–25 as neutral.

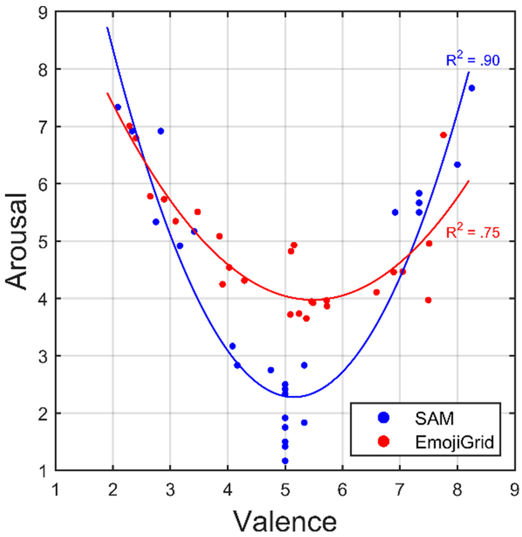

Fig. 4. Relation between the mean valence and arousal ratings for affective touch video clips from the from the SATED database, obtained with the a 9-point SAM rating scale (blue dots: [15]) and with the EmojiGrid (red dots: this study). The curves represent fitted polynomial curves of degree 2 using a least-squares regression between valence and arousal. (Color figure online)

4 Conclusion and Discussion

The affective (valence and arousal) ratings obtained with the EmojiGrid show good to excellent agreement with the data provided with the database for inter-human (social) touch events. Also, our results replicate the U-shaped (quadratic) relation between the mean valence and arousal ratings, as reported in the literature [15]. Thus, we conclude that the EmojiGrid appears to be a valid graphical self-report instrument for the affective appraisal of perceived social touch events. The agreement for object touch events is good for valence but poor for arousal. This may be related to the instruction to the participants to rate "*how the touch would feel*". Although not explicitly stated to do so, participants may have preferred the receiver perspective above the sender perspective of the interaction. This perspective has less meaning in the object touch events probably resulting in a switch to the sender perspective. Classic rating tools may be less sensitive to the different perspectives which is only relevant in touch events, hence the extremely low arousal scores with the SAM tool and the low intraclass correlations.

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