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Emotion regulation of social exclusion: a cross-cultural study

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Social exclusion is harmful to basic human needs. Emotion regulation represents a potential coping strategy. As culture can influence how people react and regulate their emotions, this study examined whether emotional reaction and regulation in response to social exclusion differ between individualistic and collectivistic cultures. A total of 80 college students, half White ($n = 40$, recruited in Manchester, UK) and half East Asian ($n = 40$, recruited in Shenzhen, China) viewed social exclusion pictures expressed by same-race or other-race characters. Both groups of participants viewed these pictures under no-reappraisal (passive viewing) and reappraisal (reinterpretation) conditions. Participants rated their vicarious negative emotional experience after each picture presentation. Results showed that both White and East Asian participants expressed greater negative emotion and showed stronger emotion regulation effects when facing own-race social exclusion, i.e., the “own-race bias”. In addition, White participants were more capable of regulating the negative emotions elicited by social exclusion compared to East Asian participants. Findings highlight the importance of considering the role of culture in emotional reaction to and emotion regulation of social exclusion, which may help the development of appropriate interventions across diverse populations.

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Introduction

Social exclusion (social pain or ostracism) refers to the circumstance that individuals (or groups) are separated from the desired relationships, or devalued by peers or groups in the desired relationship (Macdonald and Leary, 2005). According to the need-threat temporal model of ostracism (Williams, 2009), during the immediate reaction stage, social exclusion strongly threatens four fundamental human needs: belonging, self-esteem, control, and meaningful existence (Onoda et al., 2010; Williams, 2007). In the following coping stage, excluded individuals try to cope with the situation so as to reduce the harmful effects of social exclusion. This can happen in a way of explicitly down-regulating their negative emotions evoked by social exclusion (Gross, 2002; He et al., 2019a, 2019b).

Both emotional reaction (a short-term state that is directly related to the environmental stimuli (Schreuder et al., 2016) and emotion regulation (the processes by which individuals influence which emotions they have, when they have them, and how they experience and express these emotions (Gross, 1998)) can be strongly affected by cultural difference (Butler et al., 2007). This is because every culture differentially encourages and reinforces emotional responding, leading to differences in the circumstances under which emotional responses are regulated (Butler et al., 2007; Kwon et al., 2013). Regarding the cultural effects on emotional reaction, numerous studies have shown that individuals have a stronger reaction or better recognition of same-race emotional stimuli emotions expressed by characters of the same race, i.e., the “own-race bias” (Brown et al., 2006; Lee et al., 2008; Roberts and Levenson, 2006). However, fewer studies have investigated how culture influences emotional response to social exclusion. A previous study found that social distress elicited by exclusion is stronger when the faces showed are from the same race background (Krill and Platek, 2009). However, this study only investigated White participants, which makes it unclear whether the “own-race bias” an emotional reaction to social exclusion is universal or cultural-specific.

Culture also influences how people initiate emotion regulation (for a review, see (Ford and Mauss, 2015). First, culture shapes the extent to which individuals are motivated to regulate their emotions. Evidence suggests that Asian participants are typically less motivated to engage in, and report more difficulties with, emotion regulation than White participants (Miyamoto et al., 2014; Morelen et al., 2013). Second, culture also impacts the adaptiveness of emotion regulation (i.e., whether emotion regulation is beneficial or harmful for an individual’s well-being; Butler, 2012). Studies found that emotion suppression, a common regulation strategy, is reported to be maladaptive for White from independent cultural backgrounds but less harmful or even adaptive for East Asians from interdependent cultural backgrounds (Butler et al., 2007; Mauss and Butler, 2010). Previous research highlights the role of culture in shaping the motivation and adaptiveness of emotion regulation. However, the cultural effect on emotion regulation of social exclusion has yet to be studied. The above generally introduces cultural differences in emotion regulation. In this study, we are interested in whether people from different cultures differ in their response to a specific form of emotion regulation (cognitive reappraisal).

