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Smile and the World Smiles (and Trusts) With You: Happiness Mimicry Shapes First Impressions

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Numerous studies have shown that the processes underlying trait judgments can be influenced by concurrent affect processing. The present project explores the role of emotional mimicry in trait attribution. Across three experiments, we asked participants to assess social characteristics of faces expressing happiness, sadness, and anger. In Experiments 1 and 3, we used facial electromyography to predict participants' inferences about trustworthiness, confidence, and attractiveness (Experiment 1) or their behaviorally assessed trust by asking participants to share virtual points in a "trust/investment game" (Experiment 3). In Experiment 2, we tested the causal relationship between facial activity and trait judgments. Participants were asked to assess trustworthiness while performing facial movements that either enhanced or inhibited muscle activity during mimicry of given emotional expressions. The results indicate that mimicry of happiness not only predicts but is causally linked to perceptions of trustworthiness—the stronger the imitation, the more positive the assessments. The results of Experiments 1 and 3 show that increased sadness mimicry is associated with lower trust ratings, although the results of Experiment 2 do not support a causal relationship. Additionally, we confirmed previous observations that people are more likely to mimic affiliative displays (i.e., happiness and sadness) than antagonistic ones (i.e., anger), with happiness being the most likely to be mimicked. In summary, these studies provide evidence that facial mimicry modulates social trait inferences and underscores the functional role of mimicry in social interactions.

Keywords: emotional mimicry, facial displays of emotions, facial electromyography, trait judgments/attribution

Predicting other people's personal characteristics and goals is an important aspect of social interactions. Emotion expressions often play a crucial role in this process. Specifically, thought emotion expression people read information about others feelings, intentions, and dispositions (Horstmann, 2003; Scarantino, 2017). People not only apply labels to emotion expressions but they also use this information to draw inferences about other people (de Melo et al., 2014; Hareli & Hess, 2010). The information provided by facial expressions can then be used to navigate social interactions (Niedenthal & Brauer, 2012).

Trait Inferences From Facial Display

People rapidly and spontaneously make judgments about others' personalities based on appearance cues (see, e.g., Kenny, 2004; Todorov & Uleman, 2002, 2003; Zebrowitz, 2004). For example, a square jaw, high forehead, or heavy eyebrows cross-culturally connote social dominance (Keating, Mazur, & Segall, 1981; Keating, Mazur, et al., 1981; Senior et al., 1999).

A second strong cue to a person's "character" is the emotional facial expression of a person. Specifically, according to appraisal theories of emotion, a relevant change in the internal or external environment is evaluated according to several dimensions, such as whether the event is pleasant or unpleasant (pleasantness), or whether the change is in line with the motivational state of the individual or obstructs the individual's goals (e.g., Arnold, 1960; Frijda, 1986; Scherer, 2009). Specific emotions are differentiated by the pattern of appraisals they are the result of. Importantly, the way a person appraises a given situation is specific to the individual and their current state. Factors such as the person's personality and skills determine their resources, values, and motivations. These, in turn, define the outcomes of their appraisal of an event.

Notably, people's naïve emotion theories tend to be largely consistent with appraisal theory (Hareli, 2014). Hence, people

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can—based on their naïve emotion theories that represent the appraisals—reconstruct the appraisals of other people's emotions (e.g., Hess & Hareli, 2017; Manstead & Fischer, 2001; Roseman, 1991; Scherer & Grandjean, 2008). This, in turn, provides insights into their goals, values and motivations, and through these into their character (de Melo et al., 2014; Hareli & Hess, 2010).

Importantly, since facial expressions are usually interpreted contextually, inferences based on facial expressions are also context-dependent. As shown by Hess et al. (2000), judgments of dominance and affiliation based on happiness and anger displays were qualified by the gender and ethnicity of the expresser. This suggests that trait attributions differentiate the meaning of emotional displays based on cultural norms and social rules for their expression.

However, not only the perceived emotions of the target but also the affective experience of the observer who processes these stimuli can affect trait judgments. For example, Winkielman et al. (2015; Olszanowski et al., 2018) showed, through mediation analyses, that trait assessments can be influenced by processing fluency, that is the ease of perceptual and conceptual mental operations that results in positive affect (Jacoby et al., 1989; Winkielman et al., 2003).

The postulate that the processes underlying trait judgments can be influenced by concurrent affect processing is implicit in embodied cognition theories. Specifically, this approach posits that the conceptual processing of emotional stimuli often functionally rests on somatosensory and motor resources, offering valuable insights into emotion concepts (e.g., Barsalou, 2008; Schirmer & Adolphs, 2017; Winkielman et al., 2018). Notably, in face-to-face interactions, observers typically imitate the emotional displays of others. This emotional mimicry serves as a signal for embodied simulation, a process through which people internally reflect the emotions of those around them. Such "mirrored" feelings shape inferences about the characteristics of others (Niedenthal et al., 2017; but see also Goldman & Sripada, 2005). For example, it has been shown that neuromuscular stimulation of the zygomaticus major (smiling) muscle caused ambiguous facial displays to be categorized as happy more frequently than in the no-stimulation condition. In turn, in the reversed situation—when the ability to mimic facial displays was limited by asking participants to hold a pen in their mouth—facial and vocal displays of emotions were rated as less authentic (Korb et al., 2014; Vilaverde et al., 2024).

A second pathway from mimicry to trait judgments is also plausible. Specifically, emotional mimicry is dependent on and fosters feelings of affiliation (Hess & Fischer, 2013). Thus, people tend to mimic others to whom they feel close (Kastendieck et al., 2021) and feel closer to others in contexts where mimicry occurs. However, feelings of closeness are related to empathy which in turn impacts person judgments. In this vein, Olszanowski et al. (2020) showed that facial activity during spontaneous mimicry of happiness and sadness, but not anger, partially predicts assessments of senders' likeability and competence. Somewhat less straightforward results were provided by study of Blairy et al. (1999). Here, participants judged how well traits related to dominance and affiliation described the protagonist. They found that when participants were instructed to voluntarily imitate the target's facial expressions, they generally judged the traits as less accurate descriptions than participants who spontaneously imitated facial expressions or successfully suppressed their mimicry. As concluded by the authors, voluntary mimicry may lower the tendency to make trait attributions regarding others' behaviors. By contrast, Olszanowski et al. (2022) reported no indirect effect of mimicry on the evaluation of physically similar or dissimilar faces expressing either happiness or anger. The limited scope of the above observations indicates that the potential impact of mimicry on social judgments may be a more complex issue that requires more detailed analysis.

In sum, there is direct and indirect evidence that facial mimicry modulates social trait inferences. It is important to underline that the two pathways described above are not mutually exclusive. The present study aimed to revisit the role of mimicry in trait attributions, in light of its function and contextual variability.

Emotional Mimicry in Social Context

In recent years, evidence has accumulated that emotional mimicry is influenced by social context. Thus, affiliative emotions (e.g., happiness) are mimicked more readily than antagonizing ones (e.g., anger or disgust; Fischer et al., 2012; Hess & Bourgeois, 2010; Hinsz & Tomhave, 1991; Olszanowski & Tołopiło, 2024). In addition, people are more likely to physically or socially mimic those similar to themselves, such as in-group members or peers, than people who are dissimilar (Ardizzi et al., 2014; Bourgeois & Hess, 2008; Olszanowski & Tołopiło, 2024; Olszanowski et al., 2022; van der Schalk et al., 2011). Conversely, in cooperative social situations, mimicry is enhanced compared to hostile or competitive situations (Hofree et al., 2018; Likowski et al., 2008; Weyers et al., 2009). Finally, mimicry may be reduced when the task does not require the full processing of emotional information. For example, mimicry may be reduced or even absent when observers have goals that require nonemotional judgments and, hence, less attention to the person's emotions (Cannon et al., 2009; Hess et al., 1998; Stel et al., 2009).

Hypotheses

The present research aimed to assess the role of facial mimicry for trait attributions. Several factors, such as the emotional meaning of the facial expression, the context in which the evaluation takes place, and the traits being evaluated, are expected to determine the degree of modulation. Specifically, since affiliative displays of similar others are more likely to be imitated, trait judgments should be more influenced for similar people with affiliative displays than for dissimilar people or people with nonaffiliative or antagonistic displays. In addition, evaluations that include an affective component (e.g., liking, attractiveness) or are related to inferences about affiliative intentions (e.g., trustworthiness, affiliation, or dominance) will be more influenced by mimicry than evaluations that are less related to affiliation or affect (e.g., confidence).

Overview of the Present Studies

To explore the interplay between social context and emotional mimicry on trait judgments, we asked participants to assess the different social characteristics of faces expressing happiness, sadness, and anger. In Experiment 1, participants rated trustworthiness, confidence, and attractiveness. In Experiment 2, we tested the causal relationship between facial activity and trait judgments. Here, participants were asked to assess trustworthiness while they performed facial movements that either enforced or inhibited muscle activity occurring during mimicry of a given emotional expression using the procedure by Blairy et al. (1999, Study 3). Finally, in Experiment 3, we behaviorally assessed trust by asking participants to share virtual points in a "trust/investment game" (Berg et al., 1995). Additionally, Experiments 1 and 3 were preceded by a task designed to create social bonds with some of the observed persons. We hypothesized that participants would favor individuals who are smiling and are socially similar compared to those displaying anger or sadness and who are socially distant. Additionally, we predicted that displays of happiness will be more readily mimicked than displays of sadness, whereas anger will be mimicked to the lowest extent. Finally, mediation analyses were used to confirm the effects of muscle activity on trait judgments.

Method Overview

The study was approved by the Ethics Committee for Scientific Research of the Faculty of Psychology at SWPS University in Warsaw.

Transparency and Openness

We have provided a full account of our sample size determination, justifications for data exclusion, and comprehensive descriptions of all the measures used in our research. The materials regarding our research: Stimuli, data files, analysis script, and preregistration are openly accessible through the Open Science Framework (Olszanowski et al., 2025).

Stimuli

Video clips showing anger, sadness, and happiness expressions displayed by eight individuals (four men and four women, all faces Caucasian) served as the stimulus material. The videos were created using FantaMorph 5.0 based on pictures taken from the Warsaw Set of Emotional Facial Expression Pictures (Olszanowski et al., 2015), following the procedure developed by Wróbel and Olszanowski (2019). Each video lasted 6 s and started with a 2-s still image of a neutral face that changed gradually within 2 s to an emotional one (i.e., anger, sadness, or happiness). After reaching the apex (i.e., full emotional display), the face returned within 1 s to a lower intensity expression (i.e., 50% neutral and 50% emotional) and stopped, keeping the still image visible for another 1 s. The 24 videos (Eight Individuals × Three Emotional Expressions) were then divided into two subsets, each containing four individuals (two women). Each subset was further divided into two alternative experimental sets in which two individuals (one woman) were introduced as having social attitudes similar to the participants', whereas the other two were described as dissimilar.

Measures

EMG Recording and Data Reduction

Muscle activity was measured using bipolar placements of single-use Ag/Cl electrodes on the left side of the face. A ground electrode was attached to the middle of the forehead, directly below the hairline. Following Tassinary et al. (2007), activity of the corrugator supercilii (which lowers the eyebrows), and zygomaticus major (which raises the lip corners) was assessed. To potentially differentiate between anger and sadness more precisely, we also measured depressor anguli oris (which lowers the lip corners) in Experiment 1 and lavator labii superioris (raises the upper lip) in Experiment 3. Analyses of single muscle activity are presented in Appendix. Since these were complementary measurements, these results, as well as the results of separate analyses for the corrugator and zygomaticus, are presented in the Suplementary Analysis (see Appendix).

To control for artifacts in the electromyography (EMG) signal (i.e., yawning, face touching), we video-recorded participants during the main part of the experimental procedure and visually inspected recordings to remove data containing artifacts due to excessive muscle movements. The EMG signal was measured with a BioPac MP150 amplifier, digitized with 24-bit resolution, sampled at 1 kHz, and recorded on a personal computer. The signal was offline filtered with a 20- to 400-Hz bandpass filter and a 50-Hz notch filter, moving average filter integrating over 50 ms and rectified to transform into positive values. All digital processing and data exports were done using ANSLAB v2.5 software. For the analyses, the signal was averaged from a 0.5-s baseline (prior to the stimulus onset) up to 7 s (6 s of the video +1 extra second) of the stimulus presentation divided into 0.5-s epochs, which resulted in a baseline and 14 data points for each trial. The data were within participant z-scored. Trials exceeding 3 *SD* for 5 or more data points were marked as artifact and excluded from analysis.

Based on the assumption that happiness expressions are indexed by higher activation of zygomaticus major as compared to corrugator supercilii, whereas anger and sadness expressions can be manifested by higher activation of corrugator supercilii as compared to zygomaticus major, matching facial activity indexes were calculated. To define mimicry of happiness, the activity of corrugator supercilii was subtracted from the activity of zygomaticus major and to define sadness and anger zygomaticus was subtracted from corrugator (see Hess & Blairy, 2001; Hess et al., 2017). This mimicry index averaged across the time when the emotion display was visible on the targets' face (from Second 2–6 of the video), was used as the dependent variable. Index values above 0 indicate convergent facial responses, whereas values below 0 indicate divergent facial responses (i.e., a more anger-like reaction to happiness or more happiness-like reaction to anger). The results of the analyses for individual muscles are presented in Appendix.

