

Kicking The Barking Dog Effect: Effects of Anger and Trigger Identity on Triggered Displaced Aggression

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Abstract

Based on “kicking the barking dog” effect, this study investigated the mechanism of triggered displaced aggression from the perspectives of individuals and groups. The results revealed that (1) when the provocation and triggering situation appeared simultaneously, individuals showed a stronger hostile attribution and aggression toward the trigger; (2) The hostile attribution played a complete mediating role in the influence of anger on the triggered displaced aggression, and the triggering situation played a moderating role. In case of triggering situations, individuals showed stronger hostile attribution with an increase in anger. When there was no triggering situation, the change in anger had no significant effect; (3) Trigger identity played a moderating role in the path of “anger → hostile attribution → triggered displaced aggression” in the triggering situation. Compared with the in-group of the trigger, individuals made stronger judgments of hostile attribution to the out-group of the trigger, when in a state of anger, and subsequently activated the triggered displaced aggression. However, for the out-group of trigger, there was no significant effect. This study expands the scope of application of kicking the barking dog effect and provides suggestions for controlling the escalation of intergroup conflicts.

Introduction

“A man who was severely berated by his boss in the company chose to submit to humiliation for fear of losing his job. When he came home and saw the dog barking at the door to welcome him, he did not treat his dog as friendly as usual, but kicked it away with his strength” [1]. This example illustrates the “kicking the barking dog effect”; the man feels criticized by his boss, which is a strong provocation, while the barking dog acts as a weak trigger and is kicked away because the man could not vent his anger directly to the boss. This phenomenon is often referred to as triggered displaced aggression (TDA). Thus, TDA refers to a reaction by an individual who, for some reason, is unable to directly respond to the initial source of provocation, but when provoked by another relatively weak trigger situation, the individual engages in aggressive behaviors that do not match the conflict [2,3]. TDA can be seen everywhere in life, for example, in instances of domestic violence, animal abuse, and child abuse [4,5], and can even lead to the outbreak and escalation of group conflicts [6,7], thus affecting social stability. Existing research on TDA has mostly focused on its external influence factors, such as the trigger and the similarity between the trigger and the substitute [2,8,9]. However, these studies paid little attention to the internal process of TDA. The current study was based on kicking the barking dog effect theory and examined the mechanism of TDA from the perspectives of individuals and groups, which provided some references for preventing and reducing the escalation of violent group conflicts.

According to the general aggression model, emotion and cognition, as internal factors, affect the expression of aggressive behaviors [10]. As a special form of aggressive behavior, TDA can also be affected by emotion [11,12]. Indeed, previous studies have demonstrated that negative emotions, such as anger and depression, are often regarded as predictors of aggressive behaviors [13-16]. Existing studies have also found that provocative anger, that is, the anger generated by the provocative situation [2,5,17].

The ego depletion theory believes that the total amount of self-control resources an individual possesses is limited. Accordingly, after a period of activities that require the use of self-control resources, self-control ability will be exhausted, which will affect the performance of subsequent tasks that require self-control [18,19]. In other words, when individuals encounter a provocative situation that generates anger, they will attempt to control their words and behavior through self-control, to conform to social norms. Subjective cognition, emotion, and other factors will cause ego depletion [20], which can lead individuals to engage in immoral and risk-taking behaviors in subsequent

triggering situations ^[21]. However, there is a time interval between the emergence of the anger caused by the initial provocative situation and the displaced aggression toward another, subsequent trigger. When this interval is short, the initial anger might not have time to dissipate and the level of physiological arousal will affect subsequent aggressive behaviors. However, when this interval is long, the anger and accompanying physiological arousal can last for only 10–20 minutes without any follow-up processing. The individual's rumination on anger plays a role in maintaining it, which affects subsequent aggressive behavior. It also leads to the generation of a series of cognitions related to aggression. The accessibility of aggressive cognition leads individuals to generate an attribution bias in the triggering situation ^[1]. With this in mind, the current study attempted to investigate how anger affects the cognitive pathway of TDA.

According to the cognitive-neoassociation theory of aggression, the anger caused by a provocative situation can activate the memory network related to aggression, causing the individual to generate a hostile explanation for the subsequent weak triggering situation, culminating with aggressive behaviors toward the target ^[13]. Similarly, other studies have demonstrated that anger and cognition-related aggression, can be activated by the provocative situation, which in turn triggers the individual's attribution bias toward the weak stimulus in the subsequent triggering situation, namely hostile attribution ^[22]. Compared with sadness and neutral emotions, anger can prompt individuals to make more hostile inferences ^[23,24]. Previous studies have demonstrated a positive correlation between hostile attribution and aggressive behaviors ^[25,26], and that hostile attribution plays a mediating role in the relationship between provocative anger and aggressive behaviors ^[22]. Barlett and Anderson suggested that individuals with high levels of hostile attribution tend to pay attention to hostile cues, thus forming a hostile model of social information ^[27]. The social information processing model indicates that hostile attribution causes individuals to process and interpret others' behavioral intentions in a hostile mode; that is, even if others' real intentions are benign, it is easier to make hostile assessments, which, in turn, trigger aggressive behaviors toward others ^[28–30]. Therefore, the anger induced by the previous provocation will affect the individual's cognition of the subsequent triggering situation, which will ultimately lead to TDA. Considering this fact, the current study proposed the following hypothesis: hostile attribution plays a mediating role between anger and TDA.

In TDA, individuals first experience a strong provocative situation, causing a surge in anger. However, the target of attack is not the individual who provokes it, but the trigger. In some cases, the target might shift from an individual to an entire group, which provides a new perspective for the outbreak and escalation of group conflicts ^[31]. A lot of an individual's activities can be in relation to others around them. In recent years, the increase in social conflicts and the rapid changes in people's mentality have exacerbated the risk of conflicts between groups ^[32]. Among the manifestations of intergroup conflict, intergroup violent conflicts (such as violent conflicts between different families or violent terrorist events between different nationalities and religions) are particularly prominent. This type of conflict not only causes serious adverse effects on both sides of the dispute but also exacerbates social instability. However, intergroup violent conflict in real life is often not a direct violent confrontation between two complete groups, but more a type of conflict caused by violence and escalation of attacks between members of two groups ^[33,34]. However, it can be difficult for the existing aggression theories to explain the process of intergroup conflict spreading from individuals to groups. For example, although the general aggression model demonstrates that a social encounter can affect an individual's internal state and decision-making ability ultimately leading to aggressive behavior, it does not explain how an attack between individuals extends to their respective groups ^[10]. According to the group identity theory of the social identity model and the intergroup social relations model, each group member has an in-group preference; the higher the level of identification of the in-group, the greater the disgust toward and likelihood of belittling the out-group. Out-group identity poses a threat to the group and is regarded as a hostile and

competitive motivation, which requires defensive coping styles (such as aggressive behavior) [35–37]. Specifically, when the target and the provocateur belong to the same out-group, the more physically similar and closely related they are, the stronger the satisfaction of the attack [38]. Previous studies have also found that the character of the aggressive behavior (such as the identity of the trigger) may affect TDA [5,38]. For example, when an individual is provoked by a negative evaluation, compared with the in-group, the individual has more aggression in the displaced aggressive target of the out-group; when the individual is not provoked, there is no significant difference in the aggression of the individuals toward the displaced target of the in-group and out-group [39]. Furthermore, hostile attribution is significantly positively correlated with trigger identity. The individual is more inclined to process and interpret the behavioral intentions in a hostile manner when the trigger identifies as an out-group member, as compared to when the trigger identifies as an in-group member [2]. Intergroup threat theory also indicates that the existence of an out-group poses a certain threat to the in-group, which induces negative emotion (such as anger) in the in-group members toward the out-group. Moreover, as the degree of intergroup threat increases, negative emotions will increase, which will affect the hostile attribution of the in-group toward the out-group members' behavioral intention, and further trigger intergroup aggressive behavior [40–42]. Previous studies show that the more positive the contact between individuals and the out-group is, the lesser the tendency of the individual to behave aggressively with the out-group. This variation is indirectly produced through the decrease in threat perception among groups [43]. That is, compared to the in-group of the trigger, when individuals are provoked to trigger anger, they are more likely to generate hostile explanations to the out-group of the trigger in the subsequent weak triggering situation. The hostile explanation affects the intensity of the attack on the trigger. Therefore, this study proposed the following hypothesis: the relationship between anger and TDA is moderated by trigger identity, and it moderates the first half path and direct path of the mediating process of “anger → hostile attribution → TDA.”

