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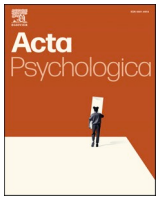

Unconscious and conscious acceptance downregulate aggressive behavior: Mediating role of anger regulation

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ABSTRACT

Social exclusion can induce negative emotions and aggression. While previous studies have investigated the effect of trait acceptance on emotional experience and aggression during social exclusion, it is still unclear how different forms of acceptance strategy can downregulate negative emotions and whether this potential reduction of negative emotions should mediate the effect of acceptance on aggression. To address these questions, 100 participants were recruited and randomly divided into three groups: control group (CG, $N = 33$), conscious acceptance group (CAG, $N = 33$) and unconscious acceptance group (UAG, $N = 34$). Negative emotions were induced by the cyberball game and measured by the modified PANAS. Aggressive behavior was assessed by the hot sauce allocation task. Results showed that anger, rather than other negative emotions, mediated the effect of acceptance on aggressive behavior. Conscious and unconscious acceptance both effectively regulated anger, hurt feelings and aggressive behavior during social exclusion. Compared to conscious acceptance, unconscious acceptance was associated with less reduction of positive emotion and had a better effect on reducing sadness. These findings highlight the advantage of applying unconscious acceptance strategy to regulating social exclusion-induced emotions for the purpose of reducing aggressive behavior.

1. Introduction

The need of belonging prompts individuals' psychosocial development (Hagerty et al., 1996). However, this need is often impeded by social exclusion, when he or she was excluded or rejected by a social group or other people (Du & Xia, 2008; Williams, 2007). As a typical negative social experience, social exclusion is considered a stressor for individuals, which may activate maladaptive coping responses such as social withdrawal and aggression (MacDonald & Leary, 2005), and is accompanied by a variety of negative consequences (Bernstein, 2016; Lynn Mulvey et al., 2017). Previous studies have found that it not only leads to increased aggressive behaviors (Ayduk et al., 2008; Nathan DeWall et al., 2010; Riva et al., 2015; Twenge et al., 2001), but also induces negative emotions such as anger, sadness and hurt feelings (Chow et al., 2008; Eisenberger et al., 2003; Leary, 2022). Meanwhile, compared to other negative emotions, anger may play a vital role in aggressive responses to social exclusion (Chow et al., 2008). Nevertheless, few studies have explored the regulation of aggressive behavior from the perspective of emotion regulation to date. Therefore, we infer that effective down-regulation of negative emotions triggered by social exclusion, especially for anger, may be an important avenue for alleviating behavioral consequences of social exclusion, as exemplified by aggression.

Previous studies have paid a great effort to understand the alleviation effect of emotion regulation on social exclusion (DeWall et al., 2011; He et al., 2021). It primarily focused on the effectiveness of reappraisal strategy in decreasing negative emotions and enhancement of positive emotions (He et al., 2018, 2020; Yanagisawa et al., 2011), which is considered as an adaptive emotional regulation strategy, and has a long-term positive effect on psychological health (Troy et al., 2018). Despite these advantages, it should be noted that it is not easy for many people to succeed in performing reappraisal strategy (Cao et al., 2020; Sarlo et al., 2013). Firstly, reappraisal itself functions through reframing one's thoughts to change the feeling at the cost of substantial involvement of cognitive efforts (Keng et al., 2013; Troy et al., 2018), which, however, heavily depends on one's executive control functions

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(Opitz et al., 2012; Schmeichel et al., 2008). In addition, numerous studies show that when facing highly arousing stimuli, people prefer distracting from it to reduce emotion intensity to reappraising its meanings, a strategy thought to be more adaptive to individual health (Cho et al., 2019; Shafir et al., 2015). Moreover, cognitive reappraisal may cause individuals to deny the important features of the situation (Chambers et al., 2009), and such denial was found to be related to individual's hostile cognitive bias and more aggressive responses after being rejected (DeWall et al., 2009). Previous studies indicate that social exclusion as a highly negative event impairs individuals' cognitive function (Campbell et al., 2006). Therefore, it is of great significance to explore other adaptive strategies, which are more suitable for emotion regulation in the context of social exclusion.

Acceptance, as an adaptive emotion regulation strategy, plays an important role in many contemporary psychotherapies, emphasizing being open to and embracing emotions and feelings without trying to change them (Hayes et al., 2006). Previous studies suggest that both the use of acceptance strategy alone (Shallcross et al., 2010) and the acceptance-based psychotherapies (Teasdale et al., 2000) can effectively regulate individuals' emotional states, leading to reduced avoidance behavior and improved social relationships (Adair et al., 2017; Batten & Hayes, 2016). Compared to reappraisal, acceptance is considered to produce fewer cognitive costs (Keng et al., 2013), and is perceived as less effortful to deploy (Troy et al., 2018). Nevertheless, the instruction-based acceptance mentioned above is a process of conscious emotion regulation, which requires bewaring and embracing emotions rather than avoiding them. This intentional process is counter to humans' natural tendencies of negative emotion processing and is thus evidenced to involve substantial cognitive resources (Yuan, Long, et al., 2015).

Conversely, unconscious emotion regulation was defined as the process of modifying the quality, intensity, or duration of emotional responses without the need for conscious supervision and explicit intentions (Koole & Rothermund, 2011). It can achieve the same goal of emotion regulation without or with less consumption of cognitive resources (Mauss et al., 2007; Williams et al., 2009; Yuan, Ding, et al., 2015). For instance, Ding et al. (2015) used a sentence unscrambling task to manipulate unconscious acceptance, where participants are required to construct a grammatical four-word sentence from five-word jumbles (Srull & Wyer, 1979). The results show that unobtrusively priming people with acceptance-related sentences led to improved subjective emotions and reduced physiological responses during a frustrating situation, compared with people primed with neutral sentences. Effective regulation of unconscious acceptance on emotional experience is also observed, with less negative emotion increase in the context of monetary loss (Yuan et al., 2019). However, to date, no study has yet applied the strategy of unconscious acceptance to the emotional and behavioral regulation in the context of social exclusion. Recent studies show that habitual use of acceptance, which measures individual differences in the natural tendency of spontaneous acceptance, is negatively associated with his/her aggression and negative emotions during social exclusion (He et al., 2022; Shea & Coyne, 2017; Waldeck et al., 2017). Therefore, we infer that unconscious acceptance may be a more adaptive regulatory strategy during social exclusion.