Procedure

The stimulus presentation was programmed in SuperLab 5.0. Each trial started with a fixation cross (jittered between 0.5 and 2 s), followed by the facial expression video, followed by 5 s of blank screen and ending with the presentation of the judgment scales (or a screen instructing participants to press the button to continue when no evaluation was required—i.e., passive viewing block). To minimize the risk of physiological signal interference, trials were separated by a 10-s blank screen (with info that a new video is being downloaded).

Social Similarity Manipulation

To generate the perception of social similarity between the participant and observed individuals in Experiments 1 and 3, a method based on the questionnaire of social attitudes was utilized (Clerke & Heerey, 2021; Wróbel & Królewiak, 2017). The questionnaire consists of a set of five statements (e.g., "Smoking should not be allowed in public spaces"; "Homosexuals should have a right to adopt children"), and participants were asked to indicate the extent to which they agree with each item on a 4-point scale. After completing the form, participants were instructed to memorize the faces and answers to the same questionnaire, presumably provided by four other participants (two men and two women). The faces presented were photographs of individuals used to create the video stimuli. A computer script assured that for two of the individuals (one man and one woman), the responses were similar to the participant's responses, whereas for two other divergent responses were shown. The assignment of the identities described as socially similar and different were counterbalanced between participants.

Experiment 1

Method

Study Design

The study followed a 3 (emotion display: anger vs. happiness vs. sadness) × 2 (social similarity: similar vs. different) × 4 (type of the task: trustworthiness evaluation vs. attractiveness evaluation vs. confidence evaluation vs. passive viewing) within-participants design.

Participants

Preregistered sample size based on repeated measures analysis of variance (ANOVA) approach assumed recruiting above 54 participants to allow the detection of a small effect ($\eta_p^2 > .02$, $1 - \beta > .8$, $\alpha = .05$). Assuming some data loss, we recruited 71 (51 women) participants for the study in exchange for partial course credit and coffee vouchers (equivalent of approx. 3$). EMG recordings of six participants could not be used due to technical reasons (i.e., signal loss or relatively high level of artifacts), and data from three participants were excluded due to ineffective manipulation of social similarity. Thus, the EMG signal analyses are based on data from 62 participants (43 women).

Power Analysis

To ensure that our sample size was sufficient to detect the observed effect sizes when analyzed with linear mixed models (LMMs), we conducted an additional sensitivity analysis usig SIMR package for R (R Core Team, 2018; Green & MacLeod, 2016). Specifically, we calculated beta (β) coefficients and Cohen's *f* values, along with their corresponding degrees of freedom, using collected data. Based on these estimates, we conducted a series of power simulations. These simulations demonstrated that with statistical power exceeding 80%, the minimum detectable effect size was Cohen's $f = 0.002$. Further details of these simulations, including the power curves, are available at Olszanowski et al. (2025).

Procedure

The experiment was conducted individually and presented as a study on memorizing other people's faces and attitudes. Participants were informed that the experiment consists of three parts, in which they will be asked to memorize, evaluate, and recognize other people's faces.

The first part of the study involved manipulating social similarity (questionnaire and memorizing faces). Before starting the second part, participants were informed that their task is to judge individuals' faces on different traits and that to measure their effort during this task, electrodes would be applied to their face. After the instructions were provided, participants completed four blocks of trials, each containing 12 video clips (Four Faces × Three Emotions). During each block, participants either judged targets on trustworthiness, attractiveness, and confidence or passively viewed the faces (without the evaluation task). The order of the blocks was random. Participants used a 7-point scale (anchored "no" to "yes") to answer the question: "is this person trustworthy/attractive/confident?" Before starting each block, participants were informed about the kind of judgment to make or that there would be no judgment.

The third part, introduced as the recognition test, was administered right after the evaluation part. Participants saw a pictures of individuals and were asked to indicate whether the person's attitudes were similar to or different from their own. Correctly indicating the similarity of attitudes for three of the four faces confirmed the effectiveness of the manipulation procedure and qualified the respondent's data for analysis.

Results

Since the study preregistration and sample size calculations were based on repeated measures ANOVA models, we provide the corresponding analyses as supplementary material (Olszanowski et al., 2025). However, due to the advantages of mixed-effects models over traditional ANOVA—such as better handling of missing data or the ability to account for trial-level and between-trial variance—we present the mixed-effects models as the primary analyses. Data were analyzed using LMMs with restricted maximum likelihood and Type III Satterthwaite's approximations to obtain *p* value estimates and intercepts for each subject. Paired comparisons were made with Bonferroni correction adjusting the *p* values. The analyses were performed using lme4 and lmerTest packages for R (Bates et al., 2015; Kuznetsova et al., 2017). Critically, the supplementary ANOVA analyses revealed a consistent pattern of significant effects, mirroring those identified in the LMMs (Olszanowski et al., 2025).

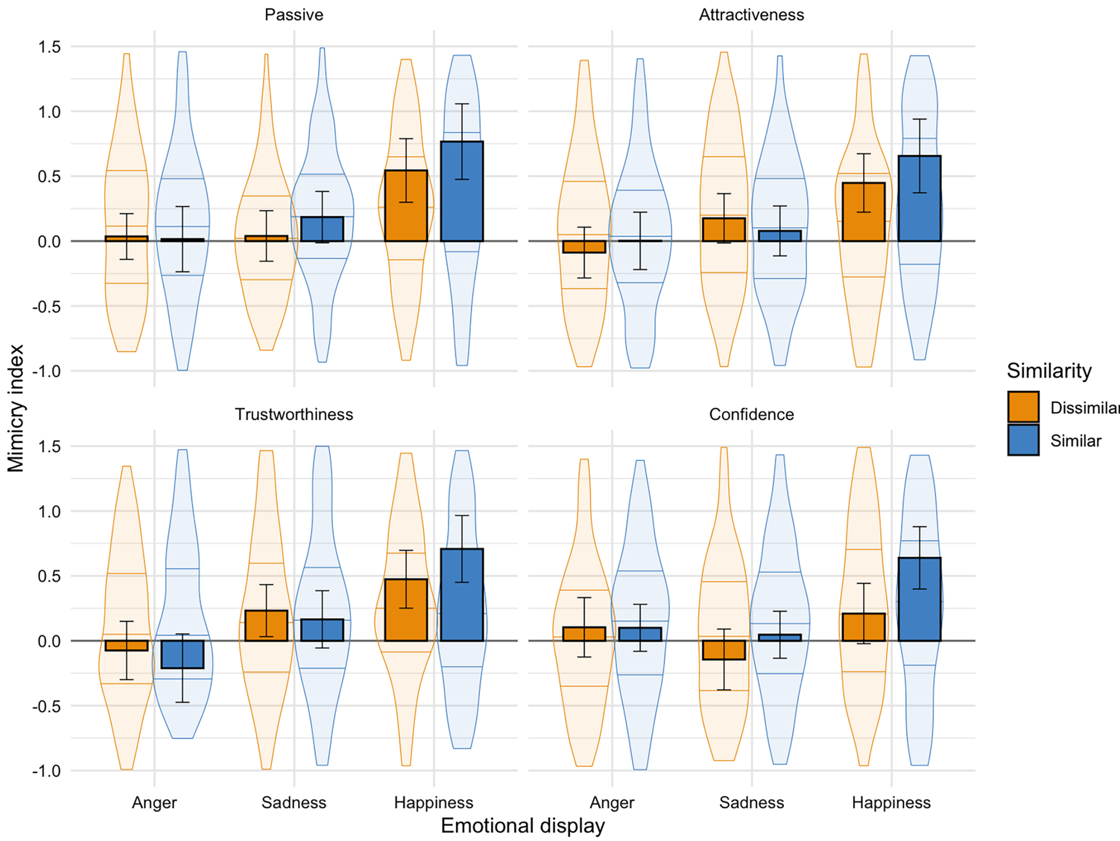
Emotional Mimicry

The fixed effect structure included emotion display (three levels: anger vs. sadness vs. happiness), social similarity (two levels: similar vs. different), and type of the task/judgment (four levels: trustworthiness vs. attractiveness vs. confidence vs. passive viewing) as well as their interactions. Participant id was entered as random factor.[1,2] A mimicry index, serving as the dependent variable, was derived by subtracting corrugator supercilii activity from zygomaticus major activity for happiness, and vice versa for sadness/anger, with these values then averaged over the 2–6 s period of the target's emotional display. Figure 1 presents the results.

[1] The alternative model, which included random intercepts of facial stimuli, showed no significant differences from the basic model in terms of data fit—Akaike information criterion $(\text{AIC})_{\text{Participant identification number (Id)}} = 9{,}314$ versus $\text{AIC}_{\text{Participant Id + Stimuli Id}} = 9{,}316$, $\chi^2 = 0.26$, $p = .611$ (see https://osf.io/m5f2v for details).

[2] We further conducted supplementary model comparisons for which we built a series of nested models starting with one including only the main effects, sequentially adding first-order interactions, and finally the full three-way interaction. A detailed report of these analyses is available at https://osf.io/m5f2v.

Figure 1
Facial Mimicry as a Function of Task, Emotion Expression, and Similarity (Experiment 1)



Note. Bars represent the mimicry index, averaging facial activity between 2 and 6 s of stimuli presentation (i.e., while the emotion display was visible on individuals' face). Error bars represent 95% confidence interval for the mean. See the online article for the color version of this figure.

A significant main effect of facial display confirmed that participants' facial activity depended on the actors' emotion display: $F(2, 2756) = 56.88$, $p < .001$, $\eta^2 = 0.04$. Mimicry was more pronounced after exposure to happy faces than after exposure to angry ($M = 0.55$, $SE = 0.05$ versus $M = -0.02$, $SE = 0.05$); $t(2755) = 10.07$, $p < .001$, $d = 0.47$, or sad faces ($M = 0.10$, $SE = 0.05$); $t(2755) = 8.09$, $p < .001$, $d = 0.37$, with no difference between the latter two, $t(2755) = 1.98$, $p = .144$, $d = 0.09$.

Further, a main effect of social similarity emerged significantly: $F(1, 2757) = 4.57$, $p = .033$, $\eta^2 < 0.01$, with more mimicry of socially similar versus dissimilar individuals ($M = 0.26$, $SE = 0.04$ vs. $M = 0.16$, $SE = 0.04$). This effect was qualified by a significant interaction with emotion display, $F(2, 2757) = 3.67$, $p = .026$, $\eta^2 < 0.01$. Specifically, happiness displays of similar individuals were mimicked more than those of dissimilar individuals ($M = 0.69$, $SE = 0.06$ versus $M = 0.42$, $SE = 0.06$); $t(2757) = 3.39$, $p = .011$, $d = 0.22$, whereas there were no differences for anger and sadness expressions. The main effect of type of the task, $F(3, 2757) = 0.86$, $p = .464$, $\eta^2 < 0.01$, the remaining two-way interactions, type of task and social similarity: $F(3, 2757) = 0.79$, $p = .503$, $\eta^2 < 0.01$; emotion display and type of task: $F(6, 2757) = 1.96$, $p = .068$, $\eta^2 < 0.01$; and the three-way interaction: $F(6, 2757) = 0.40$, $p = .877$, $\eta^2 < 0.01$, were not significant.

The conditional R^2 (fixed + random effects) of the model was .07, while marginal R^2 (fixed effects only) was .05, which translates into weak explanatory power—that is, $.02 \leq R^2 < .13$ (Cohen, 1988).

Social Evaluations

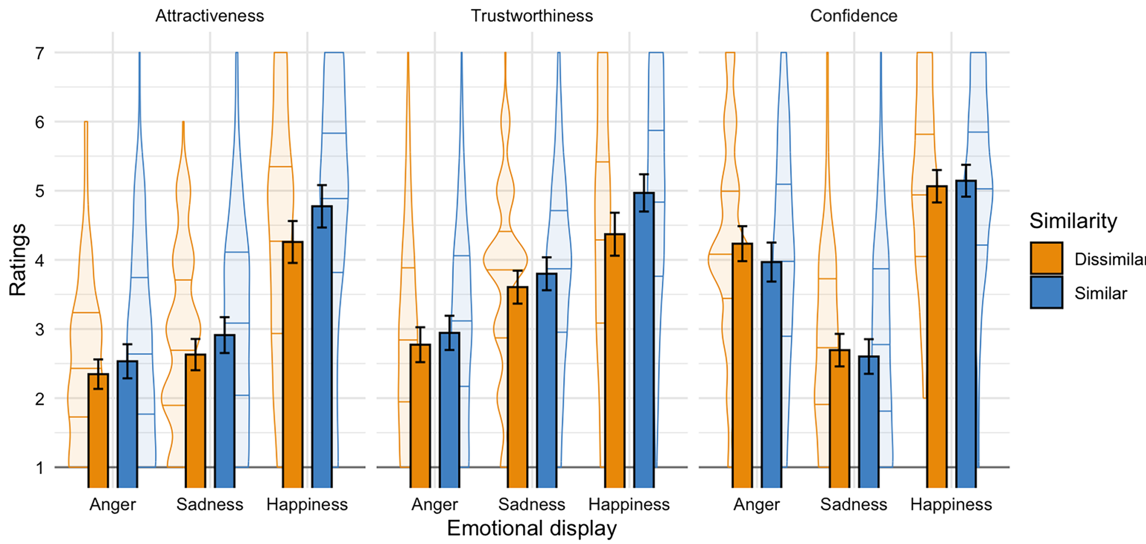
Analyses with the fixed effects emotion displays (three levels: anger vs. sadness vs. happiness) and social similarity (two levels: similar vs. different) were conducted for the each of the judgments (i.e., attractiveness, confidence, or trustworthiness). The random effects included an intercept for participants and facial stimuli.[3] Figure 2 presents the results.

