

**The Pleasure of Revenge Predicts Both Vengeful and Benevolent Motivations
Toward the Provocateur**

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Abstract

Three studies ($N = 860$) examined whether pleasure of revenge predicts both vengeful and benevolent motivations toward the provocateur. Across all studies, self-reported positive affect was higher, whereas self-reported negative affect was lower after an instance of revenge. Furthermore, the revenge-related positive affect predicted greater subsequent vengeful and benevolent motivations toward the provocateur (but more consistently the former). These findings replicate and extend previous research on affect-improving qualities of revenge. They allow for a more nuanced understanding of the reinforcing nature of vengeful pleasure. Moreover, they suggest that the pleasure of revenge might be harnessed to promote forgiveness.

Keywords: aggression, motivation, provocation, revenge, self-regulation

1. Introduction

Social (Chester & DeWall, 2017), physiological (Threadgill & Gable, 2020; Verona & Sullivan, 2008), and neuroscientific research (Chester & DeWall, 2016; Krämer et al., 2007; Singer et al., 2006) has found that revenge – aggression in response to provocation¹ – is rewarding. Retaliating makes people feel good, albeit briefly (Carlsmith et al., 2008; Eadeh et al., 2017). However, less is known about the consequences of this positive feeling. Does the pleasure of revenge satisfy the avengers and helps them to rebuild their relationship with the transgressors? Or conversely, does it magnify the desire for further vengeful reinforcement? We argue that both may be true. As such, we investigated whether pleasure of revenge predicts benevolent *and* vengeful motivations toward the provocateur.

1.1. Pleasure of revenge

Revenge has multiple positive effects (for a review see: Quansah & Gagnon, 2023). For instance, revenge decreases the accessibility of aggressive thoughts (Denzler et al., 2009). People aggress out of the desire to bring relief from feelings of frustration or pain (Berkowitz, 1989; Bushman et al., 2001), which can be brought upon by aversive social experiences such as rejection. Such retaliatory aggression is associated with neural signatures of approach motivation, which has been linked to

¹ Revenge has been defined as both the motivation to act aggressively towards the provocateur (McCullough et al., 1998; Schumann & Ross, 2010) and an act of aggression against the provocateur (Buss, 1961; Chester & Martelli, 2019). We use the term revenge for an act of retaliatory aggression (Chester & Martelli, 2019) and the term vengeful motivation for the desire to harm the provocateur (McCullough et al., 2006).

reward (Carver & Harmon-Jones, 2009; Threadgill & Gable, 2020). Participants even spontaneously smile when seeing the provocateur suffering from their retaliatory actions as indicated by increased activity of zygomaticus major muscle and orbicularis oculi muscle and decreased activity of corrugator supercilii muscle relative to the baseline activity (Mitschke & Eder, 2021).

Revenge-taking has also been linked to activation of the brain regions associated with reward processing, such as the nucleus accumbens and other portions of the striatum (Delgado et al., 2003). Accordingly, increased activity of the nucleus accumbens correlated with the desire for revenge against a confederate who acted unfairly (Singer et al., 2006). During retaliation, greater activity in the nucleus accumbens also predicted higher aggression after a provocation (Chester & DeWall, 2016). Participants with stronger activation in the dorsal striatum were willing to incur greater costs to deter defectors in an economic exchange (de Quervain et al., 2004). Retribution for unfair behavior was also accompanied by activation of the ventral striatum, thus suggesting that revenge is indeed a satisfactory experience rooted in biological functioning (Brüne et al., 2013). Indeed, people with lower-functioning dopaminergic activity are prone to act aggressively because of the rewarding features of aggression (Chester et al., 2016). Yet does this mean that revenge makes people feel better?

Chester and DeWall (2017) demonstrated that participants who believed that expressing aggressive behavior is driven by the desire to experience positive affect, were more aggressive after experiencing social exclusion. Those who were unable to regulate their affective state (i.e., had their mood ostensibly frozen; Bushman et al., 2001) were less aggressive in response to provocation. Moreover, results suggest that participants' affective state was improved through revenge. Participants were

provoked (vs. unprovoked), reported their current negative and positive affect, were given a chance to aggress, and then again reported their current negative and positive affect. Aggression reduced negative affect and increased positive affect among provoked participants (such effect did not occur among unprovoked participants). Moreover, negative affect that arose in response to provocation, predicted greater acts of aggression, which then predicted greater positive affect. These findings indicate that revenge has a self-regulatory function.

