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Abstract

Much work has focused on how reappraisal is related to emotions, but not behaviors. Two experiments advanced aggression theory by (a) testing how cognitive and attributional forms of reappraisal are related to aggressive affect and behavior, (b) testing variables that theoretically mediate the relation between attributional reappraisal and aggressive behavior, (c) testing the moderating influences of cognitive and attributional reappraisal on aggressive behavior, and (d) developing and testing an intervention aimed at reducing vengeance through reappraisal training. Study 1 used an essay writing task in a 3 (feedback: provocation, no feedback, praise) × 2 (mitigating information: present, absent) experimental design. Provoked participants who did not receive mitigating information were significantly more aggressive than provoked participants who received mitigating information. State vengeance was a significant mediator. Study 2 examined an experimental intervention on vengeance over a 16-week semester. Intervention participants who had the largest increase in reappraisal displayed the greatest decrease in vengeance. Overall, these findings suggest that reappraisal reduces vengeance and aggressive behavior.

Keywords

aggression, emotion regulation, reappraisal, vengeance

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The method by which individuals control aggressive inclinations is important in today's society. A small but growing research literature shows that reappraisal can improve emotional reactions to provocations (e.g., Mauss, Cook, & Gross, 2007). However, there is little research testing whether reappraisal reduces aggressive behavior and, if so, how. Numerous theoretical models of aggression include processes that might be used to reappraise an initial understanding of a situation or of one's current affective state (e.g., general aggression model; Anderson & Bushman, 2002). The current article further develops these theoretical links between reappraisal and aggression and tests hypothesized links among reappraisal processes, vengeance motivation, and aggression.

Reappraisal and Aggressive Affect/Behavior Regulation

Emotion theorists define reappraisal as cognitively altering a negative situation to decrease its emotional impact (termed cognitive reappraisal; Gross, 1998). Attribution (Anderson, Krull, & Weiner, 1996) and aggression theorists (Anderson & Bushman, 2002) define reappraisal as a process by which individuals seek more information to clarify their feelings and the current situation, often with a bias toward a particular outcome that satisfies certain goals such as affect regulation, self-esteem enhancement, or public image maintenance.¹

A rich literature shows that emotional and attributional reappraisal can lower anger (e.g., Mauss, Cook, Cheng, & Gross, 2007; Mauss, Cook, & Gross, 2007; Mauss, Evers, Wilhelm, & Gross, 2006). Novaco's (1977) stress inoculation anger reduction program includes reappraisal as a key component of effective anger reduction (Chemtob, Novaco, Hamada, Gross, & Smith, 1997). Also, Lazarus's theory emphasizes the effect of appraisal and reappraisal processes in determining and reducing anger, respectfully (e.g., Lazarus, 1991). Finally, a meta-analysis on anger treatments found a moderate reduction in anger for programs that utilized cognitive restructuring, a correlate of reappraisal (DiGiuseppe & Tafrate, 2003).

Recent research from the emotion literature overlaps considerably with the attribution and aggression literatures to suggest how reappraisal can influence both anger and aggressive behavior. The general aggression model (GAM; Anderson & Bushman, 2002) proposes that after an initial immediate (and automatic) appraisal of a hostile situation, reappraisal takes place if and only if there are sufficient

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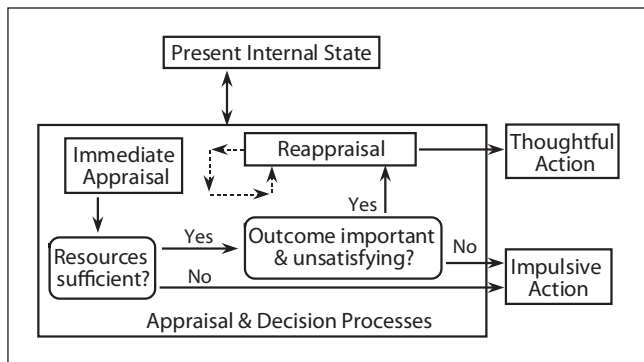


Figure 1. The general aggression model: Expanded appraisal and decision processes

Source: Anderson and Bushman (2002). Reprinted by permission, Annual Reviews, Inc.

resources (e.g., time, cognitive capacity) and if the initial appraisal is unsatisfactory. Furthermore, GAM predicts that whether reappraisal reduces, increases, or has no effect on the initial aggressive inclination depends on the emotional, cognitive, and physiological arousal results of that reappraisal. GAM also delineates how situational and personality factors can interact to influence these states and processes.