For *attractiveness* judgments, a significant main effect of emotion display emerged, $F(2, 671) = 176.31$, $p < .001$, $\eta^2 = 0.33$. Individuals displaying happiness were perceived as more attractive ($M = 4.52$, $SE = 0.14$) than those displaying sadness ($M = 2.77$, $SE = 0.14$); $t(671) = 14.70$, $p < .001$, $d = 1.32$, or anger ($M = 2.44$,

[3] Attractiveness: $AIC_{Participant\ Id} = 2637$ versus $AIC_{Participant\ Id\ +\ Stimuli\ Id} = 2{,}632$, $\chi^2 = 7.48$, $p = .006$; trustworthiness: $AIC_{Participant\ Id} = 2686$ versus $AIC_{Participant\ Id\ +\ Stimuli\ Id} = 2{,}649$, $\chi^2 = 39.36$, $p < .001$; confidence: $AIC_{Participant\ Id} = 2620$ versus $AIC_{Participant\ Id\ +\ Stimuli\ Id} = 2{,}605$, $\chi^2 = 17.09$, $p < .001$.

Figure 2

Means of Trait Ratings as a Function of Emotion Expression and Similarity (Experiment 1)



Note. Error bars represent 95% confidence interval for the mean. See the online article for the color version of this figure.

$SE = 0.14$); $t(671) = 17.47$, $p < .001$, $d = 1.57$, and individuals who displayed sadness were rated as more attractive than those displaying anger $t(671) = 2.77$, $p = .017$, $d = 0.25$. Also, socially similar individuals were rated as more attractive than dissimilar ones: $M = 3.42$, $SE = 0.14$ versus $M = 3.06$, $SE = 0.14$; $F(1, 676) = 13.39$, $p < .001$, $\eta^2 = 0.01$. The interaction was not significant: $F(2, 671) = 1.02$, $p = .361$, $\eta^2 < 0.01$. The conditional R^2 (fixed + random effects) of the model was .44 while marginal R^2 (fixed effects only) was .28, which translates into substantial explanatory power—that is, $R^2 > .26$ (Cohen, 1988).

The same pattern of results emerged for *trustworthiness*. A significant main effect of emotion display emerged, $F(2, 671) = 110.81$, $p < .001$, $\eta^2 = 0.24$, such that individuals displaying happiness were judged as more trustworthy than those displaying sadness ($M = 4.68$, $SE = 0.17$ versus $M = 3.71$, $SE = 0.17$); $t(671) = 7.96$, $p < .001$, $d = 0.72$, or anger ($M = 2.86$, $SE = 0.17$); $t(671) = 14.87$, $p < .001$, $d = 1.34$, and those displaying sadness were rated as more trustworthy than those displaying anger: $t(671) = 6.92$, $p < .001$, $d = 0.63$. Socially similar individuals were also judged as more trustworthy than dissimilar ones: $M = 3.90$, $SE = 0.17$ versus $M = 3.60$, $SE = 0.17$; $F(1, 674) = 8.95$, $p = .003$, $\eta^2 = 0.01$. No significant interactions emerged, $F(2, 671) = 1.95$, $p = .143$, $\eta^2 < 0.01$. The conditional R^2 (fixed + random effects) of the model was .34, while marginal R^2 (fixed effects only) was .21, which translates into moderate explanatory power—that is, $.13 \leq R^2 < .26$ (Cohen, 1988).

A somewhat different pattern of results emerged for *confidence* judgments. The main effect of emotion display was significant: $F(2, 671) = 213.38$; $p < .001$, $\eta^2 = 0.38$. As for attractiveness and trustworthiness, ratings on the target scale were higher for individuals displaying happiness ($M = 5.11$, $SE = 0.14$) than those displaying anger ($M = 4.10$, $SE = 0.14$); $t(671) = 8.41$, $p < .001$, $d = 0.76$, or sadness ($M = 2.65$, $SE = 0.14$); $t(681) = 20.55$, $p < .001$, $d = 1.85$. However, here, individuals who displayed anger were rated as more confident than those who displayed sadness: $t(671) = 12.14$, $p < .001$, $d = 1.10$. In contrast to judgments of attractiveness and trustworthiness, no main effects of social similarity emerged: $F(1, 675) = 0.46$, $p = .5$, $\eta^2 < 0.01$, nor a significant interaction: $F(2, 671) = 1.06$, $p = .348$, $\eta^2 < 0.01$. The conditional R^2 (fixed + random effects) of the model was .41, while marginal R^2 (fixed effects only) was .34—substantial explanatory power, that is, $R^2 > .26$ (Cohen, 1988).

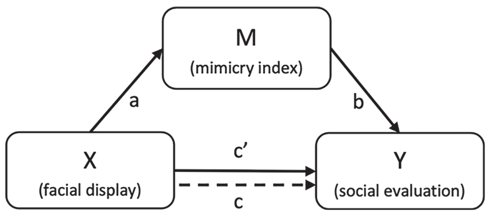
Mediation Analyses

To examine whether there is an indirect effect of emotional mimicry on judgments, we conducted a series of mediation analyses (see Figure 3) using the lme and mediation packages for R (Bates et al., 2015; Tingley et al., 2014). We treated the individuals' emotional display as the predictor (X)[4] and trait judgments as the dependent variable (Y). Since the expected pattern of muscle activation during happiness mimicry is opposite to that of sadness and anger, we unified the index of facial activity for mediation analysis, such that as activity of corrugator supercilii was subtracted from the activity of zygomaticus major for all emotion conditions. Hence, a positive value indicated a more smile-like response (higher activation zygomaticus major as compared to corrugator supercilii), whereas a negative value indicated a more frowning response (higher activation of corrugator supercilii as compared to zygomaticus major). The index values were used as the mediator (M). Here, a significant mediation effect would indicate that the judgment about a given trait is mediated entirely (full mediation) or partially (partial mediation) by the act of mimicking a specific facial expression of emotion.

Table 1 provides estimates of fixed effects for the analyzed paths. The analyses showed a partial indirect effect of happiness and sadness mimicry on trustworthiness and attractiveness judgments but not on confidence judgments. Specifically, more happiness

[4] Dummy-coded to contrast the displayed emotion of interest (1) against two other emotions (0), for example, happiness was contrasted against anger and sadness.

Figure 3
The Schema of Mediation Model Tested in the Presented Studies



mimicry predicted higher ratings, whereas more sadness mimicry predicted lower ratings. In turn, for anger displays, there was significant, partial indirect effect of emotional mimicry on confidence judgments but not on judgments of trustworthiness or attractiveness. There, more anger mimicry predicted lower ratings.

Summary

Overall, these findings suggest that mimicry predicts trait judgments. In addition, as hypothesized, happiness was more readily mimicked than sadness and anger, and the happiness of socially similar individuals was more readily mimicked than the happiness of dissimilar individuals. Further, the effects of emotional expressions on trait judgments were replicated such that happiness was associated with more attractiveness, trustworthiness, and confidence compared to sadness and anger. In turn, sadness was associated with higher trustworthiness and attractiveness than anger, whereas anger was associated with higher confidence than was sadness. The expected effect of social similarity on trait ratings was found for attractiveness and trustworthiness—socially similar individuals were rated more favorably, with a somewhat different pattern for confidence. Here, dissimilar individuals expressing anger were judged to be more confident than similar ones.

Finally, mimicry was shown to mediate these effects—more mimicry of happiness predicted higher ratings of trustworthiness and attractiveness, whereas more mimicry of sadness predicted lower ratings. A different mediation pattern emerged for confidence: As predicted, mimicry of anger was associated with lower ratings. Importantly, the mediation was partial in all cases, meaning that mimicry does not fully predict judgments. This suggests that additional mediating or moderating mechanisms, such as appraisals (e.g., Hareli, 2014), likely play a role in inferring social traits from facial displays. Emotional mimicry may function alongside these mechanisms.

In sum, we replicated previous findings that people mimic affiliative emotions to a larger extend and that socially similar individuals are mimicked more. The results also support our hypothesis that mimicry predicts trait ratings, especially for traits that have affective relevance. However, although the results align with our predictions, it is essential to note that the observed relationships between mimicry and evaluations are correlational. Consequently, the causative direction of this relationship cannot be unequivocally determined. To test the notion that mimicry influences evaluations, further study based on the design by Blairy et al. (1999, Study 3) was conducted.

Specifically, participants were asked to activate muscles in patterns that were either congruent or incongruent with the observed expression. In the congruent condition, this task enforced activity in the same muscles as the observed expression, thereby enhancing mimicry. Conversely, in the incongruent condition, the task prompted activation of opposing muscles, hindering mimicry. If mimicry influences evaluations, congruent activity should enhance the impact of the observed expression on evaluations (raising ratings in the case of happiness and lowering them in the case of anger and sadness), whereas incongruent activity should diminish this influence (lower ratings for happiness, higher ratings for sadness and anger) compared to the passive viewing condition.

Experiment 2

Method

Study Design

The study followed a 3 (emotional display: anger vs. sadness vs. happiness) × 3 (induced facial activity: congruent vs. incongruent vs. free) within-participants design.

Table 1
Mediational and Indirect Effects of the Relationship Between Emotional Display and Trait Judgments via Mimicry

Display (X)	Evaluation (Y)	Path a	Path b	Path c (total effect)	Path c' (direct effect)	Indirect effect
Happiness	Attractiveness	0.60***	0.27***	1.91***	1.75***	M = 0.16, 95% CI [0.09, 0.23], p < .001
	Trustworthiness	0.62***	0.18***	1.40***	1.30***	M = 0.11, 95% CI [0.05, 0.18], p < .001
	Confidence	0.45***	0.03	1.70***	1.69***	M = 0.02, 95% CI [−0.03, 0.06], p = 1.0
Sadness	Attractiveness	−0.42***	0.39***	−0.69***	−0.52***	M = −0.17, 95% CI [−0.26, −0.09], p < .001
	Trustworthiness	−0.57***	0.30***	−0.05	0.11	M = −0.17, 95% CI [−0.26, −0.10], p < .001
	Confidence	−0.11	0.11*	−1.91***	−1.90***	M = −0.01, 95% CI [−0.04, 0.01], p = 1.0
Anger	Attractiveness	−0.17[a]	−0.39***	−1.22***	−1.15***	M = −0.07, 95% CI [−0.15, 0.01], p = .558
	Trustworthiness	−0.06	0.29***	−1.36***	−1.34***	M = −0.02, 95% CI [−0.07, 0.04], p = 1.0
	Confidence	−0.33***	0.17**	0.24[a]	0.30*	M = −22120.06, 95% CI [−0.11, −0.01], p = .027

Note. Estimates of fixed effects (paths a, b, c, and c') and indirect effects are presented with 95% confidence intervals (computed using 10,000 Monte Carlo simulations), p values were adjusted using the Bonferroni correction to account for multiple comparisons. CI = confidence interval.
* p < .05. ** p < .01. *** p < .001.
[a] p < .07.

Participants

Since the observed effect sizes for evaluative judgments in Experiment 1 were relatively large, we decided on a slightly smaller sample size and recruited 50 participants (35 women) who participated in the study in exchange for partial course credit and coffee vouchers. Based on the analysis of video recordings from the experiment, we excluded four participants due to noncompliance with the instructions. Thus, the analyses are based on 46 participants (32 women).

Power Analysis

Following the methodology established in Experiment 1, comparable sensitivity analyses were conducted. These analyses revealed a consistent minimum detectable effect size for interaction of Cohen's $f = 0.006$ ($1 - \beta > .8$, $\alpha = .05$) across all employed LMMs.

Procedure

The experiment was conducted individually and presented as a validation of new software that detects and recognizes faces and facial displays in different environments; at this stage, the software is set to learn about mouth and eyebrows movements. Participants were instructed that their task is to watch videos of individuals and to assess their trustworthiness, while the software will analyze their facial activity. Participants were also informed that their facial activity would be recorded on video during the task for later analysis by the software. In practice, the recorded footage was used to retrospectively verify whether participants performed the task correctly. In addition to visually inspecting the video recordings, iMotions 7.0 software was used to analyze participants' behavior to confirm that their facial activity aligned with the instructions.

