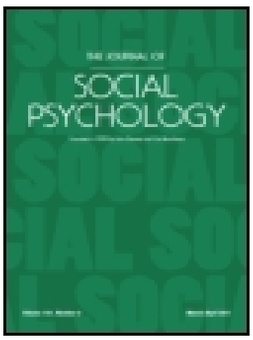

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Group membership moderates the process of making trust judgments based on facial cues

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ABSTRACT

Trust is a foundation of interpersonal communication. Faces have a significant impact on trust judgments, and separate research demonstrates that group membership also influences trust judgments. However, it remains unclear whether and how group membership moderates the effect of face trustworthiness on trust judgments and investment decisions. In the present research, two experiments were conducted to explore the moderating effect of group membership (i.e., in-group vs. out-group) on perceptions of facial trustworthiness and trust judgments. Results showed that participants invested significantly more money on trials with trustworthy faces than trials with untrustworthy faces. Additionally, there was a significant interaction between group membership and facial trustworthiness; the investment difference between trustworthy faces and untrustworthy faces was greater for trials with in-group member faces than out-group member faces. These findings indicate that top-down and bottom-up cues jointly influence behavioral decisions.

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Trust; group membership; facial trustworthiness; top-down; bottom-up

Trust helps maintain shared value and stability of society (Bascandziev & Harris, 2016; Liu et al., 2018; Thielmann & Hilbig, 2016), influencing all aspects of life, such as shopping, marriage, friendships, and seeking medical treatment (Rychlowska et al., 2019). Trust builds individual cooperation and reciprocity (Hoicka et al., 2017; Schul & Peri, 2015). In contrast, when trust is lacking, individuals may take self-protective measures (Spence et al., 2016), which can result in unfavorable outcomes such as increased costs in commercial transactions (Bottazzi et al., 2016). Several studies have reported that trust judgments are influenced by facial appearance (Ert et al., 2016; Jessen & Grossmann, 2017), but the role of group membership remains relatively unexplored. The purpose of the present research was to examine whether group membership and facial features affect trust judgments, and attendant behavioral decisions, simultaneously.

Faces can powerfully affect first impressions, which strongly influence trust judgments (Ert et al., 2016; Jessen & Grossmann, 2017; Wilson & Rule, 2015). Facial trustworthiness is generally determined by facial features, with high inner eyebrows, pronounced cheekbones, wide chins, and a shallow nose sellion (the point at which the nose meets the forehead) more strongly associated with trustworthiness than lower inner eyebrows, shallow cheekbones, thin chins, and a deep nose sellion (Todorov et al., 2008). Facial trustworthiness, in turn, influences behavioral decisions.

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A significant body of research demonstrates that facial trustworthiness can influence decision-making behavior, such as helping others or choosing spouses (Jessen & Grossmann, 2017; Zhang et al., 2016). One common paradigm used to study the impact of facial trustworthiness on behavior is the trust game, which examines the production processes and influential factors of interpersonal trust in decision-making situations (Berg et al., 1995). In the trust game, the "trustor" is given funds that they may choose to invest in another person (the "trustee"). The trustee then has the choice to return all, some, or none of the funds back to the trustor. Trust is measured by the amount invested by the trustor. In this scenario, the trustor's investment is risky because they cannot be sure the trustee will return the funds, thus trusting behaviors include risk of injury or loss to oneself (Moretto et al., 2013). Yet, even in this risky situation, individuals are generally willing to invest money in people, and more willing to invest in people with trustworthy faces than people with untrustworthy faces (Centorrino et al., 2015; Chang et al., 2010; Stirrat & Perrett, 2010).

Previous studies have used the trust game to explore the influence of facial trustworthiness on trust judgments in a Chinese sample (Li et al., 2017), but the facial images used in this research did not come from a standardized face database. The first stage of Experiment 1 addresses the ecological and reliable approach by using photographs from a standardized face database of Chinese to explore the influence of facial trustworthiness on trust judgments among Chinese participants in Chinese culture.