Here, we conducted a cross-cultural study to examine whether emotional responses to and emotion regulation of social exclusion differed depending on cultural differences. To address these questions, we compared college students from two race backgrounds (i.e., White and East Asian), for whom cultural norms and values encompassing emotional response and emotion regulation differ quite dramatically: White cultures are individualistic, while East Asian cultures are collectivistic and group-oriented (Matsumoto, 2006). It is expected that people from those

two cultures may show a difference in how they react and regulate their emotions during social exclusion. In line with our previous work (He et al., 2018; He et al., 2019a, 2019b), this study employed cognitive reappraisal as the emotion regulation strategy due to its wide application (Buhle et al., 2014) and relatively long-lasting regulation effects compared with other emotion regulation strategies such as emotion suppression and distraction (Kross and Ayduk, 2008; K. N. Ochsner and Gross, 2005; K. N. Ochsner et al., 2012; Webb et al., 2012). Furthermore, unlike emotion suppression, the frequency of reappraisal usage largely does not differ across cultures and reappraisal may be equally important across cultures (Ford and Mauss, 2015). The employment of reappraisal in a cross-cultural study design may reduce those confounding effects.

In this study, White and East Asian participants vicariously experienced or regulated the negative emotion during social exclusion by viewing pictures in two conditions: same-race picture, and other-race picture. The first aim of the study was to test the hypothesis that participants would have stronger emotional responses to social exclusion expressed by characters of the same race. The second aim of the study was to determine whether emotional regulation of social exclusion would also be affected by cultural differences. In accordance with our first hypothesis, the second hypothesis is that participants would also show higher emotion regulation ability to social exclusion expressed by own-race characters. We also expected that White participants would show better emotion regulation of social exclusion than East Asian participants. This expectation-making was also motivated by a previous study which found that individuals with an individualistic orientation, compared to those with a collectivistic orientation, showed a more adaptive coping response to social exclusion (Pfundmair et al., 2015).

Methods

Participants. We recruited White participants from the University of Manchester in Manchester, UK, and East Asian participants from Shenzhen University in Shenzhen, China. To verify the ethnic background, in the UK, we used the standard list of ethnic groups recommended in the UK GOV website (<https://www.ethnicity-facts-figures.service.gov.uk/ethnic-groups>) and recruited individuals who self-identified as White. In China, self-reported ethnicity was checked against their identity cards issued by the Chinese Government. Participants were not eligible if they had a self-reported history of mental health conditions or if they reported having lived abroad for any significant period (i.e., more than 1 year). The experimental protocol was approved by the Ethics Committees of the University of Manchester and Shenzhen University and this study was performed strictly in accordance with the approved guidelines. Participants signed an informed consent form prior to the experiment.

Before the experiment, participants were asked to complete several questionnaires regarding demographic information (gender, age, education, ethnic background), Beck Depression Inventory Second Edition (BDI-II; (Beck et al., 1996)), Self-rating Depression Scale (SDS; (Zung et al., 1965)), the Trait form of Spielberger’s State-Trait Anxiety Inventory (STAI-T; (Spielberger et al., 1983)), (ERQ; (Gross and John, 2003)); including two subscales of emotional regulation strategies, i.e., cognitive reappraisal and expressive suppression), and Rejection Sensitivity Questionnaire (RSQ; (Downey and Feldman, 1996)). Participants were excluded if their questionnaire scores suggested they were vulnerable to depression (scores of SDS > 0.5 or BDI-II > 13), as there is a strong link between social exclusion and depression (Allen and Badcock, 2003). On this basis, we excluded 3 White

and 2 East Asian participants. The final sample comprised 80 participants (40 White and 40 East Asian participants). There were no significant differences in demographic variables or questionnaire scores between the two ethnic groups (Table 1).