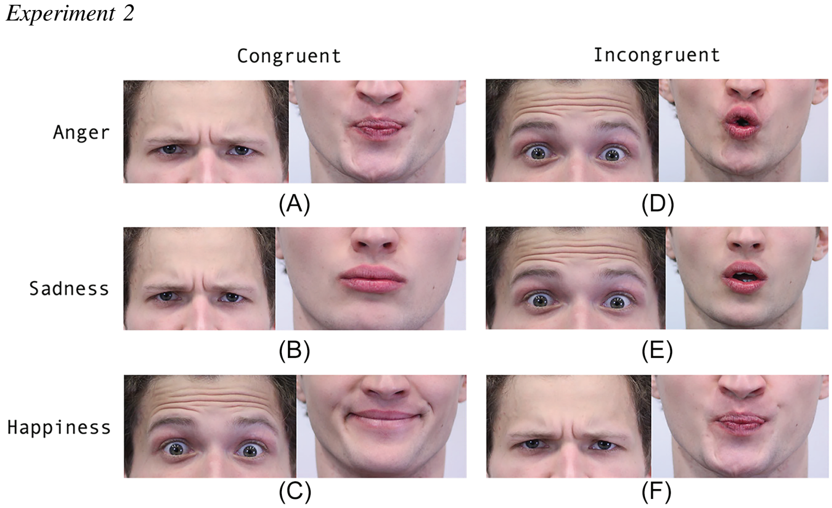
During the experiment, participants were presented with three blocks of trials, each containing 12 video clips (Four Faces × Three Emotions). During one block, participants were asked only to watch videos and provide their evaluations. During the two other blocks, participants were asked to produce a specific facial activation during the video presentation. The same set of faces was used in each block; the order of the blocks was randomized for each participant. Before the video presentation, descriptions with images appeared on the screen, indicating the required arrangement of mouth and eyebrows, and reminding participants to maintain this arrangement until a signal appeared on the screen (after the video and before the evaluation). No reference to emotions was made during the instructions.

Congruent facial activity for happiness consisted of raised eyebrows and raised corners of the mouth (see Figure 4, Panel C), for sadness of furrowed eyebrows and pulling down the corners of the mouth (Figure 4, Panel B), and for anger of furrowed eyebrows and tightened/pressed lips (Figure 4, Panel A). Conversely, incongruent facial activity for happiness consisted of furrowed eyebrows and tightened/pressed lips (Figure 4, Panel F), for sadness of raised eyebrows and an open mouth (Figure 4, Panel E), and for anger of raised eyebrows and slightly parted and stretched lips (Figure 4, Panel D). The order of the blocks was randomized for each participant. It is worth noting that the indicated facial behaviors were intended to induce the activation of one target muscle while counteracting the activation of another target muscle by engaging antagonist muscles (e.g., congruent facial activation for happiness promoted zygomaticus major activation along with the activation of the *frontalis*, which is antagonistic to the corrugator supercilii; Schumann et al., 2021).

The assessments were made on 7-point scale (anchored from *no* to *yes*) as a response to question: "Is this person trustworthy?" At the end of each block, participants were requested to evaluate the task difficulty by responding to the question: "How difficult was the task

Figure 4

Congruent and Incongruent Facial Activity Requested From the Participants in Experiment 2



Note. The images were examples presented to the participants during experimental procedure. Permission to publish this image was obtained from the individual shown. See the online article for the color version of this figure.

just performed?" on a 7-point scale (anchored from *very easy* to *very difficult*).

Results

Similar to Experiment 1 data were analyzed using LMMs with restricted maximum likelihood and Type III Satterthwaite's approximations to obtain p value estimates and intercepts for each subject. Paired comparisons were made with Bonferroni correction adjusting the p values. The fixed effect included individuals' emotional displays (three levels: anger vs. sadness vs. happiness) and induced facial activity (three levels: congruent vs. incongruent vs. not induced). The random effects included the intercept for participant id as well as for facial stimuli[5]. Figure 5 presents the results. The supplementary ANOVA analyses revealed a consistent pattern of significant effects, mirroring those identified in the LMMs (Olszanowski et al., 2025).

The analysis revealed a main effect of emotion display: $F(2, 1740) = 295.66$, $p < .001$, $\eta^2 = 0.25$. As in Experiment 1, individuals who displayed happiness were assessed as more trustworthy than those displaying sadness ($M = 4.84$, $SE = 0.19$ versus $M = 3.73$; $SE = 0.19$); $t(1739) = 13.92$, $p < .001$, $d = 0.81$, or anger ($M = 2.91$; $SE = 0.19$); $t(1739) = 24.23$, $p < .001$, $d = 1.40$, and individuals displaying sadness were rated as more trustworthy than those displaying anger, $t(1739) = 10.31$, $p < .001$, $d = 0.60$. There was no significant main effect of induced facial activity: $F(2, 1739) = 1.27$, $p = .280$, $\eta^2 < 0.01$, however, a significant interaction emerged: $F(4, 1739) = 4.04$, $p = .003$, $\eta^2 = 0.01$.

Simple main effects analysis revealed that induced facial activity influenced evaluations when individuals displayed happiness: $F(2, 545) = 7.89$, $p < .001$, $\eta^2 = 0.03$, but not sadness: $F(2, 545) = 2.03$, $p = .131$, $\eta^2 = 0.01$, or anger: $F(2, 545) = 0.24$, $p = .786$, $\eta^2 < 0.01$. Specifically, participants evaluated smiling individuals as more trustworthy when their own facial activity was congruent ($M = 5.10$, $SE = 0.20$) rather than incongruent ($M = 4.57$, $SE = 0.20$): $t(545) = 3.97$, $p < .001$, $d = 0.40$. There was no significant difference between the congruent facial activity condition and the spontaneous facial activity condition ($M = 4.85$, $SE = 0.20$); $t(545) = 1.86$, $p = .192$, $d = 0.19$, nor between incongruent and spontaneous facial activity: $t(545) = 2.12$, $p = .105$, $d = 0.21$. Importantly, participants evaluated task difficulty as moderate in each condition ($M_{\text{cong}} = 4.00$, $SE = 0.32$; $M_{\text{incong}} = 4.10$, $SE = 0.32$; $M_{\text{not induced}} = 3.95$, $SE = 0.32$) with no significant differences between conditions: $F(2, 144) = 0.10$, $p = .902$, $\eta^2 < 0.01$. The conditional R^2 (fixed + random effects) of the model was .38, while marginal R^2 (fixed effects only) was .21, which translates into moderate explanatory power—that is, $.13 \leq R^2 < .26$ (Cohen, 1988).

Summary

Experiment 2 shows that manipulated facial muscle activity congruent with a display of happiness resulted in higher trustworthiness ratings compared to activity incongruent with a display of happiness. No significant differences emerged for sadness and anger. This contrasts with Experiment 1, where sadness mimicry was related to reduced ratings. Overall, the results of Experiments 1 and 2 confirm that facial activity related to emotion mimicry can modulate trait ratings.

The observed role of forced muscle activation indirectly suggests that the mechanism by which mimicry influence judgments may be related to facial feedback mechanisms. Although, as indicated by the current literature, the effect of facial feedback seems to be quite limited, it has been shown that stimulation of muscles responsible for emotional expression can slightly increase the intensity of experiencing those emotions and influence ratings of emotionally neutral material (Coles et al., 2019, 2022; Efthimiou, Baker, Clarke, et al., 2024; Efthimiou, Baker, Elsenaar, et al., 2024). However, it is worth noting that previous studies indicate no or a relatively low impact of mimicry on evoking emotional feelings (e.g., Hess & Blairy, 2001; Lischetzke et al., 2020; Olszanowski et al., 2020; van der Schalk et al., 2011). Therefore, it is unlikely that the observed changes in trait inferences are due to changes in experienced emotions. This line of reasoning would require additional research that also includes the measurement of emotions experienced by participants.

It is important to note that the two experiments described so far focused on situations in which inferences about traits were restricted to purely declarative assessment, which does not entail any risk for the assessor. In real-life scenarios, such assessments are more likely to translate into decision-making regarding others and carry potential consequences. Thus, in Experiment 3, we employed a more realistic self-relevant assessment of trustworthiness. Specifically, we used a "trust-investment game" (Berg et al., 1995). The trust-investment game simulates a scenario in which one player (the investor) must decide whether to share money or another kind of resource that has measurable value with the other player (the trustee). The structure of the game creates a trade-off situation between caution and the desire to gain an advantage, as the investor must trust that the funds transferred to the trustee will be returned with profits. Therefore, the game is a useful tool for studying trust behavior in controlled experimental settings.

Experiment 3

Method

Study Design

The study followed a 3 (senders' emotional display: anger vs. sadness vs. happiness) × 2 (group: in-group vs. out-group) × 2 (type of the task: passive viewing vs. trust-game) within-participants design.

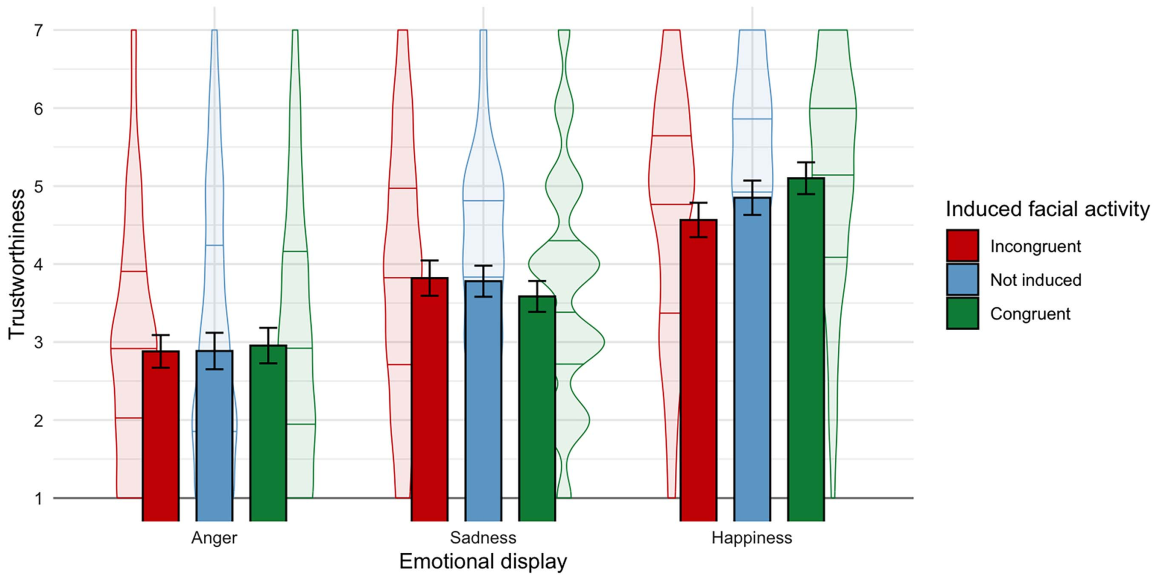
Participants

Assuming similar effect sizes as in Experiment 1 and expecting some data loss due to technical issues regarding the use of EMG, we recruited 70 participants (48 women) who participated in the study in exchange for partial course credit and coffee vouchers. EMG recordings of four participants could not be used due to technical reasons (e.g., signal loss or relatively high level of artifacts), while the data of another two were excluded due to a lack of response variance during the trust-investment game. Thus, the EMG analyses are based on 64 participants (43 women).

[5] $\text{AIC}_{\text{Participant Id}} = 6{,}460$ versus $\text{AIC}_{\text{Participant Id + Stimuli Id}} = 6{,}409$, $\chi^2 = 53.51$, $p < .001$.

Figure 5

Means for Trustworthiness Ratings as a Function of Actor Emotion Display and Congruency of Participants' Expression (Experiment 2)



Note. Error bars represent 95% confidence interval for the mean. See the online article for the color version of this figure.

Power Analysis

Sensitivity analyses indicated a consistent minimum detectable effect size of Cohen's $f = 0.006$ ($1 - \beta > .8$, $\alpha = .05$) for the LMMs employed.

Procedure

The experiment was conducted individually and presented as a study of social behaviors during virtual gaming. Participants were informed that the experiment consisted of two parts, during which they would be assigned to a group of other players and engage in "the game." After signing the consent forms, participants were instructed that they needed to create their game profiles before starting "the game." Photographs of their faces were taken with neutral and emotional facial displays. Subsequently, we used the social similarity manipulation from Experiment 1. Participants were shown images from two people with similar and two with dissimilar answers to the questionnaire. Additionally, participants were informed that their pictures and answers to the questionnaire would be shown to other players during their turns in the game.