In summary, the current study was based on the kicking barking dog effect theory. Three experiments were conducted to investigate the effects of anger and hostile attribution in TDA under the framework of individuals and groups. To investigate the generating process of TDA, the pilot experiment examined the effects of emotions on subsequent cognition in the individual framework. Experiment 1 examined the relationship between anger, hostile attribution, and subsequent aggressive behaviors, under the individual framework, and the generating process of TDA was discussed. Experiment 2 examined the relationship between anger, hostile attribution, and subsequent aggressive behaviors, under the group framework, and further examined the effect of trigger identity in the generating process of TDA. As such, this study explored the mechanism of TDA while preliminarily exploring the escalation of intergroup violent conflict, from the perspective of trigger identity.

Experiment

2 Preliminary experiment: The effect of anger on hostile attribution and aggressive intention

2.1 Participants

Participants were 50 undergraduate students (31 males and 19 females), who were randomly selected for the study. Of these, three did not complete the experiment and were eliminated. The final number of participants was 47 (30 males and 17 females), and the age range was 18–27 years old (average age=23.11 [$SD=2.25$]). Participants were randomly assigned to either the experimental group ($n=24$) or the control group ($n=23$). The Ethics Committee of Ningbo University approved this study, in accordance with the ethical principles of the Declaration of Helsinki 1975 (and its revised version). All participants, in the preliminary as well as main experiments, provided written informed consent prior to the study. After completing the study, the participants received monetary rewards.

2.2 Materials

2.2.1 Anger

To measure participants' anger, we used the Emotional State Self-Rating scale by Peng et al. ^[44]; on seven items, participants expressed the extent to which they appeared in the scale, such as "hate." Considering the consistency of the scores, the five-point scoring in the original scale was changed to a seven-point scoring (1=none at all; 7=extremely strong). Higher scores represented stronger anger. Cronbach's alpha for the scale was

2.2.2 Hostile attribution

Following Gagnon et al., six ambiguous situations (situations that can be interpreted as hostile or non-hostile) were selected ^[45]. For example, "Imagine that a classmate did not invite you to attend his birthday party; what would you think was the reason for not being invited?" Each situation contained two hostile and two non-hostile explanations. A seven-point scoring system was adopted, ranging from 1 (not possible at all) to 7 (very possible). Participants' hostile attribution in the ambiguous situations was measured according to the score given to the hostile explanation: higher the score, stronger the hostile attribution. The internal consistency coefficient for the explanation of hostility in all situations was 0.77.

2.2.3 Anger intentions

To measure the participants' aggressive intention toward individuals in ambiguous situations, we used direct questions, such as "How much do you want to be angry with these two classmates?" A seven-point scoring system was used, ranging from 1 = "not at all" to 7 = "want a lot." A higher score indicated more aggressive intention. Previous studies have demonstrated that direct inquiry can form coherence with the aforementioned hostile attribution situation to achieve consistency between the target in the former and the latter case, thereby proving to be more effective than a single questionnaire or scale measuring aggression ^[3].

2.2.4 Anger priming technique

Based on the work of Sjöström and Gollwitzer, the recall method was used to manipulate both anger-inducing and general situations ^[38]. In the anger-inducing situations, participants were asked to recall a recent experience (including the timing, the place, and a general description of what happened) that had generated anger; this experience could also induce strong anger at the present moment. In the general situation, participants were asked to recall the recent description of a product or the explanation of a word in a book. In both situations, participants were asked to write down all the details they were asked to recall. Further details regarding this can be found in the Supplementary Information.

2.3 Experimental design and procedures

A single-factor (situation type: anger-inducing vs. general) experimental design was adopted, and the dependent variables were the individual's scores of hostile attribution and aggressive intention. First, all participants completed the Emotional State Self-Rating scale as the pre-test, followed by the anger-inducing situation (the experimental group) and the general situation (the control group); the Emotional State Self-Rating scale and measures of hostile attribution and aggressive intention were administered as the post-test assessment. The pre-test, experimental and control situation, and post-test were all conducted on the same day. After the experiment, the purpose of the study was explained to the participants for reassuring them.

2.4 Results

First, the validity of the provoked anger manipulation was tested. The paired sample *t*-test revealed that the post-test ($M=3.71$, $SD=1.68$) scores for anger were significantly higher than those in the pre-test ($M=1.58$, $SD=0.97$; $t(23)=-7.47$, $p<0.001$, $d=1.39$) in the experimental group, while the pre-test ($M=1.70$, $SD=1.26$) and the post-test ($M=1.52$, $SD=0.99$) scores for anger showed no significant difference ($t(22)=0.30$, $p=0.730$) in the control group. In addition, there was no significant difference between the experimental group and the control group in the pre-test scores for anger ($t(45)=0.34$, $p=0.730$), which indicated that the anger-inducing manipulation was effective.

Subsequently, hostile attribution and aggressive intention were used as dependent variables in the analysis of variance by a 2 (sex: male or female) \times 2 (situation type: provoked vs. general) between-group design. The results showed that for hostile attribution, the main effect of the situation type was significant ($F(1, 43)=14.18$, $p<0.001$, $\eta^2_p=0.251$), and the experimental group had a stronger degree of hostile attribution than the control group; the main sex effect ($F(1, 43)=0.16$, $p=0.690$) and the interaction ($F(1, 43)=1.25$, $p=0.270$) were not significant. For aggressive intention, situation type ($F(1, 43)=1.34$, $p=0.250$), sex ($F(1, 43)=2.54$, $p=0.120$), and the interaction ($F(1, 43)=0.04$, $p=0.840$) were not significant.

2.5 Discussion

The pilot experiment found that individuals in a state of anger had a strong hostile attribution in the subsequent ambiguous situation. This showed that anger affected the individual's subsequent cognitive processing of the situation, which provided the basis for establishing the occurrence of TDA. Previous studies on hostile attribution and aggressive intention show that greater hostile attribution may lead to stronger aggressive behaviors^[46,47]. However, the pilot experiment found no significant difference in aggressive intention between the experimental and control groups.

In light of these results, we speculated that, since the provocative situation from the pilot experiment and the subsequent triggering situation adopted the method of recall and imagination, perhaps participants did not experience them as they would have if these had been real situations. Further, the pilot experiment inquired participants' aggressive intentions directly. However, in most cultural backgrounds, aggressive intention and behavior are not socially approved or desirable; consequently, participants were likely to hide aggressive intentions. Therefore, with Experiments 1 and 2, participants were experienced a provocative and a triggering situation firsthand and a more effective way to measure aggression was chosen.