The pleasure of revenge, however, is often intermingled with negative affect, thus creating an ambivalent affective experience. For instance, reminding individuals of vicarious revenge (i.e., the assassination of Osama bin Laden) makes them angrier (Lambert et al., 2014). People expect revenge to make them feel better, but revenge can make them feel worse. This presumably happens because revenge-taking increases thinking about a given transgression (Carlsmith et al., 2008), consequently making the revenge-seeker feel bitter. Indeed, the bittersweet model of revenge (Eadeh et al., 2017) proposes that revenge elicits both positive and negative feelings. Following this line of thought, we propose that revenge-related pleasure may foster both benevolent and vengeful motivations toward the provocateur.

1.1.1. Pleasure of revenge and benevolent motivations toward the provocateur

The initial and lingering negative affect (anger or resentment) that arises after a transgression often prevents people from forgiving their transgressors (Lawler et al., 2005; Rohde-Brown & Rudestam, 2011). According to the affective counterbalancing model, positive affect related to revenge may combat the lingering negative affect that occurs due to a transgression — thus removing this affective barrier (Chester & Martelli, 2019). In an analogical vein, receiving apologies from the transgressor can facilitate forgiveness, because apologies-related positive feelings

outweigh the transgression-related negative feelings (Worthington & Wade, 1999).

The pleasure from revenge is temporarily effective in restoring people's affective states to their pre-provocation levels (Chester & DeWall, 2017). Taking revenge is also empowering (Strelan et al., 2017; Strelan et al., 2020), as it closes the injustice gap between the victim and the provocateur (Strelan & van-Prooijen, 2013).

Revenge-related empowerment (i.e., having an ability to exert influence upon another person; Anderson et al., 2012) has indeed been linked to greater benevolent motivations toward the provocateur (Strelan et al., 2017).

1.1.2. Pleasure of revenge and vengeful motivations toward the provocateur

Besides promoting benevolent motivations toward the provocateur, the revenge-related reward is likely to also foster vengeful motivations. Reward seeking is associated with greater aggression (Derefinko et al., 2011). In line with the reinforcement model of revenge (Chester et al., 2018), the hedonic reward from revenge-taking is a pleasant, approach-related state (Tunison et al., 2019) that reinforces the likelihood that an individual will pursue revenge in the future. Hence, it may result in revenge-seeking behavior (Berkowitz, 1974; Golden & Shaham, 2018; Schwartz et al., 2013). Positive affect, when experienced in anticipation of, during, and after an action, reinforces that action (Berridge & Kringelbach, 2008), and positive affect is a reliable correlate of aggression (Chester, 2017). These positive feelings has been described as an *aggressive pleasure* (Chester et al., 2019).

Activity in the striatum, part of the brain that is associated with revenge-seeking behavior (de Quervain et al., 2004), plays an important role in addiction development (Robbins & Everitt, 1996) and aggression shows core features of compulsive behavior (Golden et al., 2017). Retaliatory aggression may then increase the

likelihood of responses that produce them, resulting in greater subsequent revenge-taking. Stated more simply – pleasure of revenge reinforces revenge.

2. Present Research

We sought to replicate and extend previous work which showed that retaliatory aggression improves affective state (Chester & DeWall, 2017). First, we tested whether among provoked participants post-aggression positive affect will be higher than pre-aggression positive affect, whereas post-aggression negative affect will be lower than pre-aggression negative affect. These predictions were not pre-registered. Next, we examined whether provocation would elicit greater (pre-aggression) negative affect, which would subsequently predict greater aggression, which would then predict greater (post-aggression) positive affect, which would ultimately predict greater vengeful and benevolent motivations (but not avoidant motivations) toward the provocateur. To test these predictions, we conducted three experiments in which participants were first provoked (vs. unprovoked), then reported their current affect, were given the opportunity to aggress, again reported their current affect, and then reported their current motivations toward the provocateur. Thus, we tested a serial mediation model (with three serial mediators), being an extension of the serial mediation model introduced by Chester and DeWall (2017). For each study, we report all manipulations, measures, and exclusion. Data, codebooks, and materials for this research are publicly available at:

<https://osf.io/4a7sn>.

Sample size estimation for this research was based on a sample of participants recruited by Chester and DeWall (2017). Respectively, the number of participants recruited in the study we aimed to replicate and extend was $N = 156$. We doubled this sample to account for a more complex serial mediation model and