The second part of the experiment included an adapted form of the "trust-investment game" (Berg et al., 1995). Instructions stated that the game consists of two stages and that the first stage involves several rounds. In each round, participants receive six points, and they have to decide whether to send some, none, or all of the points to the other player. Participants were informed that their decisions should be made based on the information they received about the other player before the game (the profiles of the other players) and a short movie presented at the start of each round. Any points sent by them to the other player will be tripled for that player. An example was provided illustrating that if they choose to send nothing, the other player will receive nothing while they will keep all six points to themselves. If they send three points the other player would receive nine points while they would be left with three. If they send all six points the other player would receive 18 points, but at the same time, they would be left with nothing. Instructions underlined that within the next few days, all other players will attend their game session, watch the participant profile and receive the same instructions. For example, if the participant sends three points, the other player receives nine points and can thus return any amount between 0 and 9. In such case, participants could gain between 3 (the points they had left after the first stage) and 12 points (if the other player decides to give all points back). Participants were told that the purpose of the game is to collect the maximum points after two stages of the game and get the highest rank among all other players. It was underlined that they need to think of an optimal strategy that will allow them to maximize gains, that is trust that the points they share with another person will be returned. To meet ethical requirements, all participants were fully debriefed at the end of the experiment, and the real purpose of the experimental procedure was explained.

The experimental session was divided into two blocks of trials. The first block consisted of 12 trials (Four Faces × Three Emotions, shown in a random order) with passive observation. Participants were informed that this was intended to refamiliarize themselves with the other players. The second block consisted of 36 trials (Four Faces × Three Emotions × Three Subblocks) in which participants were sharing points.

Results

Data were analyzed using LMMs with restricted maximum likelihood and Type III Satterthwaite's approximations to obtain *p* value estimates and intercepts for each subject. Paired comparisons were made with Bonferroni correction adjusting the *p* values. The supplementary ANOVA analyses revealed a consistent pattern of significant effects, mirroring those identified in the LMMs (Olszanowski et al., 2025).

Emotional Mimicry

Fixed effects included the factors of emotion display (three levels: anger vs. sadness vs. happiness), social similarity (two levels: similar vs. different), and type of task (two levels: passive viewing vs. trust game) as well as their interactions. The random effects included an intercept for participant id.[6] As for Experiment 1, the mimicry index—that is, matching facial muscles activity scores averaged between 2 and 6 s of stimuli presentation (i.e., when the emotional display was visible on individuals' face) was used as the dependent variable. Figure 6 presents the results.

A main effect of emotion display, $F(2, 2903) = 30.02$, $p < .001$, $\eta^2 = 0.02$, confirmed that participants' facial activity depended on other players' displays. Mimicry was stronger after exposure to happiness than to anger displays ($M = 0.42$, $SE = 0.05$ versus $M = -0.05$, $SE = 0.05$), $t(2903) = 7.31$, $p < .001$, $d = 0.38$, or sadness displays ($M = 0.04$, $SE = 0.05$), $t(2903) = 5.93$, $p < .001$, $d = 0.31$, with no difference between the latter: $t(2901) = 1.38$, $p = .504$, $d = 0.03$. The main effects of social similarity, $F(1, 2903) = 0.62$, $p = .433$, $\eta^2 < 0.01$, and type of the task, $F(1, 2905) = 1.15$, $p = .283$, $\eta^2 < 0.01$ were nonsignificant. However, there was a significant interaction between other players' emotion display and type of the task: $F(2, 2903) = 12.35$, $p < .001$, $\eta^2 = 0.01$. Pairwise comparisons revealed that displays of happiness were mimicked more during passive viewing than during the trust game: $M = 0.63$, $SE = 0.08$ versus $M = 0.21$, $SE = 0.05$, $t(2905) = 4.52$, $p < .001$, $d = 0.34$, with no difference for anger and sadness. Finally, there was no significant two-way interaction between emotional display and social similarity: $F(2, 2902) = 1.47$, $p = .230$, $\eta^2 < 0.01$. The same obtained for social similarity and type of task interaction: $F(1, 2903) = 0.07$, $p = .797$, $\eta^2 < 0.01$, as well as for the three-way interaction: $F(2, 2902) = 0.66$, $p = .516$, $\eta^2 < 0.01$. The conditional R^2 (fixed + random effects) of the model was .04 while marginal R^2 (fixed effects only) was .02, which translates into weak explanatory power—that is, $.02 \leq R^2 < .13$ (Cohen, 1988).

To follow up on the significant interaction between other players' emotional display and type of the task, separate analyses for each type of the task with the factors emotion display and social similarity as well as their interaction were conducted. For passive viewing, a significant main effect of other players' emotion display, $F(2, 656) = 27.70$, $p < .001$, $\eta^2 = 0.07$, emerged. Happy faces were mimicked more than angry ($M = 0.63$, $SE = 0.08$ versus $M = -0.15$, $SE = 0.08$), $t(662) = 7.10$, $p < .001$, $d = 0.65$, and sad faces ($M = 0.02$, $SE = 0.8$), $t(660) = 5.57$, $p < .001$, $d = 0.51$, with no difference between sad and angry faces: $t(658) = 1.53$, $p = .377$, $d = 0.14$. There was no significant effect of social similarity: $F(1, 656) = 0.10$, $p = .749$, $\eta^2 < 0.01$, nor a significant interaction: $F(2, 656) = 1.17$, $p = .311$, $\eta^2 < 0.01$. Similarly, for the trust game, there was a significant main effect of emotion: $F(2, 2183) = 4.09$, $p = .017$, $\eta^2 < 0.01$, happiness displays were mimicked more than angry ($M = 0.21$, $SE = 0.05$ versus $M = 0.05$, $SE = 0.05$), $t(2182) = 2.56$, $p = .032$, $d = 0.13$, but no significant differences between happy and sad faces ($M = 0.06$, $SE = 0.05$), $t(2183) = 2.39$, $p = .051$, $d = 0.12$, and sad—angry faces: $t(2183) = 0.17$, $p = 1.0$, $d = 0.01$. Also, no significant main effect of social similarity: $F(1, 2183) = 1.10$, $p = .294$, $\eta^2 < 0.01$, nor an interaction: $F(2, 2183) = 0.81$, $p = .444$, $\eta^2 < 0.01$.

Trust Game

Fixed effects included emotion displays (three levels: anger vs. sadness vs. happiness) and social similarity (two levels: similar vs. different), whereas random effects included an intercept for participant id as well as one for facial stimuli.[7] Additionally, an initial analysis revealed that participants showed a general tendency to increase the number of shared points over the course of the game; thus, trial number was included as a covariate. Figure 7 presents the results.

There was a significant main effect of emotion display, $F(2, 2228) = 97.35$, $p < .001$, $\eta^2 = 0.07$, as participants shared more points with players displaying happiness ($M = 3.31$, $SE = 0.14$) compared to players displaying sadness ($M = 2.70$, $SE = 0.14$); $t(2228) = 8.96$, $p < .001$, $d = 0.46$, or anger ($M = 2.38$; $SE = 0.14$), $t(2228) = 13.74$, $p < .001$, $d = 0.70$. Players displaying sadness received more points than those displaying anger, $t(2228) = 4.79$, $p < .001$, $d = 0.25$. Further, a main effect of social similarity emerged, $F(1, 2232) = 240.48$, $p < .001$, $\eta^2 = 0.09$, such that participants shared more points with socially similar than dissimilar players ($M = 3.24$; $SE = 0.14$ vs. $M = 2.36$; $SE = 0.14$). The interaction was not significant, $F(2, 2228) = 2.10$, $p = .123$, $\eta^2 < 0.01$. The conditional R^2 (fixed + random effects) of the model was .39 while marginal R^2 (fixed effects only) was .12, which translates into weak explanatory power—that is, $.02 \leq R^2 < .13$ (Cohen, 1988).

Mediation

As for Experiment 1, the other players' emotional display was set as the predictor (X),[8] facial activity index (activity of corrugator supercilii subtracted from the activity of zygomaticus major) was the mediator (M), and number of shared points was the dependent variable (Y). As can be seen in Table 2, more happiness mimicry was related to sharing more points with the sender, whereas more sadness and anger mimicry was related to sharing fewer points.

Summary

Experiment 3 confirmed the overall findings of Experiment 1 by using a more realistic measure of trust. Overall, individuals who smiled were more likely to be mimicked and trusted compared to those who frowned. Importantly, mediation analyses suggest that mimicry played a significant role in influencing trust decisions. Contrary to Experiment 1, social similarity did not affect mimicry. A possible reason for the reduced mimicry during game-task and lack of differences in mimicry between socially similar and dissimilar individuals could be that, during the game, participants' mental focus was on points and game strategy rather than on the emotional

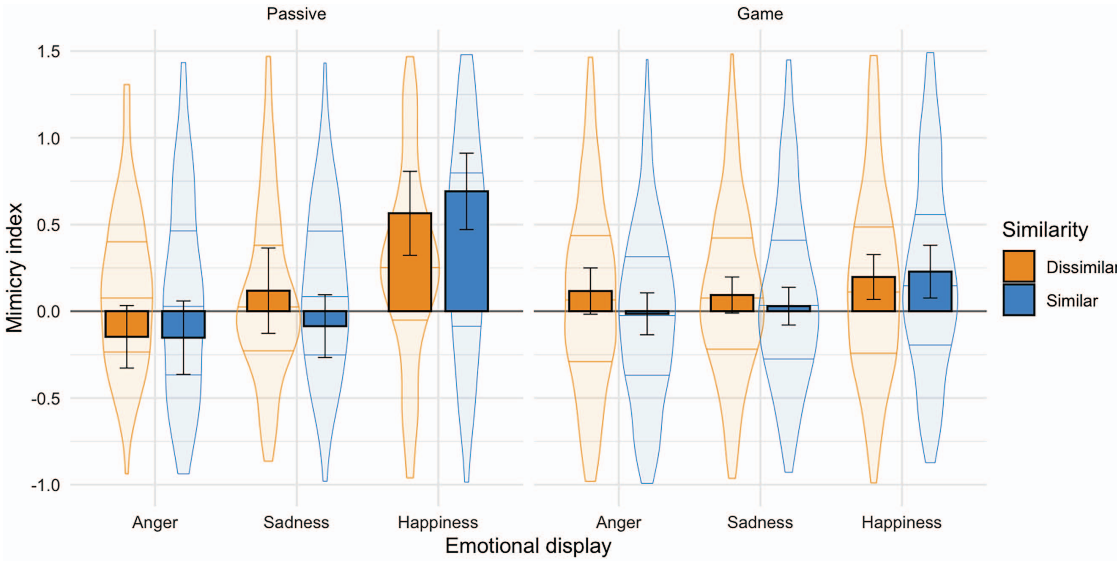
[6] The alternative model, which included random slopes for facial stimuli, returned a boundary fit warning.

[7] $AIC_{\text{Participant Id}} = 8{,}108$ versus $AIC_{\text{Participant Id + Stimuli Id}} = 8{,}069$, $\chi^2 = 42.27$, $p < .001$.

[8] Dummy-coded to contrast the displayed emotion of interest (1) against two other emotions (0), for example, happiness was contrasted against anger and sadness.

Figure 6

Facial Mimicry as a Function of Task, Emotion Expression, and Similarity (Experiment 3)

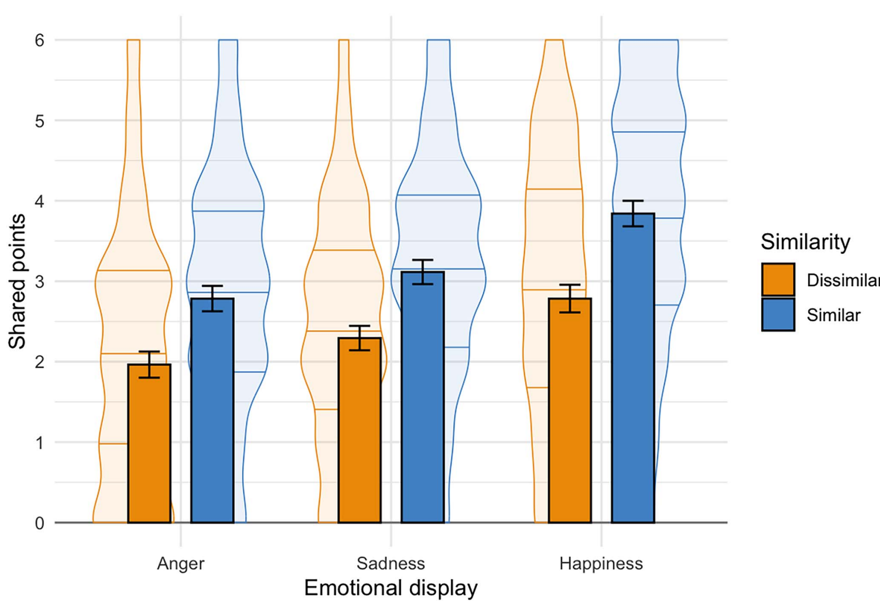


Note. Bars represent the mimicry index, averaging facial activity between 2 and 6 s of stimuli presentation (i.e., while the emotion display was visible on individuals' face). Error bars represent 95% confidence interval for the mean. See the online article for the color version of this figure.

face (Cannon et al., 2009; Forbes et al., 2021). A similar pattern of results was observed in our previous studies (Olszanowski & Tołopiło, 2024). In that case, the effect of social similarity on emotion mimicry was observed when the task accompanying the observation of emotional displays required relatively low cognitive engagement (i.e., reading brief description of situation that evoked emotional reaction—Study 1). In contrast, introducing a simulated game that required more strategic thinking (Study 2) reduced emotion mimicry, also eliminating the difference in mimicking socially similar and dissimilar individuals. Nonetheless, a more

Figure 7

Means for Shared Points as a Function of Emotion Expression and Similarity (Experiment 3)



Note. Error bars represent 95% confidence interval for the mean. See the online article for the color version of this figure.