3 Experiment 1: Kicking the barking dog effect—the roles of anger and hostile attribution

3.1 Participants

A total of 90 undergraduate students (38 males and 52 females) were randomly selected. Of these, five either did not complete the experiment or guessed its purpose and were, therefore, eliminated. The final number of participants was 85 (35 males and 50 females); the age range was 18–25 years (average age=19.36 [$SD=1.30$]).

3.2 Materials

Anger: The same as the pilot experiment.

Hostile attribution: The Hostile Attribution Bias Scale by Topalli and O'Neal was used [48], with a total of five items, such as "Imagine you are walking through the school corridor and two classmates are coming toward you. When you pass them, they look at you, whisper to each other, and laugh. Please answer: why do these two classmates laugh when they pass by you?" A seven-point scoring was adopted, from 1 = "completely inconsistent" to 7 = "completely consistent". A higher score indicated a stronger hostile attribution. The internal consistency coefficient of the scale was 0.88 in this study.

Aggression: We adopted Reijntjes et al.'s idea that the best way to measure the individual's aggression toward others was by determining their opinion about the level of reward that should be received by others [8]. The chosen reward level becomes a measure of their aggression. There were seven grades, from the least to the most rewarding, and a lower reward level represented stronger aggression. Further details regarding this measure can be found in the Supplementary Information.

3.3 Experimental design

A 2 (provocation: yes, or no) × 2 (trigger: yes, or no) between-group design was adopted, and the dependent variables were anger, hostile attribution, and the score of aggression. Here, anger refers to the change in the amount of anger between pre- and post-test, which is collectively referred to as "provocative emotion" for the convenience of the reader (the same below). Participants were assigned to four conditions: the provocative and triggering group (20 participants), the provocative and non-triggering group (18 participants), the non-provocative and triggering group (21 participants), and the non-provocative and non-triggering group (26 participants).

3.4 Situation manipulation

According to the classic experimental paradigm of TDA, participants were provided different types of feedback to manipulate the previous provocative situation and the subsequent triggering situation [3,17].

Provocative situation: Participants were allowed to solve a relatively difficult problem within the specified time, following which the experimental assistant A offered them feedback. In the provocative situation, the feedback the participants received was "The answer you wrote is too groundless! I thought the people who came to participate in the experiment were at least on the same level...but your answer...ho ho..." In the non-provocative situation, the feedback was "The total score is 10 and you got 6.7 points, which is above the average level."

Triggering situation: As the surface task, the participants were asked to list as many qualities an astronaut has as they could think of, in a limited space of time, and explain their reasons. Experimental assistant B scored the answers in terms of creativity, quality, effort, diversity, and rationality. Each aspect was scored from 1 to 7. The higher the score, the better the aspect was considered to be. In the triggering situation, the participants scored 1, 2, 3, 1, 3 in each aspect and 2 as the total score, and the feedback provided was "In my opinion, the completion is not good. I think that, as a person who has the ability to think independently, you should perform better." In the non-triggering situation, the participants' corresponding scores were 6, 5, 6, 5, 5 for each aspect and 5 as the total score, and they would receive the following feedback: "It's okay to complete it in a limited time."

3.5 Procedure

First, the participants were informed that this study was on problem-solving abilities and that they needed to fill in the basic information and emotional pre-test questionnaires. Second, the participants and experimental assistant A collaborated to solve the first problem. After solving the problem, the participants received feedback from

experimental assistant A, depending on which situation they had been assigned to. Since the feedback was computerized, the participants could not attack experimental assistant A after receiving such feedback. After receiving the feedback, the participants completed the emotional post-test. Later, the participants and experimental assistant B cooperated to solve another problem, after which they received feedback from experimental assistant B, depending on which situation they had been assigned to. After receiving the feedback, the participants would complete the measurement of hostile attribution toward experimental assistant B and determine the reward level that experimental assistant B should receive (used as the measurement of aggression). Finally, the experimenter asked the participants whether they had guessed the real purpose of the experiment, explained the content of the experiment, and soothed the participants' emotions by psychological counseling (Figure 1).

3.6 Results

First, the validity of the provoked anger manipulation was tested. The paired sample *t*-test found that the post-test scores for anger ($M=3.58$, $SD=1.64$) were significantly stronger than the pre-test ($M=1.05$, $SD=0.32$; $t(37)=-9.59$, $p<0.001$, $d=1.64$) in the provocative situation group. There was no significant difference between the pre-test ($M=1.06$, $SD=0.32$) and the post-test ($M=1.15$, $SD=0.42$) scores for anger in the non-provocative situation group ($t(46)=-1.66$, $p=0.100$). Moreover, there was no significant difference between the two groups in the anger pre-test ($t(83)=0.16$, $p=0.870$), indicating that the method through which the anger was provoked in the experiment was effective.

3.6.1 Differences of hostile attribution and aggression in different situations

The results of variance analysis are shown in Table 1.

Table 1. Participants' hostile attribution and aggression in different types of situation ($M\pm SD$)

	Situation Type	Hostile Attribution	Aggression
No Provocation	no trigger ($n=26$)	9.77±3.72	2.19±0.90
	trigger ($n=21$)	10.76±4.10	2.38±1.16
Provocation	no trigger ($n=18$)	11.44±3.18	2.00±1.03
	trigger ($n=20$)	21.10±4.81	4.20±1.01

For hostile attribution, the main effect of the provocative situation was significant ($F(1, 81)=47.12$, $p<0.001$, $\eta^2_p=0.371$), and hostile attribution in the provocative situation was significantly higher than that in the non-provocative situation. The triggering situation had a significant main effect ($F(1, 81)=37.02$, $p<0.001$, $\eta^2_p=0.313$), and it was significantly higher than in the non-triggering situation; the interaction was significant ($F(1, 81)=24.50$, $p<0.001$, $\eta^2_p=0.230$). A simple effect analysis found that there was a significant difference ($p<0.001$) in hostile attribution between the presence and absence of trigger in the provocative situation; thus, participants in the triggering situation produced stronger hostile attributions. Similarly, in the triggering situation, the difference in hostile attribution between the presence and absence of provocation was significant ($p<0.001$); thus, participants in the provocative situation produced stronger hostile attributions. In the non-provocative situation ($p<0.05$) and non-triggering situation ($p=0.180$), there was no significant difference (see Figure 2a). This indicates that the participants would show stronger hostile attribution when the provocative and triggering situations were simultaneous.

Regarding aggression, the main effect of the provocative situation was significant ($F(1, 81)=13.29, p<0.001, \eta^2_p=0.142$), and aggression in the provocative situation was significantly higher than that in the non-provocative situation. The main effect of the triggering situation was significant ($F(1, 81)=28.64, p<0.001, \eta^2_p=0.261$); the aggression in the triggering situation was significantly higher than that in the non-triggering situation. The interaction was significant ($F(1, 81)=20.31, p<0.001, \eta^2_p=0.200$). A simple effect analysis revealed that there was a significant difference ($p<0.001$) in aggression between the presence and absence of trigger in the provocative situation, and the participants in the triggering situation displayed stronger aggression (see Figure 2b). In the triggering situation, there was a significant difference ($p<0.001$) in aggression between the presence and absence of provocation, and the participants in the provocative situation showed stronger aggression. In the non-provocative ($p=0.530$) and non-triggering situation ($p=0.540$), there was no significant difference. This indicates that the participants would show the strongest aggression when the provocative situation and the triggering situation existed simultaneously.