2. The present study

The current study explored how different forms of acceptance downregulate negative emotions and aggressive behavior triggered by social exclusion. Affective responses and aggression were measured by subjective emotion rating and a hot sauce allocation task, respectively, as recommended by classic studies (Lieberman et al., 1999). Previous studies have indicated that conscious acceptance, compared to unconscious acceptance, is accompanied by more cognitive conflict and resource depletion, which are perceived as negative stimuli and may lead to failures in emotion regulation, respectively (Dreisbach & Fischer, 2015; Grillon et al., 2015; Yuan et al., 2019). Therefore, we predict that unconscious acceptance strategy, compared with conscious acceptance, is associated with higher positive emotions ratings, lower negative emotions ratings and lower aggression after social exclusion. In addition, aggressive behavior is an external display and motivational outcome of internal negative emotions, which is most evident in the feeling of anger (Chow et al., 2008). Similarly, He et al. (2022) found that trait acceptance is conducive to decreasing aggressive tendencies by decreasing anger. In this regard, the potential regulation effect of acceptance on aggressive behavior is probably realized through its regulatory effect on the dominant emotion of anger. This possibility needs to be directly explored, by testing the mediating roles of typical negative emotions in the effects of different forms of acceptance on aggressive behavior. As prior studies have consistently reported that anger, sadness and hurt feelings are the most typical negative emotions as a result of social exclusion (Chow et al., 2008; MacDonald & Leary, 2005), the current study also measured these three discrete emotions, in order to clarify how different forms of acceptance downregulate the emotional consequences of social exclusion. In addition, among the three emotions, accumulating evidence indicates that the feeling of anger, but not the other two, serves as a direct trigger to external aggressive behavior (Chow et al., 2008; He et al., 2022). Based on these considerations, we hypothesize that the mediating role of anger in the effect of acceptance on aggressive behavior should be confirmed.

3. Method

3.1. Participants

One hundred college students were recruited in the current study, and the age of these participants ranged from 18 to 22 years old (M = 19.95, SD = 1.31; 85 females). A priori power analysis using G*Power (version 3.1.9.7) indicated that a sample size of 54 participants was sufficient with a power of 0.95. We recruited participants through self-reported method online. Participants who reported naïve to the Cyberball game and hot sauce allocation task, and free of medical, psychiatric disorders or current/regular medications were recruited. They were right-handed and had normal or corrected normal vision. All participants were randomly allocated to three different groups: control group (CG) (33 participants, 27 females), conscious acceptance group (CAG) (33 participants, 29 females), and unconscious acceptance group (UAG) (34 participants, 29 females). The study was approved by the ethical committee of Southwest University. All participants provided written informed consent before the experiment and were financially compensated for participation.

To verify whether our randomization manipulation was successful, we tested whether the three groups were similar in gender composite, emotion- and aggression-related traits and states, and hot sauce preference which was closely related to the experiment. No significant difference in sex ratio across the three groups was found ($\chi^2_{(2)} = 0.48$, p = 0.79), and participants from these three groups did not differ in emotion- and aggression-related traits and states, as well as hot sauce preference related to the current study ($ps > 0.05$; see Fig. 1A in Appendix A).

3.2. Procedure

After arrival at the laboratory, participants were asked to fill out a set of questionnaires assessing emotion- and aggression-related traits and states, as well as a questionnaire measuring their hot sauce preference, in order to confirm the effectiveness of randomization.

The formal experiment procedure was divided into three phases as follows:

1) In the baseline phase, participants were instructed to stay calm for 3 min, and then completed the modified PANAS (T1) as a baseline measurement of affective states. This phase was designed to control the potential influence of pre-experiment group differences on the emotion regulation effects.

2) In the task phase, the implicit priming paradigm was conducted through a scrambled sentence task, and participants were required to construct a grammatical four-word sentence from five-word jumbles (Srull & Wyer, 1979). At first, all the participants completed 3 neutral sentences in order to get familiar with the task. Then, the participants from three groups received different word materials respectively. Specifically, UAG completed 11 sentences containing acceptance-related information in addition to 6 neutral sentences, through which they were primed with the emotion regulation goal of acceptance (Ding et al., 2015; Mauss et al., 2007). For example, " 1需要 2顺其自然 3最后 4事情 5有些", the correct order of the sentence is 5-4-1-2, which means letting things take its natural course, and the word-2 is related to acceptance. Participants in CG and CAG both completed 17 neutral sentences unrelated to emotion regulation strategies.

Participants in UAG and CG received no further instructions. CAG members were provided with the additional instruction as follows: "You may experience various emotions in the Cyberball game. Please experience these emotions with an open mind. You should understand that the existence of any emotion is natural, understandable, and temporary. When you try to change or control these emotions, the harder you try, the more emotional distress you will have. Therefore, try to embrace and accept them. Let yourself reach a state of harmony with your emotions so that you can better integrate into the game."

Subsequently, all the participants played the Cyberball game, a virtual ball tossing game, which was exploited by Williams et al. (2000) and presented by a programmed procedure using E-prime 2.0. In this game, each participant presented as an avatar on the computer screen, was required to use mental visualization imaging they were playing with other two co-players connected via internet (who were actually computer-generated, represented by avatars). Participants selected one of two players to pass the ball by clicking on corresponding avatar, and the computer-controlled players would pass the ball again after a random jitter (2–5 s). To simulate exclusion, participants were only given chance to catch the ball 3 times (10 % in a total of 30 passes) in the initial stage, and then they no longer caught the ball from the two players, excluded by the two players. After that, participants completed the modified PANAS (T2), rated "how well you were accepted by others in the game" on a 9-point scale (1: not at all; 9: extremely) measuring exclusive feeling, and recalled "how many times you had caught the ball", which aimed to confirm successful social exclusion manipulation.

After the Cyberball game, the hot sauce allocation task (Lieberman et al., 1999) was adopted to measure the aggressive response of participants.