The activation of the internal state variables is related to appraisal and decision processes that predict when an impulsive and/or thoughtful behavior is likely to occur. Figure 1 displays how one's present internal state can trigger the reappraisal process and indicates that the results of that process influence the present internal state and impulsive and thoughtful behavior. Impulsive aggression is more likely to occur after a provocation when reappraisal is not engaged. On the other hand, thoughtful aggression may occur even if reappraisal takes place, if the reappraisal confirms or intensifies the initial immediate hostile appraisal (e.g., rumination). Finally, if reappraisal changes the meaning of the provocation, for example, if mitigating information becomes available, then the reappraisal process can reduce aggressive motivation and behavior. In other words, reappraisal is a method of gaining additional information about the situation, one's own feelings, and possible courses of action.

The presence and salience of key situational variables, such as mitigating information, may cue reappraisal processes that allow a more benign interpretation of some initial provocation, such as an insult. For example, additional information about recent negative events in the provocateur's life allows the provoked person to reattribute the insult to the uncharacteristically sad or negative mood of the person who insulted him or her. In other words, mitigating factors are pieces of information that may change an initially hostile attribution after a provocation into one that is less personally threatening, likely decreasing aggressive behavior. Indeed, lower levels of aggressive behavior have been found when (a) the researcher apologizes for the provocation (e.g., Ohbuchi, Kameda, & Agarie, 1989), (b) participants are told

their "partner" did not intend to hurt them (e.g., Batson, Bowers, Leonard, & Smith, 2000), and (c) the provocation is explained to be justified (e.g., Dill & Anderson, 1995; Stemmler, 1997). We believe that mitigating factors reduce aggressive behavior by altering one's initial hostile attribution from the provocateur to the extra information (e.g., Krieglmeier, Wittstadt, & Strack, 2009), hence, reappraisal. Although these studies reliably show that mitigating information is negatively related to aggressive behavior, the internal mechanisms for this change have gone understudied and are examined in the current research.

Possible Mediators Between Reappraisal and Aggressive Behavior

Emotion regulation theories (e.g., Gross, 1998) argue that aggressive affect should mediate the relation between cognitive reappraisal and aggressive behavior. One type of aggression-related affect seems particularly relevant to reappraisal effects on aggression for a couple of reasons. Vengeance (also known as revenge motivation) is defined as "an attempt to redress an interpersonal offense by voluntarily committing an aggressive action against the perceived offender" (McCullough, Bellah, Kilpatrick, & Johnson, 2001, p. 602). Vengeance contains both cognitive (e.g., planning) and affective elements (anger; e.g., Bushman & Anderson, 2001). Stillwell, Baumeister, and Del Priore (2008) argued that a goal of vengeance is to restore equity after a provocation and found evidence to suggest that avengers actively seek out methods to hurt a transgressor. Wilkowski, Robinson, and Troop-Gordon (2010) found that vengeance was a significant mediator between effortful control and aggressive behavior. Other studies have found that revenge motivation partially mediates the effect of violent video games on immediate aggressive behavior and on trait aggressiveness (e.g., Anderson et al., 2004; Anderson & Murphy, 2003). If the predictions from GAM are correct, then reappraisal processes should decrease levels of vengeance when mitigating information is found and used to generate a less threatening attribution for the initial provocative behavior. Also, because reappraisal contains an affective component, cognitive reappraisal should reduce aggressive behavior because of a decrease in vengeance. The possibility of such convergence between cognitive and attributional reappraisal has yet to be tested.

Overview

Two experiments tested several theoretical propositions that have gone understudied in the literature. These studies advance aggression theory by (a) testing how reappraisal is related to aggressive emotions and behavior, (b) testing theoretically derived potential mediators of the relation between

attributional reappraisal and aggression, (c) testing the moderating influences of trait reappraisal, and (d) developing and testing a reappraisal intervention aimed at reducing vengeance. Study 1 tests whether reappraisal will be negatively related to aggressive behaviors through the reduction of aggressive affect.

Study 1: Experimental Effects of Mitigating Information

In Study 1 participants wrote an essay and were given provoking, praising, or no feedback from an anonymous same-sex “partner.” Then, half of the participants received additional information about their partner, information that could be interpreted as mitigating hurtful feedback. Next, participants completed state measures of vengeance and engaged in an aggressive behavior task with the partner; the mediating influence of revenge motives was assessed. Finally, we tested the moderating effect of trait cognitive reappraisal.

If attributional reappraisal is at work, then according to our model the mitigating information should reduce aggressive behavior by provoked participants. Furthermore, this mitigation effect should be mediated by as revenge motivation. If people who score high on trait reappraisal are relatively more likely to seek out and use mitigating information after being provoked, then we should also see evidence of moderated mediation. We therefore conducted moderated mediation tests with trait cognitive reappraisal as a moderator in the mediated relations between presence of mitigating information and aggressive behavior through vengeance.

Method

For partial course credit in their psychology classes, 235 participants (42% male) from a large Midwestern university participated in the current study. The average age of the participants was 19.77 ($SD = 2.15$) years. The majority of the participants were Caucasian (80%).