Table 2
Mediational and Indirect Effects of the Relationship Between the Emotional Display and the Shared Points in Trust-Investment Game via Mimicry

Display (X)	Path a	Path b	Path c (total effect)	Path c' (direct effect)	Indirect effect (a × b)
Happiness	0.27***	0.14***	0.79***	0.75***	M = 0.05, 95% CI [0.03, 0.08], $p < .001$
Sadness	−0.13**	0.17***	−0.15*	−0.13*	M = −0.15, 95% CI [0.03, 0.70], p = .090
Anger	−0.13*	0.16***	−0.64***	−0.62***	M = −0.03, 95% CI [0.01, 0.06], p = .054

Note. Estimates of fixed effects (paths a, b, c, and c') and indirect effects are presented with 95% confidence intervals (computed using 10,000 Monte Carlo simulations), p values were adjusted using the Bonferroni correction to account for multiple comparisons. CI = confidence interval.
* $p < .05$. ** $p < .01$. *** $p < .001$.

favorable perception of similar individuals at the level of declarative responses was found.

General Discussion

The aim of the present research was to explore the interplay between social context and emotional mimicry for trait judgments. Our experiments replicated previous observations that people preferentially evaluate and show more trust to smiling others, particularly when they are socially similar (Ardizzi et al., 2014; Bourgeois & Hess, 2008; Olszanowski et al., 2022). Another replicated observation was that smiles are more likely to be mimicked than displays of sadness and anger (Hess, 2021; Olszanowski & Tołopiło, 2024). In Experiment 1, we found that judgments of other people's social traits were affected by mimicry of their emotional displays, whereas this seemed to be less the case for the evaluation that was less related to the sociality dimension (e.g., confidence). In addition, the influence of mimicry was mainly evident for displays with affiliative meanings (i.e., happiness and sadness). In turn, Experiment 3 extended the observations related to the relationship between mimicry of happiness and sadness and its influence on judgments, specifically trust-related decisions. Finally, Experiment 2 suggested that happiness but not sadness or anger mimicry is causally related to trustworthiness ratings.

Despite some limitations, which we will address later, the results are worth interpreting in the context of the broader idea that social evaluations may be shaped by concurrent affect-related processes. Specifically, in all three studies, we found evidence that increased smile mimicry was associated with greater perceived trustworthiness of the smiling other. In Experiments 1 and 3, the opposite result emerged for sadness mimicry. By contrast, anger was mimicked to a far lesser degree, and the mediation analyses suggesting a path between mimicry and decreased trustworthiness ratings was found in Experiment 3. These findings are in line with newer studies that suggest that mimicry of different emotions may have different social effects. In this context, Mauersberger and Hess (2019) found that mimicry of affiliative expressions positively influenced perceived interaction quality, whereas mimicry of antagonistic expressions had the opposite effect.

The finding that happiness mimicry was positively associated with perceived trustworthiness, while anger displays do not have this effect, fits well with both prevalent models of mimicry presented above (e.g., Hess & Fischer, 2013; Winkielman et al., 2018). Specifically, the embodied cognition approach (e.g., Winkielman et al., 2018) underlines that bodily states related to emotional experience play an essential role in forming a holistic representation of the perceived situation as well as the objects involved in it. In the context of present studies, this suggests that observing and mimicking smiles facilitate access to positive associations, which in turn leads to more positive judgments. This would not be the case for anger, which was also mimicked to a much lesser degree.

Conversely, the contextual model of emotional mimicry emphasizes that the main purpose of mimicry is to help to achieve affiliative goals (A. Fischer & Hess, 2017). As predicted by this model, social similarity should increase mimicry, which was found for happiness at least in Experiment 1. This model also predicts that mimicry fosters further affiliation and, hence, would be associated with more trust in the mimickee, as was found for happiness mimicry in Experiments 1 and 3. This model also would not predict the positive effects of anger mimicry (Mauersberger & Hess, 2019).

Interestingly, neither model could explain the reduction in perceived trustworthiness associated with sadness mimicry. Sadness is a social, affiliative emotion. It contains an appeal for empathy and support (Scarantino et al., 2022). As such, neither the embodiment account nor the contextual model account predicts that sadness mimicry will lead to a more negative, less affiliative stance toward the mimickee. One possible explanation could be that participants reacted on one hand to the overt appeal for empathy, but still felt unsure about the "honesty" of the signal. Another explanation would refer to the perception of sad individuals as more submissive and agreeable, and as such, less resistant to the pressures of others and thereby untrustworthy (Hess et al., 2005); sadness mimicry could reinforce such feelings. Notably, the findings from Experiment 2 suggested that happiness mimicry was causally related to happiness mimicry, which was not the case for sadness mimicry. Thus, it is possible that different processes underlie sadness and happiness mimicry. This echoes the findings of recent studies that found differences in antecedents between these two types of mimicry (Kastendieck et al., 2022, 2023).

The limitations of the study should also be noted. Specifically, regarding potential imperfections of the mimicry index as well as the ecological validity of the research context. First, although EMG measurement allows for capturing subtle changes in muscle activation that are not visible to the naked eye, it is an invasive measurement. This means that placing the electrodes on the participant's face reduces their sense of comfort and ease, but it may also increase their awareness of their own facial expressions. Additionally, the measurement focuses on individual muscles, whereas emotional expressions and their imitation are determined by a combination of multiple muscle activities. From this perspective, the index we used, although based on the activity of two muscles, may still lack precision. Third, the laboratory study situation and the observation of recorded expressions are quite distant from natural interaction with a live person, especially in the context of a simulated game, where the lack of feedback (i.e., whether and how many points the partner has returned) may influence subsequent decisions and behaviors of participants. It is also worth noting that mimicry can contextually be modified by factors related to eye contact and the awareness of being observed (see Olszanowski & Wróbel, 2024, for review). Future research should aim to create situations where participants can feel a more direct connection with the person they are observing and evaluating.

In sum, the present research confirms previous observations that people preferentially mimic happy displays and additionally suggests that such mimicry can influence trait inference processes. The findings are in line with more recent research that suggests that not all mimicry is equal in terms of the antecedents and consequences of mimicry. As such, our findings are in line with studies that found that mimicry of angry expressions may have effects opposite to those of mimicry of happy expressions (Mauersberger & Hess, 2019). Furthermore, the unexpected finding that mimicry of affiliative sadness expressions actually reduces perceived trustworthiness is intriguing. In Experiment 2, no causal link emerged between sadness mimicry and trustworthiness ratings. As such, it is possible that the effects of sadness mimicry are more strongly dependent on the context. In the present case, for example, participants may not have trusted sadness to be an honest signal. Future research should focus more closely on the effects of context on mimicry as a function of the specific emotions that are mimicked.

In conclusion, the present project provides further evidence that people draw inferences about others based on their facial displays. Crucially, this study supports the notion that mimicry is a predictor of trait ratings and, particularly with regard to happiness, provides arguments supporting its causal role in shaping these ratings. To some extent, this confirms the common observation captured in the song lyrics: "When you're smiling the whole world smiles with you"—that expressing positive emotions can be expected to result in a positive reception and attitude toward oneself. From a scientific perspective, these findings extent our understanding of the role of mimicry in the social interactions.

References

Ardizzi, M., Sestito, M., Martini, F., Umiltà, M. A., Ravera, R., & Gallese, V. (2014). When age matters: Differences in facial mimicry and autonomic responses to peers' emotions in teenagers and adults. *PLOS ONE*, *9*(10), Article e110763. https://doi.org/10.1371/journal.pone.0110763

Arnold, M. B. (1960). *Emotion and personality. Psychological aspects* (Vol. 1). Columbia University Press.

Barsalou, L. W. (2008). Grounded cognition. *Annual Review of Psychology*, *59*(1), 617–645. https://doi.org/10.1146/annurev.psych.59.103006.093639

Bates, D., Mächler, M., Bolker, B., & Walker, S. (2015). Fitting linear mixed-effects models Using lme4. *Journal of Statistical Software*, *67*(1), 1–48. https://doi.org/10.18637/jss.v067.i01

Berg, J., Dickhaut, J., & McCabe, K. (1995). Trust, reciprocity, and social history. *Games and Economic Behavior*, *10*(1), 122–142. https://doi.org/10.1006/game.1995.1027

Blairy, S., Herrera, P., & Hess, U. (1999). Mimicry and the judgment of emotional facial expressions. *Journal of Nonverbal Behavior*, *23*(1), 5–41. https://doi.org/10.1023/A:1021370825283

Bourgeois, P., & Hess, U. (2008). The impact of social context on mimicry. *Biological Psychology*, *77*(3), 343–352. https://doi.org/10.1016/j.biopsycho.2007.11.008

Cannon, P. R., Hayes, A. E., & Tipper, S. P. (2009). An electromyographic investigation of the impact of task relevance on facial mimicry. *Cognition and Emotion*, *23*(5), 918–929. https://doi.org/10.1080/02699930802234864

Clerke, A. S., & Heerey, E. A. (2021). The influence of similarity and mimicry on decisions to trust. *Collabra: Psychology*, *7*(1), Article 23441. https://doi.org/10.1525/collabra.23441

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Routledge. https://doi.org/10.4324/9780203771587

Coles, N. A., Larsen, J. T., & Lench, H. C. (2019). A meta-analysis of the facial feedback literature: Effects of facial feedback on emotional experience are small and variable. *Psychological Bulletin*, *145*(6), 610–651. https://doi.org/10.1037/bul0000194

Coles, N. A., March, D. S., Marmolejo-Ramos, F., Larsen, J. T., Arinze, N. C., Ndukaihe, I. L. G., Willis, M. L., Foroni, F., Reggev, N., Mokady, A., Forscher, P. S., Hunter, J. F., Kaminski, G., Yüvrük, E., Kapucu, A., Nagy, T., Hajdu, N., Tejada, J., Freitag, R. M. K., … Liuzza, M. T. (2022). A multi-lab test of the facial feedback hypothesis by the Many Smiles Collaboration. *Nature Human Behaviour*, *6*(12), 1731–1742. https://doi.org/10.1038/s41562-022-01458-9

de Melo, C. M., Carnevale, P. J., Read, S. J., & Gratch, J. (2014). Reading people's minds from emotion expressions in interdependent decision making. *Journal of Personality and Social Psychology*, *106*(1), 73–88. https://doi.org/10.1037/a0034251

Efthimiou, T. N., Baker, J., Clarke, A., Elsenaar, A., Mehu, M., & Korb, S. (2024). Zygomaticus activation through facial neuromuscular electrical stimulation (fNMES) induces happiness perception in ambiguous facial expressions and affects neural correlates of face processing. *Social Cognitive and Affective Neuroscience*, *19*(1), Article nsae013. https://doi.org/10.1093/scan/nsae013

Efthimiou, T. N., Baker, J., Elsenaar, A., Mehu, M., & Korb, S. (2024). Smiling and frowning induced by facial neuromuscular electrical stimulation (fNMES) modulate felt emotion and physiology. *Emotion*, *25*(1), 79–92. https://doi.org/10.1037/emo0001408

Fischer, A., & Hess, U. (2017). Mimicking emotions. *Current Opinion in Psychology*, *17*, 151–155. https://doi.org/10.1016/j.copsyc.2017.07.008

Fischer, A. H., Becker, D., & Veenstra, L. (2012). Emotional mimicry in social context: The case of disgust and pride. *Frontiers in Psychology*, *3*, Article 475. https://doi.org/10.3389/fpsyg.2012.00475

Forbes, P. A. G., Korb, S., Radloff, A., & Lamm, C. (2021). The effects of self-relevance vs. reward value on facial mimicry. *Acta Psychologica*, *212*, Article 103193. https://doi.org/10.1016/j.actpsy.2020.103193

Frijda, N. H. (1986). *The emotions*. Cambridge University Press.