Hypothesis 1: In the trust game, participants would invest more money in people who had trustworthy faces than untrustworthy faces.

Many studies explain the impact of facial features on behavioral decisions using a bottom-up perspective, but making judgments solely based on facial cues may not capture the full picture. In recent years, researchers have begun to examine the top-down processes of encoding facial cues, with some of this research focusing on the influence of group membership on facial perceptions and judgments. Group membership influences facial perceptions very early in the processing stream (Ratner & Amodio, 2013), creating ample opportunity to influence downstream judgments. For example, in-group faces are more likely to be evaluated positively, while out-group faces are perceived negatively (Weisbuch & Ambady, 2008; Paulus & Wentura, 2018), and political partisans rate individuals as more physically attractive when told they preferred the same political candidates as themselves, implying a shared group membership (Nicholson et al., 2016). More relevant to the current investigation, when facial cues are combined with group membership, individuals consider the faces of in-group members to be more competent, attractive, and trustworthy than those of out-group members (Tsankova et al., 2018). Therefore, it is reasonable to infer that top-down processes driven by group memberships may influence trust judgments based on facial trustworthiness.

Previous research investigated the impact of group membership on facial processing, but it is still unclear how top-down information (group membership) and bottom-up information (faces) affect trust behavior simultaneously. Previous research found that in-group faces are more finely processed than out-group faces (Ratner & Amodio, 2013). Perhaps this is because judging the facial trustworthiness of in-group members can be vital to survival (Winston et al., 2002). Relatedly, people tend to think that out-group members have greater similarity and consistency (i.e., lack internal diversity), while in-group members have greater internal differences (Hughes et al., 2019). Given this, it is reasonable to assume that group membership and facial trustworthiness may interact to influence investment decisions. For members of the in-group, people may pay greater attention to differences in facial trustworthiness, while paying less attention to differences in facial trustworthiness for members of the out-group under the assumption that they are "all the same." Thus, the impact of facial trustworthiness on investment choices may be greater for in-group faces than out-group faces.

Hypothesis 2: Group memberships and facial features interact to affect investment behavior; the effect of facial features on investment behavior is greater for in-group faces than out-group faces.

The current research uses a minimal group paradigm (Tajfel, 1978) to manipulate facial group membership (in-group versus out-group) and the classic "trust game" paradigm (Centorrino et al., 2015) to measure trust judgments. Experiment 1 examines the moderating impact of group membership on perceptions of facial trustworthiness and trust judgments, and how bottom-up processing affects trust behavior in Chinese participants. Experiment 2 further investigates the moderating effect of group membership on facial trustworthiness and trust judgments.

Experiment 1

Method

Participants

Forty participants between the ages of 18 and 25 years (M_{age} = 20.10, SD = 1.80) were recruited for Experiment 1 (20 males and 20 females). Participants attended both the first and second stage of the experiment, with the second stage starting at least one week later to avoid facial familiarity effects. No participants were able to accurately report whether the faces in the two stages were identical. Eight participants were removed from the sample due to failing a manipulation check, leaving a final sample of 32 participants (14 males and 18 females; M_{age} = 19.91, SD = 1.59). A sensitivity analysis conducted with G*Power (Faul et al., 2007) indicated that the minimum effect size detectable with this sample size and power of 0.80 is f = 0.21. Eyesight, right-hand dominance, and psychiatric/brain damage history were tested in all participants and declared normal. All participants were volunteers and written informed consent was obtained before the start of the experiment. The study was approved by the local ethics committee as in accordance with the ethical principles of the Declaration of Helsinki. All measures, manipulations and exclusions are disclosed.