3.6.2 The mediating role of hostile attribution and the moderating role of the triggering situation

In order to further explore the relationship between anger, hostile attribution, and aggression, a correlation analysis was conducted. The results showed that there was a significant positive correlation between the three variables ($p<0.01$), which also provided the possibility for subsequent analysis. To further explore the generation process of the TDA, the bootstrap method was conducted using anger as the independent variable, hostile attribution as the mediating variable, and aggression as the dependent variable. The results showed that the path of “anger → hostile attribution → aggression” was significant, with 95% CI [0.21, 0.64], excluding 0. The path of “anger → aggression” was not significant, with 95% CI [-0.15, 0.24], including 0. Therefore, hostile attribution played a complete mediating role between anger and aggression.

Since in this experiment the attack refers to TDA, further analysis of the possible role of the triggering situation is warranted. Because the triggering situation was a categorical variable (trigger or no trigger), it was converted into a dummy variable (trigger=1, no trigger=0). Subsequently, the variables were standardized to avoid multicollinearity and the regression analysis method was adopted to test the moderating effect^[49]. First, the anger and triggering situation were included in the regression equation. Second, their interaction terms were also included in the regression equation. If the interaction term significantly predicts the dependent variable, it indicates a significant moderating effect between the two variables. The results showed that both anger ($\beta=0.36, p<0.001$) and the triggering situation ($\beta=0.37, p<0.001$) can significantly predict hostile attribution. Further, the interaction term between anger and the triggering situation was significant ($\beta=0.36, p<0.001$), indicating that the triggering situation played a moderating role in the influence of anger on hostile attribution. In order to further analyze the moderating effect, a single slope analysis was performed to examine the effect of anger on hostile attribution, when the triggering situation was plus or minus one standard deviation (see Figure 3). When there was a highly triggering situation, the anger significantly predicted hostile attribution positively ($b_{simple}=0.72, SE=0.09, p<0.001$). When there was a low triggering situation that was not triggered, the change in anger did not significantly predict hostile attribution ($b_{simple}=0.001, SE=0.13, p=0.970$). This shows that when there was a trigger, the individual's hostile attribution to the trigger significantly increased with the increase in anger, but when there was no trigger, the change in anger had no significant effect on hostile attribution.

3.7 Discussion

Experiment 1 comprehensively investigated the relationship between the provocative situation and the provoked emotional state, the triggering situation and the individual's hostile attribution to it, and aggression under the individual framework to explore the generating process of TDA. As far as the interaction between provocative situation and triggering situation is concerned, for hostile attribution, this interaction was significant, which shows that the individual would produce strong hostile attribution to the trigger when the provocative and the triggering situation existed simultaneously. For the intensity of the attack, the previous provocative situation and the subsequent triggering situation also interacted with each other, which means that only when the provocative and triggering situation existed simultaneously, the individual would show TDA. There was a consistent response pattern between the provocative and triggering situations, on the one hand, which shows that hostile attribution can significantly predict aggressive behavior [47,50]. On the other hand, it also reflects the importance of the interconnection between the two types of situations. The mediating analysis revealed that hostile attribution played a complete mediating role in the influence of anger on aggressive behavior. This further verified the influence of anger on hostile attribution found in the pilot experiment, and the fact that the TDA occurred because the provocative situation incited anger, made the individual produce stronger hostile attribution to the trigger in the triggering event under the influence of this anger, and led to aggressive behavior toward the trigger.

4 Experiment 2: The moderating role of the trigger identity on TDA

4.1 Participants

A total of 85 undergraduate students (32 males and 53 females) studying at the same university were randomly selected. Of these, three guessed the intention of the experiment and, thus, were invalidated. The final number of participants was 82 (30 males and 52 females); and the age range was 18–22 years old (average age=19.49 years [$SD=0.95$]).

4.2 Materials

The measurement of anger, hostile attribution, and aggression were the same as in Experiment 1. The internal consistency coefficient for the Emotional State Self-Rating scale and the Hostile Attribution Bias scale were 0.84 and 0.89, respectively, in this study.

Group identity: Five items from the Group Identity Scale by Yzerbyt et al. [51] was used, for example, "I am a member of our group," and "I have a very close relationship with the group members." A seven-point scoring system was adopted, ranging from 1 = "completely disagree" to 7 = "completely agree." The internal consistency coefficient of the scale was 0.71 in this study.

4.3 Experimental design

Experiment 2 used a 2 (trigger: yes, no) × 2 (trigger identity: in-group or out-group) between-group design, and the dependent variables were anger, hostile attribution, and the score of aggression.

4.4 Situation manipulation

Group formation: Using the minimal group paradigm to manipulate group formation [52], the experimenter presented the works of painter A and painter B (a total of 28 pairs) to the participants at the same time, and let the participants select their favorites from each pair of works. Finally, the participants were divided into groups according to the

painter they had preferred ^[53]. The experimenter asked the participants to complete a false personality questionnaire and informed them that individuals with similar results would be included into the same group.

Provocative situation, triggering situation: The same as Experiment 1.

Further details can be found in the Supplementary Information.

4.5 Procedure

First, the experimenter informed the participants that this was a personality test, asked them to select one of the works from each pair of works, and administered a false personality questionnaire. The experiment was conducted in two groups—A and B (some of the group members were fake participants). Before the formal experiment, the experimenter arranged for the members of the two groups to meet with each other briefly, to make group B believe that the experiment was legitimate. The communication content for the experiment was decided in advance, and the Anger Self-Rating scale and the Group Identity Scale were completed. Second, the same method from Experiment 1 was used to operate the provocative situation (all participants were provoked), induce the participants' anger, and all the triggers were the members of out-group A. The triggers for the members of Group B came from members of the out-group (group A) and other members of the in-group (group B). Finally, the participants completed the measurement of hostile attribution and the level of reward that the trigger should receive. After the experiment, the participants were asked whether they had guessed the purpose of the experiment. The experimenter explained the content of the experiment and soothed the participants' emotions by psychological counseling.

4.6 Results and Analysis

4.6.1 Effectiveness test of group formation and anger manipulation

Based on the standard of Yzerbyt et al. ^[51], the "4 (neutral)" scoring of the Group Identity scale was used as the reference value. When the score is greater than "4," the stronger the in-group identity is. Therefore, the difference between the scores of in-group identity and "4" was compared. The results showed that the participants' identity to the in-group ($M=5.31$, $SD=0.77$) was significantly greater than "4" ($t(80)=15.40$, $p<0.001$, $d=1.70$), which indicates that the in-group and the out-group were formed through the minimal group paradigm. The participants' anger after being provoked ($M=3.15$, $SD=1.64$) was significantly greater than before ($M=1.04$, $SD=0.19$; $t(81)=-11.81$, $p<0.001$, $d=1.29$), which indicates that the induction of anger was effective in the experiment.

4.6.2 Comparison of the differences between participants' hostile attribution and the intensity of the attack under different experimental operations

The results of variance analysis are shown in Table 2.

