Combating the Sting of Rejection with the Pleasure of Revenge:

A New Look at How Emotion Shapes Aggression

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Acknowledgments

Abstract

How does emotion explain the relationship between social rejection and aggression? Rejection reliably damages mood, leaving individuals motivated to repair their negatively-valenced affective state. Retaliatory aggression is often a pleasant experience. Rejected individuals may then harness revenge's associated positive affect to repair their mood. Across six studies (total $N = 1,516$), we tested the prediction that the rejection-aggression link is motivated by expected and actual mood repair. Further, we predicted that this mood repair would occur through the positive affect of retaliatory aggression. Supporting these predictions, naturally-occurring (Studies 1 and 2) and experimentally-manipulated (Studies 3 and 4) motives to repair mood via aggression moderated the rejection-aggression link. These effects were mediated by sadistic impulses towards finding aggression pleasant (Studies 2 and 4). Suggesting the occurrence of actual mood repair, rejected participants' affective states were equivalent to their accepted counterparts after an act of aggression (Studies 5 and 6). This mood repair occurred through a dynamic interplay between pre-aggression affect and aggression itself, and was driven by increases in positive affect (Studies 5 and 6). Together, these findings suggest that the rejection-aggression link is driven, in part, by the desire to return to affective homeostasis. Additionally, these findings implicate aggression's rewarding nature as an incentive for rejected individuals' violent tendencies.

Keywords: aggression, social rejection, emotion regulation, mood, positive affect

Introduction

Frustrated goals motivate actions. Thirsty people drink water, tired people sleep, and cold people seek sources of heat. Similarly, distressed people pursue better moods (Larsen, 2000). This emotion-regulation motivation may help explain a paradoxical, interpersonal phenomenon: the rejection-aggression link (Twenge, Baumeister, Tice, & Stucke, 2001). Building off of findings that suggest that retaliatory aggression is often experienced as pleasant (e.g., Chester & DeWall, 2016; Ramírez, Bonniot-Cabanac, & Cabanc, 2005), we conducted six studies to test the hypothesis that rejected people act aggressively due to a motivation to repair their damaged mood by harnessing revenge's pleasant properties.

The Rejection-Aggression Link: The Role of Negative Affect

Socially rejected individuals often behave aggressively (Buckley, Winkel, & Leary, 2004; Leary, Twenge, & Quinlivan, 2006; Twenge et al., 2001). These aggressive outbursts happen most frequently when rejected people lack opportunities to regain a sense of social belonging (DeWall & Richman, 2011). The targets of these aggressive tendencies extend beyond the rejecters themselves to include innocent bystanders (Twenge et al., 2001) and ingroup members (Gaertner, Iuzzini, & O'Mara, 2008). These effects may even motivate such mass violence as school-shootings (Leary, Kowalski, Smith, & Phillips, 2003).The rejection-aggression link appears to be motivated by several proximal factors, including anger (Chow, Tiedens, & Govan, 2008), social pain (Chester et al., 2014; Eisenberger, Way, Taylor, Welch, & Lieberman, 2007), hostile cognitive bias (DeWall, Twenge, Gitter, & Baumeister, 2009; Reijntjes et al., 2011), and the need to re-establish control (Warburton, Williams, & Cairns, 2006;

Wesselmann, Butler, Williams, & Pickett, 2010). Together, these findings suggest that the negatively-valenced, aversive experience of rejection directly promotes subsequent aggression.

The relationship between rejection and aggression is exacerbated by features that increase rejection's aversive nature, including narcissism (Chester & DeWall, 2016; Twenge & Campbell, 2003), rejection-sensitivity (Ayduk, Gyurak, & Luerssen, 2008; Pfundmair et al., in press), disrupted serotonergic brain functioning (Gallardo-Pujol, Andres-Pueyo, & Maydeu-Olivares, 2013; Eisenberger et al., 2007), and impaired executive functioning (Chester et al., 2014). Conversely, factors that mollify the aversive experience of rejection reduce aggression. Rejected individuals who engaged in a subsequent affiliative interaction with another person did not show the typical aggressive response (Twenge et al., 2007). Stimulation of the lateral prefrontal cortex, a brain region that regulates the pain of rejection, reduced the links between rejection, hurt feelings, and aggression (Riva, Romero-Lauro, DeWall, & Bushman, 2012; Riva, Romero-Lauro, DeWall, Chester, & Bushman, 2015). These moderating factors further suggest that rejection's unpleasant nature motivates aggressive responses.

The ability of social rejection to increase negative affect is qualified by several factors. Earlier research on social rejection supported the *numbness hypothesis*, which posited that rejection elicited a state of blunted negative affect and pain, as a means of coping with such a powerful social injury (DeWall & Baumeister, 2006). Others argued, via pain overlap theory, that social rejection was a strongly aversive and painful event (Eisenberger, 2012; MacDonald & Leary, 2005). Meta-analytic evidence appeared to favor both the numbness (Blackhart, Nelson, Knowles, & Baumeister, 2009) and

negative affect (Gerber & Wheeler, 2009) approaches. Reconciling these two approaches, subsequent research has identified that social rejection can promote both numbness and negative affect, depending on the nature of the rejection itself. Acute social injuries, such as brief instances of exclusion tend to evoke negative affect, whereas chronic social injuries, such as believing that one will always be alone, tend to promote numbness (Bernstein & Claypool, 2012). This ability of rejection to promote both pain and numbness fits well with temporal frameworks of reactions to rejection, in which such social injuries initially evoke negative affect, but if they continue to occur, evoke a numb resignation to the ostracism (Riva, Wesselmann, Wirth, Carter-Sowell, & Williams, 2014). In the context of the present research, we isolated our hypotheses to acute, and not chronic, instances of social rejection. As discussed, such acute instances of social rejection are reliably associated with negative affect. Yet why would negative affect promote rejection-related aggression?

Aggression and Affect: Mood Improvement Motives and the Pleasure of Revenge

Negative affect has been heralded as one of the chief proximate predictors of aggression (Berkowitz, 1989). However, contemporary aggression research has begun to demonstrate that the link between negative affect and aggression may be more indirect than direct, and that positive affect plays a larger role than previously thought in promoting aggression. Drawing from classical Freudian notions of catharsis and modern work on emotion-regulation, several studies have shown that individuals readily believe that aggression will improve their mood (Bushman, 2002; Bushman, Baumeister, & Phillips, 2001; Bushman, Baumeister, & Stack, 1999; Chester, Merwin, & DeWall, 2015). Further, these expectations that aggression will make people feel better strongly

increase aggressive responses to provocations (Bushman et al., 1999, 2001; Chester et al., 2015). These findings mesh well with recent theorizing that people's current affective state is less deterministic of behavior than how they *anticipate* they will feel (Baumeister, Vohs, DeWall, & Zhang, 2007; DeWall, Baumeister, Chester, & Bushman, 2016).

Negative affect may not directly promote aggression, but it may provide the motivation to seek out aggression's (perceived) mood-improving qualities. Although the role of emotion-regulation motives in promoting aggression are well-established, it is largely unknown whether aggression fulfills these mood-improvement goals. To date, research has largely concluded that aggression is ineffective at reducing negative affect (Bushman, 2002; Bushman et al., 1999). However, a direct test of whether aggression does improve mood is currently lacking. Yet why might aggression influence mood?

One account of aggression's ability to improve mood is the reactive approach motivation (RAM) model (McGregor, Nash, Mann, & Phills, 2010). According to this theory, aversive states such as anxiety that are characterized by avoidant inhibition and uncertainty motivate individuals to engage in approach behaviors because such acts exert an anxiolytic effect through specific neurobiological and cognitive mechanisms. As an approach behavior (Harmon-Jones & Sigelman, 2001), aggression should mollify the pain of rejection through approach-related emotion-regulation. However, social rejection is not an uncertain experience characterized by either approach or avoidance. Rejected people often show approach and avoidance behaviors depending on multiple factors (DeWall & Richman, 2011). As such, the RAM model might not fully explain the rejection-aggression link.

A more likely account arises from an emerging body of research showing that retaliatory aggression is associated with the experience of positive affect. Indeed, retaliatory aggression is rated as a pleasant experience (Carré, Gilchrist, Morrissey, & McCormick, 2010; Ramírez et al., 2005), is related to neural signatures of approach and reward (Chester & DeWall, 2016; Harmon-Jones & Sigelman, 2001; Krämer, Jansma, Tempelmann, & Münte, 2007), and is associated with genetic profiles that motivate reward-seeking behaviors (Chester et al., 2016). No such hedonic benefit appears to accompany unprovoked aggression. This pleasure of revenge may be harnessed to combat the negative affect that precedes such aggressive acts.

Sadistic Tendencies as a Mechanism

Sadism is the tendency to experience pleasure (i.e., positive affect) in response to harm of others (Buckels, Jones, & Paulhus, 2013). However, as it is most commonly measured, sadism refers less to one's current experience of sadistic pleasure and instead assesses the *expectation* that harming others will be pleasant (sample item: hurting people would be exciting; O'Meara, Davies, & Hammond, 2011). This tendency exists along a continuum of individual differences that extend into clinically disordered ranges (Buckels et al., 2013; Chabrol, Van Leeuwen, Rodgers, & Séjourné, 2009). Sadism robustly predicts aggression, above-and-beyond other "dark tetrad" traits such as narcissism (Buckels et al., 2013).

If, as we predict, rejected individuals seek to aggress out of an expectation that retaliation will be pleasant, then such a motivation should translate to an increase in sadistic expectations of aggression's hedonic value. Further, these sadistic tendencies to anticipate that aggression will be pleasant might serve as the proximate mechanism

between rejected individuals' desire to repair their mood and aggressive outcomes. This

mechanistic prediction is buttressed by the growing evidence that anticipated emotions

(i.e., how one expects that a behavior will make them feel) can motivate human

behavior (Baumeister et al., 2007; DeWall et al., 2016). Sadistic and mood repair

motives are likely to be mechanisms of the rejection-aggression link *alongside* extant

mediators such as anger and social pain, and are not proposed as replacements of

these psychological processes. Indeed, aversive states such as social pain may serve

as the hedonic bedrock on which the motivation to use aggression to improve mood is

constructed.

Present Research

The present research tested the prediction that the rejection-aggression link is

motivated by the desire to repair mood via retaliatory aggression's association with

positive affect. We conducted six studies to provide correlational and experimental

evidence for this model. Study 1 tested the hypothesis that individual differences in the

motivation to repair mood via aggression would exacerbate the rejection-aggression

link. Study 2 tested whether this interactive effect was mediated by the perceived and

expected pleasure of retaliatory aggression (i.e., sadistic impulses). Studies 3 and 4

sought to replicate these two prior studies using an experimental manipulation that

altered mood repair motives. Finally, Studies 5 and 6 tested whether these emotion-

regulation motives were successfully fulfilled in the form of actual mood repair. More

specifically, this final experiment tested (A) whether aggression would return

participants' levels of negative and positive affect to those of their accepted

counterparts and (B) whether these changes in negative and positive affect would be

mediated by pre-aggression affect and aggression itself.

Study 1: The Motivation to Repair Mood via Aggression Moderates the Rejection-Aggression Link

Study 1 provided the first test of the hypothesis that rejected people behave

aggressively out of a desire to improve their mood. Whereas prior research has focused

on the direct role of negative affect, this is an initial study to examine whether positive

affect has an indirect role in helping to explain rejection-related aggression. To be sure,

prior research has shown that catharsis beliefs can moderate aggressive responses to

provocation (Bushman et al., 2001). However, it remains unknown if this effect extends

to the rejection-aggression link. To test our hypothesis, participants were randomly

assigned to experience social acceptance or rejection. Next, all participants were given

an opportunity to aggress against their acceptors or rejecters. Finally, we measured the

dispositional motivation to behave aggressively in order to improve one's mood.

Methods

Participants

Participants consisted of 132 undergraduates (90 females; Age: $M = 19.40$, $SD = 1.93$) who were recruited from the University of Kentucky's introductory psychology

subject pool by an online posting for a study on 'Mental Visualization Abilities'.

Participants were compensated with credit towards their course's research requirement.