Materials

Aggressive behavior. Aggressive behavior was assessed using the tangram task, developed by Gentile et al. (2009). This task instructs participants that their “partner” has to solve a number of puzzles that the participants choose for them. These tangram puzzles are based on several differently shaped pieces of plastic used to form a specific outlined shape. Outlines that require many pieces (six or seven pieces) are harder and more time-consuming to complete compared to the medium or easy puzzles. Overall, there are 30 tangram puzzles (10 easy, 10 medium, and 10 hard). Participants are asked to select 11 of the possible 30 puzzles for their partner to solve. The participants are instructed that if the partner can

solve the 10 tangrams in a set amount of time, they will win a \$25.00 gift certificate to a local establishment, but if they do not solve 10 of the 11 puzzles, then they will not receive the gift certificate. Aggressive behavior is operationalized as the number of hard tangrams selected.

Revenge motives. To measure motives to aggress, a five-item questionnaire was used that assessed revenge (adapted from Anderson & Murphy, 2003). Participants indicate why they are about to select the number and difficulty level of tangrams to give to their partner on a 1 (*not at all*) to 5 (*a lot*) rating scale. A sample item is, “I want to pay back my partner for the essay evaluation he/she wrote.” Items were summed such that higher scores on these items indicate more revenge motives ($\alpha = .76$).

Reappraisal. The reappraisal subscale from the Emotion Regulation Questionnaire (Gross & John, 2003; $\alpha = .94$) assessed trait cognitive reappraisal. This six-item questionnaire asks participants the extent to which they agree with the items on a 1 (*strongly disagree*) to 7 (*strongly agree*) rating scale. A sample item is, “I control my emotions by changing the way I think about the situation I’m in.” Items were summed such that higher scores indicate higher levels of reappraisal.

Demographics. A demographics questionnaire assessed sex, ethnicity, and age.

Procedure

Participants arrived in the laboratory for a study called “Decision Making and Partner Performance With Puzzles” and were greeted by two researchers. On completion of the informed consent, participants were told that they would be completing two tasks with a partner: an essay task and a puzzle task. The tangram puzzle task was explained, and participants practiced solving one tangram. All participants were then led into a cubicle and asked to write an essay on their views on abortion for 5 minutes.

After the essay was written, one experimenter explained that the partner was completing questionnaires in the next cubicle while waiting to grade the essay. The participant was told to give his or her partner some time to grade the essay and while the participant was waiting, he or she completed several filler questionnaires, the trait reappraisal scale, and a demographic questionnaire. During this time, the researcher randomly assigned participants to one of the six experimental conditions.

After the participant completed the questionnaires, the experimenter explained that prior to engaging in the puzzle task, he or she would be able to communicate with his or her partner over instant messenger (IM) to get to know each other while the researcher entered the essay grades into the computer. The cubicle door was shut and the second researcher (pretending to be the “partner”) instigated the following IM conversation with all participants independent of condition:

“So, I guess you are my partner, HI”
 [Wait for response]
 “Umm, I don’t know what I need to ask. What is your major, I guess?”
 [Wait for response]
 “Oh that is cool. I am a psych major. What year are you in school?”
 [Wait for response]
 “Well, I am like a junior. I really want to go to grad school, you know. So, I am trying to get as much experience doing research as I can. My advisor says graduate schools really like that. I am trying to be a researcher in this lab, actually. I hope I get in.”

Immediately after this last message was sent the first researcher opened the participant’s cubicle door and signaled to the other research to send the final message:

“Oh, the experimenter is back and is telling me to tell you bye. So, ttyl.”

Next, for those in the praise and provocation conditions, the researcher showed them their feedback. Those in the praise condition were given high marks and told that their essay was one of the best essays they (the partner) had ever read. Those in the provocation condition were given low marks and told that their essay was one of the worst they (the partner) had ever read. While the next sequence of events was described to the participants, one researcher signaled to the other to send the mitigating information for those in the information conditions. Those who were provoked received the following information over IM:

“Hey are you there? If you are, I just wanted you to know that the reason I graded your essay the way I did was because I broke up with my (boyfriend [female participants]/girlfriend [male participants] last night :@”

Those who were praised received the following information over IM:

“Hey are you there? If you are, I just wanted you to know that the reason I graded your essay the way I did was because I got a raise at work last night :)”

Those who were given no feedback were given the following information over IM:

“Hey are you there? If you are, I just wanted you to know that the reason I graded your essay the way I did was because I feel like I am in a OK mood”

Emoticons were included for those in the provoked-mitigating information and praised-mitigating information

conditions to add extra emphasis on the emotional feelings of their anger or enjoyment contributing to the grades given on the essay task.