Materials

A total of 175 neutral facial images were selected from the Chinese Affective Picture System (Gong et al., 2011). After processing in Photoshop CS5, all stimuli were grayscale photos with the same physical properties such as size, brightness, contrast, and spatial frequency. The picture size was 400 × 400 pixels. The facial images only included internal features such as eyes, noses, mouths, and cheeks. All faces exhibited a neutral expression and were free from accessories and blemishes (e.g., facial hair, glasses, skin blemishes, make-up).

An independent sample of 56 participants (23 males, 33 females), between the ages of 18 and 25 (M_{age} = 21.49, SD = 2.06) were recruited to evaluate the trustworthiness of the facial images using a scale ranging from 1 (totally untrustworthy) to 7 (totally trustworthy). Facial images ranked in the top 27% were categorized as trustworthy faces (20 photos), and images ranked in the bottom 27% were categorized as untrustworthy faces (20 photos). Paired sample t-tests showed a significant difference between trustworthy faces (M = 4.86, SD = .26) and untrustworthy faces (M = 3.05, SD = .34), t (39) = 18.88, $p < .001$, d = 5.98.

Measures

The experiment consisted of two stages. In the first stage, we used the trust game paradigm (Centorrino et al., 2015) to measure the extent to which participants trusted the trustworthy and untrustworthy faces. At the beginning of the game, the participant (the "trustor") has a certain amount of money, and they must decide how much of this money (e.g., all, some, none) to invest in their game partner (the "trustee"). If the trustor decides to invest, the experimenter will automatically triple the amount, which means the trustee receives triple the amount of money the trustor originally invested. The trustee may then decide to return a portion of the invested amount to the trustor, or they may

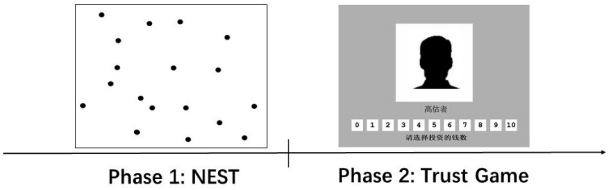

Figure 1. Overview of the study.

choose to keep all the money for themselves. If the trustor decides not to invest, the game ends and the trustor simply keeps the initial money.

The second stage involved manipulating group memberships using Tajfel's minimal group paradigm (Tajfel, 1978) combined with the Numerical Estimation Style Test (NEST) (Ratner & Amodio, 2013).

Procedure

In the first stage, participants were told they were going to play an investment game with people from all walks of life. The game had a total of 50 trials: 10 trials for the practice phase and 40 trials for the experimental phase. In each trial, participants played the role of a trustor, and the trustees' facial images were presented on a computer screen while participants were making investment decisions. A picture of a cross "+" was first presented on the screen for 500 ms as a fixation point, then the trustee's facial image was presented in the center of the screen. Each participant had 10 renminbi (RMB) they could invest in each trial. Values ranging from 0 to 10 were displayed below the facial image on the screen and represented the different amounts of money participants could choose to invest on that trial. Participants were told to choose a number representing the amount they wished to invest in the trustee displayed on the screen. Their final, total money after investment was displayed on the screen at the end of each trial. All facial images in the 50 trials were displayed randomly for each participant.

The second stage of the study included two parts. The first part involved dividing participants into different groups based on the NEST (i.e., forming minimal groups). The second part was a repetition of the "trust game," however, the trustees' group memberships were also displayed on the screen while participants made investment decisions.

For the NEST, participants were told they would play a game to test their cognitive type. The test consisted of 10 trials, with 20 to 30 black dots displayed on a computer screen with a white background for 500 ms per trial. Participants were asked to estimate the number of dots as accurately as possible and enter the estimated number using the keyboard. The screen displayed fake feedback at the end of the test. The feedback for each participant was the same – they were all informed that they belong to the "overestimate" group.