Materials

Angry Mood Improvement Inventory. The Angry Mood Improvement Inventory

(AMII) was developed by Bushman and colleagues (2001) to assess the degree to

which individuals tend to control and express anger behaviorally *as motivated by a desire to improve mood.* The AMII contains an eight-item subscale of particular relevance to our mood improvement hypothesis, the Anger Expression – Out subscale. This subscale assesses the tendency to express angry mood outwardly as aggressive behavior in the attempt to repair mood. Each item refers to behaviors (e.g., "express my anger"; "strike out at whatever angers me") that participants rate along a five-point scale, which indicates the degree to which they would like to perform the given behavior *to try and feel better* when they are angry or furious. The AMII possesses excellent levels of both internal reliability within each subscale and test-retest reliability (Bushman et al., 2001; Bushman & Whitaker, 2010; Chester et al., 2015). As evidence of construct validity, the Anger Expression – Out subscale of the AMII predicts greater positive affect after an instance of retaliatory aggression (Chester & DeWall, 2016).

  Need threat scale. The 30-item need threat scale assesses the aversive experience of social rejection (Williams, 2009). Each item refers backwards in time to participants' subjective experience during an instance of rejection. The first 20 items assess the degree to which the rejection incident threatened the fundamental human needs for belongingness, self-esteem, control, and meaningful existence (sample items: 'during the game I felt rejected; during the game I felt liked; during the game I felt meaningless; I felt I had control over the course of the game). The next 8 items assess the impact of the rejection event on negative and positive affect (e.g., I felt angry, I felt happy) and the last two items serve as an explicit manipulation check (e.g., I was excluded). An additional item provides a more objective measure of rejection (i.e., the percentage of ball tosses participants thought that they received during the Cyberball

task). The subscales of the need threat scale have shown excellent internal reliability, are sensitive to experimental inductions of social rejection, and correspond to neural indicators of pain and distress (Eisenberger et al., 2003; Williams, 2009).

   Voodoo doll task. A relatively novel task to flexibly measure aggressive behavior in both the laboratory and via the internet is the Voodoo Doll Task (DeWall et al., 2013). Capitalizing on the human tendency to bestow certain objects with magical properties (King, Burton, Hicks, & Drigotas, 2007; Rozin, Millman, & Nemeroff, 1986), the voodoo doll task asks individuals to imbue an inanimate doll with features of actual individuals (e.g., romantic relationship partners; DeWall et al., 2013). Then, participants are given the option to stab 0 to 51 pins in the doll, a form of aggression. This task has shown excellent reliability over time, corresponds to other measures of aggression (e.g., trait aggression questionnaires, noise blasts directed at others), exhibits appropriate responsiveness to laboratory provocations, and tends not to vary whether the task is administered in the laboratory or over the internet (Bushman, DeWall, Pond, & Hanus, 2014; Chester et al., 2015; DeWall et al., 2013; Slotter et al., 2012). In the context of Study 1, participants imagined the doll as the perpetrator of social acceptance or rejection. The Voodoo Doll Task does not signify 'actual' aggression because the victim does not experience direct harm. Instead, the Voodoo Doll Task captures symbolic aggression. However, tremendous cognitive, emotional, and behavioral overlap exists between actual and symbolic forms of behavior (King et al., 2007; Rozin et al., 1986).

Procedure

   Participants completed this experiment over the internet through a third-party survey host, which ostensibly sought to measure how various personality traits impact

peoples' ability to mentally visualize events. The experiment began with a validated

paradigm designed to induce feelings of social acceptance and rejection called

Cyberball (Williams, Cheung, & Choi, 2000; Williams, Yeager, Cheung, & Choi, 2012).

Participants were told that the purpose of the task was to practice their ability to

mentally visualize events, which took the form of a virtual ball toss game that

participants ostensibly played with two other same-sex undergraduates. In fact, the

partners were pre-programmed aspects of the computer. Out of the 30 ball tosses

preprogrammed into the game, participants were randomly assigned to receive either

10 tosses distributed equally throughout the task (acceptance condition) or just 3 tosses

at the beginning of the task and then no more while their partners passed the ball back

and forth to one another (rejection condition). After the Cyberball task, participants

completed the Need Threat Scale as a manipulation check.

Participants were then asked to complete the Voodoo Doll Task, a supposed

measure of mental visualization abilities. In this version of the task, participants were

told that a doll, whose image appeared on the screen below, represented 'either one of

your Cyberball partners.' Participants then viewed what the doll would look like with

increasing numbers of pins stabbed into it (0-19 pins) and were presented with a slider

bar to select how many pins they wanted to stab into the doll. After confirming their pin

count, participants completed the Angry Mood Improvement Inventory.

<div align="center">**Results and Discussion**</div>

Descriptive Statistics and Manipulation Checks

Rejected participants reported that they received fewer ball tosses, felt more

rejected, more threat to basic psychological needs, greater negative affect, and less

positive affect than their accepted counterparts (Table 1). All four subscales of the

Angry Mood Improvement Inventory displayed sufficient internal consistency: αs: .72 -

.90. The rejection manipulation did not affect dispositional mood repair motives, as

measured by the Anger Expression – Out subscale of the Angry Mood Improvement

Inventory, $t(130) = -0.33$, $p = .741$, $d = .06$.

Moderation Analyses

A Kolmogorov-Smirnov test revealed that the distribution of number of pins did

not meet the assumption of normality because the distribution was zero-inflated and

positively skewed, $k(132) = .30$, $p < .001$. Subsequently, a Poisson loglinear distribution

was adopted for subsequent analyses using generalized mixed linear modeling (as

recommended by DeWall et al., 2013). Rejection increased aggression, $B = 0.32$, $X^2 =$

20.81, $p < .001$, and mood repair via aggression motives (as measured by the Anger

Expression – Out subscale of the AMII) was associated with greater aggression, $B =$

0.90, $X^2 = 101.65$, $p < .001$. We observed a significant interaction between rejection and

mood repair motives, $B = 0.30$, $X^2 = 4.43$, $p = .035$ (Figure 1).

At low (-1 SD) mood repair motive levels, rejection did not significantly affect the

number of pins placed in the doll, $B = 0.18$, $X^2 = 2.56$, $p = .109$. In contrast, at high (+1

SD) levels, rejection increased the number of pins placed in the doll, $B = 0.47$, $X^2 =$

30.96, $p < .001$. These findings offer initial evidence that rejection-related aggression

occurs primarily among people who expect such aggression to improve their moods.

Yet the psychological mechanism through which this interactive effect operates on

aggression remains unknown. To explore a possible mechanism underlying this

interactive effect, we conducted Study 2.

Study 2: Sadistic Impulses Mediate the Interactive Effect of Mood Repair Motives

and Rejection on Aggression

Study 1 demonstrated that the rejection-aggression link was only observed among individuals who are motivated to repair their mood via aggression. In Study 2, we sought to replicate and extend these results by testing whether they were mediated by sadistic impulses. Procedures were similar to Study 1, with three main exceptions. First, Study 2 was conducted in a laboratory setting, instead of over the internet. Second, we used a different measure of aggression, which better captured 'actual' aggressive behavior. In this task, participants completed a competitive reaction-time task against one of their Cyberball partners, in which they could administer unpleasant and prolonged noise blasts. Third, participants reported their sadistic impulses after completing the social rejection paradigm. We expected that, again, the rejection-aggression link would only occur among individuals who were motivated to repair their mood via aggression. Further, we predicted that this interactive effect would be mediated by increases in sadistic impulses. If obtained, these findings would demonstrate that the expected pleasure of revenge plays a proximate, motivational role in the rejection-aggression link.

Methods

Participants

Participants were 363 undergraduates (247 females; Age: $M = 18.66$, $SD = 0.99$) who were recruited from the University of Kentucky's introductory psychology subject pool by an online posting for a study on 'Mental Visualization Abilities'. Participants were compensated with credit towards their course's research requirement.

Materials

  Short sadistic impulse scale. The SSIS is a brief version of the Sadistic

Attitudes and Behaviors Scale (O'Meara et al., 2011). This single-factor, 10-item scale

contains items such as 'I enjoy seeing people hurt' and 'hurting people would be

exciting' that participants respond to along a 1 (disagree) to 7 (agree) Likert-type scale.

In order to assess levels of sadism.

  Taylor aggression paradigm. Participants completed the Taylor Aggression

Paradigm (TAP), a well-validated measure of behavioral aggression framed as a

competitive reaction time game played over the internet with a fictitious opponent

(Anderson & Bushman, 1997; Giancola & Chermack, 1998; Taylor, 1967). For each of

the 25 trials of the task, participants set the volume (60 – 105 decibels) and duration (0

– 5 seconds) of an aversive noise blast that their opponent ostensibly heard if

participants won the competition (i.e., press a button faster). A non-aggression option

was also provided if participants wanted to refrain from aggression. If participants lost

the trial, they were blasted with noise that their opponent ostensibly determined ahead

of time. Wins and losses were randomly determined with the exception of the first trial,

which all participants lost. Although this measure may appear as a trivial computer

game, it has been shown to function similarly to aggression in the 'real world' and to

possess excellent construct and predictive validity (Anderson & Bushman, 1997;

Giancola & Chermack, 1998).

Procedure

  Participants arrived at our laboratory and began the study by completing the

Cyberball task that was used in Study 1, in which they were randomly-assigned to be

accepted or rejected by two, same-sex undergraduate students who participants believed were connected to their computer over the internet. Participants then completed the Taylor Aggression Paradigm against one of their Cyberball partners. Finally, participants completed a battery of questionnaires that included the Need Threat Scale, the Angry Mood Improvement Inventory, and the Short Sadistic Impulse Scale.

Results and Discussion

Descriptive Statistics and Manipulation Checks

Angry Mood Improvement Inventory and aggression data were missing from twenty nine participants due to experimenter error. The Short Sadistic Impulse Scale was introduced into the study after 118 participants had been run, yielding data for 245 participants. Noise blast volume and duration levels from the aggression paradigm had high internal reliabilities, α = .93 and .92, respectively, and were significantly correlated, $r(353)$ = .93, p < .001. Thus, we standardized and averaged intensity and duration levels across all 25 trials to create a more reliable retaliatory aggression index. Rejected participants reported that they felt more rejection, more threat to basic psychological needs, greater negative affect, and less positive affect than their accepted counterparts (Table 2). All four subscales of the Angry Mood Improvement Inventory and the total score of the Short Sadistic Impulse Scale displayed sufficient internal consistency: αs: .71 - .82. The rejection manipulation did not affect dispositional mood repair motives, as measured by the Anger Expression – Out subscale of the Angry Mood Improvement Inventory, $t(332)$ = -0.33, p = .742, d = .04.

Moderated Mediation Model

An initial multiple regression model revealed that there was not a significant direct effect of the interaction between rejection and mood repair motives (as measured by the Anger Expression – Out subscale of the AMII) on aggression scores from the Taylor Aggression Paradigm, β = .27, t(327) = 1.12, p = .262. However, indirect effects can often exist where direct effects are absent (Hayes, 2009). Therefore we subsequently tested for mediation of this direct effect via sadistic impulses.

A bootstrapped moderated mediation model (using 1,000 bias-corrected bootstrap samples; PROCESS macro, model 8, Hayes, 2012) was fit in which mood repair motives (as measured by the Anger Expression – Out subscale scores of the AMII) were tested as a moderator of the a and c paths of the indirect effect of rejection on aggression scores from the Taylor Aggression Paradigm through sadism scores. The model revealed a significant index of moderated mediation (95% C.I. .001, .584). However, the indirect effect of sadism was not significant at either low (-1 $SD;$ 95% C.I. -.277, .002) or high (+1 $SD;$ 95% C.I. -.009, .434) levels of mood repair motives. In combination with the significant index of moderated mediation, this suggests that the indirect effect of sadism would be significant at levels of mood repair motives beyond 1 SD from the sample mean.

A bootstrapped mediated moderation model (using 1,000 bias-corrected bootstrap samples; Preacher & Hayes, 2008) was fit in which sadistic impulses were tested as a mediator of the effect of the interaction between mood repair motives and social rejection on aggression. The interaction term was modeled as the independent variable while main effect terms of rejection and mood repair motives were included as covariates. The resulting model explained 9.34% of the variance in aggression and

demonstrated a significant indirect effect of the interaction between rejection and AMII

tendencies on greater aggression through heightened sadistic impulses (95% C.I. .001,

.584; Figure 2).While the variables in both of these models were not measured in the

temporal sequence in which they were modeled to have occurred, this is not a pre-

requisite for accurately demonstrating indirect effects (e.g., MacKinnon & Fairchild,

2009)

Study 2 yielded some mixed results, but the evidence from this study ultimately

suggest that the interaction between individual differences in the motivation to use

aggression to repair mood and rejection on greater retaliatory aggression occurs

through an increased tendency to anticipate and perceive that aggression will be

pleasant. These findings were obtained in the laboratory using one of the most widely-

used and validated laboratory aggression measures (Anderson & Bushman, 1997;

Giancola & Chermack, 1998), suggesting that Study 1's results were not specific to

internet research or the voodoo doll task. Further, the congruence between the Voodoo

Doll Task from Study 1 and the noise blast measure in Study 2 provides converging

support for the validity and reliability of the relatively new aggression measure. It also

dovetails nicely with other investigations showing similarity in responses between the

Voodoo Doll Task and other measures of aggression (Bushman et al., 2014; Finkel et

al., 2012; Slotter et al., 2012).