All participants then completed the revenge motivation scale. Then, participants circled 11 tangrams for their partner to complete. When these were completed, the experimenter left and returned 10 minutes later, stating that the “partner” did not complete the tangrams chosen for him or her. Participants were given a funnel debriefing to assess suspiciousness and then were thanked and fully debriefed.

Results

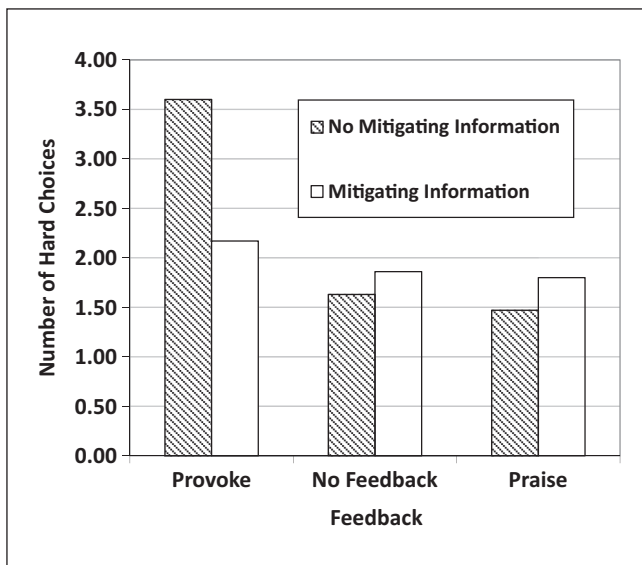
Suspicious participants. A total of 35 participants indicated suspicion with some procedural aspect of the study. Of those, 23 did not believe there was another partner, and 12 thought that the researchers told their partner to grade the essay a certain way. Because of possible participant bias and demand characteristics, these participants were not used in the primary analyses. This left 200 (43% male) participants for the primary analyses. As expected, further analysis comparing the suspicious to nonsuspicious showed a significant suspicious status relation to the feedback manipulation, $\chi^2(df=2) = 11.12$, $p < .01$. More suspicious participants were in the provocation condition ($n = 20$ of 78) compared to the praise ($n = 9$ of 78) and no feedback ($n = 6$ of 79) conditions. This was expected because provoked participants should be more likely to seek additional information to explain the provoking feedback, including becoming suspicious of the procedures. In one sense, this pattern confirms that the provocation instigated reappraisal attempts. Suspicion status was unrelated to sex, trait reappraisal, and whether the participant received mitigating information or not.

Aggressive behavior. A 3 (feedback) \times 2 (information) ANOVA was conducted to determine if there was a significant interaction between feedback and information on aggressive behavior (number of hard tangrams chosen). Results showed a significant main effect of feedback, $F(2, 194) = 6.74$, $p < .01$, partial $\eta^2 = .07$, and a significant Feedback \times Information interaction, $F(2, 194) = 3.49$, $p < .04$, partial $\eta^2 = .04$. A simple effects analysis explored this interaction. Those who received mitigating information after receiving provoking essay feedback ($M = 2.13$, $SD = 1.98$) chose significantly fewer hard tangrams than those who did not receive mitigating information ($M = 3.46$, $SD = 2.44$), $F(1, 194) = 7.08$, $p < .001$, $d = 0.38$. There was no significant effect of mitigating information on those who were not given any essay feedback or who were praised ($F_s < 1$; see Table 1 and Figure 2). Overall, this pattern of means fits our attributional reappraisal predictions very well.

Mediation. The Preacher and Hayes (2008) mediation approach was used to test the mediational hypotheses of the current study. Only the provoked conditions (with and without mitigating information) are relevant to the mediation tests. Revenge motivation significantly mediated the mitigation effect on aggression (95% CI: $-.7850$ to $-.0436$). The

Table 1. Means, Standard Deviations, and Inferential Statistics for Aggressive Behavior Across Conditions in Study 1

Essay feedback	Mitigating information	M	SD	N	F	p	d
Provoke	Yes	2.13	1.98	32	7.08	< .001	0.38
Provoke	No	3.46	2.44	26			
Neutral	Yes	1.86	1.77	35	0.26	ns	0.07
Neutral	No	1.63	1.50	38			
Praise	Yes	1.78	2.03	37	0.30	ns	0.08
Praise	No	1.53	1.76	32			

**Figure 2.** Aggressive (hard) tangram choices as a function of essay feedback and mitigation information, Study 1

relations between mitigating information and revenge motivation, $B = -1.27$, $t(54) = -2.33$, $p < .03$), and revenge motivation and aggressive behavior, $B = 0.27$, $t(54) = 4.25$, $p < .001$, showed the indirect effect.