After receiving their group membership, all participants played the trust game again. The facial images were the same as those used in the first stage. However, a description of the trustee's cognitive type ("overestimate group" or "underestimate group") was displayed below each trustee's facial image (see Figure 1)

At the end of the trust game, all participants were asked to report their cognitive type. Their options included "overestimate," "underestimate," and "forgot my cognitive type." Only data from participants who correctly reported their cognitive type as "overestimate" were retained. Eight participants were excluded from the data analysis for this reason. Finally, participants were told the purpose of the study and informed that the cognitive types were fake and used only to manipulate perceived group membership.

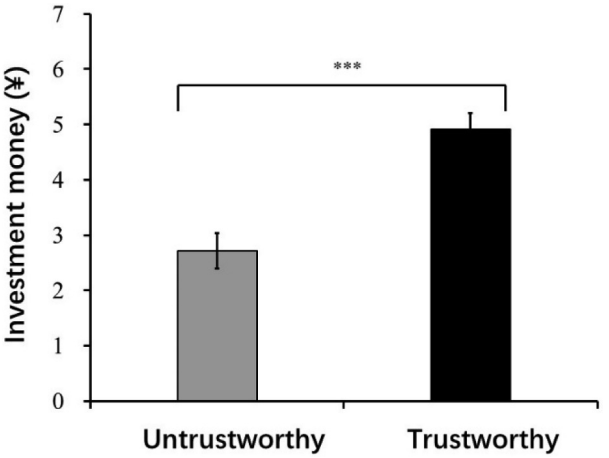

Figure 2. The amount of investment money trustees got with different facial trustworthiness (*$p < .05$, **$p < .01$, ***$p < .001$).

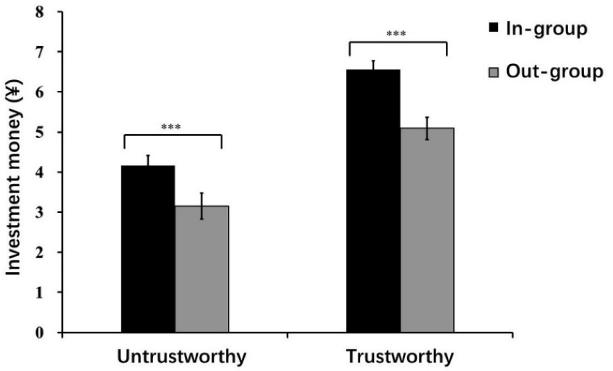

Figure 3. Interaction between facial trustworthiness and group membership.

Results

A paired samples t-test was conducted to compare investment amounts from the first stage trust game (see Figure 2). Participants invested significantly more on trials with trustworthy faces ($M = 4.92$, $SD = 1.79$) than trials with untrustworthy faces ($M = 2.71$, $SD = 1.61$), $t\ (31) = 7.14$, $p < .001$, $d = 1.30$, $BF_{10} > 1000$. This confirms that the trustworthy faces inspired more trusting judgments than untrustworthy faces.

A 2 (facial trustworthiness: trustworthy vs. untrustworthy) × 2 (group membership: in-group vs. out-group) repeated-measures ANOVA was conducted on the investment data from the second stage trust game. The main effect of facial trustworthiness was significant, $F\ (1, 31) = 15.85$, $p < .001$, $\eta^2_p = .34$, $BF_{10} = 4.71$; participants invested more money on trials with trustworthy faces ($M = 5.36$, $SD = .99$) than trials with untrustworthy faces ($M = 4.12$, $SD = 1.45$). The main effect of group membership was also significant, $F\ (1, 31) = 51.81$, $p < .001$, $\eta^2_p = .63$, $BF_{10} > 100$; Participants invested more money on trials with in-group members ($M = 5.82$, $SD = 1.32$) than trials with out-group members ($M = 3.66$, $SD = 1.20$). Most importantly, the interaction between group membership and facial trustworthiness was significant, $F\ (1, 31) = 4.92$, $p = .034$, $\eta^2_p = .14$, $BF_{10} = 9.59$.