3) In the recovery phase, participants were instructed to rest for 3 min before they completed the modified PANAS (T3), which was designed to help participants recover from the negative mood induced by the cyberball game. Afterward, they rated "how well you obeyed the instruction of mental visualization in the Cyberball game" on a 9-point scale (1: not at all; 9: extremely). Besides, CAG rated "how well you obeyed the instruction of acceptance" on a 9-point scale (1: not at all; 9: extremely). The experimental procedure was illustrated in Fig. 1.

After the experiment, participants were informed that the two players in the Cyberball game and hot sauce allocation task were computer-controlled to eliminate the adverse effects of the task.

3.3. Measures

3.3.1. Positive and negative affect

Positive Affect and Negative Affect Scale (PANAS; Watson et al., 1988) is a scale with pretty high reliability, although it might be limited in assessing emotions induced by social exclusion (Kouchaki & Wareham, 2015). Hurt feelings, sadness, and anger were strongly linked to social exclusion (Buckley et al., 2004; Chow et al., 2008; Leary, 2022) while items assessing these kinds of emotions were relatively scarce in PANAS. We therefore referred to the emotional items related to social exclusion which were used in a previous study (Buckley et al., 2004) and adopted emotional items in the standard version of the Cyberball post-game scale together with PANAS. We finally identified a modified version of PANAS with 15 items consisting of 10 negative words and 5 positive words (see Appendix B). Reliability was acceptable for both the negative words ($\alpha = 0.91$) and the positive words ($\alpha = 0.87$).

3.3.2. Aggressive response

Aggressive response was measured by the hot sauce allocation task (Lieberman et al., 1999), during which participants were informed that they would either taste food or distribute food to another two players who participated in the previous Cyberball game. The food could be salty, sweet, hot, sour, or bitter. Actually, all participants had no choice but to decide how much hot sauce would be allocated to player 1, one of the computer-controlled players. The amount of allocated hot sauce was recorded to indicate individuals' aggressive behavior. Before the formal task, participants were told that player 1 scored 2 on the 10-point hot sauce preference scale (1 = don't like at all, 10 = like very much). After the task, they were asked to recall player 1's hot sauce preference ratings.

3.4. Data analysis

All statistical analyses were performed using SPSS 26.0 (SPSS Inc., Chicago, IL, USA). To verify the effectiveness of the manipulation, independent *t*-tests and one-way ANOVAs were conducted. To analyze the effect of emotion regulation strategies on emotions, a two-way mixed-design ANOVA was conducted with phase (baseline, task, recovery) as a within-subject factor and group (CG, CAG, UAG) as a between-subject factor. We also performed a one-way ANOVA on the phase difference scores of emotions with group as the independent factor. To correct for potential family-wise error, a Bonferroni-holm method was applied to all post hoc comparisons. Additionally, to investigate the role of induced emotions in mediating the relationship between emotion regulation strategies and aggressive behaviors, mediation analyses with 5000 bootstrap resamples were performed and the 95 % confidence interval was determined with PROCESS 3.3.

4. Results

4.1. Manipulation checks

The first Manipulation check was to examine whether cyberball task successfully induced the decrease of positive emotion, and the increase of negative emotion and exclusive feeling. We also checked whether the

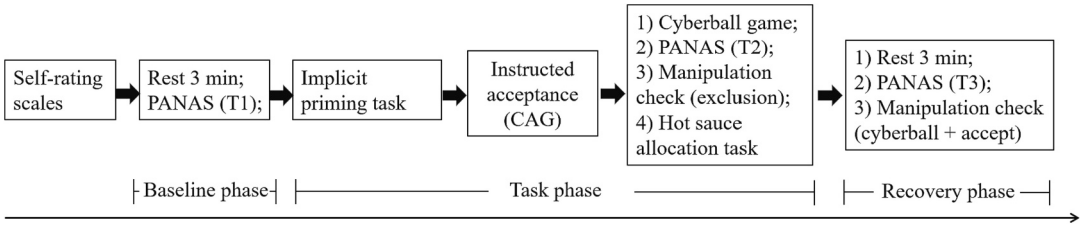

Fig. 1. Schematic illustration of behavioral procedure of the current experiment.

experimental groups were similar in baseline emotional state and in the manipulation of cyberball game. Last, we examined whether participants in the conscious acceptance condition successfully followed the acceptance instruction.

Manipulation checks suggested that 1) participants effectively followed the instruction of mental visualization in the Cyberball game. The scores in the item "how well you performed mental visualization in the Cyberball game" were significantly higher than the midpoint of the rating scale (1: not at all; 5: not sure; 9: extremely) ($M = 6.44$, $SD = 1.22$, $t_{(99)} = 11.83$, $p < 0.001$). 2) Exclusive feeling was successfully induced by the Cyberball game. The ratings of subjective exclusive feeling, measured on the single item "how well you were accepted by others in the game" were significantly lower than the midpoint of the rating scale (1: not at all; 5: not sure; 9: extremely) ($M = 2.84$, $SD = 1.38$, $t_{(99)} = -15.70$, $p < 0.001$), and did not differ among the three groups ($F_{(2, 97)} = 1.38$, $p = 0.26$); 3) No significant difference between the perceived and the actual ratio of receiving the ball was found ($t_{(99)} = -1.79$, $p = 0.08$), and three groups did not differ from the perceived ratio of receiving the ball ($F_{(2, 97)} = 1.30$, $p = 0.28$); 4) Anger, hurt feelings, sadness, other negative emotions, and positive emotions did not differ among the three groups at baseline level ($Fs_{(2, 97)} < 2.21$, $ps > 0.05$); 5) Right after the Cyberball game, anger, hurt feelings, sadness, and positive emotions were successfully induced in CG, and these ratings were significantly higher than the baseline level ($p_s < 0.001$), but not for other negative emotions; 6) CAG's self-reported ratings of acceptance instruction compliance were greater than the midpoint of the rating scale (i.e. 5) ($t_{(32)} = 9.84$, $p < 0.001$); 7) There was no significant difference between the participants' recall(M = 1.97, SD = 0.33) and pre-experiment information (2) of player 1's hot sauce preference (t(99) = −0.90, $p = 0.37$), and the data of recall did not differ across the three groups (F(2, 97) = 2.49, $p > 0.05$).