Moderated mediation. To test whether trait levels of cognitive reappraisal moderated the previous mediated relation, a moderated mediation test was conducted using the Preacher, Rucker, and Hayes (2007) method. This approach estimates the conditional indirect effect of the independent variable on the dependent variable through the mediator at different levels of the moderator. Specific to these analyses, mitigating information was used as the independent variable, revenge motivation was the mediator, trait reappraisal was the moderator, and number of hard tangrams was the dependent variable.

The relation between mitigating information and revenge motivation for provoked participants was significant, $B = -1.27$, $t(50) = -2.33$, $p < .03$, as was the relation between revenge motivation and aggressive behavior, $B = 1.33$, $t(50) = 2.67$, $p < .02$, showing the indirect effect.

Furthermore, this was qualified by a significant Revenge Motivation \times Trait Reappraisal interaction, $B = -0.04$, $t(50) = -2.14$, $p < .04$. Further analysis revealed that the indirect effect of mitigating information on aggressive behavior through revenge motives was significant only for those low on reappraisal, $B_{\text{indirect effect}} = -0.52$, $t(50) = -2.03$, $p < .05$.

Discussion

Results from Study 1 showed that attributional reappraisal after a provocation reduced aggressive behavior. Furthermore, results showed that revenge motivation significantly mediated the relation between reappraisal and aggressive behavior. Finally, trait levels of reappraisal moderated these mediated effects. This suggests that when provoked, low trait reappraisal participants are likely to use the mitigating information successfully to reduce their revenge motivations and thereby also likely to aggress. Those high on trait reappraisal may be able to regulate their negative emotions using reappraisal on their own and may be able to reduce their vengeance and aggressive behavior without mitigating information. In other words, to reduce the likelihood of aggressive behavior through vengeance, low reappraisers need explicit information, whereas high reappraisers do not.

Study 2: Reappraisal Intervention

Study 1 results suggest that situationally induced attribution reappraisal can lead to reduced aggression and that this occurs through reduction of revenge motives. Also, Study 1 showed that trait levels of cognitive reappraisal interacted with a situational manipulation of attributional reappraisal after a provocation to reduce aggressive behavior. The objective of Study 2 was to apply these findings to an intervention that focused on teaching reappraisal. To date, no published interventions have focused on reducing aggression-related variables using reappraisal training. Research has shown that interventions focused on changing hostile attribution bias (Hudley, Graham, & Taylor, 2007) and normative aggressive beliefs and aggressive fantasies (Guerra, Henry, Huesmann, & Tolan, 2007) are sufficient to reduce subsequent aggression. However, reappraisal processes act on aggressive affect, whereas the previous interventions focus on aggressive cognitions. Thus, an intervention teaching reappraisal with the purpose of reducing aggression is needed (see John & Gross, 2004).

The findings from Study 1 and our theoretical model suggest that a reappraisal focused intervention should reduce self-reported levels of vengeance over time. Vengeance was selected as the key outcome variable because Study 1 showed that vengeance mediated the relation between reappraisal and aggressive behavior.

Method

Participants. For partial course credit in their psychology classes, 155 (23% male) undergraduate students from a large Midwestern university completed this study. The average age of the sample was 18.49 ($SD = 1.89$) years. The majority of participants were Caucasian (79%).

Materials. The same trait reappraisal scale ($\alpha = .92$) and demographic questionnaire from Study 1 were used. In addition, the following scale was used:

Vengeance. The Vengeance Scale (Stuckless & Goranson, 1992) was used to assess trait levels of vengeance ($\alpha = .93$). This 20-item questionnaire asks participants to indicate their agreement with the items on a 1 (*disagree strongly*) to 7 (*agree strongly*) rating scale. A sample item includes, "Revenge is sweet." All items were summed, such that higher scores indicate higher levels of vengeance.

Procedure

The primary researcher recruited participants from 12 sections of a lower level psychology class over two semesters (fall 2009, $n = 74$; fall 2010, $n = 81$) for a study called "Teaching About Aggression." Participants were informed that the researchers were investigating what personality variables were related to how well people learn about aggression.²

Participants were assigned to one of three conditions. In the control condition ($n = 71$), participants completed only the pre- and posttest measures. In the attributional intervention ($n = 42$) and the emotional intervention conditions ($n = 40$), the primary researcher went to the classrooms eight times throughout the course of the semester and discussed the topic of the day, allowing discussion time with participants. Each session lasted 10 minutes.

Two intervention curricula were created by the first author based on theory and research on aggression-related interventions. Table 2 summarizes the topics discussed for each intervention. In the attributional intervention, the first session began with defining reappraisal and showing examples. Because the attributional approach to reappraisal focuses on seeking out additional information to clarify the situation and/or feelings, the second through the sixth sessions involved identifying visible (e.g., presence of a gun, sleep deprivation, heat) and nonvisible (e.g., history of violence, having antisocial friends) risk factors for aggression. Session 7 discussed how attributional reappraisal is related to aggressive behaviors. The final session discussed the need to take time to reappraise.