further approximated using power analysis (Faul et al., 2007) and following Fritz and MacKinnon's (2007) recommendation for sample sizes required to detect indirect effects. Sample size was estimated using the medium effect size ($f^2 = 0.09$), four predictor variables, target power of .80 and alpha level of .05 (*F* test family for linear multiple regression; G*Power 3.1). This estimation yielded a minimum sample size of 132 participants. Fritz and MacKinnon (2007) recommend sample sizes of at least 148 participants to detect an indirect effect consisting of two paths with standardized coefficients of .24 when using bias corrected bootstrap and 368 participants when one of the paths for the indirect effect is as low as .14. Considering a more complex mediational model, we aimed for the sample size of approximately 300 participants for each study. Such sample size would also be twice as large as the sample size in study carried out by Chester and DeWall (2017). We are unaware of any established way of estimating sample size for mediation models with three serial mediators. Hence, we approximated what we expect to be a sufficient sample size based on previous works and commonly used methods of estimation. Following Reviewer's recommendation, we also run a post hoc power analysis using Monte Carlo power analysis for indirect effects (https://schoemanna.shinyapps.io/mc_power_med/) with 1,000 replications. We did so for each study, using correlations between variables. Estimates are summarized in Supplementary Tables 1-3 (Study 1), Supplementary Tables 10-12 (Study 2), and Supplementary Tables 19-21 (Study 3). This power analysis suggests that some of our serial mediation models can be underpowered.

3. Study 1

Study 1 tested a serial mediation model in which pre-aggression negative affect, symbolic aggression, and post-aggression positive affect serially mediated the relationship between provocation and subsequent (a) vengeful, (b) benevolent, and

(c) avoidant motivations toward the provocateur. Thus, we examined whether revenge-related positive affect predicts both vengeful and benevolent motivations toward the provocateur but is unrelated to avoidant motivations. To test these predictions, participants received provoking or non-provoking feedback from another person on an essay they wrote, reported their current affect, completed a symbolic act of aggression against their essay evaluator, reported their current affect, and then reported their subsequent vengeful, benevolent, and avoidant motivations towards their essay evaluator. Pre-registration can be found at: <https://aspredicted.org/sd7y-x3hq.pdf>.

3.1. Method

3.1.1. Participants

Participants were 301 adults recruited from Amazon Mechanical Turk, an online crowdsourcing platform for collecting data (<https://www.mturk.com/>). Following the pre-registration plan, we excluded data from 59 participants who did not follow instructions in the essay task. Final participants were $N = 242$ (141 male, 100 female, 1 did not disclose their gender; age: $M = 34.10$, $SD = 10.43$). Participants were 51.2% White American, 32.6% Asian American, 9.9% African American, 4.1% 'Other', 1.2% Native American, and 0.8% Native Hawaiian.

3.1.2. Measures

Symbolic aggression was assessed with the Voodoo Doll Task (i.e., VDT; DeWall et al., 2013). VDT is a measure of symbolic aggression based on the tendency people have to attribute magical properties to objects. Participants are asked to ascribe characteristics of real individuals to an inanimate doll. Then, they are told to type the number of pins they would like to stick in it. A higher number of pins indicates greater symbolic aggression. The VDT shows excellent validity in the

laboratory and over the Internet (Chester et al., 2019; DeWall et al., 2013). Although the VDT assesses aggression symbolically, there exists cognitive, emotional, and behavioral overlap between actual and symbolic forms of aggression and the VDT brings about results similar to actual aggression (Chester & DeWall, 2017).

Moreover, many participants tend to believe that they cause actual harm to the person represented by the doll (Chester et al., 2019).

Positive and negative affect were measured by asking participants to what extent they felt: "happy", "pleased", and "positive" (i.e., positive affect), "angry", "anxious", "dejected", "irate", "mad", "nervous", "sad", "unhappy", "worried" (i.e., negative affect; Eadeh et al., 2017) before and after a symbolic act of aggression. Response format ranged from 1 (*not at all*) to 5 (*very much*).

Motivations toward the provocateur were assessed using the Transgression-Related Interpersonal Motivation Inventory (i.e., TRIM-18; McCullough et al., 2006) which measures: vengeful (e.g., "I'll make him/her pay"), benevolent (e.g., "I have given up my hurt and resentment"), and avoidant (e.g., "I am avoiding him/her") motivations towards the provocateur. Response format ranged from 1 (*strongly disagree*) to 5 (*strongly agree*).