4.2. Effects of emotion regulation

Two-way repeated measures ANOVAs with phase (baseline, task, recovery) as a within-subject factor and group (CG, CAG, UAG) as a between-subject factor were conducted to investigate the effects of unconscious and conscious acceptance on NA (negative affects) and PA (positive affects) respectively.

A significant phase-by-group interaction effect on NA was found ($F_{(4, 194)} = 9.524$, $p < 0.001$, $\eta^2 = 0.164$). We further examined the group effect in each phase, and observed a significant group effect during task phase ($p = 0.01$). Post hoc tests showed that the NA ratings of CG were significantly higher than those of UAG and CAG ($ps < 0.01$), while no significant difference between UAG and CAG was found ($p > 0.05$; see Fig. 2a). Similarly, a significant phase-by-group interaction effect on PA was also found ($F_{(4, 194)} = 3.172$, $p = 0.015$, $\eta^2 = 0.061$). We broke down the interaction and found a significant group effect only during task phase ($p < 0.01$), where the PA ratings of UAG were significantly higher than those of CG ($p < 0.01$) and CAG ($p = 0.04$; see Fig. 2b).

Since the main focus of the current study was on anger, sadness and hurt feelings, the same analysis procedures as the above-mentioned were performed for these three emotions, and significant phase-by-group interaction effects on sadness ($F_{(4,194)} = 5.372$, $p < 0.001$, $\eta^2 = 0.1$), anger ($F_{(2,194)} = 85.05$, $P < 0.001$, $\eta^2 = 0.467$) and hurt feelings ($F_{(4, 194)} = 4.959$, $p < 0.001$, $\eta^2 = 0.093$) were observed. Further analyses showed that there was a significant group effect on each of the three emotions only during task phase ($ps < 0.05$) as well. Results of all the post hoc tests were shown as follows: anger and hurt feelings ratings of CG were significantly higher than those of UAG and CAG ($ps < 0.001$); sadness ratings of CG were significantly higher than those of UAG ($p < 0.05$) but not of CAG ($p > 0.05$; see Fig. 2c–e). Ratings for the three emotions were not significantly different between UAG and CAG ($ps > 0.05$). No other significant differences among these conditions were found. Descriptive statistics can be seen in Table 1.

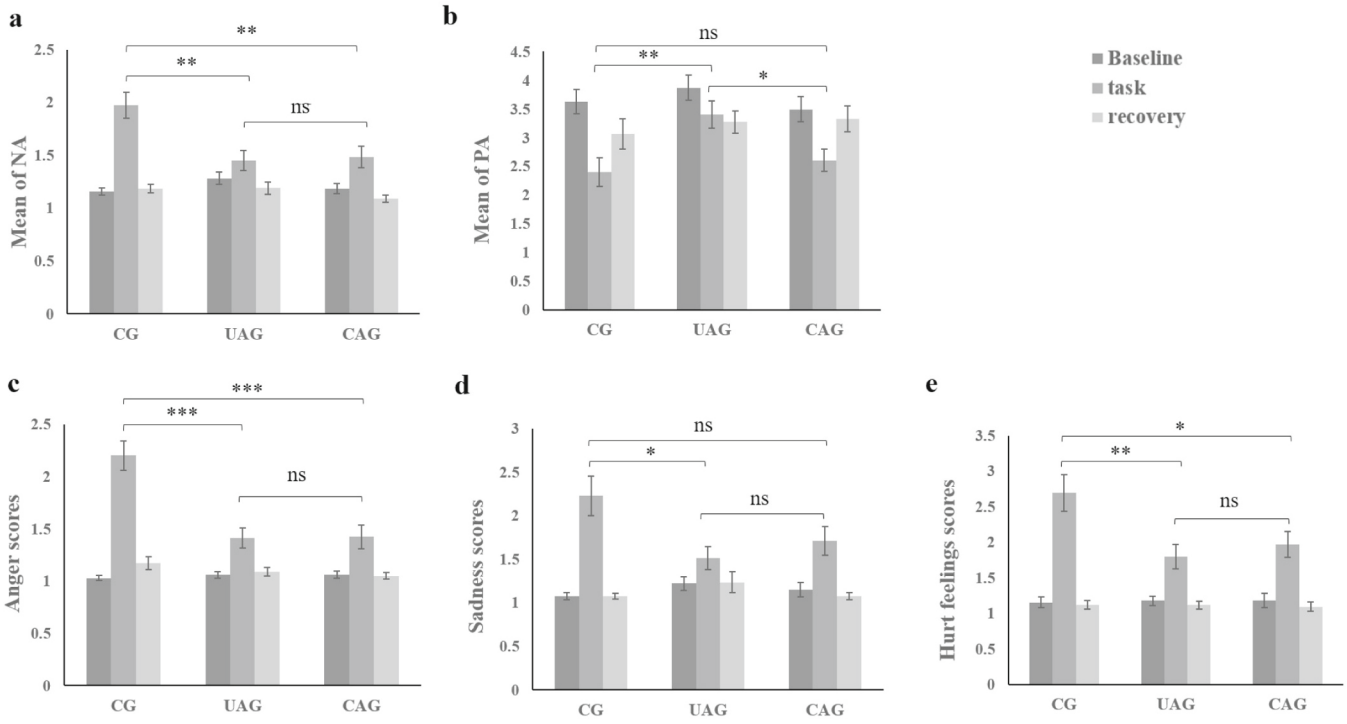

Fig. 2. a–b, the group-by-phase interactions on NA and PA; c–e, the group-by-phase interactions on anger, sadness and hurt feelings. Error bar represents standard error. NA = negative affects; PA = positive affects. CG = control group; UAG = unconscious acceptance group; CAG = conscious acceptance group. *$P < 0.05$, **$P < 0.01$, ***$P < 0.001$. Ns, not significant.

Table 1
Emotion ratings during baseline, task, and recovery phase.