Table 2. Anger, Hostile attribution, and TDA ($M\pm SD$)

Situation type	Trigger Identity	Hostile Attribution	TDA
No Triggering Situation	in-group ($n=21$)	9.05±3.01	2.14±0.79
	out-group ($n=21$)	9.29±3.89	2.24±1.14
Triggering Situation	in-group ($n=18$)	12.72±6.14	2.61±1.42
	out-group ($n=22$)	20.23±5.84	4.68±1.29

For hostile attribution, the main effect of the triggering situation was significant ($F(1, 78)=46.13, p<0.001, \eta^2_p=0.372$), and the triggering situation was significantly higher than the non-triggering situation. The main effect of trigger identity was significant ($F(1, 78)=12.95, p<0.001, \eta^2_p=0.140$), and the out-group was significantly higher than the in-group. The interaction was significant ($F(1, 78)=11.40, p<0.001, \eta^2_p=0.133$). The simple effect analysis found that there was no significant difference ($p=0.850$) between the in-group and the out-group in the non-triggering situation, and the hostile attribution toward the out-group members was significantly higher than that of in-group members ($p<0.001$). For in-group members, there was a significant difference between the triggering and the non-triggering situations ($p<0.05$). The hostile attribution in the triggering situation was significantly greater than that in the non-triggering situation. For the out-group, the hostile attribution in the triggering situation was also significantly greater than that in the non-triggering situation ($p<0.001$, see Figure 4a). This shows that, regardless of whether the trigger was an in-group member or an out-group member, the hostile attribution in the triggering situation was greater than that in the non-triggering situation, but the hostile attribution was stronger when the trigger was an out-group member.

Regarding aggression, the main effect of the triggering situation was significant ($F(1, 78)=33.90, p<0.001, \eta^2_p=0.301$), and the aggression in the triggering situation was significantly higher than that in the non-triggering situation. The main effect of trigger identity was significant ($F(1, 78)=18.75, p<0.001, \eta^2_p=0.192$), and the out-group was significantly higher than the in-group. The interaction was significant ($F(1, 78)=15.60, p<0.001, \eta^2_p=0.172$). The simple effect analysis found that there was no significant difference between the in-group and the out-group in the non-triggering situation ($p=0.790$). The participants' aggression toward out-group members was significantly higher than toward in-group members in the triggering situation ($p<0.001$). For in-group members, there was no significant difference between the triggering and the non-triggering situations ($p=0.200$). For out-group members, the aggression in the triggering situation was significantly greater than that in the non-triggering situation ($p<0.001$; see Figure 4b). This shows that when there was a triggering situation, the participants would be more aggressive when the trigger was an out-group member.

4.6.3 The mediating role of hostile attribution and the moderating role of triggering situation

Similar to the analysis in Section 3.6.2, there was a significant positive correlation between anger, hostile attribution, and aggression ($p<0.01$). The path of "anger → hostile attribution → aggression" was significant, with 95% CI [0.09, 0.54], excluding 0. The path of "anger → aggression" was not significant, with 95% CI [-0.06, 0.27], including 0. Therefore, hostile attribution played a complete mediating role between anger and aggression. In addition, anger ($\beta=0.25, p<0.01$) and the triggering situation ($\beta=0.52, p<0.001$) can significantly predict hostile attribution. The interaction between anger and the triggering situation was significant ($\beta=0.28, p<0.01$), indicating that the latter played a moderating role in the influence of the former on hostile attribution. In order to further analyze the moderating effect, a single slope analysis was performed to examine the effect of anger on hostile attribution, when

the triggering situation was plus or minus one standard deviation (see Figure 5). The results showed that, in case of a highly triggering situation, the anger significantly predicted hostile attribution positively ($b_{simple}=0.53$, $SE=0.14$, $p<0.001$); when there was a low triggering situation that was not triggered, the anger did not significantly predict hostile attribution ($b_{simple}=0.03$, $SE=0.11$, $p=0.762$). This shows that when there was a trigger, the individual's hostile attribution to the trigger significantly increased with the increase in anger, while when there was no trigger, anger had no significant effect on hostile attribution.

4.6.4 The moderating effect of the trigger identity

To further explore the influence of the trigger identity, the above model was tested with a moderated mediation effect. First, the trigger identity was converted into dummy variables, and all variables were standardized to avoid multicollinearity. According to the recommendations of Wen and Ye [54], testing the adjusted mediation model needs to test the parameters of the three regression equations. The results of the adjusted mediation model test in this study are shown in Table 3. According to Experiment 1, only in the triggering situation, anger affected the subsequent hostile attribution of the individual to triggering attribution. Therefore, only the triggering situation was considered here. The predictor variables were standardized in each equation and the variance expansion factor of all predictors was lower than 1; hence, there was no multicollinearity concern. Among them, the anger in equation 1 significantly positively predicted TDA, and the interaction between anger and trigger identity significantly predicted TDA. In equations 2 and 3, the interaction between anger and trigger identity significantly predicted hostile attribution and TDA, and hostile attribution significantly positively predicted TDA. This shows that anger, hostile attribution, trigger identity, and aggression constitute a moderated mediation model. Hostile attribution mediated the relationship between anger and TDA, and trigger identity moderated the first half path and the direct path of the mediating process of "anger → hostile attribution → TDA."

Table 3. Moderated mediation model test

	Equation 1(Y: TDA)				Equation 2(M: hostile attribution)				Equation 3(Y: TDA)			
	<i>B</i>	<i>SE</i>	β	95%CI	<i>B</i>	<i>SE</i>	β	95%CI	<i>B</i>	<i>SE</i>	β	95%CI
<i>X</i>	0.23	0.10	0.23*	[0.03, 0.43]	0.26	0.10	0.26*	[0.05, 0.46]	0.08	0.09	0.08*	[0.09, 0.25]
<i>U</i>	0.35	0.10	0.35**	[0.15, 0.54]	0.29	0.10	0.29**	[0.08, 0.49]	0.19	0.09	0.19*	[0.02, 0.36]
<i>X</i> × <i>U</i>	0.22	0.10	0.22*	[0.02, 0.42]	0.15	0.11	0.15*	[0.05, 0.36]	0.13	0.09	0.13*	[0.02, 0.23]
<i>M</i>									0.55	0.10	0.55***	[0.36, 0.74]
<i>M</i> × <i>U</i>									0.04	0.10	0.03	[-0.16, 0.23]
<i>R</i> ²			0.22				0.17				0.47	
<i>F</i>			8.77***				6.44**				15.47***	

NOTE: *X*=anger, *U*=trigger identity, *M*=hostile attribution, *Y*=TDA; trigger identity is a dummy variable, in-group=1, out-group=2, and the 95% CI of all predictor variables were obtained by Bootstrap.

In order to further analyze the moderating role of the trigger identity using the trigger identity plus or minus one standard deviation, anger performed a simple slope analysis on the effect value of TDA, and a simple effect diagram was drawn (see Fig. s1 in the Supplementary Information). The results showed that when the trigger was an out-group member, the anger significantly positively predicted TDA ($b_{simple}=0.44$, $SE=0.13$, $p<0.001$). When the trigger was an in-group member, anger did not significantly predict TDA ($b_{simple}=0.01$, $SE=0.16$, $p=0.350$). This shows that for the out-group trigger, as the individual's anger increased, the TDA also increased. For the in-group trigger, there was no significant difference in the performance of anger and TDA.