The emotional intervention focused on using reappraisal to reduce negative emotions. The first session defined reappraisal and discussed relevant examples. The second session discussed the steps that are needed to reappraise a negative situation effectively, which consisted of (a) not reacting immediately, (b) modifying the situation by paying

Table 2. Topics of the Interventions in Study 2

Session	Topic
Attributional reappraisal training	
1	Defining reappraisal
2	Factors related to aggression
3	Visible risk factors for aggression 1
4	Visible risk factors for aggression 2
5	Nonvisible risk factors for aggression 1
6	Nonvisible risk factors for aggression 2
7	Combining reappraisal and aggression
8	Taking the time to reappraise
Cognitive reappraisal training	
1	Defining reappraisal
2	How does reappraisal work
3	Practicing with reappraisal: sadness
4	Practicing with reappraisal: anger
5	Practicing with reappraisal: disgust
6	Reappraisal's time table for emotions
7	Relating reappraisal to behaviors 1
8	Relating reappraisal to behaviors 2

attention to different aspects of the environment, and (c) using Step b to reappraise a negative emotion to feel less negative. The third through fifth sessions had participants practice using reappraisal to feel less sad, angry, and disgusted. Session 6 consisted of discussing Urry's (2009) work on how reappraisal takes time to complete and how the intensity of different negative emotions may take several reappraisals to feel less negative. The final two sessions discussed how reappraisal can be used to change behaviors, not just emotions.

After each session, intervention participants were given homework assignments consistent with the in-class discussions. After the final session, all participants completed the posttest measures and were thanked and fully debriefed. Complete data on key variables were obtained for 99 of the original participants.

Results

Preliminary analyses. Reappraisal and vengeance were negatively correlated at pretest ($r = -.34, p < .01$) and posttest ($r = -.38, p < .01$). Vengeance change was negatively related to reappraisal change ($r = -.33, p < .01$).

Prior to conducting the main analyses, several one-way ANOVAs were conducted to determine whether there was a difference between the attributional and emotional intervention conditions on any key variables. Results yielded no significant differences between the interventions on pretest vengeance, pretest reappraisal, posttest vengeance, posttest reappraisal, vengeance change scores, or reappraisal change scores ($F_s < 1.3, p_s > .20$). Thus, we collapsed the two intervention conditions together for further analysis.

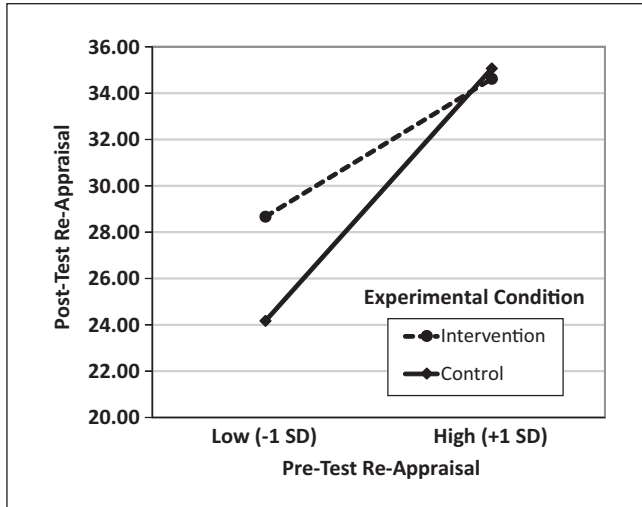


Figure 3. Condition effect of intervention at values of baseline reappraisal on posttest reappraisal, Study 2

Manipulation check. A regression analysis tested the main effects of condition (intervention vs. control) and pretest reappraisal, and their interaction, as predictors of posttest reappraisal. Results showed significant main effects of pretest reappraisal, $F(1, 95) = 46.28, p < .001$, and condition, $F(1, 95) = 5.32, p < .03$. The interaction also was significant, $F(1, 95) = 3.96, p < .05$. A simple effects analysis showed that this interaction was driven by a significant main effect of condition at low levels of pretest reappraisal, $F(1, 95) = 6.78, p < .02$. Those low on reappraisal at baseline and who were in the intervention had higher posttest reappraisal scores ($M = 28.66$) compared to those who were low on reappraisal at pretest and not in the intervention condition ($M = 24.17$). The effect of intervention condition on posttest reappraisal was nonsignificant for those high on reappraisal at baseline, $F(1, 95) = .06, p > .90$. In other words, the intervention was successful at increasing reappraisal for those who were low on baseline reappraisal (see Figure 3).