Phase	Group (N)	NA ($M \pm SD$)					PA($M \pm SD$)
		NA (α = 0.91)	Anger (α = 0.88)	Sadness (α = 0.88)	Hurt feelings	Other NA	PA (α = 0.87)
Baseline (T1)	CG (33)	1.16 ± 0.21	1.03 ± 0.13	1.08 ± 0.22	1.15 ± 0.44	1.30 ± 0.44	3.63 ± 1.23
	CAG (33)	1.19 ± 0.28	1.06 ± 0.19	1.15 ± 0.46	1.18 ± 0.58	1.30 ± 0.35	3.50 ± 1.27
	UAG (34)	1.29 ± 0.34	1.06 ± 0.19	1.22 ± 0.45	1.18 ± 0.39	1.51 ± 0.58	3.87 ± 1.26
Task (T2)	CG (33)	1.97 ± 0.77	2.20 ± 0.80	2.23 ± 1.31	2.70 ± 1.49	1.49 ± 0.57	2.41 ± 1.42
	CAG (33)	1.49 ± 0.59	1.42 ± 0.66	1.71 ± 0.96	1.97 ± 1.05	1.30 ± 0.40	2.61 ± 1.11
	UAG (34)	1.45 ± 0.55	1.41 ± 0.56	1.51 ± 0.78	1.79 ± 1.01	1.36 ± 0.50	3.41 ± 1.40
Recovery (T3)	CG (33)	1.18 ± 0.23	1.17 ± 0.34	1.08 ± 0.18	1.12 ± 0.33	1.27 ± 0.35	3.07 ± 1.52
	CAG (33)	1.09 ± 0.19	1.05 ± 0.17	1.08 ± 0.25	1.09 ± 0.38	1.13 ± 0.22	3.33 ± 1.29
	UAG (34)	1.19 ± 0.34	1.09 ± 0.25	1.24 ± 0.69	1.12 ± 0.33	1.26 ± 0.41	3.28 ± 1.12

Note. NA = negative affects; PA = positive affects; CG = control group; CAG = conscious acceptance group; UAG = unconscious acceptance group. α = Cronbach's α. T1, T2 and T3 are the three measurements of the modified PANAS.

4.3. The effect of emotion regulation strategies on aggressive behavior

To examine whether hot sauce preference of participants would influence the performance of hot sauce allocation task, Pearson correlation analysis was performed, and no significant association between these two factors was found($r = -0.06$, $p > 0.05$).

As predicted, participants in CAG ($M = 6.27$, $SD = 9.67$) and UAG ($M = 5.71$, $SD = 8.39$) allocated less hot sauce to player 1 when compared to CG($M = 20.21$, $SD = 28.07$). The normality test found that the data of hot sauce allocation was positively skewed, $Z_{skewness} = 14.13$. In line with previous studies, the aggressive behavior index was calculated by adding 1 to the amount of hot sauce and then performing logarithmic transformation (Lieberman et al., 1999; Warburton et al., 2006). Subsequently, a one-way ANOVA was conducted to examine the group effect on aggressive behavior. To control the possible influences of individual differences in personality traits and state, aggressive trait, self-esteem and exclusive feeling were entered as covariates. A significant group effect ($F(2, 94) = 6.98$, $p = 0.001$,$\eta^2 = 0.13$) was found. Post hoc tests showed that aggressive behavior of CG ($M = 0.97$, $SE = 0.08$) was greater than that of CAG ($M = 0.63$, $SE = 0.08$, $p < 0.01$) and UAG ($M = 0.50$, $SE = 0.08$, $p < 0.01$), while the latter two conditions showed no significant differences ($p > 0.05$).

4.4. The mediation analyses for the effect of acceptance on aggressive behavior

Chow et al. (2008) found that anger played an important role in regulating aggressive behavior induced by social exclusion. Therefore, in order to investigate whether the effect of conscious and unconscious acceptance on aggressive behavior was mediated by anger, we conducted a mediation analysis with group as independent variable, the amount of hot sauce as dependent variable, and anger during task phase as the mediator. To control the possible influence of individual differences in baseline anger and exclusive feeling, anger in baseline phase and exclusive feeling were included as covariables. We coded "conscious acceptance condition = 1" or "unconscious acceptance condition = 1" as an experimental condition and coded "control condition= 0" as a control condition.

The results (see Table 2 and Fig. 3) showed that, when control group was used as a reference, the total effects of both conscious (Total effect = −0.33, SE = 0.12, 95%CI: [−0.57, −0.10]) and unconscious acceptance (Total effect = −0.40, SE = 0.12, 95%CI: [−0.64, −0.17]) on aggressive behavior were significant. However, after anger was included as a mediator in the model, the direct effects of conscious acceptance (Direct effect = −0.07, SE = 0.12, 95 % CI: [−0.30, 0.16]) and unconscious acceptance (Direct effect = −0.14, SE = 0.12, 95 % CI: [−0.37, 0.09]) were not significant. Specifically, the mediating effect of anger through unconscious acceptance (Indirect effect = −0.27, SE = 0.08, 95%CI: [−0.42, −0.13]) and conscious acceptance (Indirect effect =

Table 2
The results of mediation analysis of anger following social exclusion.

Path	b	Boot SE	Boot LLCI	Boot ULCI
CA → Anger	−0.72[a]	0.15	−1.02	−0.42
UA → Anger	−0.73[a]	0.15	−1.03	−0.43
Anger → Aggressive behavior	0.36[a]	0.07	0.22	0.50
Total effect				
CA → Aggressive behavior	−0.33[a]	0.12	−0.57	−0.10
UA → Aggressive behavior	−0.40[a]	0.12	−0.64	−0.17
Direct effect				
CA → Aggressive behavior	−0.07	0.12	−0.30	0.16
UA → Aggressive behavior	−0.14	0.12	−0.37	0.09
Indirect effect				
CA → Anger → Aggressive behavior	−0.26[a]	0.08	−0.43	−0.13
UA → Anger → Aggressive behavior	−0.27[a]	0.08	−0.42	−0.13

Note. CA = conscious acceptance; UA = unconscious acceptance. *b*: the unstandardized coefficient.
[a] Significant effect.