4.7 Discussion

Experiment 2 explored the internal process of TDA and the role of trigger identity in the group context. The mediating effect test revealed that hostile attribution played a completely mediating role in the process of influence of anger on TDA, and the triggering situation played a moderating role in the process of anger affecting hostile attribution. This is consistent with the findings of Experiment 1 and further validates the role of anger and hostile attribution in TDA. For hostile attribution, the interaction between the trigger identity and the triggering situation was significant. Regardless of the trigger being an in-group or an out-group member, the individual would show stronger hostile attribution under the triggering situation. When the trigger was an out-group member, the individual's hostile attribution would be more intense. For aggression, the interaction between the trigger identity and the triggering situation was significant, and the trigger would only be attacked if it was an out-group member. In Experiment 2, unlike in Experiment 1, the hostile attribution and aggression were not synchronous in performance, which may be due to the influence of trigger identity. The moderated mediating effect test revealed that hostile attribution partly mediated the relationship between anger and TDA, and trigger identity mediated the first half path and direct path of the mediating process of "anger → hostile attribution → TDA." In addition, the simple slope test found that for the out-group trigger, as the individual's anger increased, the TDA also increased. For the in-group trigger, there was no significant difference in the performance of anger and TDA.

Discussion

5.1 Internal process of TDA

From the perspective of the continuity of emotion cognition-behavior, this study explored the internal process of TDA, from both individual and group perspectives. The pilot experiment conducted as a preliminary verification of the influence of emotion on cognition, showed that anger produces stronger hostile attribution to subsequent ambiguous situations, which is consistent with previous research findings^[55]. This influence of emotion on cognition becomes a bridge connecting the previous and subsequent triggering situation in TDA. Experiment 1 comprehensively examined the previous provocative situation and the emotional state provoked by it, the subsequent triggering situation and the individual's cognitive processing of it, and the expression of the individual's aggressive behavior. The results revealed that the anger provoked by the provocative situation affected the TDA, by influencing the individual's hostile attribution to the trigger. That is, the key to the occurrence of TDA is the influence of the previous state on subsequent cognitive processing. The previous provocative situation and the anger that it incites are the premise for TDA, while the subsequent triggering situation is the key to the occurrence of aggressive behavior. Experiment 2 studied TDA under a group framework. The results indicated that hostile attribution played a mediating role between anger and aggression, which further verified that TDA originated from the state caused by the provocation, and this affected the individual's cognitive processing of the triggering situation. However, Experiment 2 also showed that when the trigger was an in-group member, the individual still showed hostile

attribution toward it; however, in this case, the individual did not display aggression. In other words, there are other influencing factors between hostile attribution and the expression of aggression, which need to be further explored in a follow-up study. Since people cannot avoid previous provocative situations in real life, they can reduce the occurrence of TDA by adopting some strategies; on the one hand, the emotions aroused by the provocation can be dissipated as soon as possible, which can destroy the premise of TDA. On the other hand, strategies such as cognitive reappraisal can weaken the hostile attribution to the trigger. Cognitive reappraisal is an advanced attention strategy that adjusts the emotional response by changing the understanding of emotional events [56]. Thus, the individual can create a new interpretation of the events through cognitive reappraisal, thereby reducing hostile explanations and decreasing the possibility of aggressive expression.

5.2 The role of the trigger identity in the process of TDA

In real life, intergroup violent conflicts do not usually involve direct violent confrontation between groups; instead, they are usually caused by the escalation of violent aggressive behaviors between members of the two groups, which involves the spread of aggression from two individuals to multiple individuals. However, the existing research on this problem is not sufficiently deep. For example, the general aggression model focuses more on the generation and development of an individual's aggressive behavior [10], while the TDA involves the transfer of attack target, which provides a breakthrough for better understanding the escalation of intergroup violent conflicts. Experiment 2 explored the generation process of TDA under the group framework and comprehensively considered the role of trigger identity. The results indicated that individuals showed stronger hostile attribution and aggressive behavior toward the out-group triggers, which is consistent with previous research findings. On the basis of social identity theory, individuals will show preference for the in-group, while rejecting the out-group, due to the need to improve their self-esteem [53]. Therefore, when the out-group members engage in bad behaviors, people are inclined to make stable and internal attributions and produce stronger aggressive behaviors [5]. As a result, the TDA may lead to the escalation of intergroup violent conflicts through two mechanisms; on the one hand, when the individual is provoked, if an out-group member triggers him at this time, the individual is likely to direct his anger toward the out-group member, which presents a hidden danger for intergroup violent conflicts. On the other hand, when the individual is provoked by an out-group member, he is more likely to perform displaced aggression, directing it toward the other out-group members, which makes aggressive behavior spread from two individuals to three or more individuals. If the victim of displaced aggression also adopts the behavioral pattern of TDA, the attack may spread to even more individuals, leading to violent conflicts between the two groups. In real life, people often cannot avoid the initial provocative situation and the subsequent triggering situation, so how can conflict escalation be avoided? Experiment 2 revealed that anger caused by provocation also affects subsequent aggressive behavior through hostile attribution under the group framework. That is, as in the individual framework, the anger caused by the provocative situation can be dissipated as soon as possible to reduce aggression. In addition, Experiment 2 also showed that group identity moderates the influence of hostile attribution on aggression. Specifically, when the trigger is an in-group member, the individual's aggressive behavior will increase with the increase in hostile attribution. When the trigger is an out-group member, even if the individual does not have a stronger hostile attribution, strong aggressive behavior can still be displayed. In other words, under the group framework, merely reducing hostile attribution may not be an effective way to reduce the escalation of conflict. However, if the hostile attribution is reduced on the basis of changing group identity awareness, it may largely reduce the possibility of violent conflicts and the spread of aggression from the individual to the group.

5.3 Research significance and prospects

This study showed that the occurrence of trigger substitution is caused by anger, and anger stimulates individuals' hostile attribution, thus prompting them to show TDA. This illustrates how vast the topic of TDA indeed is. Moreover, the study revealed, to some extent, that aggression between individuals is one of the breakthrough points of group conflict; that is, the aggressive behavior present in group conflict may be due to the transfer of displaced aggression between in-group members and out-group members. When the target identity is an in-group or out-group, TDA is manifested in the phenomenon of displaced retaliation between groups. In addition, the findings of the study have practical guidance values. First, the study found that hostile attribution played a mediating role in the influence of anger caused by a provocative situation on TDA. Therefore, on the one hand, it is possible to reduce the occurrence of TDA by alleviating an individual's anger, or by diverting the individual's attention, effectively freeing it from the imprisonment of emotional thinking. On the other hand, cognitive reappraisal can be adopted to weaken hostile attribution to the trigger^[56]. Second, the identity of in-group and out-group targets moderates the influence of hostile attribution on aggressive behavior. This shows that changing the perception of group identity can reduce hostile attribution, thereby reducing the possibility of violent conflict escalating from between individuals to between groups.

This study also has some limitations. First, the study assumes the influence of emotion (anger) on cognition (hostile attribution) as the starting point, but the relationship between emotion and cognition is not one-way. Individuals who often perform hostile attribution will also experience anger more often^[57]. Conversely, reducing hostile attribution through intervention can effectively reduce the individual's anger experience^[58]. The occurrence of TDA is likely to be the result of the interaction between emotion and cognition, and subsequent research should explore the impact of this two-way relationship on TDA. Second, the use of minimum group paradigm manipulation to form the in-group and the out-group may be conducive to the standardized operation of experimental research. However, compared with real life groups, the experimental group lacked involvement and commitment to the in-group, so it loses certain ecological validity. Follow-up research should be based on different groups in real life (such as different fan groups and religious groups) to study the generating process of the TDA.

Conclusion

The conclusions of the current study are as follows. First, when the provocation and triggering situations were simultaneous, the individual showed stronger hostile attribution and aggression toward the trigger. Second, hostile attribution played a completely mediating role, and the triggering situation played a moderating role in the relationship between anger and TDA. When there was a triggering situation, the individual showed stronger hostile attribution as the anger increased. When there was no triggering situation, the change in anger had no significant effect. Third, trigger identity played a moderating role in the process of "anger → hostile attribution → TDA" in the triggering situation. For an in-group trigger, the individual would make stronger hostile attribution to the out-group and subsequently perform TDA. For an out-group trigger, there was no significant effect.