Despite these contributions, our findings from both Studies 1 and 2 were limited

because we measured, and did not manipulate, mood repair motives. To address this

limitation and provide experimental grounds for causal inference, we conducted Study

3.

Study 3: The Inability to Repair Mood Attenuates the Rejection-Aggression Link

Studies 1 and 2 demonstrated that naturally-occurring variability in the motivation to repair mood via aggression were crucial determinants of whether rejected individuals were aggressive. Study 2 demonstrated that individuals who are motivated to use aggression to repair their mood do so because aggression is perceived as pleasant. In Study 3, we sought to experimentally manipulate mood repair motives in order to replicate previous research and adding the ability to make causal inferences regarding the role of mood repair motives. To do so, participants were randomly assigned to feel socially accepted or rejected, were randomly assigned to have their mood supposedly frozen or unfrozen (thus preventing any mood repair motives from altering behavior), and then were given an opportunity to behave aggressively.

Methods

Participants

Participants consisted of 167 undergraduates (118 females; Age: $M = 19.04$, $SD = 1.72$) who were recruited from the University of Kentucky's introductory psychology subject pool by an online posting for a study on 'Mental Visualization Abilities'. Participants were compensated with credit towards their course's research requirement.

Materials

Mood freeze paradigm. We used a mood freezing paradigm from Bushman and colleagues (2001) that has a well-established background in social psychology experiments (e.g., Cialdini et al., 1987; Manucia, Baumann, Cialdini, 1984; Tice, Bratslavsky, & Baumeister, 2001). In this paradigm, participants consumed a placebo capsule containing 500mg of vitamin C. Fictitiously, participants were told that the

capsule contained 'Bramitol', a cognitive enhancement drug that the experimenters were supposedly testing in regards to its psychological effects. Participants were then randomly assigned to be told that Bramitol had either a side effect of freezing their mood for approximately 60 minutes (mood freeze condition) or that it had no known side effects (control condition).

Procedure

Participants were asked to fast for three hours before arriving at our laboratory. Participants were given the Bramitol cover story and consumed the placebo capsule. Next, participants were told that while they waited for the Bramitol to become psychologically active, they would complete a short mental visualization task. This task was the Cyberball task that was used in Studies 1 and 2, in which they were randomly-assigned to be accepted or rejected by two, same-sex undergraduate students who participants believed were connected to their computer over the internet. Participants then completed the Need Threat Scale and upon completing this self-report measure, were told that Bramitol had now likely begun to exert its psychological effects. Finally, participants completed the Taylor Aggression Paradigm against one of their Cyberball partners and responded to a single mood freeze manipulation-check item acquired from Bushman and colleagues (2001).

<div align="center">

Results and Discussion

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Descriptive Statistics and Manipulation Checks

Need Threat Scale and mood freeze manipulation check data were missing from four participants due to computer errors. Rejected participants reported that they felt more rejection, more threat to basic psychological needs, and more negative affect (but

no differences in positive affect) than their accepted counterparts (Table 3). The mood

freezing manipulation did not alter the effect of rejection, except in blunting the

perceived threat of rejection on their self-perceptions of having a meaningful existence.

Mood frozen participants endorsed the item 'the pill I took froze my mood' more, $M =$

3.13, $SD = 1.70$, than did control participants, $M = 2.24$, $SD = 1.33$, $t(161) = 3.74$, $p <$

.001, $d = 0.60$.

Aggression data were missing from four participants due to experimenter error.

Noise blast volume and duration levels from the aggression paradigm had high internal

reliabilities, $\alpha = .95$ and .94, respectively, and were significantly correlated, $r(152) = .90$,

$p < .001$. Thus, we standardized and averaged intensity and duration levels across all

25 trials to create a more reliable retaliatory aggression index. Experimenters indicated

that nine participants either failed to follow the instructions or that experimenter errors

undermined the quality of their data (e.g., "subject began playing Cyberball before

instructed to do so"), these individuals were removed from subsequent analyses

(remaining $N = 154$).

Moderation Analyses

We observed null main effects of rejection, $F(1, 150) = 1.39$, $p = .240$, $\eta_p^2 = .01$,

and the mood freeze manipulation on aggression, $F(1,150) = 0.72$, $p = .396$, $\eta_p^2 = .01$.

As predicted, rejection interacted with the mood freeze manipulation, $F(1,150) = 5.64$, p

$= .019$, $\eta_p^2 = .04$ (Figure 3).

Linear contrasts were used to better understand the observed interaction. Among

mood unfrozen participants, rejection increased retaliatory aggression, $F(1,150) = 6.08$,

$p = .015$, $\eta_p^2 = .04$. In contrast, rejection's effect on greater aggression was substantially

less among mood frozen participants, $F(1,150) = 0.74$, $p = .390$, $\eta_p^2 = .01$. Among

accepted participants, the mood freeze manipulation had little effect on aggression,

$F(1,150) = 1.15$, $p = .286$, $\eta_p^2 = .01$. In contrast, the mood freeze manipulation

significantly reduced aggression among rejected participants, $F(1,150) = 5.27$, $p = .023$,

$\eta_p^2 = .03$.Thus, using an experimental manipulation of mood repair motives, we

replicated the interactions observed in the previous two studies. Individuals who were

not motivated to use aggression to repair their mood showed an attenuated aggressive

response to rejection.

Study 4: The Inability to Repair Mood Attenuates the Rejection-Aggression Link, Mediated by Sadism

In Study 3, we experimentally manipulated mood repair motives in order to

provide causal evidence for the role of affect regulation in aggressive responses to

social rejection. In Study 4, we sought to replicate Study 3 using an online sample and

to extend these findings by implicating sadistic impulses as a mediator (as in Study 2).

To do so, participants were randomly assigned to feel socially accepted or rejected,

were randomly assigned to have their mood supposedly frozen or unfrozen (thus

preventing any mood repair motives from altering behavior), were given an opportunity

to behave aggressively, and reported their sadistic impulses.

Methods

Participants

Participants consisted of 177 undergraduates (134 females; Age: $M = 19.26$, SD

$= 2.28$) who were recruited from the University of Kentucky's introductory psychology

subject pool by an online posting for a study on 'Mental Visualization Abilities'. Participants were compensated with credit towards their course's research requirement.

Materials

Mood freeze paradigm. We adapted the mood freezing paradigm from Study 3 to the internet environment. To do so, participants viewed an optical illusion image for 30 seconds after being deceptively told that previous research had demonstrated that this image either froze individuals' moods for 30 minutes (mood frozen condition) or left moods unaffected (mood unfrozen condition). The image was a grouping of 18 colorful, banded circles which appeared to rotate when in fact they were not doing so.

Procedure

Participants completed this experiment over the internet through a third-party survey host, which ostensibly sought to measure how writing skill impacted individuals' ability to mentally visualize events. The experiment began with a validated paradigm designed to induce feelings of social acceptance and rejection in which participants were randomly assigned to write an essay (1,000 character minimum) about a time when they were either socially accepted or rejected by an individual person (Gardner, Pickett, & Brewer, 2000; Maner, DeWall, Baumeister, & Schaller, 2007; Pickett, Gardner, & Knowles, 2004). Participants were then randomly assigned to have their mood frozen for 30 minutes or unaffected by a 30-second viewing of a visual illusion image. After these manipulations, participants completed the Need Threat Scale which served as a manipulation check and two mood freeze manipulation-check items acquired from Bushman and colleagues (2001).

All participants were then asked to complete the Voodoo Doll Task, a supposed measure of mental visualization abilities. In this version of the task, participants were told that a doll, whose image appeared on the screen below, represented 'the individual from your essay.' Participants then viewed what the doll would look like with 0 -19 pins stabbed into it and were presented with a slider bar to select how many pins they wanted to stab into the doll. Participants then completed a battery of questionnaires including the Short Sadistic Impulse Scale.

Results and Discussion

Descriptive Statistics and Manipulation Checks

Need Threat Scale and mood freeze manipulation check data were missing from three participants due to computer errors. Rejected participants reported that they felt more rejection, more threat to basic psychological needs, greater negative affect, and less positive affect than their accepted counterparts (Table 4). The mood freezing manipulation did not alter the effect of rejection. Unfortunately, mood frozen participants did not endorse the item 'the image I viewed froze my mood' more ($M = 4.11$, $SD = 2.52$) than did control participants ($M = 3.88$, $SD = 2.55$), $t(172) = 0.60$, $p = .500$, $d = 0.09$. However, mood frozen participants endorsed the item 'the image I viewed affected my mood' more ($M = 3.64$, $SD = 2.17$) than did control participants ($M = 2.75$, $SD = 2.83$), $t(172) = 2.57$, $p = .011$, $d = 0.39$. Thus, the effect of our mood freeze manipulation on participants' affective states is ambiguous. The total score of the Short Sadistic Impulse Scale displayed sufficient internal consistency, $\alpha = .70$.

Moderation Analyses

As in Study 1, a Kolmogorov-Smirnov test revealed that the distribution of number of pins did not meet the assumption of normality as the distribution was zero-inflated and positively skewed, $k(177) = .29$, $p < .001$. Subsequently, a Poisson loglinear distribution was adopted for subsequent analyses using generalized mixed linear modeling. We observed a main effect of rejection on greater aggression, $B = 0.81$, $X^2 = 58.96$, $p < .001$, and a main effect of the mood freeze manipulation on lesser aggression, $B = -0.64$, $X^2 = 78.27$, $p < .001$. Most importantly, rejection interacted with the mood freeze manipulation, $B = -1.09$, $X^2 = 48.36$, $p < .001$ (Figure 4).

Among control participants, rejection increased the number of pins placed in the doll, $B = 1.89$, $X^2 = 267.99$, $p < .001$. In contrast, rejection's effect on greater aggression was substantially less among mood frozen participants, $B = 0.81$, $X^2 = 58.96$, $p < .001$. Thus, we replicated the interactions observed in the previous three studies.

Moderated Mediation Model

To assess whether sadistic impulses mediated the rejection-aggression link, and whether our mood freeze manipulation moderated this indirect effect, a bootstrapped moderated mediation model (using 1,000 bias-corrected bootstrap samples; PROCESS macro, model 8, Hayes, 2012) was fit in which Short Sadistic Impulses Scale scores were tested as a mediator between the rejection manipulation and the number of pins from the voodoo doll task, and the mood freeze manipulation was tested as a moderator of the *a* and *c* paths of this indirect effect. Sadism data were missing from four participants due to computer errors. We predicted that sadism's indirect effects would only hold for participants in the control group as their emotion regulation motives were

unchanged by the mood freeze manipulation. The resulting model explained 29.05% of the variance in aggression.

Among participants in the control condition, rejected participants reported greater sadism ($M = 1.72$, $SD = 0.59$) than their accepted counterparts did ($M = 1.42$, $SD = 0.53$), $t(84) = 2.53$, $p = .013$, $d = .53$. The effect of rejection on greater aggression was mediated by this increased sadism (95% C.I.: 0.15, 6.58; Figure 5). However, among mood frozen participants, rejected participants did not report greater sadism ($M = 1.71$, $SD = 0.73$) than their accepted counterparts ($M = 1.50$, $SD = 0.52$), $t(85) = 1.58$, $p = .118$, $d = .21$. Further, the effect of rejection on greater aggression was not mediated by sadism within this group (95% C.I.: -0.17, 2.20; Figure 5).

These findings provide additional support that aggression in response to rejection is motivated by a desire to repair one's mood, an effect that is mediated by the expected positive affect associated with the harming one's rejecter. Our use of a different social rejection manipulation provides support for the ability of these effects to exist beyond the bounds of the Cyberball paradigm.