3.1.3. Procedure

After consenting, participants gave their age, gender, and ethnicity. Then, they were informed that they would get to interact with another participant in a series of tasks. To experimentally simulate a provocative interaction that would elicit vengeful motivations, we used the social feedback task (Bushman & Baumeister, 1998). Participants wrote an essay (800 characters minimum) about a time they were angry (as in Chester & DeWall, 2017), which they were informed would be exchanged over the Internet and evaluated by another participant who was allegedly completing the

same study. Once participants submitted their essays, they passively viewed a 25-s loading screen and then saw a prewritten essay about their partner's negative experience with being ignored at a house party. Participants then evaluated this essay along with several criteria. After viewing a 25-s loading screen, participants viewed bar graphs that showed their essay scores across all dimensions and their overall score. Participants were randomly assigned to receive either negative (10/35 points; $N = 121$) or positive (30/35 points; $N = 121$) feedback. Below each bar graph, we included a comment from the fictitious partner which either stated "One of the worst essays that I have EVER read..." (negative feedback condition) or "Great essay!!!" (positive feedback condition). After completing the essay task, participants reported their current positive and negative affect which served both as a manipulation check and measure of pre-aggression affect. Participants then completed the VDT (an alleged measure of mental visualization abilities). They were displayed a doll, informed that the doll represented their partner from the essay task, and asked to type the number of pins (0 - 51) they would like to stick in the doll. After typing the number of pins, participants again reported their current positive and negative affect, and then reported their motivations toward the essay evaluator. Participants then completed a few questionnaires which are not reported here (see OSF project page). A debriefing followed.

3.2. Results

3.2.1. Transformation of aggression measure

The Kolmogorov-Smirnov test demonstrated that the distribution of the number of pins was leptokurtic and positively skewed, $k(242) = .30$, $p < .001$. We thus used logarithmic transformation (after adding 1 to all values to transform 0 values) to reduce skewness and kurtosis of the pins (see Supplementary Table 4).

We applied the logarithmic transformation following previous works (e.g., Chester & Lasko, 2018). Since this transformation was not pre-registered, we conducted analyses on both raw and transformed symbolic aggression measures.

3.2.2. Descriptive statistics and manipulation checks

Descriptive statistics, internal consistencies of measures, and zero-order correlations between variables are summarized in Table 1 and Supplementary Table 5. Gender differences in study variables are presented in Supplementary Table 6². Participants who received negative feedback reported that they felt greater negative affect, $t(240) = 3.65$, $d = 0.46$, $p < .001$, and lesser positive affect, $t(240) = -8.27$, $d = -1.05$, $p < .001$, than participants who received positive feedback. Moreover, participants who received negative feedback were more aggressive than participants who received positive feedback, $t(240) = 2.59$, $d = 0.33$, $p = .010$. These results indicate that our provocation manipulation was effective.

² Male participants reported higher pre-aggression and post-aggression negative affect than female participants. Controlling for gender did not change the pattern of results in subsequent analyses.

Table 1*Descriptive Statistics and Zero-Order Correlations Between Study Variables, Study 1*

Variable	<i>M</i>	<i>SD</i>	α	1.	2.	3.	4.	5.	6.	7.	8.
1. Pre-aggression positive affect	3.12	1.29	.92	-							
2. Pre-aggression negative affect	2.43	1.07	.94	-.09	-						
3. Symbolic aggression (raw score)	12.28	16.59	-	-.03	.31***	-					
4. Symbolic aggression (log transformed)	.72	.63	-	.09	.46***	.86***	-				
5. Post-aggression positive affect	3.12	1.18	.90	.71***	.06	.06	.18**	-			
6. Post-aggression negative affect	2.22	1.08	.95	.09	.88***	.32***	.49***	.06	-		
7. Vengeful motivations	2.56	1.16	.90	.29***	.60***	.38***	.56***	.30***	.64***	-	
8. Benevolent motivations	3.34	.83	.83	.25***	.21***	-.03	.07	.22***	.30***	.21***	-
9. Avoidant motivations	3.05	1.10	.92	-.07	.58***	.34***	.44***	.001	.55***	.65***	.04

Note. ** $p < .01$, *** $p < .001$. Raw score = pins count without logarithmic transformation. Log transformed = pins count after logarithmic transformation.

3.2.3. Aggression-related mood improvement: Moderation analyses

Attempting to replicate findings of Chester and DeWall (2017) on mood improving qualities of revenge, we ran a 2 (feedback: negative vs. positive) x 2 (affect: negative vs. positive) x 2 (time: pre-aggression vs. post-aggression) mixed ANOVA (see Table 2). This analysis was not pre-registered. We observed significant differences in pre-aggression and post-aggression positive and negative affect among provoked participants (see Supplementary Table 7). Among provoked participants, post-aggression positive affect was higher than pre-aggression positive affect, $F(1, 240) = 16.59, p < .001, \eta^2_p = .065$, whereas post-aggression negative affect was lower than pre-aggression negative affect, $F(1, 240) = 58.55, p < .001, \eta^2_p = .196$. In turn, among unprovoked participants, post-aggression positive affect was lower than pre-aggression positive affect, $F(1, 240) = 18.01, p < .001, \eta^2_p = .070$, whereas post-aggression negative affect did not significantly differ from pre-aggression negative affect, $F(1, 240) = 2.00, p = .158, \eta^2_p = .008$ (see Figure 1). These results suggest that participants' affective state improved after an instance of revenge (as in Chester & DeWall, 2017).