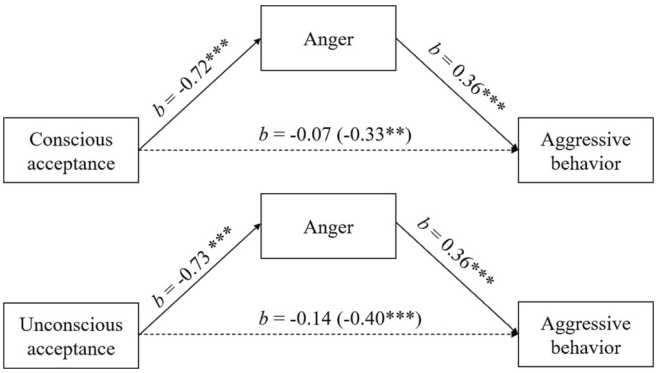

Fig. 3. The mediation model of emotion regulation strategy to anger to aggressive behavior. The conscious and unconscious acceptance groups were respectively compared to control group (control group = 0, conscious acceptance group = 1, unconscious acceptance group = 1). The results of this figure were unstandardized coefficients, with anger during baseline phase and exclusive feeling controlled. The total effects were shown in parentheses. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

−0.26 SE = 0.08, 95%CI: [−0.43, −0.13]) on aggressive behavior were significant. In summary, both acceptance strategies could reduce aggressive behavior by reducing anger.

Additionally, in order to further examine the exclusive role of anger in mediating the effect of emotion strategy on aggressive behavior in social exclusion, sadness and hurt feelings during task phase were also included as mediators to build multiple parallel mediation models (other negative emotions were excluded from the current analysis due to not being significantly induced by exclusion). Similarly, the possible influence of individual differences in baseline emotions were controlled with anger, sadness, hurt feelings and exclusive feeling as covariables. The results (see Table 3 and Fig. 4) showed that there were significant mediating effects of anger in the regulatory effects of conscious acceptance (Indirect effect = −0.30, SE = 0.09, 95%CI: [−0.50, −0.14]) and unconscious acceptance (Indirect effect = −0.32, SE = 0.10, 95%CI: [−0.53, −0.15]) on aggressive behavior. No other mediating effects were found. The results of specific regression analysis steps mentioned above can be found in Appendix A Tables A2 and A3. We also analyzed correlation between aggressive behavior and emotions during task phase (see Table A1 in Appendix A).

5. Discussion

It has been suggested that social exclusion situation may lead to aggressive behavior (Ayduk et al., 2008; Nathan DeWall et al., 2010; Twenge et al., 2001), which is an external display and motivational outcome of induced internal negative emotions, especially anger (Chow et al., 2008). Although our previous studies have found that negative emotions induced by achievement frustration and monetary loss could be well downregulated using acceptance strategy (Yuan et al., 2019; Yuan, Ding, et al., 2015), little is known about the effect of acceptance strategy on regulating negative emotions induced by social exclusion. It is also unclear whether different forms of acceptance strategy in the context of social exclusion would vary in their potential regulatory effects, and whether acceptance strategy regulates aggressive behavior via regulating internal negative emotions. To fill in the gaps, the present study compared the impact of unconscious and conscious acceptance on emotional experiences and aggressive behavior, and tested whether the feeling of anger mediated the effect of acceptance on aggressive behavior. Results showed that both unconscious and conscious acceptance alleviated adverse emotional experiences and reduced aggressive behavior. Additionally, unconscious acceptance had a better beneficial effect on regulating sadness and positive emotions in comparison to conscious acceptance, indicating that unconscious acceptance might be more effective in regulating emotional experiences under social exclusion situations. It has been found that anger mediated the effect of acceptance on reducing aggressive behavior, suggesting that the emotion of anger plays an important role in the generation of aggressive behavior during social exclusion, and modulation of aggressive behavior may be realized through the regulation of the emotion of anger.

Table 3
An analysis of the mediating effect of anger, sadness and hurt feelings on aggressive behavior.

Mediation path	Indirect effect	Boot SE	Boot LLCI	Boot ULCI
CA → Anger → Aggressive behavior	−0.30[a]	0.09	−0.50	−0.14
UA → Anger → Aggressive behavior	−0.32[a]	0.10	−0.53	−0.15
CA → Sadness → Aggressive behavior	0.02	0.04	−0.05	0.11
UA → Sadness → Aggressive behavior	0.03	0.05	−0.06	0.14
CA → Hurt feelings → Aggressive behavior	−0.002	0.03	−0.07	0.07
UA → Hurt feelings → Aggressive behavior	−0.003	0.04	−0.08	0.09

Note. CA = conscious acceptance; UA = unconscious acceptance.
[a] Significant effect.

Previous studies have reported that social exclusion experiences elicited strong negative emotional responses (Williams et al., 2000), and lead to aggressive behaviors (Twenge et al., 2001). It has been established that most of human behaviors are motivated by the need to belong—a fundamental motivation (Baumeister & Leary, 2007). Social exclusion leads to a state in which individuals feel detached from others and thus experience a thwarted need to belong that may further induce negative experiences and aggressive behavior. In support of this view, it has been reported that aggression was positively associated with negative emotions (e.g., Ebesutani et al., 2014; Riva et al., 2015). In addition, a previous study found that cognitive reappraisal is an effective way in inhibiting aggression (Scott et al., 2015). Our results further showed that acceptance could be another effective approach to downregulate aggression.

More importantly, our results demonstrated the mediating effect of negative emotions between acceptance strategy and aggressive behavior. The mediator was specific to the regulation of anger, but not of sadness and hurt feelings. Compared to anger which is related to blaming an external cause, sadness is associated with blaming one's self (Hochschild, 2022). Motivational tendency related to sadness is a moderate retreat (Roseman, 2001). Hurt feelings are associated with simultaneous approach and avoidance motivations (MacDonald, 2009), while this approach motivation manifests in maintaining interpersonal connection and repairing relationships under social exclusion (Lemay Jr et al., 2012). Unlike sadness and hurt feelings, anger is an approach-related emotion (Carver & Harmon-Jones, 2009). It may promote an effort to harm the offending other, which may aim at approaching a particular desired condition, causing discomfort to others, or rectifying an injustice (Shaver et al., 1987). It has been reported that trait anger could be a predictor of aggression in the context of individuals with a high approach-oriented posture (Koole et al., 2022), and aggression would be effectively reduced by controlling anger (Glancy & Saini, 2005). This suggests the role of anger in eliciting approach-related motivational tendency (Carver & Harmon-Jones, 2009; Harmon-Jones, 2003) and making adaptive responses to threat or defense (Lazarus, 1991). In line with these previous findings, our results indicated that anger might play a vital role in the generation of aggression during social exclusion, suggesting the importance of reducing aggressive behavior via emotion regulation strategies to downregulate the feeling of anger. These findings highlight the key role of anger in aggression, and guide the regulation of aggressive behavior in the context of social exclusion.