Goldman, A. I., & Sripada, C. S. (2005). Simulationist models of face-based emotion recognition. *Cognition*, *94*(3), 193–213. https://doi.org/10.1016/j.cognition.2004.01.005

Green, P., & MacLeod, C. J. (2016). SIMR: An R package for power analysis of generalized linear mixed models by simulation. *Methods in Ecology and Evolution*, *7*(4), 493–498. https://doi.org/10.1111/2041-210X.12504

Hareli, S. (2014). Making sense of the social world and influencing it by using a naïve attribution theory of emotions. *Emotion Review*, *6*(4), 336–343. https://doi.org/10.1177/1754073914534501

Hareli, S., & Hess, U. (2010). What emotional reactions can tell us about the nature of others: An appraisal perspective on person perception. *Cognition and Emotion*, *24*(1), 128–140. https://doi.org/10.1080/02699930802613828

Hess, U. (2021). Who to whom and why: The social nature of emotional mimicry. *Psychophysiology*, *58*(1), Article e13675. https://doi.org/10.1111/psyp.13675

Hess, U., Adams, R., Jr., & Kleck, R. (2005). Who may frown and who should smile? Dominance, affiliation, and the display of happiness and anger. *Cognition and Emotion*, *19*(4), 515–536. https://doi.org/10.1080/02699930441000364

Hess, U., Arslan, R., Mauersberger, H., Blaison, C., Dufner, M., Denissen, J. J., & Ziegler, M. (2017). Reliability of surface facial electromyography. *Psychophysiology*, *54*(1), 12–23. https://doi.org/10.1111/psyp.12676

Hess, U., & Blairy, S. (2001). Facial mimicry and emotional contagion to dynamic emotional facial expressions and their influence on decoding accuracy. *International Journal of Psychophysiology*, *40*(2), 129–141. https://doi.org/10.1016/S0167-8760(00)00161-6

Hess, U., Blairy, S., & Kleck, R. E. (2000). The influence of facial emotion displays, gender, and ethnicity on judgments of dominance and affiliation. *Journal of Nonverbal Behavior*, *24*(4), 265–283. https://doi.org/10.1023/A:1006623213355

Hess, U., & Bourgeois, P. (2010). You smile—I smile: Emotion expression in social interaction. *Biological Psychology*, *84*(3), 514–520. https://doi.org/10.1016/j.biopsycho.2009.11.001

Hess, U., & Fischer, A. (2013). Emotional mimicry as social regulation. *Personality and Social Psychology Review*, *17*(2), 142–157. https://doi.org/10.1177/1088868312472607

Hess, U., & Hareli, S. (2017). The social signal value of emotions: The role of contextual factors in social inferences drawn from emotion displays. In J.-M. Fernández-Dols & J. A. Russell (Eds.), *The science of facial expression* (pp. 375–393). Oxford University Press.

Hess, U., Philippot, P., & Blairy, S. (1998). Facial reactions to emotional facial expressions: Affect or cognition? *Cognition and Emotion*, *12*(4), 509–531. https://doi.org/10.1080/026999398379547

Hinsz, V. B., & Tomhave, J. A. (1991). Smile and (half) the world smiles with you, frown and you frown alone. *Personality and Social Psychology Bulletin*, *17*(5), 586–592. https://doi.org/10.1177/0146167291175014

Hofree, G., Ruvolo, P., Reinert, A., Bartlett, M. S., & Winkielman, P. (2018). Behind the robot's smiles and frowns: In social context, people do not mirror android's expressions but react to their informational value. *Frontiers in Neurorobotics*, *12*, Article 14. https://doi.org/10.3389/fnbot.2018.00014

Horstmann, G. (2003). What do facial expressions convey: Feeling states, behavioral intentions, or action requests? *Emotion*, *3*(2), 150–166. https://doi.org/10.1037/1528-3542.3.2.150

Jacoby, L. L., Kelley, C. M., & Dywan, J. (1989). Memory attributions. In H. L. Roediger, III & F. I. M. Craik (Eds.), *Varieties of memory and consciousness: Essays in honour of endel Tulving* (pp. 391–422). Lawrence Erlbaum.

Kastendieck, T., Dippel, N., Asbrand, J., & Hess, U. (2023). Influence of child and adult faces with face masks on emotion perception and facial mimicry. *Scientific Reports*, *13*(1), Article 14848. https://doi.org/10.1038/s41598-023-40007-w

Kastendieck, T., Mauersberger, H., Blaison, C., Ghalib, J., & Hess, U. (2021). Laughing at funerals and frowning at weddings: Top-down influences of context-driven social judgments on emotional mimicry. *Acta Psychologica*, *212*, Article 103195. https://doi.org/10.1016/j.actpsy.2020.103195

Kastendieck, T., Zillmer, S., & Hess, U. (2022). (Un)mask yourself! Effects of face masks on facial mimicry and emotion perception during the COVID-19 pandemic. *Cognition and Emotion*, *36*(1), 59–69. https://doi.org/10.1080/02699931.2021.1950639

Keating, C. F., Mazur, A., & Segall, M. H. (1981). A cross-cultural exploration of physiognomic traits of dominance and happiness. *Ethology and Sociobiology*, *2*(1), 41–48. https://doi.org/10.1016/0162-3095(81)90021-2

Keating, C. F., Mazur, A., Segall, M. H., Cysneiros, P. G., Kilbridge, J. E., Leahy, P., Divale, W. T., Komin, S., Thurman, B., & Wirsing, R. (1981). Culture and the perception of social dominance from facial expression. *Journal of Personality and Social Psychology*, *40*(4), 615–626. https://doi.org/10.1037/0022-3514.40.4.615

Kenny, D. A. (2004). PERSON: A general model of interpersonal perception. *Personality and Social Psychology Review*, *8*(3), 265–280. https://doi.org/10.1207/s15327957pspr0803_3

Korb, S., With, S., Niedenthal, P., Kaiser, S., & Grandjean, D. (2014). The perception and mimicry of facial movements predict judgments of smile authenticity. *PLOS ONE*, *9*(6), Article e99194. https://doi.org/10.1371/journal.pone.0099194

Kuznetsova, A., Brockhoff, P. B., & Christensen, R. H. B. (2017). lmerTest package: Tests in linear mixed effects models. *Journal of Statistical Software*, *82*(13), 1–26. https://doi.org/10.18637/jss.v082.i13

Likowski, K. U., Mühlberger, A., Seibt, B., Pauli, P., & Weyers, P. (2008). Modulation of facial mimicry by attitudes. *Journal of Experimental Social Psychology*, *44*(4), 1065–1072. https://doi.org/10.1016/j.jesp.2007.10.007

Lischetzke, T., Cugialy, M., Apt, T., Eid, M., & Niedeggen, M. (2020). Are those who tend to mimic facial expressions especially vulnerable to emotional contagion? *Journal of Nonverbal Behavior*, *44*(1), 133–152. https://doi.org/10.1007/s10919-019-00316-z

Manstead, A. S. R., & Fischer, A. H. (2001). Social appraisal: The social world as object of and influence on appraisal processes. In K. R. Scherer, A. Schorr, & T. Johnstone (Eds.), *Appraisal processes in emotion: Theory, methods, research* (pp. 221–232). Oxford University Press. https://doi.org/10.1093/oso/9780195130072.003.0012

Mauersberger, H., & Hess, U. (2019). When smiling back helps and scowling back hurts: Individual differences in emotional mimicry are associated with self-reported interaction quality during conflict interactions. *Motivation and Emotion*, *43*(3), 471–482. https://doi.org/10.1007/s11031-018-9743-x

Niedenthal, P. M., & Brauer, M. (2012). Social functionality of human emotion. *Annual Review of Psychology*, *63*(1), 259–285. https://doi.org/10.1146/annurev.psych.121208.131605

Niedenthal, P. M., Wood, A., Rychlowska, M., & Korb, S. (2017). Embodied simulation in decoding facial expression. In J.-M. Fernández-Dols & J. A. Russell (Eds.), *The science of facial expression* (pp. 397–414). Oxford University Press.

Olszanowski, M., Kaminska, O. K., & Winkielman, P. (2018). Mixed matters: Fluency impacts trust ratings when faces range on valence but not on motivational implications. *Cognition and Emotion*, *32*(5), 1032–1051. https://doi.org/10.1080/02699931.2017.1386622

Olszanowski, M., Lewandowska, P., Ozimek, A., & Frankowska, N. (2022). The effect of facial self-resemblance on emotional mimicry. *Journal of Nonverbal Behavior*, *46*(2), 197–213. https://doi.org/10.1007/s10919-021-00395-x

Olszanowski, M., Pochwatko, G., Kuklinski, K., Scibor-Rylski, M., Lewinski, P., & Ohme, R. K. (2015). Warsaw set of emotional facial expression pictures: A validation study of facial display photographs. *Frontiers in Psychology*, *5*, Article 1516. https://doi.org/10.3389/fpsyg.2014.01516

Olszanowski, M., & Tołopiło, A. (2024). "Anger? No, thank you. I don't mimic it": How contextual modulation of facial display meaning impacts emotional mimicry. *Cognition and Emotion*, *38*(4), 530–548. https://doi.org/10.1080/02699931.2024.2310759

Olszanowski, M., Tołopiło, A., & Hess, U. (2025, May 29). *Emotional mimicry in social context*. https://osf.io/m5f2v

Olszanowski, M., & Wróbel, M. (2024). Why we mimic emotions even when no one is watching: Limited visual contact and emotional mimicry. *Emotion Review*, *16*(1), 16–27. https://doi.org/10.1177/17540739231193639

Olszanowski, M., Wróbel, M., & Hess, U. (2020). Mimicking and sharing emotions: A re-examination of the link between facial mimicry and emotional contagion. *Cognition and Emotion*, *34*(2), 367–376. https://doi.org/10.1080/02699931.2019.1611543

R Core Team. (2018). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing. https://www.R-project.org

Roseman, I. J. (1991). Appraisal determinants of discrete emotions. *Cognition and Emotion*, *5*(3), 161–200. https://doi.org/10.1080/02699939108411034

Scarantino, A. (2017). How to do things with emotional expressions: The theory of affective pragmatics. *Psychological Inquiry*, *28*(2–3), 165–185. https://doi.org/10.1080/1047840X.2017.1328951

Scarantino, A., Hareli, S., & Hess, U. (2022). Emotional expressions as appeals to recipients. *Emotion*, *22*(8), 1856–1868. https://doi.org/10.1037/emo0001023

Scherer, K. R. (2009). The dynamic architecture of emotion: Evidence for the component process model. *Cognition and Emotion*, *23*(7), 1307–1351. https://doi.org/10.1080/02699930902928969

Scherer, K. R., & Grandjean, D. (2008). Facial expressions allow inference of both emotions and their components. *Cognition and Emotion*, *22*(5), 789–801. https://doi.org/10.1080/02699930701516791

Schirmer, A., & Adolphs, R. (2017). Emotion perception from face, voice, and touch: Comparisons and convergence. *Trends in Cognitive Sciences*, *21*(3), 216–228. https://doi.org/10.1016/j.tics.2017.01.001

Schumann, N. P., Bongers, K., Scholle, H. C., & Guntinas-Lichius, O. (2021). Atlas of voluntary facial muscle activation: Visualization of surface electromyographic activities of facial muscles during mimic exercises. *PLOS ONE*, *16*(7), Article e0254932. https://doi.org/10.1371/journal.pone.0254932

Senior, C., Phillips, M. L., Barnes, J., & David, A. S. (1999). An investigation into the perception of dominance from schematic faces: A study using the World-Wide Web. *Behavior Research Methods, Instruments & Computers*, *31*(2), 341–346. https://doi.org/10.3758/BF03207730

Stel, M., van Dijk, E., & Olivier, E. (2009). You want to know the truth? Then don't mimic! *Psychological Science*, *20*(6), 693–699. https://doi.org/10.1111/j.1467-9280.2009.02350.x

Tassinary, L. G., Cacioppo, J. T., & Vanman, E. J. (2007). The skeletomotor system: Surface electromyography. In J. T. Cacioppo, L. G. Tassinary, & G. G. Berntson (Eds.), *Handbook of psychophysiology* (pp. 267–299). Cambridge University Press.

Tingley, D., Yamamoto, T., Hirose, K., Keele, L., & Imai, K. (2014). mediation: R package for causal mediation analysis. *Journal of Statistical Software*, *59*(5), 1–38. https://doi.org/10.18637/jss.v059.i05

Todorov, A., & Uleman, J. S. (2002). Spontaneous trait inferences are bound to actors' faces: Evidence from a false recognition paradigm. *Journal of Personality and Social Psychology*, *83*(5), 1051–1065. https://doi.org/10.1037/0022-3514.83.5.1051

Todorov, A., & Uleman, J. S. (2003). The efficiency of binding spontaneous trait inferences to actors' faces. *Journal of Experimental Social Psychology*, *39*(6), 549–562. https://doi.org/10.1016/S0022-1031(03)00059-3

van der Schalk, J., Hawk, S. T., Fischer, A. H., & Doosje, B. (2011). Moving faces, looking places: Validation of the Amsterdam Dynamic Facial Expression Set (ADFES). *Emotion*, *11*(4), 907–920. https://doi.org/10.1037/a0023853

Vilaverde, R. F., Horchak, O. V., Pinheiro, A. P., Scott, S. K., Korb, S., & Lima, C. F. (2024). Inhibiting orofacial mimicry affects authenticity perception in vocal emotions. *Emotion*, *24*(6), 1376–1385. https://doi.org/10.1037/emo0001361

Weyers, P., Mühlberger, A., Kund, A., Hess, U., & Pauli, P. (2009). Modulation of facial reactions to avatar emotional faces by nonconscious competition priming. *Psychophysiology*, *46*(2), 328–335. https://doi.org/10.1111/j.1469-8986.2008.00771.x

Winkielman, P., Coulson, S., & Niedenthal, P. (2018). Dynamic grounding of emotion concepts. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *373*(1752), Article 20170127. https://doi.org/10.1098/rstb.2017.0127

Winkielman, P., Olszanowski, M., & Gola, M. (2015). Faces in-between: Evaluations reflect the interplay of facial features and task-dependent fluency. *Emotion*, *15*(2), 232–242. https://doi.org/10.1037/emo0000036

Winkielman, P., Schwarz, N., Fazendeiro, T. A., & Reber, R. (2003). The hedonic marking of processing fluency: Implications for evaluative judgment. In J. Musch & K. C. Klauer (Eds.), *The psychology of evaluation: Affective processes in cognition and emotion* (pp. 189–217). Lawrence Erlbaum.