The number of White participants was set to match the sample size ($n = 40$) of East Asian participants previously defined in a pilot study conducted in China. To verify whether we had sufficient power to detect a significant behavioral difference between cultures, we applied G*Power software (Faul et al., 2007) to test the sufficiency of the sample size. The post hoc power calculation for repeated measures ANOVAs (within-between interaction) indicated that with a total sample size of 80 participants we had >99% power to detect a medium effect size ($f = 0.25$) at $\alpha = 0.05$ (the parameters were also used in previous cross-cultural studies; Bradford et al., 2018; Trachootham et al., 2017; Wright et al., 2018).

Stimuli. Experimental materials were 60 pictures (30 images with White characters and 30 images with East Asian characters; White images or EA images for short; Fig. 1a) depicting social exclusion. The White/EA images were identical in terms of other aspects besides the race of the characters depicted. The social

exclusion images were selected from the social exclusion pictures used in our previous studies (all pictures were downloaded from the internet using the search term “social exclusion”; He et al., 2018; He et al., 2019a, 2019b); each image included one rejectee (the person being excluded) and a group of rejectors (the people interacting with each other and excluding the rejected). The valence and arousal of material were rated on a 9-point scale by another 40 college students (20 White and 20 East Asian participants) who were not participants in the experiment (valence: 1 for the most negative and 9 for the most positive; arousal: 1 for the least arousing and 9 for the most arousing). Descriptive data of the valence and arousal of experimental materials used in the experiment are listed in Table 2. Repeated-measures ANOVA performed on valence or arousal, with picture type (White vs. EA images) as a within-subject factor, and ethnic group (White vs. East Asian participants) as a between-subject factor, revealed no significant main or interaction effects (Table 3).

The number of people in the pictures and the contrast of the images were matched between the two categories. During the experiment, the images were presented in the center of the LCD screen.

Emotion regulation task. The task in this study was the same as the one used in our pilot study (He et al., 2018). The task was divided into two blocks, i.e., a no-reappraisal block and a reappraisal block. In order to avoid carry-over effects caused by the reappraisal instruction, the passive viewing task was always performed before the cognitive reappraisal task (see also (He et al., 2018, 2019a, 2019b)). The 60 White or EA images were randomly assigned to no-reappraisal and reappraisal blocks. In each block the number of White or EA images was equal. The assignment of pictures was random between participants.

As shown in Fig. 1b, each trial began with a central fixation of 2 s, followed by an 8 s image presentation, during which participants were required to watch passively (no-reappraisal block) or regulate their negative emotions (reappraisal block). They were then asked to report the level of negative feeling they felt from the person being excluded in the picture on a 9-point scale (a high score indicated a high level of negativity) within 5 s.

When passively viewing social exclusion images, participants were instructed as follows: “in this section, please think about how you would feel in a situation similar to that of the highlighted person in the picture.” When reappraising social exclusion images, participants were instructed as follows: “in this

Table 1 Demographical characteristics of the two groups of participants (mean and standard deviation).

Items	White (n = 40)	East Asian (n = 40)	t	p
Gender (male/female)	20/20	20/20		
Age (years)	20.05 ± 1.58	20.53 ± 1.96	-1.19	0.237
BDI-II	6.70 ± 4.27	8.20 ± 3.90	-1.64	0.105
SDS	0.41 ± 0.07	0.41 ± 0.05	-0.03	0.977
STAI-T	40.35 ± 7.90	40.45 ± 5.89	-0.06	0.949
RSQ	8.74 ± 2.93	7.41 ± 3.38	1.89	0.063
ERQ				
Reappraisal	28.85 ± 5.23	29.73 ± 5.82	-0.71	0.481
Suppression	13.25 ± 4.28	14.30 ± 4.24	-1.10	0.274

Independent samples t-test was performed (two-tailed) between White and East Asian groups. BDI-II beck depression inventory second edition, SDS self-rating depression scale, STAI-T the trait form of Spielberger’s state-trait anxiety inventory, RSQ rejection sensitivity questionnaire, ERQ the emotion regulation questionnaire.