Despite the consistent support for our motivational hypothesis from Studies 1 through 4, it remains unclear whether rejection-related aggression actually achieved its intended goal of mood repair. It also remained unknown whether this potential mood repair occurred through increases in positive affect, decreases in negative affect, or both. To fill this gap in our knowledge, we conducted a fifth study.

Study 5: Mood Repair and Aggression after Negative Social Feedback

Studies 1 through 4 established that mood repair motives helped explain why socially rejected people behave aggressively, but they did not examine whether such

motivated behavior actually resulted in mood repair. Study 5 sought to fill this gap by

measuring levels of negative and positive affect before and after aggressive responses

to negative social feedback (an experience often used to induce feelings of social

rejection: e.g., Eisenberger, Inagaki, Muscatell, Haltom, & Leary, 2011; Mendes,

McCoy, Major, & Blascovich, 2008; Somerville, Heatherton, & Kelley, 2006).

Specifically, participants received negative or positive social feedback, reported their

current negative and positive affect, were given an opportunity to behave aggressively,

and then again reported their current negative and positive affect. Admittedly, negative

social feedback does not exactly map on to the experience of social rejection, an issue

which we address in the subsequent study (i.e., Study 6) by replicating this study design

with a 'true' social rejection paradigm.

Study 5's design allowed us to test two hypotheses. The first hypothesis was that

the opportunity to aggress after negative social feedback would restore participants'

levels of negative and positive affect to levels reported by their counterparts who

received positive social feedback.

We then used path analysis to test the second hypothesis that mood repair after

negative social feedback would occur through a temporal sequence in which (A)

negative feedback would elicit greater negative affect, (B) this increase in negative

affect would then predict greater subsequent aggression, and (C) greater aggression

would predict greater subsequent positive affect and (D) lesser subsequent negative

affect. This sequential path would support the idea that the pain of a rejecting

experience would then promote aggression in order to ultimately regulate one's affective

state.

Methods

Participants

Participants consisted of 156 adult participants recruited from Amazon's

Mechanical Turk subject pool (75 females; Age: $M = 33.32$, $SD = 10.25$) for a study on

'Mental Visualization Abilities'. Participants were compensated with $0.50. The study

was posted with the following keywords: survey. We required workers to have a 95%

approval rate on all previous MTurk tasks.

Materials

Positive Affect Negative Affect Schedule. The PANAS is a validated measure

of current levels of positive and negative affect (i.e., mood; Watson, Clark, & Tellegen,

1988). This 20-item measure contains two 10-item subscales that assess negative and

positive affect. To measure these constructs, participants rated how much they agreed

with the statement that they are currently experiencing a given feeling (negative sample

items: ashamed, upset; positive sample items: excited, proud) along a 1 (strongly

disagree) to 7 (strongly agree) response scale. Each participant received a score for

each of the two subscales by averaging across each of their responses on that given

subscale. Scores could range from 1 (low) to 7 (high).

Procedure

Participants completed this experiment over the internet through a third-party

survey host, which ostensibly sought to measure how various personality traits impact

peoples' ability to mentally visualize events. The experiment began with a social

feedback task used in previous research to experimentally simulate an aversive social

interaction with a fictitious partner (Bushman & Baumeister, 1998; Chester et al., 2015;

DeWall et al., 2012). Participants wrote an essay (800 character minimum) about a time they were very angry, which they were told would be exchanged over the internet with a same-sex partner who was supposedly, simultaneously completing the same study. The rationale behind the essay task was that the experimenters wanted "an idea of how skilled you are at writing about an event you had to mentally visualize." After submitting their written essay and passively viewing a 25 second loading screen, participants viewed a pre-written essay about a fictitious experience in which the participants' partner was angry with their friends for ignoring them at a party. Participants then evaluated this essay along 5 criteria (e.g., writing style) along a 7-point (poor to excellent) scale and were given an option to write comments on the essay. Many participants appeared to engage with the fake essay, leaving comments such as "sorry for the situation, good essay though", "great, can totally relate", and "I have been in that same situation! So annoying. Well written essay that clearly communicated the situation and how you felt about it."

After passively viewing a 17 second loading screen, participants viewed two bar graphs that showed their essay's scores across all 5 dimensions and their overall score. Participants were randomly assigned to receive either negative (10/35 points) or positive (30/35 points) feedback. Below each bar graph was a comment from participants' fake partner, which either stated 'one of the worst essays that I have EVER read!' (negative social feedback condition) or 'great essay!' (positive social feedback condition).

After completing the essay task, participants completed the Positive Affect Negative Affect Schedule, which both served as a manipulation check and an

assessment of pre-aggression affect. Participants then completed the Voodoo Doll

Task. Participants were told that the doll represented 'your partner from the essay

evaluation task.' Participants then viewed what the doll would look like with 0 -19 pins

stabbed into it and were presented with a slider bar to select how many pins they

wanted to stab into the doll (0 – 51). After confirming their pin count, participants again

completed the Positive Affect Negative Affect Schedule, which served as a measure of

post-aggression mood.

Results and Discussion

Descriptive Statistics and Manipulation Checks

Of the 156 participants, one participant failed to complete all of the measures of

the study. Validating our social feedback paradigm, participants who received negative

feedback reported that they felt greater negative affect (negative feedback condition: M

= 2.96, SD = 1.35, positive feedback condition: M = 2.27, SD = 1.34, $t(153)$ = 3.23, p =

.002, d = 0.51) and less positive affect (negative feedback condition: M = 3.91, SD =

1.31, positive feedback condition: M = 5.04, SD = 1.11, $t(153)$ = -5.83, p < .001, d = -

0.93) than participants who received positive feedback. All four mood measures

displayed sufficient internal consistency: αs: .91 - .95.

As in Studies 1 and 4, a Kolmogorov-Smirnov test revealed that the distribution

of number of pins did not meet the assumption of normality as the distribution was zero-

inflated and positively skewed, $k(155)$ = .29, p < .001. Subsequently, a Poisson loglinear

distribution was adopted for subsequent analyses using generalized mixed linear

modeling (as recommended by DeWall et al., 2013). Aggressive behavior was

characterized by a main effect of negative feedback on greater aggression, $B = 1.44$, X^2 = 539.03, $p < .001$.

Mood-Repair Moderation Analyses

To assess the extent to which the opportunity to aggress repaired the damaged mood of rejected participants, a 2 (negative vs. positive social feedback) x 2 (negative vs. positive valence) x 2 (pre- vs. post-aggression) mixed-effects general linear model was fit to participants' mood reports. A significant 3-way negative feedback x valence x pre/post interaction emerged on participants' mood (Figure 6; for full model statistics of the model see Table 5). Mixed-factor linear contrasts revealed that among negative feedback participants, negative affect decreased, $F(1, 153) = 14.89$, $p < .001$, $\eta_p^2 = .09$, and positive affect increased, $F(1, 153) = 24.48$, $p < .001$, $\eta_p^2 = .14$, after the Voodoo Doll Task. Among positive feedback participants, there were no significant changes in negative affect, $F(1, 153) = 2.35$, $p = .127$, $\eta_p^2 = .02$, and a significant decrease in positive affect, $F(1, 153) = 9.66$, $p = .002$, $\eta_p^2 = .06$, after the Voodoo Doll Task. Thus, aggression was successful at reducing participants' negative affect who had received negative feedback and increasing their positive affect, whereas no such effect occurred among participants who received positive feedback.

Before aggression, participants who received negative social feedback showed greater negative, $F(1, 153) = 10.40$, $p = .002$, $\eta_p^2 = .06$, and less positive affect, $F(1, 153) = 34.00$, $p < .001$, $\eta_p^2 = .18$, than did participants who received positive feedback. Yet after aggression, these two groups no longer showed differences in either negative, $F(1, 153) = 0.13$, $p = .716$, $\eta_p^2 = .00$, or positive affect, $F(1, 153) = 0.33$, $p = .566$, $\eta_p^2 = $

.00. After an act of aggression, rejected and accepted participants were affectively indistinguishable.

Mechanisms of Mood Repair

Bootstrapped serial mediation models (using 1,000 bias-corrected and accelerated bootstrap samples; PROCESS macro, model 6, Hayes, 2013) were fit to test the mechanisms through which individuals recovered from negative social feedback. To do so, we modeled several indirect effects whereby the direct effect of negative feedback on post-aggression affect (the point at which participants exhibited affective recovery) was serially mediated by pre-aggression affect and then aggressive behavior on the voodoo doll task.

First, we modeled whether negative social feedback increased subsequent negative affect, which then was associated with greater aggression, which then predicted greater post-aggression positive affect. The resulting model explained 7.21% of the variance in post-aggression positive affect. The model revealed a significant serial indirect effect (95% C.I.: .023, .163; Figure 7A), as well as a significant simple indirect effect where the direct effect of negative feedback on post-aggression positive affect was mediated by greater aggression (95% C.I.: .103, .512). These findings suggest that negative affect motivated individuals who had received negative social feedback to aggress. Further, the more that individuals were aggressive was associated with greater subsequent positive affect.

Second, we replaced post-aggression positive affect as the dependent measure with post-aggression *negative* affect. The resulting model explained 6.16% of the variance in post-aggression negative affect. The model revealed a significant serial

indirect effect (95% C.I.: .004, .109; Figure 7B), as well as a significant simple indirect effect where the direct effect of negative feedback on post-aggression negative affect was mediated by greater aggression (95% C.I.: .003, .327). These findings suggest that the while the extent of the aggression appeared to increase positive affect, it also appears to have increased negative affect as well.

Both of these models met the criteria for exerting a suppression effect, as the direct effect became stronger after controlling for the indirect effect and the sign of the indirect effect was opposite to that of the direct effect (MacKinnon, Krull, & Lockwood, 2000).These findings suggest that the ability of negative feedback to impair one's mood is suppressed and restrained by participants' use of aggression as an emotion regulation strategy. Also, both of these serial indirect effects were no longer significant if pre-aggression *positive* affect was modeled instead of pre-aggression negative affect (95% C.I.s: -.101, .006 and -.180, .250).

These significant indirect effects supported our prediction that the rejection-aggression link was motivated by the initial sensation of negative affect and is able to achieve mood repair by increasing positive affect. This effect appears to be counterbalanced by concurrent increases in negative affect. Further, the association between the extent of participants' aggression and their subsequent positive affect suggest that it is not just the opportunity to aggress that repairs participants' moods, but the *extent to which they are aggressive* in those opportunities.

To maximize our power, we used a manipulation that produced strong effect sizes on negative and positive affect. We also capitalized on added power that accompanied the use of repeated-measures of affect over time. Despite our efforts to

maximize power, it was desirable to replicate and extend our effects using a larger sample. In addition, Study 5 did not use a 'true' manipulation of social rejection. Therefore, we conducted Study 6 to replicate these findings with a larger sample and to use an experimental manipulation that more closely mapped onto the construct of social rejection.

Study 6: Mood Repair and the Rejection-Aggression Link

Study 6 sought to replicate the mood repair and serial mediation models of Study 5 using an experimental induction of social rejection with a larger sample. Specifically, participants experienced social acceptance or rejection, reported their current negative and positive affect, were given an opportunity to behave aggressively, and then again reported their current negative and positive affect. This design allowed us to replicate the effects observed in Study 5.

Methods

Participants

Participants consisted of 530 adult participants recruited from Amazon's Mechanical Turk subject pool (239 females; Age: $M = 32.28$, $SD = 8.43$) for a study on 'Mental Visualization Abilities'. Participants were compensated with $0.50. The study was posted with the following keywords: psychology, experiment, survey. We required workers to have a 95% approval rate on all previous MTurk tasks.

Procedure

Participants completed this experiment over the internet through a third-party survey host, which ostensibly sought to measure how various personality traits impact peoples' ability to mentally visualize events. The experiment began with the identical

Cyberball paradigm used in Study 1 (Williams et al., 2000, 2012). After Cyberball, participants completed the Need Threat Scale, which both served as a manipulation check and an assessment of pre-aggression affect. Participants then completed the Voodoo Doll Task. Participants were told that the doll represented 'either one of your Cyberball partners.' Participants then viewed what the doll would look like with 0 -19 pins stabbed into it and were presented with a slider bar to select how many pins they wanted to stab into the doll (0 – 51). After confirming their pin count, participants again completed the 8-item mood subscale of the Need Threat Scale which served as a measure of post-aggression mood. Finally, participants completed the Angry Mood Improvement Inventory.