We conducted simple effect analyses to separately examine the effect of facial trustworthiness for in-group member and out-group member trials (see Figure 3). For in-group member trials, participants invested significantly more money on trials with trustworthy faces ($M = 6.55$, $SD = 1.42$) than

trials with untrustworthy faces (M = 4.16, SD = 1.86), p < .001, 95% CI = [−3.11, −1.68], BF_{10} > 1000. Participants also invested more money in trials with trustworthy faces (M = 5.09, SD = 1.25) than trials with untrustworthy faces (M = 3.15, SD = 1.60) for the out-group member trials, p < .001, 95% CI = [−2.51, −1.37], BF_{10} > 1000, but the difference was smaller for out-group member trials (M_{diff} = 1.94) than in-group member trials (M_{diff} = 2.39), t (31) = 2.22, p = .034, d = .25. This suggests facial trustworthiness had a stronger impact on trust judgments and investment decisions for in-group members than out-group members.

Discussion

Results from Experiment 1 suggest that group membership moderates the effect of face trustworthiness on trust judgments. Specifically, face trustworthiness appears to exert a stronger influence on trust judgments when those judgment involve in-group members than when those judgments involve out-group members.

The first stage of the experiment used ecologically valid materials to initially verify that facial trustworthiness also affects trust judgments in Chinese culture. Although participants could not accurately report whether faces in the first and second stages of the experiment were identical, we cannot rule out that familiarity influenced trust judgments for the trustworthy and untrustworthy faces in the second stage. Experiment 2 was conducted to address this limitation.

Experiment 2

Method

Participants

We recruited 36 participants (11 males and 25 females; M_{age} = 23.72, SD = 1.41) for Experiment 2. A sensitivity analysis conducted with G*Power 3.1 (Faul et al., 2007) indicated that the minimum effect size detectable with this sample size and power of 0.80 was f = 0.20. Participant selection criteria and ethical considerations were the same as in Experiment 1.

Materials and measures

All materials and measures were the same as Experiment 1.

Procedure

The procedure was the same as Experiment 1, with the exception that there was no first stage. Participants first completed the NEST to identify them as "over estimators" and then completed the 50-trial trust game.

Results

A 2 (facial trustworthiness: trustworthy vs. untrustworthy) × 2 (group membership: in-group vs. out-group) repeated measures ANOVA was conducted on the amount of money invested in the trust game. The main effect of facial trustworthiness was significant, F (1, 35) = 26.69, p < .001, η^2_p = .43, BF_{10} > 1000; participants invested more money in trials with trustworthy faces (M = 4.50, SD = 1.63) than untrustworthy faces (M = 3.10, SD = 1.74). In contrast, the main effect of group membership was not significant, F (1, 35) = 1.67, p = .20, η^2_p = .05, BF_{10} = 0.44, nor was the interaction between the two factors, F (1, 35) = 2.34, p = .14, η^2_p = .06, BF_{10} > 1000.

Although the interaction was not significant, we conducted simple effect analyses to directly test our original predictions. Starting with trials with in-group members, participants invested significantly more money in trustworthy faces (M = 4.35, SD = 1.25) than untrustworthy faces (M = 2.94, SD = 1.25), p < .001, 95% CI = [−1.94, −0.88], BF_{10} > 100. On trials with out-group members,

participants still invested significantly more money in trustworthy faces (M = 4.54, SD = 1.31) than untrustworthy faces (M = 3.44, SD = 1.34), $p < .001$, 95% CI = [−1.64, −0.56], $BF_{10} > 1000$. A comparison of difference scores between out-group member trials (M_{diff} = 1.10) and in-group member trials (M_{diff} = 1.41), failed to reach significance, t (35) = 1.53, p = .135, d = .20, but was trending in the same direction as in Experiment 1 (larger effect of face trustworthiness on in-group member trials than out-group member trials). These results therefore partially confirm that group membership moderated the effect of facial trustworthiness on trust judgments, with facial trustworthiness exerting a stronger effect on trials with in-group faces than those with out-group faces.