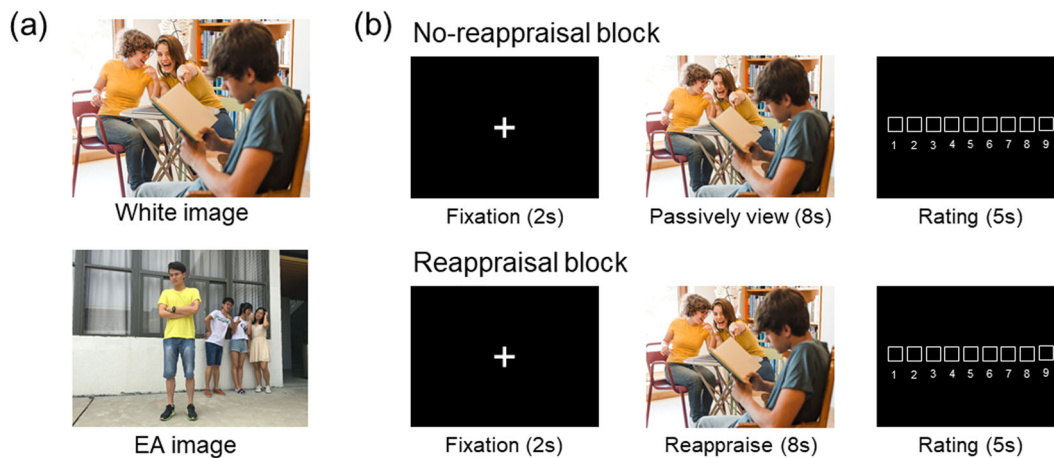


Fig. 1 Experimental paradigm and sample images. a Sample images of social exclusion with White or East Asian characters (White or EA images for short). The sample White image was designed by Freepik and the license allows the picture to be freely used. For the sake of copyright, the persons in the sample EA image are replaced by the graduate students in the research group. All the four persons in the picture gave their consent for the material to appear in academic journals. b Stimulus presentation in one experiment trial. EA, East Asian.

section, please imagine a better outcome or find a different explanation of the situation. For example, you could imagine that the group of people who are interacting with each other is talking about something that the person alone is not interested in, or the person alone could make some change and join the group very soon. After you re-interpret the nature of the scene, please think about how you would feel in this situation if you were the highlighted person in the picture”.

Statistics. Statistical analysis was performed using SPSS Statistics 20.0 (IBM, Somers, USA). Descriptive data were presented as mean ± standard deviations unless otherwise mentioned.

We tested the first hypothesis that participants would show a stronger emotional response to social exclusion expressed by same-race characters. Repeated-measures ANOVA was performed on subjective ratings in the no-reappraisal block, with *picture type* (White vs. EA images) as a within-subject factor, and *ethnic group* (White vs. East Asian participants) as a between-subject factor.

We then tested the second hypothesis that White and East Asian participants would show different emotion regulation abilities to social exclusion, with a bias in favor of their own race. To access emotion regulation ability, we defined a measure called *reappraisal advantage* as the differential rating between no-reappraisal and reappraisal blocks (see also Gross, 2002; He et al., 2019b). Here we used *reappraisal advantage* instead of raw subjective rating score as the dependent variable to simplify the interpretation, with the consideration that reappraisal exerts a reliable effect on negative emotions, i.e., rating of negative emotion is lower in the reappraisal condition as compared to that in the no-reappraisal condition (Ochsner et al., 2004). As a result, the three-way ANOVA (*picture type* × *block type* × *ethnic group*) performed on subjective ratings was simplified to a two-way ANOVA (*picture type* × *ethnic group*) performed on *reappraisal advantage*. This method has also been used in many papers (He et al., 2019a, 2019b; McRae et al., 2012; Smoski et al., 2014; Troy et al., 2010).