Results and Discussion

Descriptive Statistics and Manipulation Checks

Of the 530 participants, one participant failed to complete the post-aggression mood measure. Validating our Cyberball paradigm, rejected participants reported that they received fewer ball tosses, felt more rejection, more threat to basic psychological needs, greater negative affect, and less positive affect than their accepted counterparts (Table 6). All four subscales of the Angry Mood Improvement Inventory displayed sufficient internal consistency: αs: .77 - .87. The rejection manipulation did not affect dispositional mood repair motives, as measured by the Anger Expression – Out subscale of the Angry Mood Improvement Inventory, $t(521) = 0.86$, $p = .391$, $d = .08$.

As in Studies 1, 4, and 5, a Kolmogorov-Smirnov test revealed that the distribution of number of pins did not meet the assumption of normality as the distribution was zero-inflated and positively skewed, $k(530) = .19$, $p < .001$.

Subsequently, a Poisson loglinear distribution was adopted for subsequent analyses using generalized mixed linear modeling (as recommended by DeWall et al., 2013). Aggressive behavior was characterized by a main effect of rejection on greater aggression, $B = 0.51$, $X^2 = 4.84$, $p = .028$. Anger Expression – Out subscale scores from the Angry Mood Improvement Inventory did not moderate the effect of rejection on aggression, $p > .10$. We are uncertain as to why this effect failed to replicate.

Mood-Repair Moderation Analyses

To assess the extent to which the opportunity to aggress repaired the damaged mood of rejected participants, a 2 (rejected vs. accepted) x 2 (negative vs. positive valence) x 2 (pre- vs. post-aggression) mixed-effects general linear model was fit to participants' mood reports. A significant 3-way rejection x valence x pre/post interaction emerged on participants' mood (Figure 8; for full model statistics of the model see Table 7). Mixed-factor planned contrasts revealed that among rejected participants, negative affect decreased, $F(1, 527) = 26.79$, $p < .001$, $\eta_p^2 = .05$, and positive affect increased, $F(1, 527) = 23.47$, $p < .001$, $\eta_p^2 = .04$, after the voodoo doll task. Among accepted participants, there were no significant changes in either negative, $F(1, 527) = 0.06$, $p = .813$, $\eta_p^2 = .00$, or positive affect, $F(1, 527) = 0.81$, $p = .369$, $\eta_p^2 = .00$, after the Voodoo Doll Task. Thus, aggression was successful at reducing rejected participants' negative affect and increasing their positive affect, whereas no such effect occurred among accepted participants.

Before aggression, rejected participants showed greater negative, $F(1, 527) = 14.28$, $p < .001$, $\eta_p^2 = .03$, and less positive affect, $F(1, 527) = 10.87$, $p = .001$, $\eta_p^2 = .02$, than accepted participants. Yet after aggression, these two groups no longer showed

differences in either negative, $F(1, 527) = 0.11$, $p = .742$, $\eta_p^2 = .00$, or positive affect,

$F(1, 527) = 0.07$, $p = .792$, $\eta_p^2 = .00$. After an act of aggression, rejected and accepted

participants were again affectively indistinguishable.

Mechanisms of Mood Repair

Bootstrapped serial mediation models (using 1,000 bias-corrected and

accelerated bootstrap samples; PROCESS macro, model 6, Hayes, 2012) were fit to

test the mechanisms through which individuals recovered from social rejection. To do

so, we modeled several indirect effects whereby the direct effect of social rejection on

post-aggression affect (the point in which participants exhibited affective recovery) was

serially mediated by pre-aggression affect and then aggressive behavior on the Voodoo

Doll Task.

First, we modeled whether social rejection increased subsequent negative affect,

which then was associated with greater aggression, which then predicted greater post-

aggression positive affect. The resulting model explained 9.85% of the variance in post-

aggression positive affect. The model revealed a significant serial indirect effect (95%

C.I.: .006, .033; Figure 9A). These findings suggest that the negative affect that social

rejection elicited motivated individuals to aggress. Further, the more individuals were

aggressive the more subsequent positive affect they reported.

Second, we replaced post-aggression positive affect as the dependent measure

with post-aggression *negative* affect. The resulting model explained 32.67% of the

variance in post-aggression negative affect. The model revealed a non-significant serial

indirect effect (95% C.I.: -.001, .013; Figure 9B). The path leading from aggression to

post-aggression negative affect was non-significant, suggesting that, in this study,

aggression had less of an impact on negative affect than previously expected. This

failure to replicate the serial indirect effect from Study 5 suggests that post-aggression

mood repair may be less driven by changes in negative affect and more by increases in

positive affect after aggression. Both of these serial indirect effects were no longer

significant if pre-aggression *positive* affect was modeled instead of pre-aggression

negative affect (95% C.I.s: -.004, .006 and -.004, .007).

General Discussion

Aggression undermines the harmonious state that society works towards.

Understanding the motivations behind such belligerence is a crucial goal for

psychological science. Classic theories of aggressive behavior have emphasized

negative affect as a proximate mediator of the link between interpersonal provocations

and retaliatory aggression, aggression's most common manifestation (Anderson &

Bushman, 2002; Berkowitz, 1989). However, additional research has implicated

emotion-regulation motives (Bushman et al., 2001) and positive affect (Chester &

DeWall, 2016) as important motivators behind retaliatory aggression. Further, these

latter two factors have yet to be explored in the domain of the rejection-aggression link.

We tested the overarching hypothesis that the positive affect associated with retaliatory

aggression would motivate rejected people to aggress to repair their damaged mood.

Across most of our studies, experimental manipulations of social rejection

increased aggressive behavior, supporting the reliability and strength of the rejection-

aggression link (Twenge et al., 2001). These effects were observed across online,

symbolic and in-lab, 'actual' measures of aggression. However, future research should

attempt to replicate these effects using other aggression measures such as the hot

sauce paradigm (Lieberman, Solomon, Greenberg, & McGregor, 1999). These aggressive responses to exclusion support the larger concept that humans have an elemental need to belong with others and that threats to this need will elicit powerful, and sometimes maladaptive, responses (Baumeister & Leary, 1995).

Despite the strength of these observed effects of rejection on aggression, this effect was largely attenuated among individuals who perceived aggression as an ineffective means to repair mood (though we failed to replicate this effect in Study 6). These moderating effects speak to the ability of emotion-regulation motives to influence aggressive responding across domains. This critical role of mood repair motives in the rejection-aggression link, while previously speculated to exist (Leary et al., 2006), has now been supported. These affect-centered motivational states should be better incorporated into meta-theoretical frameworks such as the General Aggression Model (Anderson & Bushman, 2002).

In Studies 5 and 6, we showed that aggression leads to actual mood repair among rejected individuals and that the extent of the mood repair correlated with the extent of retaliatory aggression. Specifically, rejected participants were statistically indistinguishable, in regards to their negative and positive affect levels, from their accepted counterparts after they were allowed to retaliate. This effect may seem to counter previous research showing that negative affect (e.g., anger) appears to increase after aggression (Bushman, 2002). However, Studies 5 and 6 differed from that of previous research on catharsis in many ways that prevent us from arguing for the existence of effective catharsis after aggression. We did not manipulate the type of activity participants performed in between their mood measures and therefore we

cannot be sure that the changes in mood were because of aggression or simply due to

natural variations over time. However, previous research has indicated that indicators of

negative affect due to social rejection can persist from a few minutes (despite showing

greater negative affect and less positive affect than accepted participants; Wirth &

Williams, 2009**)** up to 45 minutes after the rejection incident (Zadro, Boland, &

Richardson, 2006). Therefore, rejected participants should have still reported worse

mood than their accepted counterparts during the course of the study we conducted

which lasted approximately 20-25 minutes. However, the exact timecourse of affective

responses to rejection remains an uncertain area ripe for future investigation. Indeed,

had we measured participants' affect levels just a few minutes later, it is possible that

they returned to their former, aversive states. Our final study also used a symbolic

measure of aggression, the Voodoo Doll Task, and was performed over the internet.

Future research should explore whether aggression causes actual mood repair using

more direct, physical forms of aggression. These limitations of the present research, in

combination with others discussed later in the manuscript, qualify our conclusions. More

research is needed on these topics before any real-world applications can be made in

regards to the role of mood repair in motivating aggressive behavior.

        We also observed that the mood repair evident among rejected participants in

Studies 5 and 6 was mediated by initial increases in negative affect, which then

predicted increased aggression, which then predicted increased positive affect. This

specificity of positively-valenced affect fits well with psychological research

demonstrating that aggression is associated with this experience (Carré et al., 2010;

Ramírez et al., 2005). More broadly, aggressive behaviors that are associated with

pleasure are intrinsically reinforced (Berkowitz, 1974) and thus the rejection-aggression link may represent a learned response that is bolstered by the positive affect associated with aggression. The ability of post-aggression affect and mood repair motives to reliably predict the magnitude of aggressive responses to rejection speak to the predictive power of *anticipated* affect over currently-felt emotions (Baumeister et al., 2007; DeWall et al., 2016). Indeed, rejected individuals seem more driven by how they expect to feel than their affective state during the rejection incident. Aggression research will benefit greatly from considering the powerfully predictive role of anticipatory affect.

Across the studies that included a trait measure of the motive to use aggression to repair mood (i.e., Studies 1, 2, and 6), we observed no evidence that our rejection manipulation had an impact on such dispositional motives. This should not be taken as evidence that social rejection does not alter the motivation to repair mood, as our underlying theory predicts that this is, in fact, exactly the case. We simply used a measure of mood repair motives that was designed and validated to capture dispositional, trait levels of this construct (Bushman et al., 2001), and not state fluctuations due to transient situational inputs.

Aggression exists among many other behaviors that are expected to improve or repair individuals' moods (e.g., alcohol consumption). Even aggression's opposite, altruism, can effectively improve distressed individuals' affective states (Cialdini, Baumann, & Kenrick, 1981). Aggression should be viewed as one, among many, behavioral avenues through which rejected individuals attempt to repair their affective states. Indeed, the mood repair motives of rejected individuals may explain the wide

array of seemingly contradictory and paradoxical behavioral responses that are often observed in response to rejection, such as antisocial and affiliative behaviors (Chester, DeWall, & Pond, 2016). Future research should test the role of these mood repair motives as a potential mechanism that links rejection to its various behavioral outcomes.

An interesting possibility is that, in order to obtain the positive affect associated with retaliatory aggression, individuals may actively seek out provocation in their daily lives. Conventionally, aggression research has characterized provocation as an ambient and aversive aspect of the social environment, and less as a condition that individuals may be motivated to obtain. Future research should investigate whether provocation- and rejection-seeking exists among individuals motivated to harness the positive affect of retaliatory aggression.

These results may have practical implications for violence interventions. If aggression is motivated by the experience of positive affect, then treatments may gain traction on reducing aggressive behavior by replacing the mood-improving qualities of violence with other, less damaging, forms of emotion-regulation such as reappraisal strategies and mindfulness meditation (for a review of effective aggression interventions see Denson, 2015). Further, treatments and pharmacological substances that blunt the associated reward of certain behaviors may be viable avenues to subdue the aggression of violent offenders who seek the 'kick' of positive affect that aggression likely yields. As early evidence, naloxone, an opioid antagonist frequently used to prevent fatal overdose among opioid-dependent individuals (e.g., heroin users), has been linked to lesser aggression in mice (Lynch, Libby, & Johnson, 1983). Indeed, it

may be that aggressive behavior closely mirrors that of addictive behaviors in that it results in a short-term improvement in mood and that this motivates individuals to seek out this behavior. Parallels between violent and addictive behavior should be explored.

Limitations and Future Directions

Our findings should be evaluated in light of several limitations. First, for four out of six studies, we used the Voodoo Doll Task to measure aggression. This task, while valid and reliable (DeWall et al., 2013), is removed from the typical form that aggression takes. Laboratory and internet measures of aggression often take far more mild forms than punches and wrestling moves, but real-world instances of aggression (e.g., physical fights) should be assessed in relation to their mood-improving qualities to be certain that the somewhat artificial nature of our aggression measures is not yielding external validity for our results. Second, our mood measurements for Studies 5 and 6 occurred relatively quickly after the instance of aggression and thus we are unable to see the long-term consequences of aggression on mood. It may be that aggression returns affect levels to baseline in the short interim following the act, but that positive affect subsides and negative affect returns to its previously high levels shortly thereafter. Future research should explore the temporal durability of aggression's mood-repairing effects.