Effect of intervention on reappraisal and vengeance. A one-way ANCOVA was conducted on posttest vengeance with experimental condition as the independent variable and pretest vengeance as the covariate. Results yielded a significant effect of pretest vengeance, $F(1, 96) = 183.05, p < .001$. As would be expected of trait measures, pre- and posttest vengeance were strongly related. More importantly, there also was a significant effect of intervention condition, $F(1, 96) = 4.51, p < .04$. Those in the intervention had lower posttest vengeance scores ($M = 57.90$) than those in the control condition ($M = 63.06$). In short, the reappraisal training reduced trait vengeance.

Moderating effect of reappraisal change on vengeance change. Next, we tested whether the intervention effect on vengeance would be most pronounced for those participants who actually displayed an increase in trait reappraisal. To do this, we first used the pre-post regression analyses to compute residual

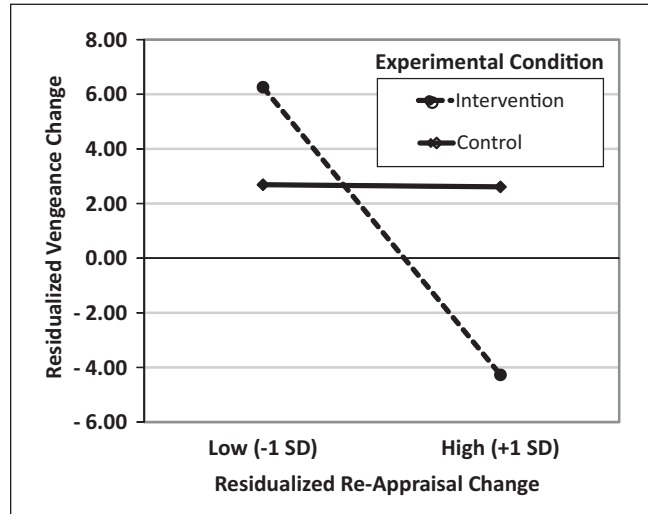


Figure 4. Conditional effect of intervention at values of reappraisal change on vengeance change, Study 2

change scores on reappraisal and vengeance, essentially subtracting out the pretest scores on these measures. We then ran a regression model with the vengeance change score as the outcome variable and the reappraisal change score, the experimental condition, and the Reappraisal \times Condition interaction as predictor variables. Prior to entry of the interaction term, both the condition and the reappraisal main effects were significant, $F_s(1, 93) = 5.01$ & $9.72, p_s < .05$ & $.01$, respectively. Of most interest, though, was the significant Condition \times Reappraisal interaction, $F(1, 93) = 4.11, p < .05$. Follow-up tests showed a significant negative slope between reappraisal change and vengeance change for those in the intervention condition, $F(1, 47) = 10.81, b = -0.85, p < .001$. This effect was not found for those in the control condition, $F(1, 44) = 0.00, b = -0.01, p > .95$. Figure 4 displays these slopes based on the predicted means at ± 1 SD of reappraisal change. Further tests showed that the experimental condition effect on vengeance change was significant for participants who scored high on reappraisal change, $F(1, 93) = 6.95, p < .01$, whereas there was no effect of the intervention on those whose reappraisal change scores were low, $F(1, 93) = 0.07$.

Discussion

Study 2 used the findings from Study 1 to create a vengeance-reducing intervention with a focus on teaching the power of reappraisal. Over the course of one semester the intervention reduced trait vengeance, relative to the no intervention control group. The additional effects of reappraisal change suggest that the intervention effect on vengeance operated through changes in reappraisal. Specifically, intervention participants who had the largest increase in reappraisal ($+1$ SD on reappraisal change) had the largest decrease in vengeance.

General Discussion

Overall, the results strongly support the hypothesis that both cognitive and attributional reappraisal can reduce aggressive behavior and do so predominately through the reduction of vengeance. The research showed that both giving people mitigating information and teaching people to use mitigating information can reduce aggression and vengeance.

Mediating the Relation Between Reappraisal and Aggressive Behavior

The GAM (Anderson & Bushman, 2002) posits that an initial attribution (or appraisal) is made regarding another's behavior. If the individual has sufficient time, cognitive resources, and motivation, reappraisal of that initial attribution is likely if the outcome of the initial attribution is important yet unsatisfying. Support for GAM was found in Study 1 with the significant Feedback \times Information interaction for aggressive behavior. GAM would argue that the initial attribution after a provocation is linked to anger and vengeance. When mitigating information is presented after the provocation, participants are provided with the means to reappraise. Therefore, the provocation is likely attributed to the mitigating information rather than the "partner." This would explain why aggressive behavior was significantly lower for those who were provoked and received mitigating information relative to those who were provoked without such information. Furthermore, we predicted and results showed that vengeance mediated the relation between reappraisal and aggressive behavior in Study 1.