Results

For subjective ratings in the no-reappraisal block, we observed a two-way interaction of *picture type* × *ethnic group* ($F(1,78) = 30.74, p < 0.001, \eta_p^2 = 0.283$; Fig. 2). Further simple effects analysis indicated that White participants reported higher ratings of negative emotion for the White images (6.12 ± 1.36)

compared to the EA images ($5.53 \pm 1.48; F(1,78) = 21.73, p < 0.001, \eta_p^2 = 0.218$); conversely East Asian participants reported higher ratings of negative emotion for the EA images (6.00 ± 0.94) compared to the White images ($5.60 \pm 0.84; F(1,78) = 10.10, p = 0.002, \eta_p^2 = 0.115$). While White participants reported higher ratings of negative emotion (6.12 ± 1.36) than East Asian participants (5.60 ± 0.84) for the White images ($F(1,78) = 4.36, p = 0.04, \eta_p^2 = 0.053$), no significant group difference was observed for the EA images ($F(1,78) = 2.84, p = 0.096, \eta_p^2 = 0.035$; White vs. East Asian participants = 5.53 ± 1.48 vs. 6.00 ± 0.94).

For *reappraisal advantage*, the main effect of *picture type* was significant ($F(1,78) = 12.85, p = 0.001, \eta_p^2 = 0.141$): participants reported more *reappraisal advantage* for the EA images (1.13 ± 1.43) compared to the White images (0.83 ± 1.43). The main effect of *ethnic group* was also significant ($F(1,78) = 6.55, p = 0.001, \eta_p^2 = 0.077$): the White participants showed a larger *reappraisal advantage* (1.35 ± 1.69) compared to the East Asian participants (0.60 ± 0.94). More importantly, we observed a two-way interaction of *picture type* × *ethnic group* ($F(1,78) = 30.39, p < 0.001, \eta_p^2 = 0.280$; Fig. 2). Further simple effects analysis indicated that while East Asian participants reported more *reappraisal advantage* for the EA images (0.99 ± 1.06) compared to the White images ($0.22 \pm 0.83; F(1,78) = 41.38, p < 0.001, \eta_p^2 = 0.347$), no significant difference between types of pictures was observed in White participants ($F(1,78) = 1.86, p = 0.177, \eta_p^2 = 0.023$; White vs. EA images = 1.44 ± 1.65 vs. 1.27 ± 1.73). The simple effects analysis also indicated that while the White participants showed a larger *reappraisal advantage* (1.44 ± 1.65) compared to the East Asian participants (0.22 ± 0.83) for the White images ($F(1,78) = 17.55, p < 0.001, \eta_p^2 = 0.184$), no significant group difference was observed for the EA images ($F(1,78) = 0.80, p = 0.374, \eta_p^2 = 0.010$; White vs. East Asian participants = 1.27 ± 1.73 vs. 0.99 ± 1.06).

For the sake of completeness, an ANOVA was additionally performed on subjective ratings in the reappraisal block with *picture type* as a within-subject factor and *ethnic group* as a between-subject factor. The main effect of *picture type* was significant ($F(1,78) = 25.60, p < 0.001, \eta_p^2 = 0.247$): participants reported higher ratings of negative emotion for the White images (5.03 ± 1.50) compared to the EA images (4.64 ± 1.51). The main effect of *ethnic group* was also significant ($F(1,78) = 5.13, p = 0.026, \eta_p^2 = 0.062$): the East Asian participants reported higher ratings of negative emotion (5.20 ± 1.05) for both types of the picture compared to the White participants (4.47 ± 1.72).

In this study, the order of two blocks was fixed. To test whether effects of social exclusion were attenuated over time (see Williams’ temporal need-threat model; Williams, 2009), an additional temporal analysis was performed in each block, with the rating of negative emotion in the first half of trials compared to that in the second half of trials. Paired-samples t-test shows that the rating of negative emotion was not significantly different between two halves of the no-reappraisal block ($t(79) = 0.09, p = 0.930$; first half = 5.83 ± 1.02 , second half = 5.80 ± 1.20), as well as the reappraisal block ($t(79) = -0.26, p = 0.794$; first half = 4.79 ± 1.35 , second half = 4.88 ± 1.59).