Third, all of our aggression measures were retaliatory in nature. Additional research is needed to understand if the mood-improving qualities of aggression hold across displaced and unprovoked domains. Further, it remains unknown whether emotion-regulation motives moderate the effect of provocation and rejection on aggression towards innocent bystanders. Fourth, our online mood freeze manipulation

from Study 4 was the first attempt at employing such a design and was not pilot tested. Failure of participants to report that this manipulation 'froze' their moods, but instead that the manipulation ambiguously 'affected' them, should elicit some healthy skepticism in Study 4's results. Fifth, we did not assess how mood repair might occur after an actual act of aggression versus our symbolic Voodoo Doll Task, nor did we measure participants' subjective experience of felt revenge. Because we do not expect any of our effects to be specific to a particular measure or manipulation, we would expect these findings to replicate using other methods and measures. Additionally, giving participants other pleasurable options besides revenge might allow us to understand where retaliatory aggressions stands in the variety of behaviors that individuals perform to repair their mood after social rejection (e.g., smoking cigarettes: DeWall & Pond, 2011). Finally, we did not directly measure participants' motives to improve their mood before and after rejection. Thus, it remains unknown whether provocations such as rejection increase the motive to improve mood, which in turn, increases aggression among those who view it as a viable means of mood repair.

Conclusions

When people think about what aggressive people are like, the irate, furious hothead often comes to mind. Their anger and frustration is thought to propel them toward aggression (Berkowitz, 1989). Yet why would such an aversive state do so? In this article, we proposed that aversive states push individuals towards the often pleasant experience of revenge. Supporting this claim, we consistently found that rejected individuals acted aggressively but only if they expected that aggression might repair their aversive state. We reported additional evidence that this strategy appears to

achieve its intended goal as, after an instance of aggression, rejected individuals'

moods were indistinguishable from their accepted counterparts. The extent of rejected

individuals' retaliatory responses appeared to be motivated by the reinforcement they

received in the form of increases in positive affect. Across these findings, we hope to

have demonstrated support for the role of emotion-regulation motives in aggressive

behavior, and that this new information can lead to theoretical progress and

advancements in violence-reducing interventions.

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Tables

Table 1. Manipulation check data from of the Need Threat Scale of Study 1, by condition.

	Accepted $M\,(SD)$	Rejected $M\,(SD)$	Rejected > Accepted	α	d
Belonging Threat	3.27(1.03)	2.27(0.90)	$t(129) = 5.91$**	.84	1.04
Control Threat	2.98(0.91)	3.81(0.88)	$t(129) = 5.21$**	.78	0.92
Meaning Threat	2.39(0.98)	3.21(1.21)	$t(129) = 4.28$**	.88	0.75
Self-Esteem Threat	2.69(1.06)	3.14(1.07)	$t(129) = 2.43$*	.87	0.43
Negative Affect	1.76(0.97)	2.66(1.18)	$t(129) = 4.80$**	.94	0.85
Positive Affect	3.11(1.17)	2.48(1.11)	$t(129) = -3.13$*	.96	-0.55
Felt Rejection	1.83(1.13)	3.35(1.54)	$t(129) = 6.53$**	.95	1.15
% Ball Tosses	27.56(13.67)	15.36(14.83)	$t(123) = -4.78$**	n/a	-0.86

*$p < .01$, **$p < .001$

Table 2. Manipulation check data from of the Need Threat Scale of Study 2, by condition.

	Accepted M (SD)	Rejected M (SD)	Rejected > Accepted	α	d
Belonging Threat	2.36(0.79)	3.34(0.98)	$t(356) = 10.43^*$	.83	1.11
Control Threat	2.93(0.80)	3.98(0.84)	$t(356) = 12.10^*$	.73	1.28
Meaning Threat	2.30(0.81)	3.23(0.98)	$t(356) = 9.81^*$	.85	1.04
Self-Esteem Threat	2.55(0.83)	3.19(0.90)	$t(356) = 7.00^*$	.85	0.74
Negative Affect	1.45(0.65)	1.70(0.71)	$t(356) = 3.45^*$	.80	0.37
Positive Affect	3.82(0.86)	3.49(0.85)	$t(356) = -3.55^*$	.90	-0.38
Felt Rejection	1.65(0.92)	3.69(1.41)	$t(356) = 16.22^*$	.96	1.72

$^*p < .001$

Table 3. Manipulation check data from of the Need Threat Scale of Study 3, by condition.

	Accepted M (SD)	Rejected M (SD)	Rejected > Accepted	Mood Frozen > Control	α
Belonging Threat	2.18(0.60)	3.22(0.89)	$t(152) = 8.66**$, $d = 1.40$	$t(152) = -1.97$	.75
Control Threat	2.88(0.84)	4.05(0.73)	$t(152) = 9.24**$, $d = 1.50$	$t(152) = -0.64$	.84
Meaning Threat	2.09(0.61)	3.27(0.91)	$t(152) = 9.47**$, $d = 1.54$	$t(152) = -2.11*$	.85
Self-Esteem Threat	2.55(0.81)	3.27(0.78)	$t(152) = 5.59**$, $d = 0.91$	$t(152) = 0.01$	.80
Negative Affect	1.22(0.51)	1.56(0.70)	$t(152) = 3.01**$, $d = 0.49$	$t(152) = 0.25$	.82
Positive Affect	3.97(0.70)	3.78(0.75)	$t(152) = -1.63$, $d = -0.26$	$t(152) = -0.55$	.87
Felt Rejection	1.46(0.79)	3.94(1.14)	$t(152) = 15.67**$, $d = 2.52$	$t(152) = -0.88$	.98

$*p < .05$, $**p < .005$

Table 4. Manipulation check data from of the Need Threat Scale of Study 4, by condition.

	Accepted M (SD)	Rejected M (SD)	Rejected > Accepted	Mood Frozen > Control	α
Belonging Threat	1.83(0.81)	3.55(0.83)	$t(172) = 13.88^*$, $d = 2.12$	$t(172) = 0.01$, $d = 0.00$	.86
Control Threat	2.74(0.86)	3.74(0.85)	$t(172) = 7.77^*$, $d = 1.18$	$t(172) = 0.39$, $d = 0.06$	.92
Meaning Threat	1.95(0.85)	3.34(1.02)	$t(172) = 9.76^*$, $d = 1.49$	$t(172) = 0.16$, $d = 0.02$	.90
Self-Esteem Threat	2.18(0.90)	3.79(0.89)	$t(172) = 11.91^*$, $d = 1.82$	$t(172) = 0.15$, $d = 0.02$	.80
Negative Affect	1.61(0.82)	3.32(0.94)	$t(172) = 12.87^*$, $d = 1.96$	$t(172) = 0.21$, $d = 0.03$	.93
Positive Affect	3.95(1.03)	2.09(0.90)	$t(172) = -12.71^*$, $d = -1.94$	$t(172) = -0.06$, $d = -0.01$	.97
Felt Rejection	1.65(1.06)	3.78(1.21)	$t(172) = 12.32^*$, $d = 1.88$	$t(172) = -0.36$, $d = -0.05$	.90

$^*p < .001$

Table 5. Summary statistics for the mixed-effects general linear model from Study 5 on participants' mood reports (model df *= 1, 153).*

	F	p	η_p^2
Negative Feedback (between)	0.62	.431	.004
Valence (within)	199.12	< .001	.565
Pre/Post (within)	0.01	.909	.000
Negative Feedback * Valence	13.29	< .001	.080
Negative Feedback * Pre/Post	3.01	.085	.019
Valence * Pre/Post	3.31	.037	.028
Negative Feedback * Valence * Pre/Post	43.24	< .001	.220

Table 6. Descriptive data of the Need Threat Scale of Study 6, by condition.

	Accepted M (SD)	Rejected M (SD)	Rejected > Accepted	α	d
Belonging Threat	2.52(1.02)	2.99(1.11)	$t(528) = 5.15^*$	.84	0.45
Control Threat	2.90(0.85)	3.24(0.95)	$t(528) = 4.22^*$	.73	0.37
Meaning Threat	2.49(1.03)	2.92(1.09)	$t(528) = 4.63^*$	.86	0.40
Self-Esteem Threat	2.51(0.91)	2.89(1.03)	$t(528) = 4.54^*$	.85	0.40
Pre-Aggression Negative Affect	1.99(1.08)	2.36(1.21)	$t(528) = 3.73^*$	.91	0.32
Pre-Aggression Positive Affect	3.48(1.08)	3.14(1.29)	$t(528) = -3.38^*$	.95	-0.29
Post-Aggression Negative Affect	2.00(1.02)	2.03(1.04)	$t(527) = 0.33$	.90	0.03
Post-Aggression Positive Affect	3.43(1.11)	3.45(1.18)	$t(527) = 0.26$	.94	0.02
Felt Rejection	2.52(1.40)	3.02(1.42)	$t(528) = 4.05^*$	.89	0.35
% Ball Tosses	27.82(18.99)	23.54(18.56)	$t(508) = -2.57^*$	n/a	-0.22

$^*p < .001$

Table 7. Summary statistics for the mixed-effects general linear model from Study 6 on participants' mood reports (model df = *1, 527).*

	F	p	η_p^2
Rejection (between)	0.27	.607	.001
Valence (within)	288.46	< .001	.354
Pre/Post (within)	0.56	.454	.001
Rejection * Valence	5.66	.018	.011
Rejection * Pre/Post	0.06	.803	.000
Valence * Pre/Post	13.38	< .001	.025
Rejection * Valence * Pre/Post	20.57	< .001	.038

Figures

Figure 1. Interactive effect from Study 1 of Cyberball condition and Anger Expression –

Out subscale scores from the Angry Mood Improvement Inventory (AMII) on aggression

from the voodoo doll task, whereby greater AMII scores were associated with a stronger

rejection-aggression link. Interaction plotted as recommended by Dawson, J. F.