Table 2

Summary Statistics for Mixed ANOVA on Participant's Mood, Study 1 (Model $df = 1, 240$)

Effect	<i>F</i>	<i>p</i>	η^2_p
Negative feedback (between)	7.01	.009	.028
Affect (within)	77.21	<.001	.243

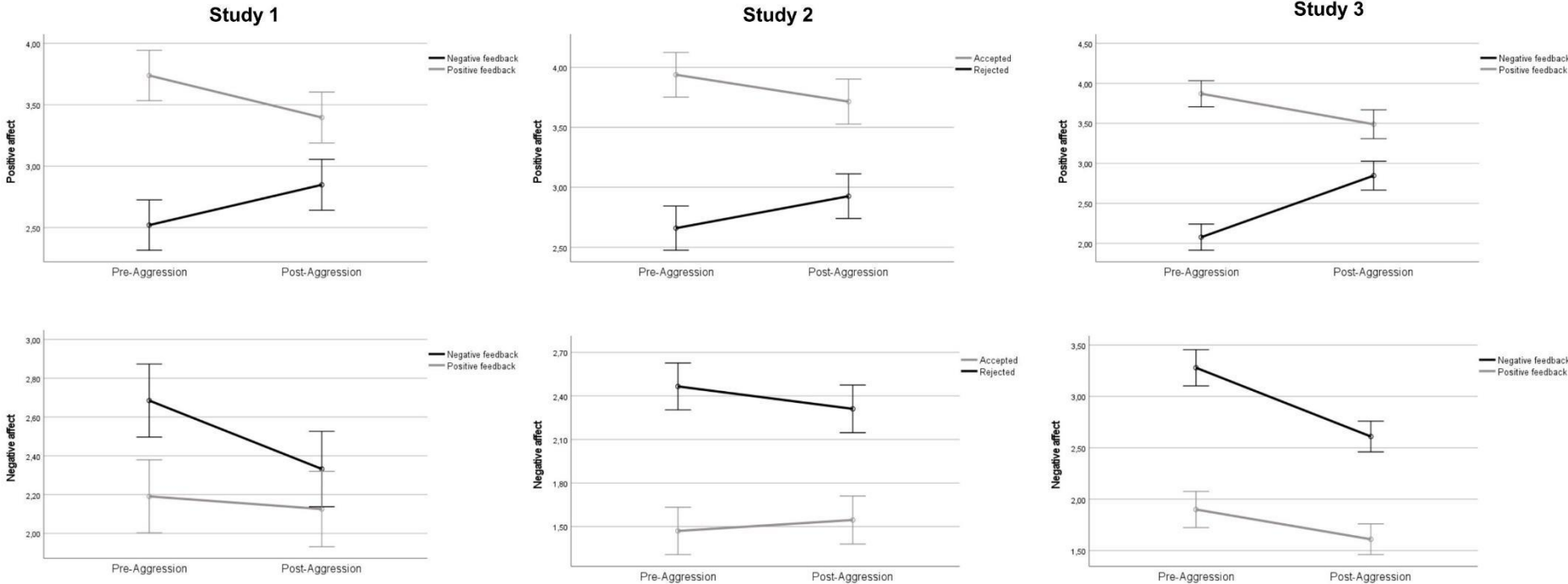
Pre/Post Assessment (within)	17.47	<.001	.068
Negative feedback X Affect	46.74	<.001	.163
Negative feedback X Pre/Post	13.68	<.001	.054
Affect X Pre/Post	6.87	.009	.028
Negative feedback X Affect X Pre/Post	38.56	<.001	.138

3.2.4. Consequences of aggressive pleasure: Serial mediation analyses

To test whether negative feedback elicited (pre-aggression) negative affect, which then predicted symbolic aggression, which then predicted (post-aggression) positive affect, which ultimately predicted (a) vengeful, (b) benevolent, and (c) avoidant motivations toward the provocateur, we ran three serial mediation models using PROCESS 4.2 macro for SPSS (Model 6; Hayes, 2022). Serial mediation coefficients are presented in Supplementary Table 8 (models with log-transformed symbolic aggression values) and Supplementary Table 9 (models with raw-score symbolic aggression values).