Discussion

The results from Experiment 2 only partially confirmed the results from Experiment 1. Facial trustworthiness influenced trust judgments for both in-group and out-group members. While there was a trend such that facial trustworthiness appeared to be more influential when making judgments about in-group members, this trend did not reach significance.

General discussion

The trust game paradigm was used in the present research to explore the extent to which group membership moderates the impact of facial cues on trust-based decision-making. Supporting Hypothesis 1, Chinese participants in both experiments invested more money in individuals who had trustworthy faces than individuals who had untrustworthy faces. In partial support of Hypothesis 2, group membership moderated this effect in Experiment 1 and was trending toward moderation in Experiment 2. Specifically, facial trustworthiness appeared to more strongly influence decisions to invest in in-group members than decisions to invest in out-group members. These are the first studies to demonstrate the joint and interactive influence of facial trustworthiness and group membership on trust judgments.

Individuals tend to trust people who had trustworthy faces

The present research results replicate past findings that people are more likely to trust those with specific trustworthy facial features. This is best explained by the emotion overgeneralization hypothesis, which proposes that the evaluation of traits is an overgeneralization of emotional valence (Engell et al., 2010; Franklin & Zebrowitz, 2013; Todorov et al., 2008, 2008). Specifically, facial features that resemble those signaling happiness or anger elicit inferences about the person's traits (trustworthy versus untrustworthy) and intensions (helpful or harmful; Oosterhof & Todorov, 2008). Applied to the current research, the trustworthy face stimuli possess facial features that resemble happiness facial cues. This information is used by participants to infer that the person is trustworthy and does not intend any harm, leading to a willingness to invest more money during the trust game. In contrast, untrustworthy face stimuli possess facial features that resemble anger. Participants might use this information to infer the person is untrustworthy and intends to cause them harm, leading them to invest less money in that person during the trust game. In this way, bottom-up processing of basic facial features exerts a significant and meaningful influence on trust perceptions and attending behavioral decisions.

These results extend previous findings on facial features and trust in two important ways. First, both experiments used faces from real individuals instead of computer-generated faces, which enhances the ecological validity of the results. Second, the results verify previous research conducted with Chinese samples (Li et al., 2017), confirming the generalizability of these findings in this population. Beyond this, our examination of group membership makes another important contribution to the literature.

Group membership as a potential moderator

Experiment 1 found clear evidence that group membership moderated the effect of facial trustworthiness on trust judgments and behavioral decisions. These results may be best interpreted in the context of the dual-process account of selective trust (Hermes et al., 2018). According to this account, there are two general processes that underlie trust judgments – Type I and Type II. Type I processes operate quickly and automatically with minimal need for cognitive resources, yielding trust judgments based largely on heuristics. In contrast, Type II processes are slower, more deliberate, and require the availability of cognitive resources to operate. It is assumed that, when making trust judgments, Type I processes yield an initial judgment which may or may not be subjected to modification by Type II processes further down in the processing stream (Hermes et al., 2018).

Applied to the current research, it is plausible facial trustworthiness is processed in a bottom-up fashion largely via Type I processes while group membership is processed via Type II processes. In Experiment 1, Type I processes yielded heuristic trust judgments based on facial trustworthiness, but these judgments were modified in a top-down fashion by Type II processes using the provided group membership information. The trust game from Stage 1 provides a useful baseline regarding the difference in investment decisions between trustworthy and untrustworthy faces, driven by Type I processes. For the Stage 2 trust game, the difference in investment decisions between trustworthy and untrustworthy faces was larger on in-group trials than the difference from Stage 1. This suggests Type II processes enhanced processing of facial trustworthiness information for in-group members, which resulted in greater investment differences between trustworthy and untrustworthy faces. In contrast, the Stage 2 difference in investment decisions between trustworthy and untrustworthy faces was smaller on out-group trials than the difference from Stage 1. This suggests Type II processes may have reduced processing of facial trustworthiness information for out-group member faces, resulting in smaller investment differences across face types.