Table 2 Descriptive data of the valence and arousal of experimental materials (mean and standard deviation).

Items	White (n = 40)	East Asian (n = 40)
<i>Valance</i>		
White image	2.08 ± 0.84	2.44 ± 0.93
EA image	2.45 ± 0.80	2.29 ± 0.75
<i>Arousal</i>		
White image	3.73 ± 1.09	3.99 ± 1.17
EA image	4.10 ± 1.17	3.99 ± 1.11

Table 3 Results of the ANOVAs for valence and arousal of experimental materials.

Effects	Valance	Arousal
Picture type	$F(1,38) = 0.34, p = 0.566, \eta_p^2 = 0.009$	$F(1,38) = 0.57, p = 0.454, \eta_p^2 = 0.015$
Ethnic group	$F(1,38) = 0.31, p = 0.580, \eta_p^2 = 0.008$	$F(1,38) = 0.08, p = 0.784, \eta_p^2 = 0.002$
Picture type × ethnic group	$F(1,38) = 1.81, p = 0.187, \eta_p^2 = 0.045$	$F(1,38) = 0.70, p = 0.438, \eta_p^2 = 0.016$

Given that the sample was balanced by gender, we also tested whether there were any potential gender effects in the data. Repeated-measures ANOVAs were performed on subjective ratings in the no-reappraisal block or *reappraisal advantage*, with *picture type* (White vs. EA images) as a within-subject factor, and *gender* (male vs. female participants) as a between-subject factor. For subjective ratings in the no-reappraisal block, the main effect of *gender* was significant ($F(1,78) = 11.16, p = 0.001, \eta_p^2 = 0.125$): female participants reported higher ratings of negative emotion (6.20 ± 0.99) for both types of pictures compared to male participants (5.42 ± 1.10). For *reappraisal advantage*, the main effect of *gender* was marginally significant ($F(1,78) = 3.86, p = 0.053, \eta_p^2 = 0.047$): female participants showed a marginally larger *reappraisal advantage* (1.35 ± 1.69) for both types of pictures compared to male participants (5.42 ± 1.10). The ANOVA results can be seen in Table 4.

Discussion

The aim of this study was to identify the influence of culture on emotional reaction to and emotional regulation of social exclusion, among White and East Asian college students in both UK and China, with the expectation that White participants, from an individualist culture, and East Asian participants from a collectivist culture, may differ in reacting and regulating their emotions during social exclusion.

The first hypothesis in the study assumed that social exclusion pictures will induce greater emotional reactions in participants of their own race. Our results indicate that both White and East Asian participants had more negative responses to social exclusion expressed by same-race than other-race characters. In

addition, White participants, compared with East Asian participants, reacted more negatively to social exclusion posed by White characters. These results fit with the known “own-race bias” in face or emotion processing (Brown et al., 2006; Krill and Platek, 2009; Lee et al., 2008; Roberts and Levenson, 2006). It has been argued that same-race characters may represent in-group members from the same social group, who might share common growth and cultural environments with the participant, while social exclusion posed by other-race characters is not as distressing because these characters may represent out-group membership (Krill and Platek, 2009). In addition, physical pain evokes more empathy when experienced by same-race characters compared to other-race characters (Molenberghs, 2013), an effect that might also apply to social pain.