Figure 1

Evidence for Increased Positive Affect and Decreased Negative Affect After An Instance of Retaliatory Aggression, Studies 1-3



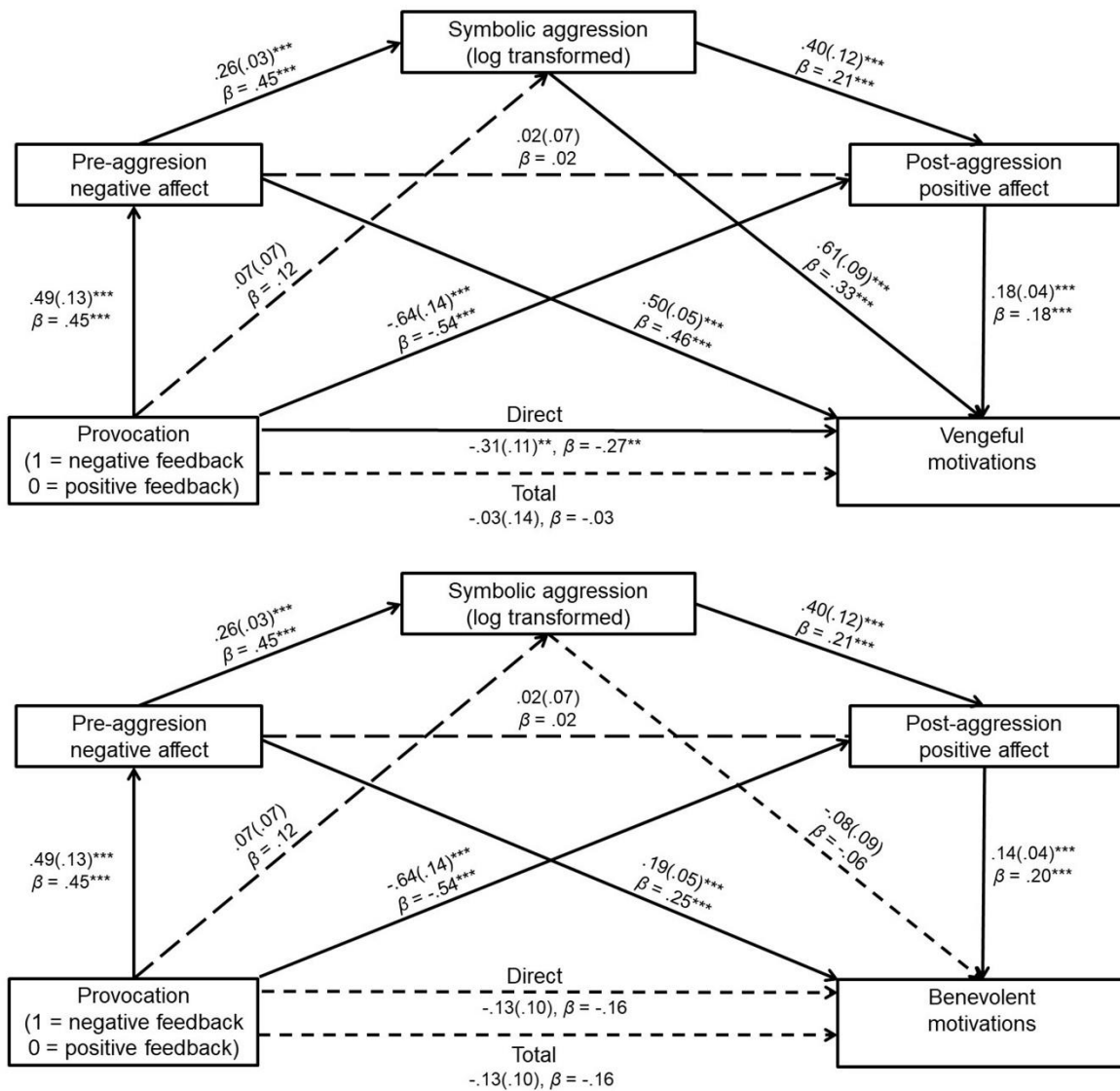
Note. Lines represent group averages, and error bars represent +/- 1 standard error of the mean

3.2.4.2. Benevolent motivations. The model was significant, $F(4, 237) = 6.79$, $p < .001$, and explained 10.2% variance in benevolent motivations. The direct effect was insignificant, $b = -.13$, $SE = .10$, $p = .208$, 95% CI [-.353; .077], so was the total effect, $b = -.13$, $SE = .10$, $p = .199$, 95% CI [-.348; .073]. The indirect effect of pre-aggression negative affect, symbolic aggression, and post-aggression positive affect was significant, $b = .007$, $SE = .004$, 95% CI [.001; .019]. Thus, the more participants were symbolically aggressive was related to greater positive affect, which then predicted greater subsequent desire to forgive (see Figure 2).