In addition, our results found that unconscious acceptance, compared to conscious acceptance, was more effective in regulating sadness and positive emotions. It has also been reported that unconscious acceptance is useful in maintaining participants' positive affective states (Ding et al., 2015). As opposed to unconscious acceptance, conscious acceptance requires individuals to embrace their negative emotions naturally (Hayes-Skelton et al., 2013; Orsillo et al., 2003), making it a resource-costly process that might intensify unpleasant feelings (Hofmann et al., 2009). Similarly, Yuan et al. (2019) found that explicit acceptance process was accompanied by cognitive conflict and resource depletion, while unconscious acceptance consumes relatively fewer cognitive resources, suggesting its efficacy on emotion regulation. Consistent with these findings, our results further suggested an advantage of unconscious acceptance strategy in regulating overall emotions, such as positive affect maintenance and reducing sadness during social exclusion, except for the similar regulatory effects of conscious and unconscious acceptance on anger and aggression.

Beyond our expectation, the present study found that unconscious and conscious acceptance strategies were equally effective in reducing the amount of aggressive behavior. Considering the similar regulatory effect of two acceptance strategies on anger, which plays a unique

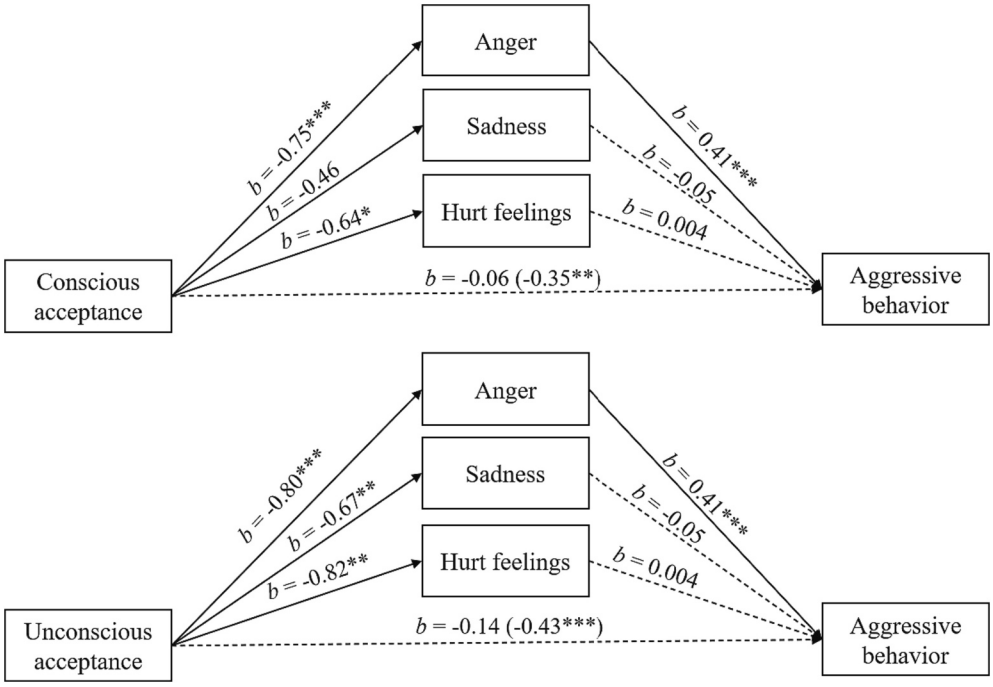

Fig. 4. The multiple parallel intermediary model. The conscious and unconscious acceptance groups were respectively compared to control group (control group = 0, conscious acceptance group = 1, unconscious acceptance group = 1). The results of this figure were unstandardized coefficients, with anger, sadness and hurt feelings during baseline phase and exclusive feeling controlled. The total effects were shown in parentheses. $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

mediating role between acceptance and aggression, it may be that both strategies are effective in reducing anger and its relevant aggressive behavior. Consistent with our findings, previous findings indicated that unconscious and conscious acceptance strategies have significant regulatory effects on negative emotions (e.g., Ding et al., 2015; Wolgast et al., 2011; Yuan et al., 2019), suggesting that the beneficial effects of both unconscious and conscious acceptance strategies on aggressive behavior may stem from their role in reducing anger. This study demonstrates the effectiveness of unconscious acceptance and provides directions for future aggression intervention studies.

Some limitations need to be acknowledged. First, more female participants were recruited than their male counterparts, although there was no significant difference in the gender ratio across the treatment groups. Men manifest a higher level of direct aggression than women (e.g., Archer, 2004; Bettencourt & Miller, 1996). A recent study also found that more retaliatory aggression was observed in men, and more unjustified aggression toward an innocent target was noted in women after rejection (Rajchert et al., 2023). However, the present study was limited to examining one type of aggressive behavior (direct aggression). Future studies could further explore the effectiveness of acceptance on different types of aggressive behavior after rejection and simultaneously consider the effect of gender. In addition, no more objective physiological indices were measured other than self-reported and behavioral measurements in the current study. Furthermore, the current results were based on the investigation on healthy populations, with the effect of acceptance strategies on clinical conditions (like depression) unknown. Impaired function in building social and interpersonal relationships was reported in depressive patients (Kupferberg et al., 2016), and they would excessively respond to exclusive situations (Hsu et al., 2015; Jobst et al., 2015; Seidl et al., 2020; Silk et al., 2014). Previous studies have found that unconscious emotion regulation strategies were more effective ways than conscious strategies on emotion regulation in depressive patients (Li & Yuan, 2018). Future investigations may consider exploring the effect of both unconscious and conscious acceptance on regulating the induced negative emotions of depressive patients in exclusive situations. In addition, the present study lacks exploring the influence of cognitive resources on the effect of two acceptance strategies. Investigating the differential use of cognitive resources between conscious and unconscious strategies when dealing with aggressive behavior could be an avenue for future studies.