Declarations

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Author Contributions

L.Z. and S.L. conceived and designed the study. S.L. and X.H. wrote and revised the main manuscript. S.L., Z.Z., M.S., F.L. and Y.G. collected and analyzed the data. S.L. prepared the figures. All authors reviewed the manuscript.

Declarations of interest

None

Data availability

The datasets generated and analyzed during the current study are not publicly available. The datasets are available from the corresponding author on reasonable request when the aim is to verify the published results.

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Figures

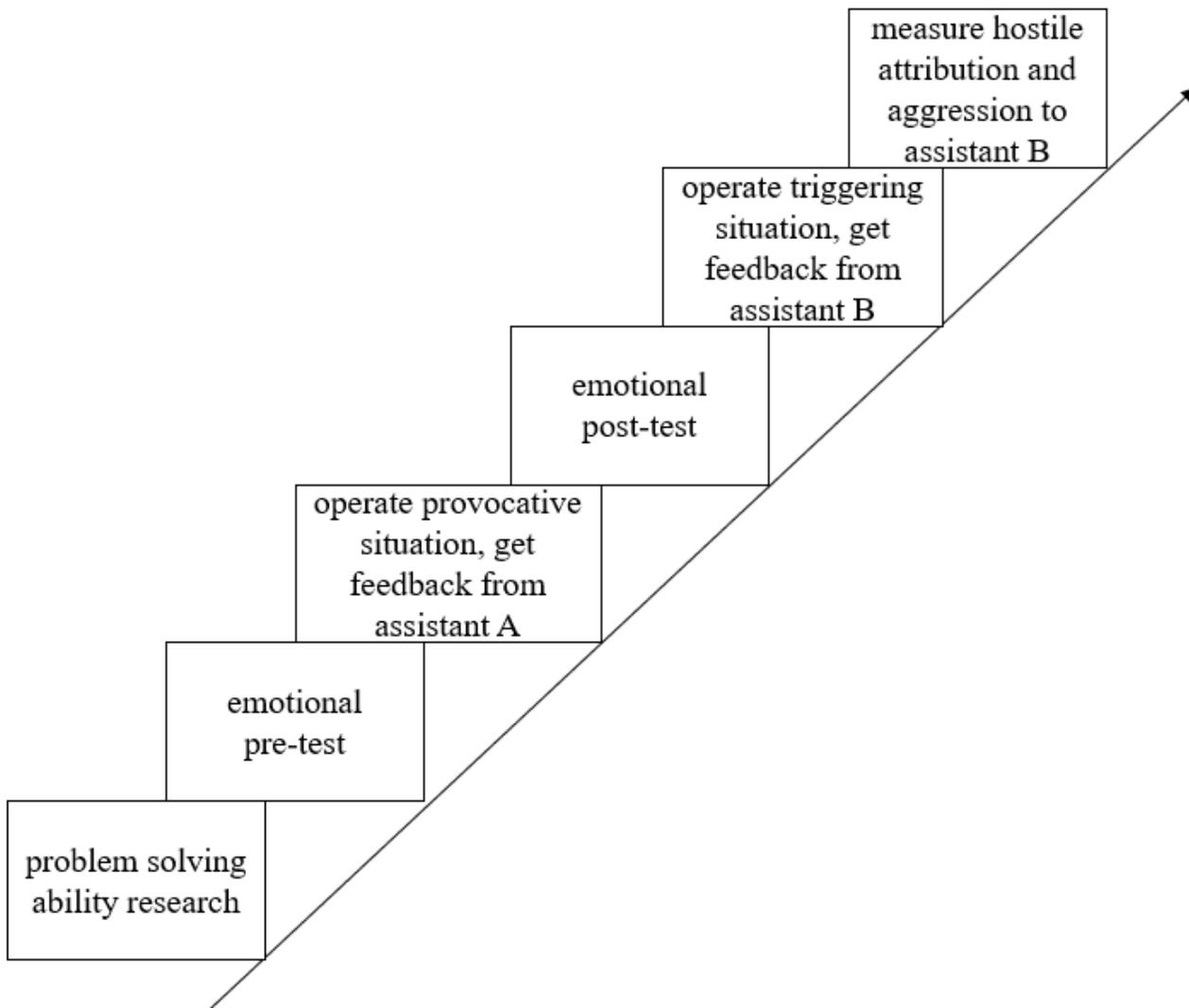