3.2.4.3. Avoidant motivations. The model was significant, $F(4, 237) = 37.71$, $p < .001$, and explained 38.8% of the variance in avoidant motivations. The direct effect was not significant, $b = .17$, $SE = .11$, $p = .154$, 95% CI [-.064; .406], but total effect was, $b = .51$, $SE = .13$, $p < .01$, 95% CI [.241; .786]. The indirect effect of pre-aggression negative affect, symbolic aggression, and post-aggression positive affect did not reach significance, $b = -.002$, $SE = .003$, 95% CI [-.009; .003]. Post-aggression positive affect was unrelated to subsequent motivation to avoid the provocateur, $p = .344$.

Figure 2

Serial Mediation Models with Vengeful and Benevolent Motivations as Outcomes, Study 1



Note. Values represent unstandardized and standardized regression coefficients and standard errors in parentheses.

** $p < .01$; *** $p < .001$.

3.3. Discussion

Study 1 replicated findings of Chester and DeWall (2017) on revenge-related affect improvement. Moreover, it extended them further by showing that post-aggression positive affect predicted subsequent vengeful and benevolent motivations

but was unrelated to avoidant motivations toward the provocateur. In Study 2 we aimed to test our predictions in a different interpersonal context using an alternative measurement of positive and negative affect (Carlsmith et al., 2008).

4. Study 2

Study 2 aimed to replicate Study 1's findings in the context of real-life transgression instead of a simulated provocation. Given that revenge is often a response to the aversive experience of social rejection (Chester & DeWall, 2017), we asked participants to recall a situation in which they were socially rejected or accepted by another individual and write about it (Gardner et al., 2000). Predictions were identical to Study 1. Pre-registration is available at:

<https://aspredicted.org/ymcn-y6v7.pdf>.

4.1. Method

4.1.1. Participants

Participants were 332 adults recruited from Amazon Mechanical Turk. Following the preregistration plan, we excluded data from 37 participants who did not follow instructions in the essay task, ending with 295 participants (157 male, 138 female; age: $M = 39.47$; $SD = 12.53$). Participants were 74.2% White American, 9.8% African American, 9.5% Asian American, 5.8% 'Other', and 0.7% Native American.

4.1.2. Procedure

After consenting, participants reported their gender, age, and ethnicity. Then, participants were randomly assigned to one of two research conditions: social rejection ($N = 149$) versus social acceptance ($N = 146$). Participants wrote an essay (500 characters minimum) about a time they were either rejected or accepted by someone (Chester & DeWall, 2017; Maner et al., 2007) and were informed that the purpose of writing was to examine their personal-event memory. After submitting the

essay, participants reported their current positive and negative affect as well as a manipulation check that assessed feelings of rejection and rejection-related threats. Participants then completed a symbolic measure of aggression, a supposed measure of mental visualization abilities (to bolster the deceptive cover story; see Chester & DeWall, 2017). Participants were shown an image of a doll and were instructed to imagine that the doll represented the person who had rejected or accepted them. Participants typed the number of pins (0-51) they wanted to stick into the doll. Afterwards, they again reported their current positive and negative affect. Finally, participants reported their current motivations toward the person from their essay. A debriefing followed.

4.1.3. Measures

Manipulation check was performed using the 30-item Need Threat Scale (Williams, 2009). Response format ranged from 1 (*strongly disagree*) to 5 (*strongly agree*).

Symbolic aggression was measured as in Study 1 (DeWall et al., 2013).

Positive and negative affect were assessed by asking to what extent they felt “pleased”, “positive”, “satisfied” (i.e., positive affect) and “irritated”, “negative”, and “vengeful” (i.e., negative affect; Carlsmith et al., 2008). Response format from 1 (*not at all*) to 5 (*very much*).

Motivations toward the provocateur were measured as in Study 1 (McCullough et al., 2006).

4.2. Results

4.2.1. Transformation of aggression measure

Kolmogorov–Smirnov test showed that the distribution of the number of pins did not meet the assumption of normality, $k(295) = .29, p < .001$. As in Study 1,

logarithmic transformation (after adding 1 to all values to transform 0 values) reduced skewness and kurtosis of the voodoo doll pin count (see Supplementary Table 4).

This transformation was not pre-registered.

4.2.2. Descriptive statistics and manipulation checks

Descriptive statistics, internal consistencies of measures, and zero-order correlations between variables are summarized in Table 3 and Supplementary Table 13. Gender differences in study variables are presented in Supplementary Table 14³. Rejected participants reported that they felt more rejection, more threat to basic psychological needs, greater negative affect, and less positive affect than accepted participants (see Supplementary Table 15). Rejected participants were also more aggressive than accepted participants, $t(293) = 7.20$, $d = 0.26$, $p < .001$, thus indicating that our manipulation of social rejection was effective.