(http://www.jeremydawson.co.uk/slopes.htm).
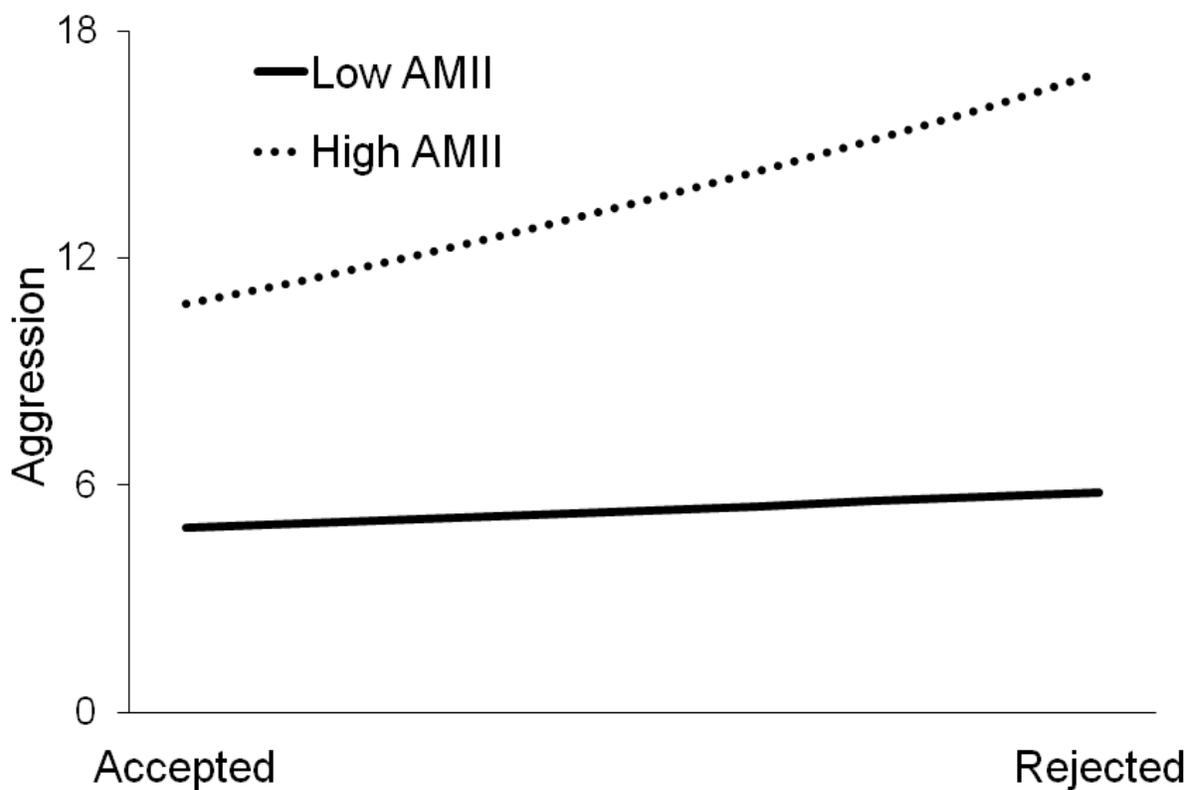
Figure 2. Mediated moderation model from Study 2 whereby the interactive effect of social rejection and the Anger Expression – Out subscale of the Angry Mood Improvement Inventory (AMII) on greater retaliatory aggression towards participants' rejecters is mediated by increases in sadistic impulses. Values represent unstandardized regression coefficients. The value in parentheses represents the direct effect after controlling for the indirect effect. *p < .05, **p < .01.
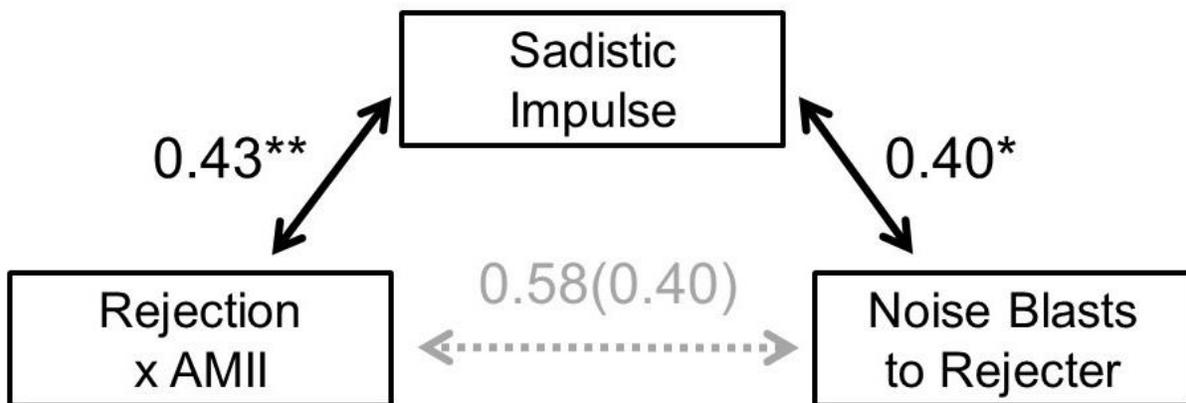
Figure 3. Interactive effect from Study 3 of social rejection and the mood freezing manipulation on aggression from the noise blast task, whereby the rejection-aggression link was attenuated among participants in the mood frozen condition. Error bars represent the standard error of the mean.
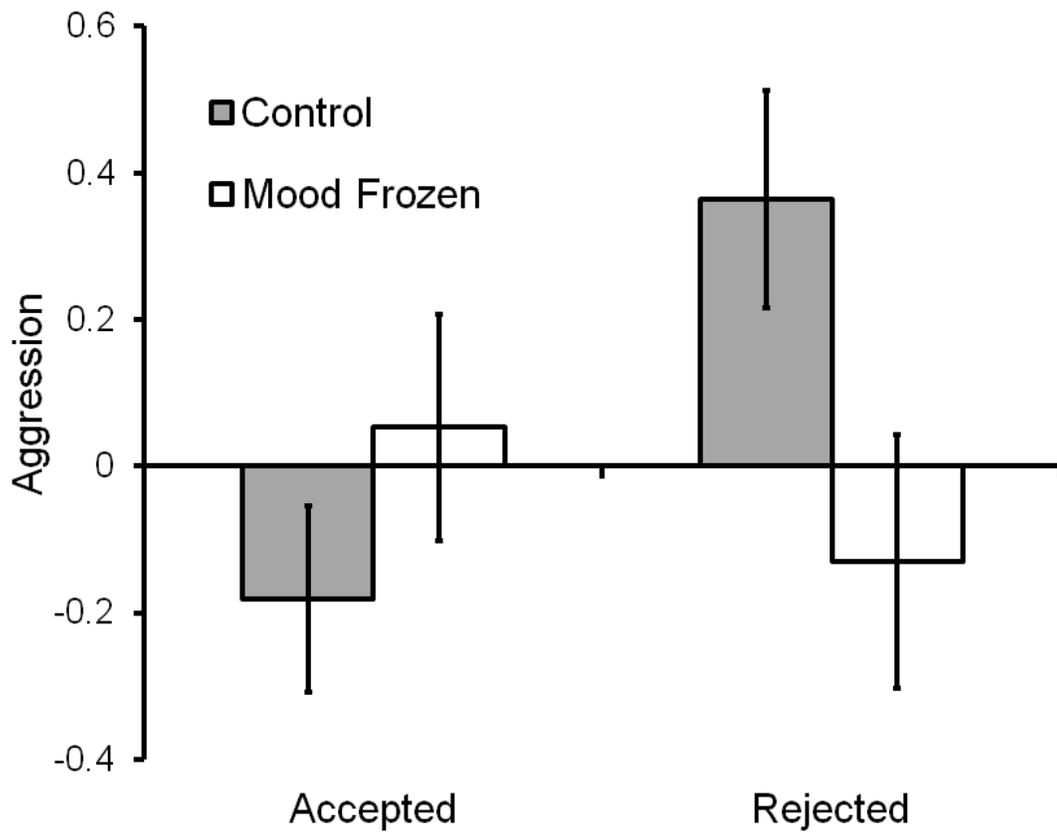
Figure 4. Interactive effect from Study 4 of rejection essay condition and the mood image condition on aggression from the voodoo doll task, whereby the rejection-aggression link was attenuated among participants in the mood frozen condition. Interaction plotted as recommended by Dawson, J. F. (http://www.jeremydawson.co.uk/slopes.htm).
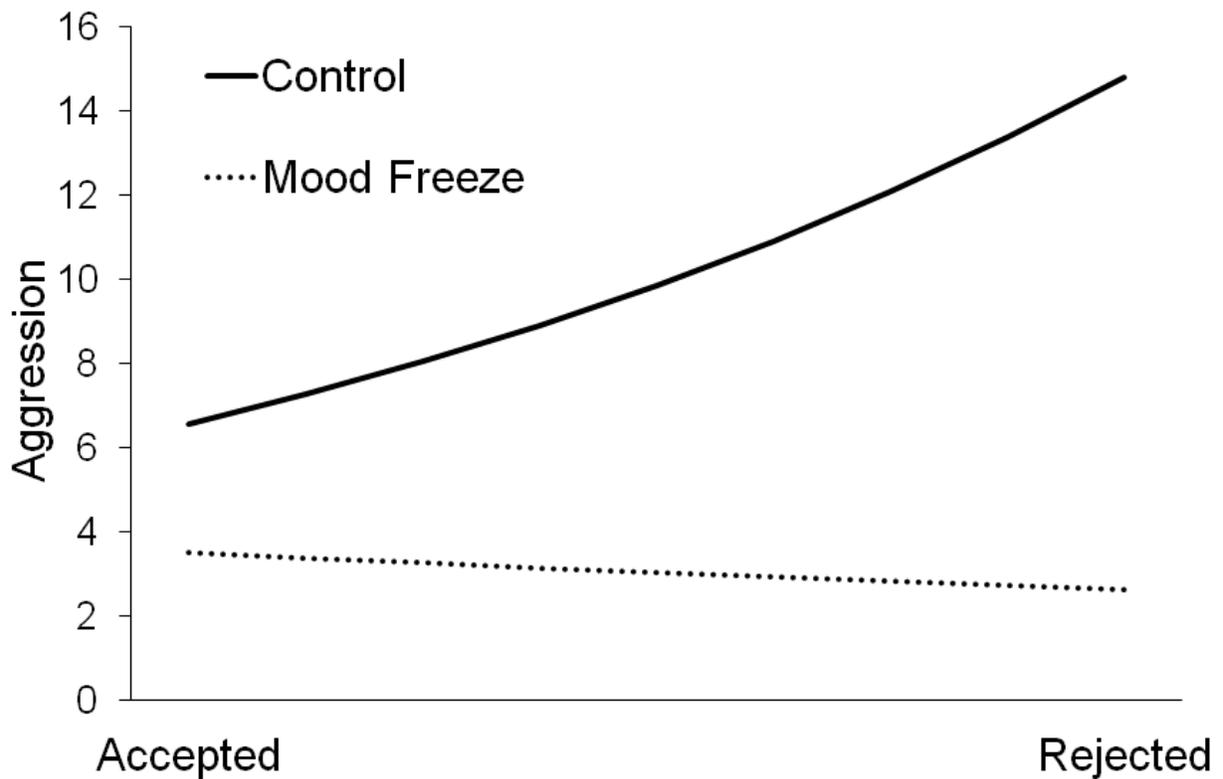
*Figure 5. Mediation models from Study 4 whereby the rejection-aggression link is mediated by sadistic impulses among participants whose mood was unfrozen, but this mediating effect did not hold for participants with a frozen mood. Values represent unstandardized regression coefficients. The values in parentheses represent the direct effects after controlling for the indirect effects. *p < .05, **p < .01, ***p < .001.*