Figure 1

Experimental procedures

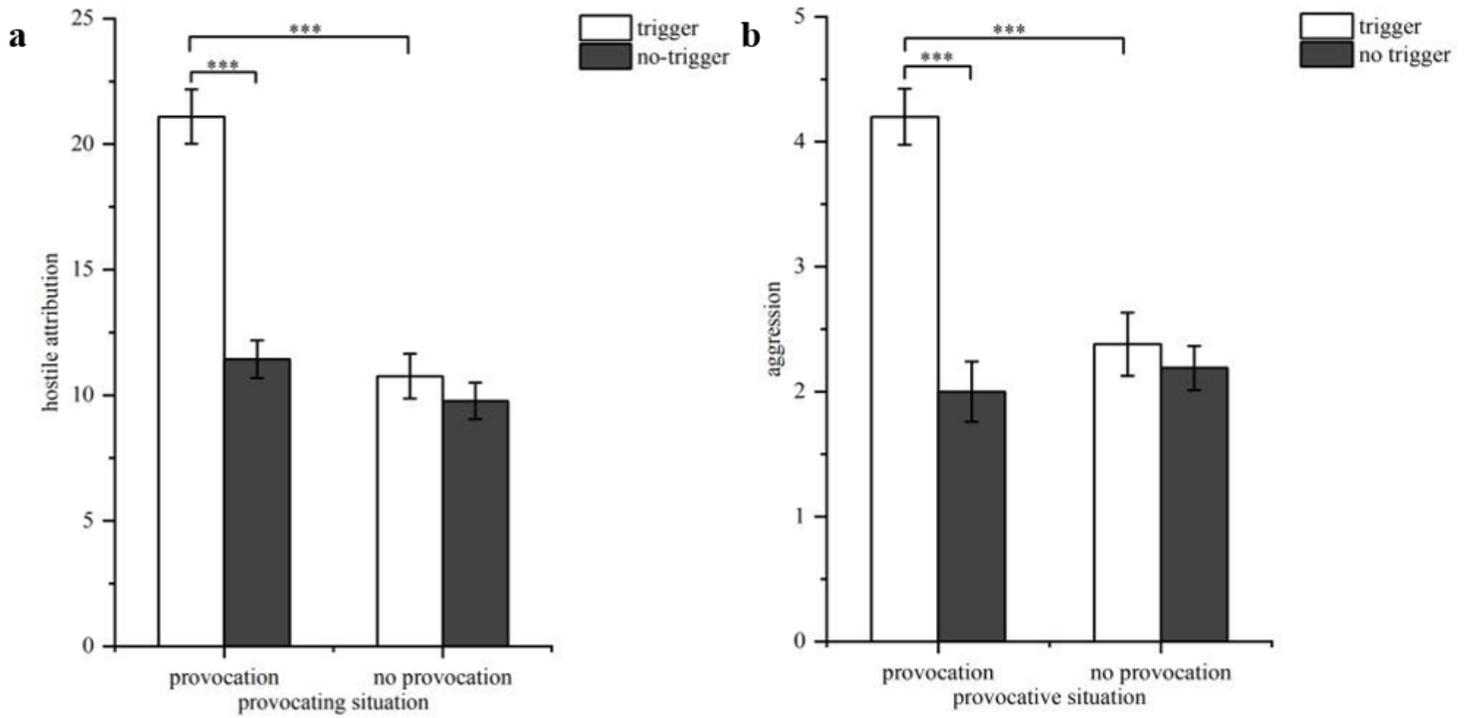


Figure 2

(a) Hostile attribution toward the trigger, (b) Aggression toward the trigger

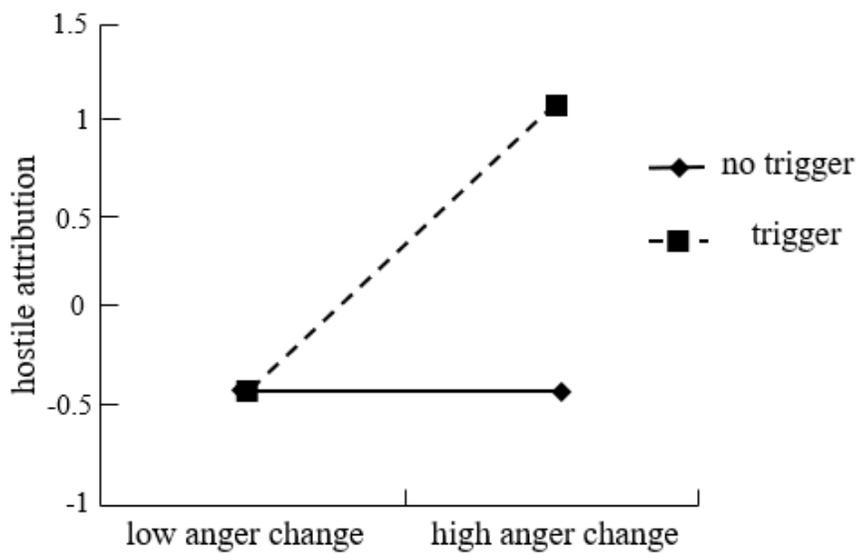


Figure 3

The moderating effect of the triggering situation in experiment 1

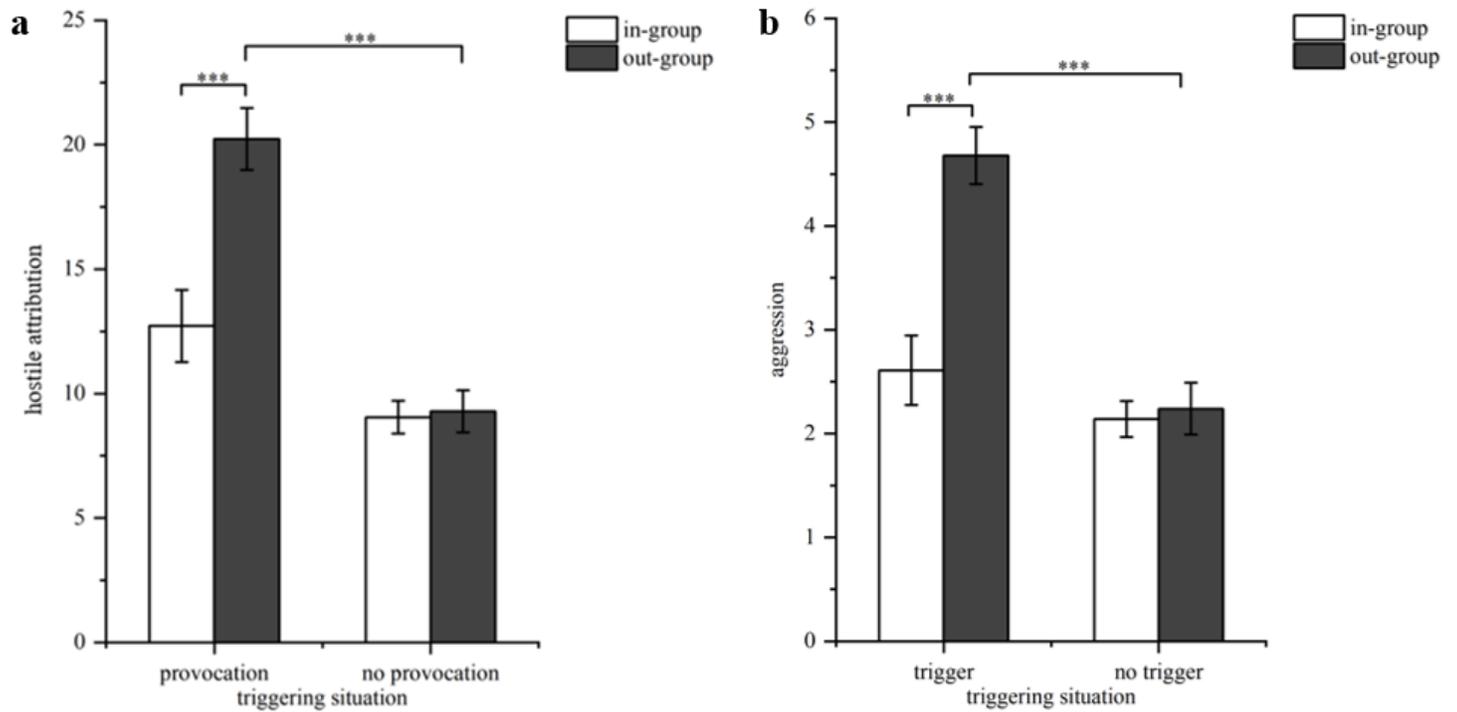


Figure 4

(a) Individual's hostile attribution toward in-group and out-group targets, (b) Individual's aggression toward in-group and out-group targets

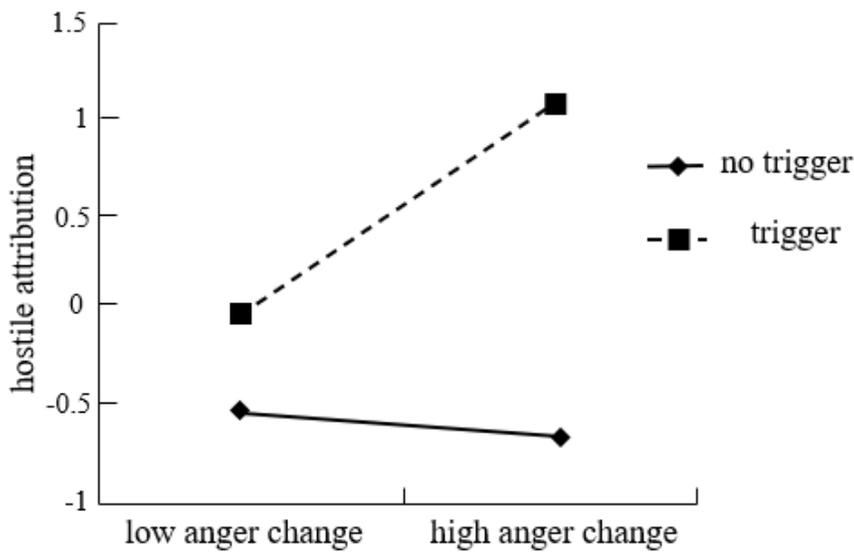


Figure 5

The moderating effect of the triggering situation in experiment 2

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