6. Conclusion

In summary, the present study demonstrated the effectiveness of acceptance strategies in alleviating aggressive behavior via the reduction of anger. Specifically, conscious and unconscious acceptance were both effective in regulating the experience of anger during social exclusion, which further promoted the decrease of aggressive behavior. In addition, compared to conscious acceptance, unconscious acceptance had better regulatory effects on the feeling of sadness and the positive affect. These findings highlight the advantage of applying unconscious acceptance strategy to regulating social exclusion-induced emotions for the purpose of reducing aggressive behavior.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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Appendix A

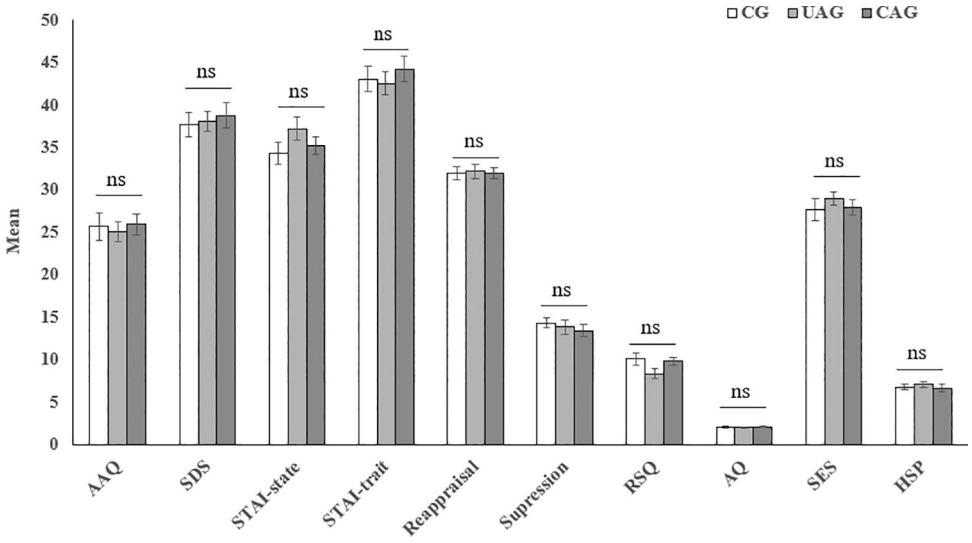

Fig. A1. Means of the emotion- and aggression-related measurements for the three groups.
Abbreviations: AAQ = Acceptance and Action Questionnaire (Bond et al., 2011); SDS = Self-Rating Depression Scale(Zung et al., 1965); STAI-state = State-Trait Anxiety Inventory-state (Speilberger et al., 1983); STAI-state = State-Trait Anxiety Inventory-trait (Speilberger et al., 1983); Reappraisal & Suppression (Emotion Regulation Questionnaire; Gross & John, 2003); RSQ = Refusal Sensitivity Questionnaire (Downey & Feldman, 1996); AQ = Aggression Questionnaire (Buss & Perry, 1992); SES = Self-Esteem Scale (Rosenberg, 2015); HSP = Hot sauce preference (Riva et al., 2015). CG = control group; UAG = unconscious acceptance group; CAG = conscious acceptance group. Error bars represent standard error. NS, not significant.

Table A1
Correlation results between aggressive behavior and emotions during task phase.

Variable	M	SD	1 Anger	2 Sadness	3 Hurt feelings	4 Other negative emotions	5 Positive emotions	6 Aggressive behavior
1 Anger	1.67	0.77	1.00					
2 Sadness	1.86	1.07	0.64**	1.00				
3 Hurt feelings	2.15	1.25	0.55**	0.74**	1.00			
4 Other negative emotions	1.39	0.50	0.61**	0.72**	0.56**	1.00		
5 Positive emotions	2.81	1.38	−0.32**	−0.31**	−0.20*	−0.21*	1.00	
6 Aggressive behavior	0.72	0.53	0.61**	0.34**	0.33**	0.35**	−0.12	1.00

Note. *$p < 0.05$, **$P < 0.01$, ***$P < 0.001$.

Table A2
The results of the hierarchical regression analysis.

	Dependent variable	Predictor	R-sq	F	b
Step1	Aggressive behavior	CA	0.23	7.24***	−0.33**
		UA			−0.40***
Step2	Anger	CA	0.40	15.72***	−0.72***
		UA			−0.73***
Step3	Aggressive behavior	CA	0.40	12.73***	−0.07
		UA			−0.14
		Anger			0.36***

Note. CA = conscious acceptance; UA = Unconscious acceptance. *b*: unstandardized coefficient, with anger, sadness and hurt feelings during baseline phase and exclusive feeling controlled. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A3
The results of the hierarchical multiple regression analysis.

	Dependent variable	Predictor	R-sq	F	b
Step1	Aggressive behavior	CA	0.25	5.24***	−0.35**
		UA			−0.43***
Step2	Anger	CA	0.46	13.22***	−0.75***
		UA			−0.80***
	Sadness	CA	0.20	3.83**	−0.46
		UA			−0.67**
	Hurt feelings	CA	0.18	3.36**	−0.64*
		UA			−0.82**

(*continued on next page*)

Table A3 (*continued*)

	Dependent variable	Predictor	R-sq	F	b
Step3	Aggressive behavior	CA	0.41	6.93***	−0.06
		UA			−0.14
		Anger			0.41***
		Sadness			−0.05
		Hurt feelings			0.004

Note. CA = conscious acceptance; UA = Unconscious acceptance. *b*: unstandardized coefficient, with anger, sadness and hurt feelings during baseline phase and exclusive feeling controlled. Coefficient.

* $p < 0.05$.

** $P < 0.01$.

*** $P < 0.001$.

Appendix B. Component words the emotion scale

Please choose the number to which each of the adjectives below describes how you feel at the moment. 1 =“very little or none”, 4 = “moderate” and 7 = “very strong”, with higher numbers indicating higher levels.

Positive Emotions (5): pleasant, happy, delighted, enthusiastic, excited (Cronbach's α = 0.87);

Anger (3): annoyed, irritated, angry (Cronbach's α = 0.88);

Sadness (2): sad, depressed (Cronbach's α = 0.84);

Hurt Feelings (1): heart hurt;

Other Negative Emotions (4): ashamed, nervous, terrible, anxious.

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