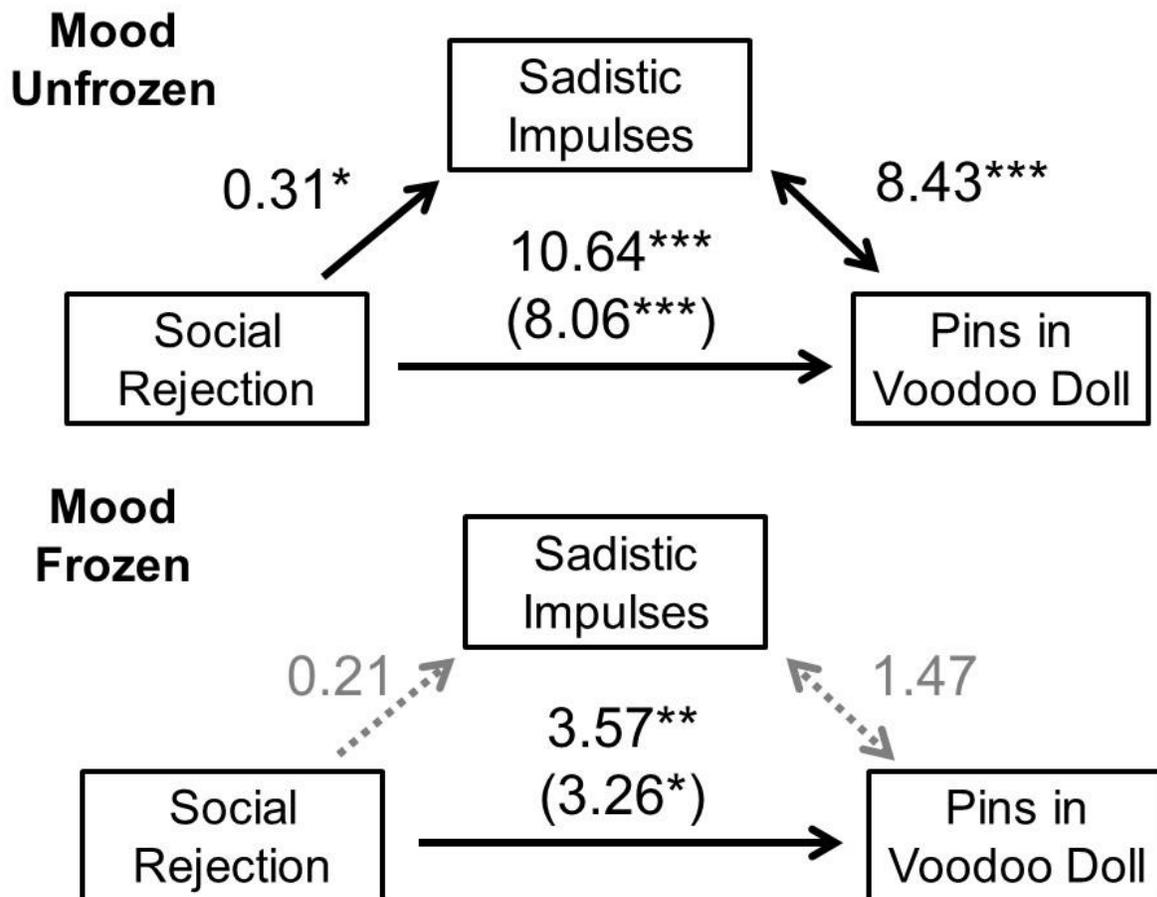
Figure 6. Evidence from Study 5 for mood repair (decreased negative affect, increased positive affect) among rejected participants who received negative social feedback after an instance of retaliatory aggression. Lines represent group averages and error bars represent +/- 1 standard error of the mean.
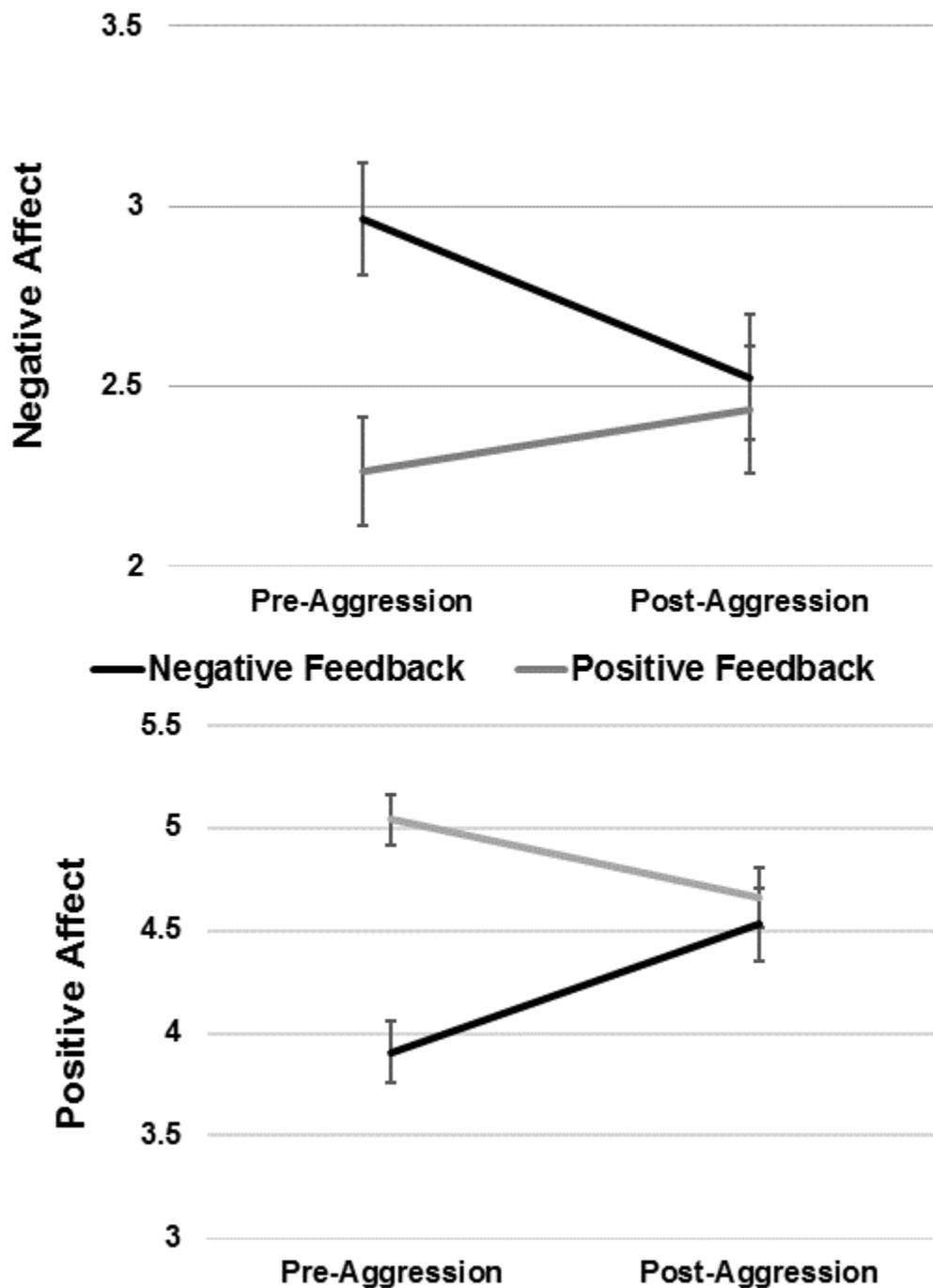
*Figure 7. Serial mediation models from Study 5 whereby the direct effect of negative social feedback on post-aggression (A) positive and (B) negative affect was mediated by pre-aggression negative affect and then aggression itself. Values represent unstandardized regression coefficients. The value in parentheses represents the direct effect after controlling for the indirect effect. †p < .10, *p < .05, **p < .01, ***p < .001.*
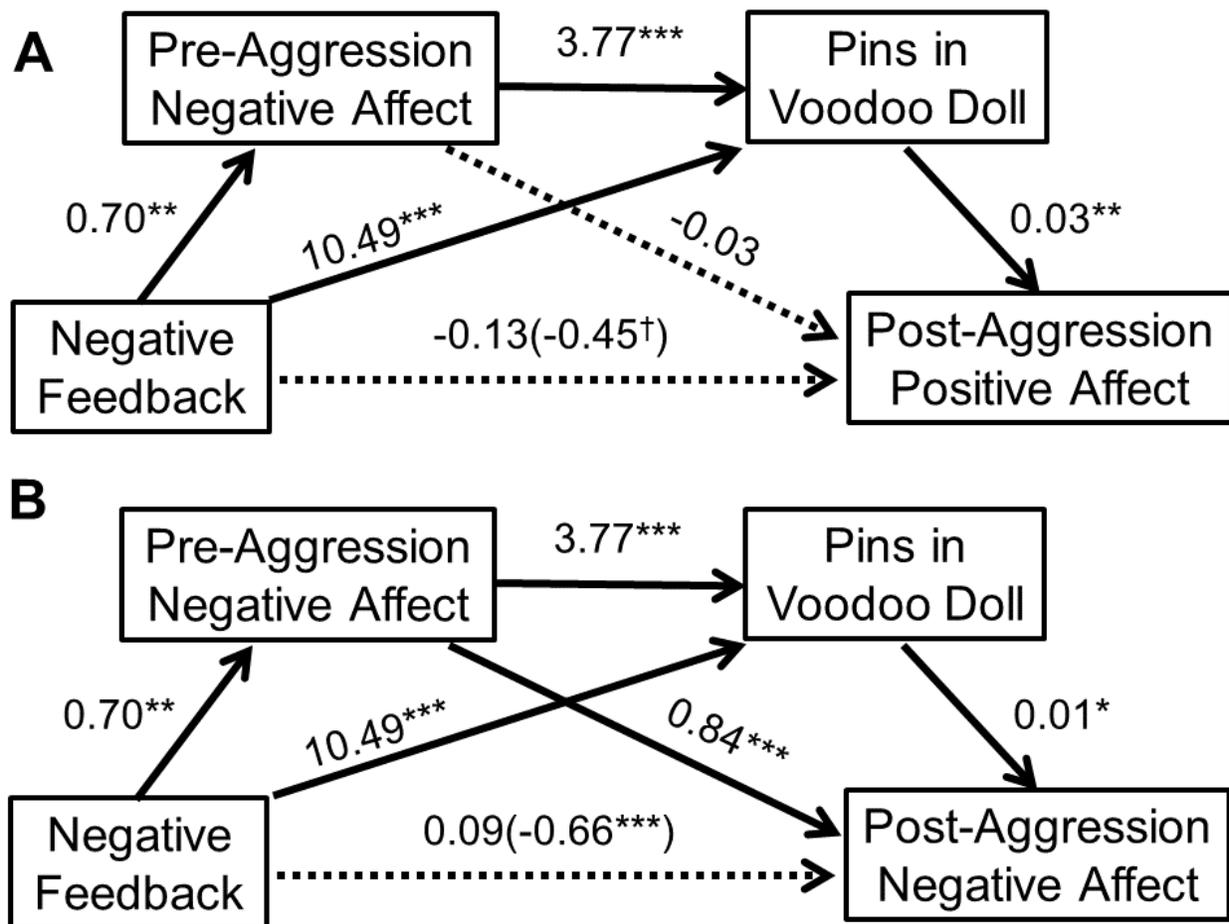
Figure 8. Evidence from Study 6 for mood repair (decreased negative affect, increased positive affect) among rejected participants after an instance of retaliatory aggression. Lines represent group averages and error bars represent +/- 1 standard error of the mean.
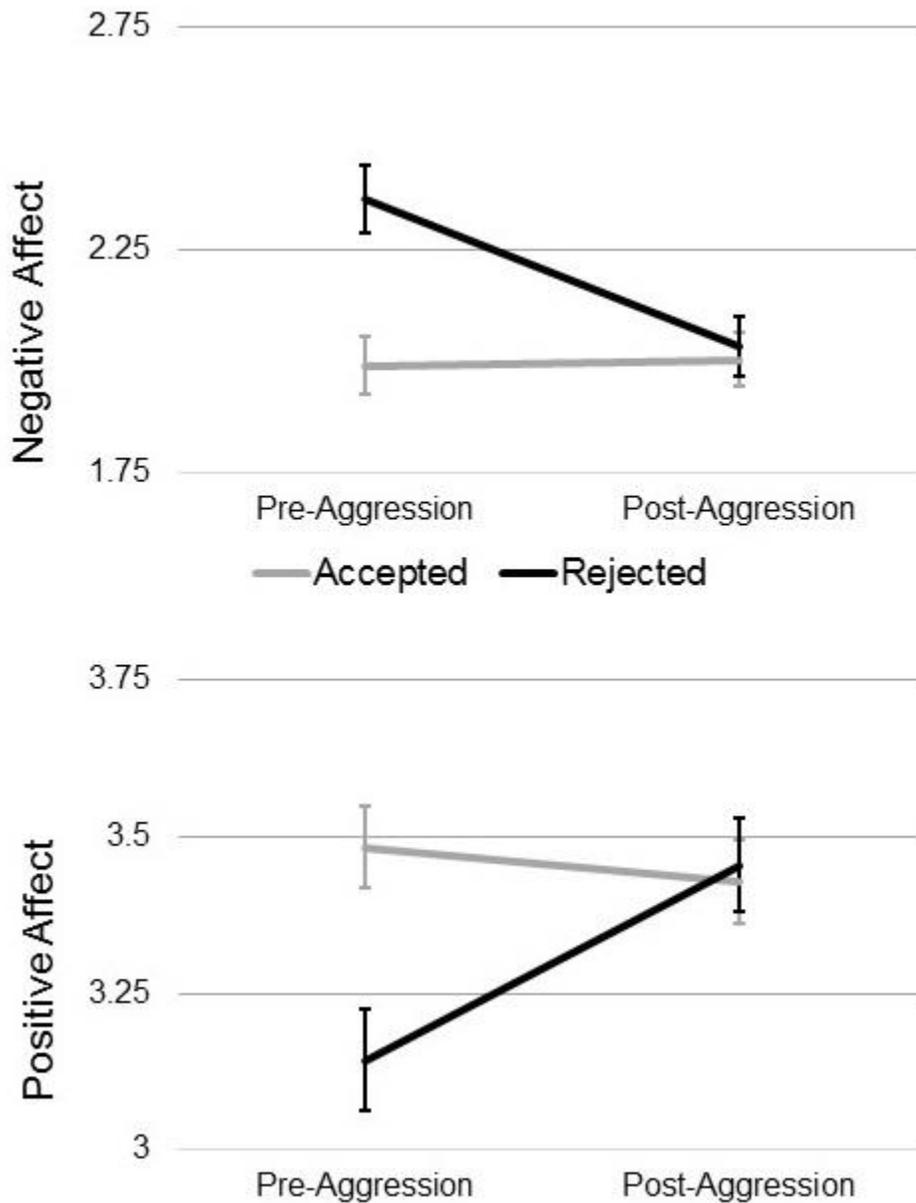
*Figure 9. Serial mediation models from Study 6 whereby the direct effect of social rejection on post-aggression (A) positive and (B) negative affect was mediated by pre-aggression negative affect and then aggression itself. Values represent unstandardized regression coefficients. The value in parentheses represents the direct effect after controlling for the indirect effect. *p < .05, **p < .01, ***p < .001.*