Wróbel, M., & Królewiak, K. (2017). Do we feel the same way if we think the same way? Shared attitudes and the social induction of affect. *Basic and Applied Social Psychology*, *39*(1), 19–37. https://doi.org/10.1080/01973533.2016.1227709

Wróbel, M., & Olszanowski, M. (2019). Emotional reactions to dynamic morphed facial expressions: A new method to induce emotional contagion. *L'Année Psychologique*, *22*(1), 91–102. https://doi.org/10.18290/rpsych.2019.22.1-6

Zebrowitz, L. A. (2004). The origin of first impressions. *Journal of Cultural and Evolutionary Psychology*, *2*(1–2), 93–108. https://doi.org/10.1556/JCEP.2.2004.1-2.6

Appendix

Suplementary Analysis

Similar to the analysis for mimicry index, data for single muscle activation were analyzed using a LMM's with restricted maximum likelihood estimation and with fixed effects that included the factors of emotion display (three levels: anger vs. sadness vs. happiness), social similarity (two levels: similar vs. different), and type of task—(four levels: trustworthiness vs. attractiveness vs. confidence vs. passive viewing—for Experiment 1; two levels: passive viewing vs. trust game—for Experiment 3) as well as their interactions. The random effects included an intercept for participant id. Type III Satterthwaite's approximations were used to obtain p value estimates and intercepts for each subject. Paired comparisons were made with Bonferroni correction adjusting the p values. The analyses were performed using lme4 and lmerTest packages for R (Bates et al., 2015; Kuznetsova et al., 2017). The muscle activity was averaged between 2 and 6 s of stimuli presentation (i.e., while the emotion display was visible on individuals' face).

Experiment 1

Zygomaticus Major

The results showed significant main effect of displayed emotion: $F(2, 2779) = 28.36$, $p < .001$, $\eta^2 = .02$. Post hoc comparisons indicated that muscle activation was higher in response to happiness than to sadness ($M = 0.30$, $SE = 0.04$ versus $M = 0.02$); $SE = 0.04$, $t(2779) = 6.68$, $p < .001$, $d = 0.31$, and anger ($M = 0.03$; $SE = 0.43$), $t(2779) = 6.37$, $p < .001$, $d = 0.29$, with no significant difference between anger and sadness: $t(2779) = 0.33$, $p = 1$, $d = 0.02$. Additionally there was a significant displayed emotion and type of task interaction: $F(6, 2780) = 2.28$, $p = .034$, $\eta^2 = .01$. Simple comparison revealed that significant difference between happiness and sadness occurred when participants performed attractiveness ($M = 0.34$, $SE = 0.06$ versus $M = -0.02$); $SE = 0.06 - t(2780) = 4.42$, $p < .001$, $d = 0.41$, and trustworthiness judgments ($M =$

(*Appendix continues*)

0.19, $SE = 0.06$ versus $M = -0.04$); $SE = 0.06 - t(28779) = 2.91$, $p = .011$, $d = 0.27$, and during passive viewing ($M = 0.42$, $SE = 0.06$ versus $M = 0.02$); $SE = 0.06 - t(2779) = 4.85$, $p < .001$, $d = 0.45$, but not during confidence judgments. In turn, difference in muscle activity between happiness and anger occurred for attractiveness ($M = 0.34$, $SE = 0.06$ versus $M = 0.03$); $SE = 0.06 - t(2779) = 3.88$, $p < .001$, $d = 0.36$, and confidence judgments ($M = 0.22$, $SE = 0.06$ versus $M = -0.04$); $SE = 0.06 - t(2779) = 3.23$, $p = .004$, $d = 0.30$, and passive viewing ($M = 0.42$, $SE = 0.06$ versus $M = 0.07$); $SE = 0.06 - t(2779) = 4.28$, $p < .001$, $d = 0.39$, but not trustworthiness judgments. Remaining statistics showed no significant differences (see Table A1 for details).

Corrugator Supercilii

The results showed significant main effect of displayed emotion—$F(2, 2847) = 60.67$, $p < .001$, $\eta^2 = .04$. Post hoc comparisons indicated that sadness was related with higher muscle reactions than happiness ($M = 0.12$, $SE = 0.04$ versus $M = -0.26$); $SE = 0.04$, $t(2847) = 10.68$, $p < .001$, $d = 0.49$, and anger, $M = 0.02$; $SE = 0.04$, $t(2846) = 2.96$, $p = .01$, $d = 0.13$, while the reactions for anger were higher than for happiness: $t(2846) = 7.71$, $p < .001$, $d = 0.35$. Additionally, there was a significant displayed emotion and social similarity interaction: $F(2, 2847) = 3.85$, $p = .021$, $\eta^2 < .01$, more specifically the difference occurred in case of happiness, $M_{\text{similar}} = -0.33$, $SE = 0.05$ versus $M_{\text{dissimilar}} = -0.19$; $SE = 0.05$, $t(2847) = 2.83$, $p = .005$, $d = 0.22$, while for anger and sadness, there were no significant differences. Remaining statistics showed no significant differences (see Table A1 for details).

Depressor Anguli Oris

The results showed only significant main effect of similarity: $F(1, 2789) = 5.56$, $p = .018$, $\eta^2 < .01$. Larger muscle activation was associated with socially similar individuals than dissimilar ones: $M = 0.04$, $SE = 0.02$ versus $M = -0.02$; $SE = 0.02$. Remaining statistics showed no significant differences (see Table A1 for details).

Experiment 3

Zygomaticus Major

The results showed significant main effect of displayed emotion: $F(2, 2935) = 14.82$, $p < .001$, $\eta^2 = .01$. Post hoc comparisons indicated that muscle activation was higher in response to happiness than to sadness ($M = 0.15$, $SE = 0.05$ versus $M = -0.13$); $SE = 0.05$, $t(2935) = 5.21$, $p < .001$, $d = 0.24$), and anger ($M = -0.07$; $SE = 0.05$), $t(2935) = 3.97$, $p = .001$, $d = 0.18$, with no significant difference between anger and sadness: $t(2934) = 1.25$, $p = .63$, $d = 0.06$. Additionally, there were a significant main effects of similarity: $F(1, 2936) = 4.52$, $p = .034$, $\eta^2 < .01$—higher muscle activation for similar than for dissimilar individuals ($M = 0.03$, $SE = 0.04$ vs. $M = -0.06$, $SE = 0.04$) and type of task: $F(1, 2936) = 11.53$, $p < .001$, $\eta^2 < .01$—higher muscle reactions occurred during passive viewing stage than during trust game ($M = 0.06$, $SE = 0.05$ vs. $M = -0.09$, $SE = 0.04$). Also, emotional display and type of task interaction was significant: $F(2, 2935) = 5.81$, $p = .003$, $\eta^2 < .01$. Simple comparison revealed that the response to happiness was stronger during passive viewing than during trust game ($M = 0.29$, $SE = 0.07$ versus $M = -0.02$, $SE = 0.05$), $t(2935) = 4.36$, $p < .001$, $d = 0.3$, but there was no difference for anger and sadness. Remaining statistics showed no significant differences (see Table A2 for details).

Corrugator Supercilii

The results showed significant main effect of displayed emotion—$F(2, 2951) = 9.80$, $p < .001$, $\eta^2 = .01$. Post hoc comparisons

Table A1
Statistics for Linear Mixed Model With Single Muscle Activity in Experiment 1

Muscle	Within-subjects effect	*df*	*F*	*p*	η^2
Zygomaticus	Displayed emotion (E)	2, 2779	28.36	<.001	.02
	Social similarity (S)	1, 2780	3.64	.056	<.01
	Type of task (T)	3, 2780	1.44	.230	<.01
	E × S	2, 2780	2.18	.113	<.01
	E × T	6, 2780	2.26	.035	<.01
	T × S	3, 2780	0.02	.996	<.01
	E × S × T	6, 2780	0.70	.652	<.01
Corrugator	Displayed emotion	2, 2847	60.67	<.001	.04
	Social similarity	1, 2847	0.99	.320	<.01
	Type of task	3, 2847	1.61	.186	<.01
	E × S	2, 2847	3.85	.021	<.01
	E × T	6, 2847	1.55	.157	<.01
	T × S	3, 2847	0.90	.439	<.01
	E × S × T	6, 2847	0.77	.596	<.01
Depressor	Displayed emotion	2, 2789	0.76	.467	<.01
	Social similarity	1, 2789	5.56	.018	<.01
	Type of task	3, 2789	2.51	.057	<.01
	E × S	2, 2789	0.56	.572	<.01
	E × T	6, 2789	1.32	.243	<.01
	T × S	3, 2789	1.88	.131	<.01
	E × S × T	6, 2789	0.30	.936	<.01

Table A2
Statistics for Linear Mixed Model With Single Muscle Activity in Experiment 3

Muscle	Within-subjects effect	*df*	*F*	*p*	η^2
Zygomaticus	Displayed emotion (E)	2, 2935	14.82	<.001	.01
	Social similarity (S)	1, 2935	4.52	.034	<.01
	Type of task (T)	1, 2935	11.53	.001	<.01
	E × S	2, 2935	0.03	.971	<.01
	E × T	2, 2935	5.81	.003	<.01
	T × S	1, 2935	0.40	.526	<.01
	E × S × T	2, 2935	0.62	.539	<.01
Corrugator	Displayed emotion	2, 2951	9.80	<.001	.01
	Social similarity	1, 2951	0.17	.679	<.01
	Type of task	1, 2951	4.06	.044	<.01
	E × S	2, 2951	0.21	.807	<.01
	E × T	2, 2951	0.54	.583	<.01
	T × S	1, 2951	0.75	.387	<.01
	E × S × T	2, 2951	0.34	.714	<.01
Lavator	Displayed emotion	2, 2942	6.07	.002	<.01
	Social similarity	1, 2942	1.53	.216	<.01
	Type of task	1, 2942	0.72	.396	<.01
	E × S	2, 2942	0.57	.564	<.01
	E × T	2, 2942	3.87	.021	<.01
	T × S	1, 2942	0.06	.800	<.01
	E × S × T	2, 2942	0.47	.625	<.01

(*Appendix continues*)

indicated that happiness display evoked the weakest muscle reaction as compared to sadness ($M = -0.27$, $SE = 0.04$ versus $M = -0.11$); $SE = 0.04$, $t(2951) = 3.83$, $p < .001$, $d = 0.2$, and anger ($M = -0.11$; $SE = 0.04$), $t(2951) = 3.85$, $p < .001$, $d = 0.2$, with no significant difference between anger and sadness, $t(2951) = 0.01$, $p = 1$, $d < 0.1$. Also, there was a significant main effect of type of task: $F(1, 2951) = 4.05$, $p = .044$, $\eta^2 < .01$—lower muscle reactions occurred during passive viewing stage than during trust game ($M = -0.20$, $SE = 0.04$ vs. $M = -0.13$, $SE = 0.03$). Remaining statistics showed no significant differences (see Table A2 for details).

Lavator Labii Superioris

The results showed significant main effect of emotional display: $F(1, 2942) = 6.10$, $p = .002$, $\eta^2 < .01$. Larger muscle activation was associated with a response to happiness displays than to display of anger ($M = 0.07$, $SE = 0.05$ versus $M = -0.07$); $SE = 0.05$, $t(2942) = 2.70$, $p = .021$, $d = 0.14$, and sadness ($M = -0.10$; $SE = 0.05$), $t(2942) = 3.29$, $p = .003$, $d = 0.17$, with no significant difference between anger and sadness: $t(2941) = 0.59$, $p = 1$, $d = 0.02$. Also, there was a significant interaction between emotional display and type of task, $F(1, 2942) = 3.87$, $p = .021$, $\eta^2 < .01$. Specifically, larger muscle activity occurred during passive viewing of happiness displays as compared to sadness displays ($M = 0.13$, $SE = 0.07$ versus $M = -0.16$); $SE = 0.07$, $t(2942) = 3.36$, $p = .012$, $d = 0.3$, while there no such difference occurred during game ($M = 0.002$, $SE = 0.05$ versus $M = -0.03$); $SE = 0.05$, $t(2942) = 0.73$, $p = .1$, $d = 0.04$. Remaining statistics showed no significant differences (see Table A2 for details).

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