Study 2 showed that using an aggression intervention that focused on teaching reappraisal decreased vengeance over time. This effect was moderated by reappraisal change. Thus, vengeance is the primary mediator in the relation between reappraisal and aggressive behavior. This finding is important because this shows that changing the perception of a provocation will likely reduce vengeance and subsequent aggressive retaliations that are typically more excessive than the original transgression (Anderson, Buckley, & Carnagey, 2008).

The Moderating Influence of Cognitive Reappraisal on Attributional Reappraisal

An important theoretical advancement was testing the moderating influence between the cognitive and attributional definitions of reappraisal on aggressive behavior. Results suggest that both definitions of reappraisal operate similarly. Results from Study 1 showed that high cognitive reappraisers were better able to use the mitigating information after a provocation to reduce their vengeance and aggressive behavior compared to low reappraisers. Study 2 showed the highest reduction in vengeance was for those who had the highest increase in their cognitive reappraisal from the

intervention (compared to control). This suggests that when people are taught either cognitive or attributional reappraisal tactics, vengeance decreases the most for those who had the highest increase in cognitive reappraisal. Thus, an all encompassing aggression theory needs to take into account such interactions, as GAM does. Furthermore, interventions focused on reducing aggressive behavior can effectively use reappraisal training, based on Study 2 findings that training participants how to use mitigating information can reduce vengeance, which was shown to be the lone mediator in the relation between mitigating information and aggressive behavior in Study 1.

Limitations and Future Research

Like all research, certain limitations exist in the present studies that should be addressed with future work. First, the majority of participants in these studies were female. Research has shown that being male is a risk factor for aggressive behavior (e.g., Eagly & Sheffen, 1986). Future work should sample additional male participants; however, we expect the findings from both studies to replicate. Bettencourt and Miller (1996) found that under high levels of provocation, sex differences in aggression are reduced to nonsignificance. Because participants in Study 1 were provoked, reappraisal's effect on aggressive behavior should be similar for males and females.

Second, neither state nor trait measures of physiological arousal were measured in the current research. GAM posits that physiological arousal is one possible route to increased aggressive behavior that may influence reappraisal processes. Research also suggests that reappraisal can affect physiological arousal (see Urry, 2009). Future work should attempt to test the mediating role of physiological arousal in the relation between reappraisal and aggressive behaviors.

Finally, the intervention is limited by not measuring aggressive behavior after a provocation. This limitation was necessitated by time and resource constraints in an already-complicated study and is justified by the findings from Study 1, which revealed that vengeance was the key mediator in the relation between reappraisal and aggressive behavior. If the intervention can successfully target the mediator, then aggressive behavior should be reduced, just as a medical intervention that reduces plaque buildup should reduce certain forms of heart disease. However, future work should measure aggressive behavior in the lab after the intervention to more directly test whether teaching reappraisal skills can reduce aggressive behaviors.

One additional area for future research is to test other predictors of reappraisal processes. For instance, GAM posits that individuals must have adequate cognitive resources, time, and the motivation to reappraise. Recent statistics suggest that many violent acts occur when cognitive ability is low. For instance, alcohol consumption has been shown to lower appraisal skills (see Sayette, 1993) and increase

aggression (Bushman & Cooper, 1990). Those low on IQ and other cognitive skills tend to also be aggressive (Huesmann, Eron, & Yarmel, 1987) and may not be able to reappraise their vengeance after a provocation. Overall, there are circumstances where people may not be able to reappraise, possibly causing violent acts to occur in the "real world." This is an area for future research.

Final Comments

Reappraisal is an effective emotion regulation strategy. Results from the current research suggest that reappraisal is effective at reducing vengeance, which reduces the probability of aggressive behavior. Overall, this is an important first step in determining how and why reappraisal is related to aggressive behavior. With continued research elucidating these processes more specifically, these relations may become better understood to, hopefully, reduce aggressive behavior.

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Notes

1. Although attributional reappraisal and cognitive reappraisal clearly overlap, there are important theoretical distinctions. The two literatures differently predict how reappraisal is related to aggressive behavior. For example, aggression researchers posit that reappraisal can either increase or decrease aggressive behavior (depending on the content of the reappraisal and the resulting emotional and cognitive changes). Conversely, emotion theorists argue that reappraisal can only decrease negative emotions (Gross, 1998) and make no predictions regarding changing aggressive behavior. Thus, it is important to distinguish between the two literatures because we believe that these two literatures can additively and interactively influence aggressive behavior, which has yet to be tested in the literature.
2. Demand characteristics were reduced because participants were never told there was an intervention, they were never told about the other conditions in the study, they were never told that we were looking specifically at reappraisal, and they were not told that the same measures would be repeated. Furthermore, all participants, independent of condition, were told the study title, thus making this a constant across both control and intervention conditions.

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