The second hypothesis assumed that social exclusion pictures will induce a greater emotion regulation effect in participants of the same race. Our results are consistent with this “own-race bias”. White participants showed more effective emotion regulation of social exclusion than East Asian participants when social exclusion images were posed by White characters. Similarly, the East Asian participants showed more effective emotion regulation of social exclusion images posed by East Asian characters versus White characters. These results are consistent with a previous study showing that a virtual avatar that looks like the self induces a greater capacity to regulate negative emotions (Wrzesnien et al., 2015). We suggested that processes related to social identity and in-group cultural belonging create more sense of realness, build more emotional connections (empathy) to the subject and thus facilitate emotion regulation (Fuchs, 2019; Szanto and Krueger, 2019; Wrzesnien et al., 2015). In contrast, cross-cultural misunderstandings reduce empathy, i.e., more difficulties in reading another’s emotions, which are likely to buffer effective emotion regulation (Nelson and Baumgarte, 2004; Schipper and Petermann, 2013). It is possible that participants perceive more in-group identity and cultural belonging to same-race characters, which may then increase the effectiveness of their emotion regulation.

Our prediction that emotion regulation effects would be greater in White participants than in East Asian participants was also confirmed. This is in accordance with previous literature, which found that Whites have increased motivation to engage in emotion regulation after experiencing a negative event, stronger regulation effects, and fewer emotion regulation difficulties than East Asians (Miyamoto et al., 2014; Morelen et al., 2013). One potential reason is that Eastern cultures are collectivistic and put high values on group orientation: East Asians often have a relatively closed social relationship structure and if socially excluded it may be harder for them to regulate their negative emotion (Kanetsuna et al., 2006). Another significant factor is that this study only employed reinterpretation as the reappraisal strategy. Previous research has suggested that Asian participants are more likely to use distancing (a different reappraisal strategy) in coping with stress compared to White participants (O’Connor and Shimizu, 2002; Sheu and Sedlacek, 2004). This is because Eastern collectivist cultures encourage more problem-avoidance coping behaviors (Chang, 1996). We, therefore, suggest that although reinterpretation has been proved to be an effective reappraisal

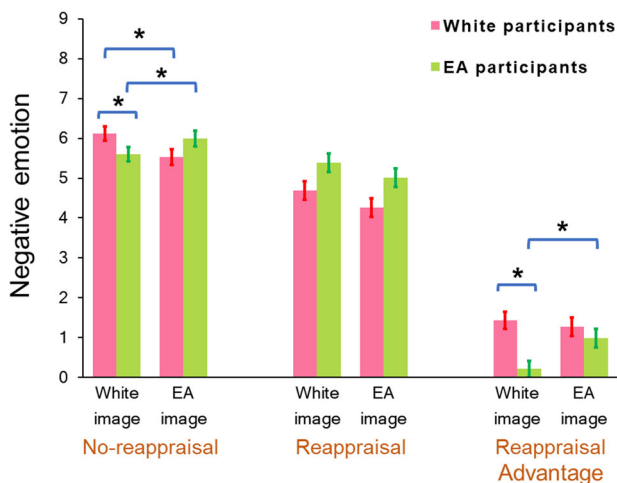


Fig. 2 The two-way interaction on ratings of negative emotion in the no-reappraisal block and the two-way interaction on ratings of “reappraisal advantage”. The “reappraisal advantage” denotes the negative emotion rating difference between no-reappraisal and reappraisal blocks. The figure also depicts the results of negative emotion rating experience in the reappraisal block. * $p < 0.05$. Error bars represent \pm SEM.

Table 4 Results of the ANOVAs for gender effects.

Effects	Subjective ratings in the no-reappraisal block	Reappraisal advantage
Picture type	$F(1,78) = 0.81, p = 0.372, \eta_p^2 = 0.010$	$F(1,78) = 9.25, p = 0.003, \eta_p^2 = 0.106$
Gender	$F(1,78) = 11.16, p = 0.001, \eta_p^2 = 0.125$	$F(1,78) = 3.86, p = 0.053, \eta_p^2 = 0.047$
Picture type \times gender	$F(1,78) = 1.66, p = 0.202, \eta_p^2 = 0.021$	$F(1,78) = 0.60, p = 0.808, \eta_p^2 = 0.001$

strategy (He et al., 2018; He et al., 2019b), the future investigation could compare this strategy to distancing. It is possible that using a distancing strategy, East Asian participants may have more improvement on emotion regulation than White participants.