This interpretation is further supported by other research finding that group membership moderates facial processing (Young et al., 2010). Specifically, in-group faces are more deeply processed at the encoding (Ratner & Amodio, 2013; Van Bavel et al., 2011) and recognition stages (B. M. Craig & Lipp, 2018; Zhao & Bentin, 2011) compared with out-group faces. In contrast, out-group faces are processed more superficially (B.M. Craig & Thorne, 2019). Additionally, when making behavioral decisions based on facial cues, more cognitive resources are used when processing in-group faces (Hugenberg et al., 2010; Van Bavel et al., 2011). Together, this evidence suggests group membership information is used in a top-down fashion to selectively enhance or reduce processing of facial information, including facial trustworthiness, via Type II processes. However, Experiment 2 yielded different results.

While group membership clearly moderated the effect of facial trustworthiness in Experiment 1, evidence for this interaction was weaker in Experiment 2 (non-significant trend). This suggests Type II processes were more influential in Experiment 1 than they were in Experiment 2. Hermes et al. (2018) identify several conditions when Type II processes are more likely to moderate or impact trust judgments – 1) when there are sufficient cognitive resources available, 2) when the person has sufficient background knowledge in the given domain, and 3) when elements of the task result in Type 1 processes yielding conflicting information or conclusions. Participants in both experiments had the same background information (group membership based on being an overestimator versus an underestimator), so we do not believe this can explain the divergent results. Participants also had the same task and information, so it is not particularly plausible that Type I processes yielded conflicting conclusions in Experiment 1 but not Experiment 2. This leaves the first explanation – availability of cognitive resources – as the most plausible explanation.

Specifically, the results suggest that participants in Experiment 1 had lower cognitive load (i.e., more cognitive resources available) while completing the trust game than participants in Experiment 2. This lower cognitive load may be due to having played the trust game before (they already knew the rules and procedures and thus did not need to devote as many resources to processing this information as they played) and/or the fact that they had already seen and judged the facial stimuli before (fewer

resources devoted to processing them), although the latter explanation seems less likely given that Experiment 1 participants were unable to report whether they had seen the faces before. An intriguing next step for future research would be to compare the moderating impact of group membership on trust judgments across two separate trust game sessions but change the facial stimuli across sessions.

There are other interesting future directions for this work. For example, the moderating impact of group membership on trust judgments may vary across different types of group. The present research used the minimal groups paradigm, as this was the most conservative test of group membership influence. It is reasonable to expect that other group memberships (e.g., nationality, race, political ideology) would exert a stronger influence on trust judgments via Type II processes given the more extensive background knowledge individuals would possess concerning these groups. Indeed, this effect may be further moderated by how strongly the participant personally identifies with that particular in-group. Another useful extension of the present research would be to measure event-related potentials during the trust game, as this could help explicate the timing and cognitive processes that are involved when group membership exerts a moderating effect.

Conclusion

Knowing how social information affects trust judgments can ultimately help people maintain good relationships. Previous research has demonstrated the impact of facial features on trust judgments and decision making (Jessen & Grossmann, 2017; Wilson & Rule, 2015) as well as the impact of group membership on behavioral decisions (Balliet et al., 2014; McAuliffe & Dunham, 2016). The current study extended this work by exploring the interactive effect of facial cues and group membership on trust judgments. The results suggest that group membership can, under certain circumstances, moderate the influence of facial trustworthiness on trust judgments, magnifying the effect for in-group members while dampening the effect for out-group members. This underscores the importance of top-down information when making behavioral decisions based on facial features.

Data availability statement

The data described in this article are openly available in the Open Science Framework at https://osf.io/6jdyt.

Open scholarship

This article has earned the Center for Open Science badges for Open Data and Open Materials through Open Practices Disclosure. The data and materials are openly accessible at https://osf.io/6jdyt.

Diclosure statement

No potential conflict of interest was reported by the author(s).

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