Several limitations should be noted. First, this study used hypothetical scenarios in which participants were asked to imagine being the excluded person in the picture. This method cannot elicit the same negative experience induced by real social exclusion scenarios. However, we employed the imagining paradigm as it has been demonstrated to be efficient in assessing the influence of emotion regulation (Kevin N. Ochsner et al., 2004; Wager et al., 2008). We, therefore, chose a standard, minimalist version of the task to ensure consistency with our previous research (He et al., 2018; He et al., 2019a, b). Second, this study only explored cultural differences in young adult participants. It is not clear whether the current findings would generalize to children, adolescents, and older adults. We chose young adults due to the fact that social exclusion is common in college and that younger adults are more sensitive to social exclusion than older adults (Loeckenhoff et al., 2013). Nevertheless, we suggest future studies further explore this question using designs evoking a more realistic social exclusion experience and a more representative sample across the lifespan. Third, we did not measure participants' attribution about the social exclusion scenario being observed. Given the evidence that observers may form very different attributions when viewing a social exclusion episode (Rudert et al., 2018), which may impact their follow-up emotion reactivity and regulation, we cannot rule out the possibility that the observed differences between White and East Asian participants were influenced by this factor. Fourth, participants' baseline self-regulation capacity was not examined, which may have an impact on their subsequent reappraisal performance. Fifth, this study did not evaluate participants' implicit racial attitude, which is an important variable for cross-cultural design (for example, see Krill and Platek, 2009; Kurdi et al., 2019). Future studies are highly recommended to use appropriated tools, such as the Race Implicit Association Test (Greenwald et al., 1998), to verify whether racial attitude might play a role in the observed cross-cultural differences in emotional reaction and regulation of social exclusion. Sixth, it should be noted that the current experimental design is not able to detect the effects of exclusion due to the lack of control stimuli without social exclusion. Although in our prior work those social exclusion pictures have gone through the validation procedure to ensure that they could apparently convey social exclusion (He et al., 2018), it's possible that in this study those stimuli may not elicit the effect of social exclusion. We want to test this effect using a more comprehensive design in the future. Finally, there is evidence that effects of social exclusion attenuate over time (Williams, 2009). The latter reappraisal block is therefore expected to have lower negative emotion ratings than the first no-reappraisal block. It's impossible to know whether the "reappraisal advantage" on negative emotions was caused by emotion regulation or the attenuation of social exclusion effects over time due to the fixed order of the two blocks. However, a temporal analysis of responses within each block could, at least partly, provide information about this alternative explanation. We, therefore, believe that the "reappraisal advantage" on negative emotions was probably not caused by this social exclusion attenuating effect, though we cannot rule out the possibility that it was caused by other factors. The results found no evidence of time-related social exclusion attenuating effects within each block. Future work could also counterbalance the order of blocks, in order to determine the effect this may have on reappraisal.

In conclusion, this study showed that both White and East Asian individuals showed significant "own-race bias" when facing social exclusion, i.e., stronger emotional response to, and better

emotion regulation of social exclusion expressed by own-race characters. Whites also exhibited more effective use of a reappraisal strategy for emotion regulation compared to East Asian individuals. Overall, the current results highlight the significance of culture as a modulating factor in emotional response to and regulation of social exclusion. Our study contributes to the understanding of culture-specific aspects of emotional reaction and emotion regulation of social exclusion, which could be helpful for developing more suitable assessments and interventions based on social cognition approaches across diverse populations. For example, our findings may inform therapists tailoring therapeutic strategies (e.g., mindfulness programs for emotion regulation skills; Toomey and Anhalt, 2016) for individuals with specific cultural backgrounds and their social distress following social exclusion or bullying (Xu et al., 2020), which could enhance the effectiveness of psychotherapy.

Data availability

The datasets analyzed during this study are available in the Dataverse repository, <https://doi.org/10.7910/DVN/INS1HU>.

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Competing interests

The authors declare no competing interests.

Additional information

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