³ We did not find any significant differences between male and female in any variable.

Controlling for gender did not change the pattern of results.

Table 3*Descriptive Statistics and Zero-Order Correlations Between Study Variables, Study 2*

Variable	<i>M</i>	<i>SD</i>	α	1.	2.	3.	4.	5.	6.	7.	8.
1. Pre-aggression positive affect	3.29	1.30	.94	-							
2. Pre-aggression negative affect	1.97	1.11	.87	-.48***	-						
3. Symbolic aggression (raw score)	9.41	16.28	-	-.22***	.43***	-					
4. Symbolic aggression (log transformed)	.52	.63	-	-.21***	.52***	.89***	-				
5. Post-aggression positive affect	3.31	1.21	.93	.73***	-.24***	-.06	-.07	-			
6. Post-aggression negative affect	1.93	1.08	.85	-.29***	.77***	.47***	.59***	-.28***	-		
7. Vengeful motivations	2.06	1.07	.90	-.02	.62***	.48***	.62***	.07	.65***	-	
8. Benevolent motivations	3.09	.99	.85	.14*	.04	-.02	.06	.15**	.13*	.16**	-
9. Avoidant motivations	2.58	1.25	.94	-.44***	.65***	.42***	.55***	-.28***	.61***	.58***	.04

Note. * $p < .05$, ** $p < .01$, *** $p < .001$. Raw score = pins count without logarithmic transformation. Log transformed = pins count after logarithmic transformation.

4.2.3. Aggression-related mood improvement: Moderation analysis

As in Study 1, we tested whether participants' mood improved after revenge-taking. This analysis was not pre-registered. A 2 (provocation: rejection vs. acceptance) x 2 (affect: negative vs. positive) x 2 (time: pre-aggression vs. post-aggression) mixed ANOVA revealed a significant three-way interaction (see Table 4). We observed significant differences in pre-aggression and post-aggression positive affect among rejected participants (see Supplementary Table 16). That is, post-aggression positive affect was significantly higher than pre-aggression positive affect, $F(1, 293) = 13.24, p < .001, \eta^2_p = .043$, and post-aggression negative affect was significantly lower than pre-aggression negative affect, $F(1, 293) = 6.61, p = .011, \eta^2_p = .022$. In turn, among accepted participants, post-aggression positive affect was significantly lower than pre-aggression positive affect, $F(1, 293) = 9.16, p = .003, \eta^2_p = .030$, whereas post-aggression negative affect did not significantly differ from pre-aggression negative affect, $F(1, 293) = 1.54, p = .215, \eta^2_p = .005$ (see Figure 1). As in Study 1, participants' affective state improved after an instance of revenge. Thus, we further replicated findings of Chester and DeWall (2017).

Table 4

Summary Statistics for Mixed ANOVA on Participant's Mood, Study 2 (Model $df = 1, 293$)

Effect	<i>F</i>	<i>p</i>	η^2_p
Rejection (between)	1.12	.290	.004
Affect (within)	222.45	<.001	.432
Pre/Post (within)	.14	.708	.0001

Rejection X Affect	109.82	<.001	.273
Rejection X Pre/Post	7.12	.008	.024
Affect X Pre/Post	.55	.457	.002
Rejection X Affect X Pre/Post	19.42	<.001	.062

4.2.4. Consequences of post-aggression positive affect: Serial mediation analyses

Next, we examined whether social rejection elicited (pre-aggression) negative affect, which then predicted symbolic acts of aggression, which subsequently predicted (post-aggression) positive affect, which then predicted (a) vengeful, (b) benevolent, and (c) avoidant motivations toward the provocateur. Serial mediation analyses were conducted using PROCESS 4.2 for SPSS (Model 6; Hayes, 2022). Serial mediation coefficients are summarized in Supplementary Table 17 (models with log-transformed symbolic aggression values) and Supplementary Table 18 (models with raw-score symbolic aggression values).

4.2.4.1. Vengeful motivations. The model was significant, $F(4, 288) = 90.40$, $p < .001$, and explained 55.6% of the variance in vengeful motivations. The total effect was significant, $b = .53$, $SE = .12$, $p < .001$, 95% CI [.291; .771], but the direct effect was not, $b = -.12$, $SE = .09$, $p = .209$, 95% CI [-.321; .070]. The indirect effect of pre-aggression negative affect, symbolic aggression, and post-aggression positive affect was significant, $b = .01$, $SE = .006$, 95% CI [.0003; .027]. Thus, being rejected by another individual elicited negative affect, which then predicted greater symbolic aggression. Symbolic aggression was associated with greater positive affect, which then predicted greater subsequent desire to harm the provocateur (see Figure 3).

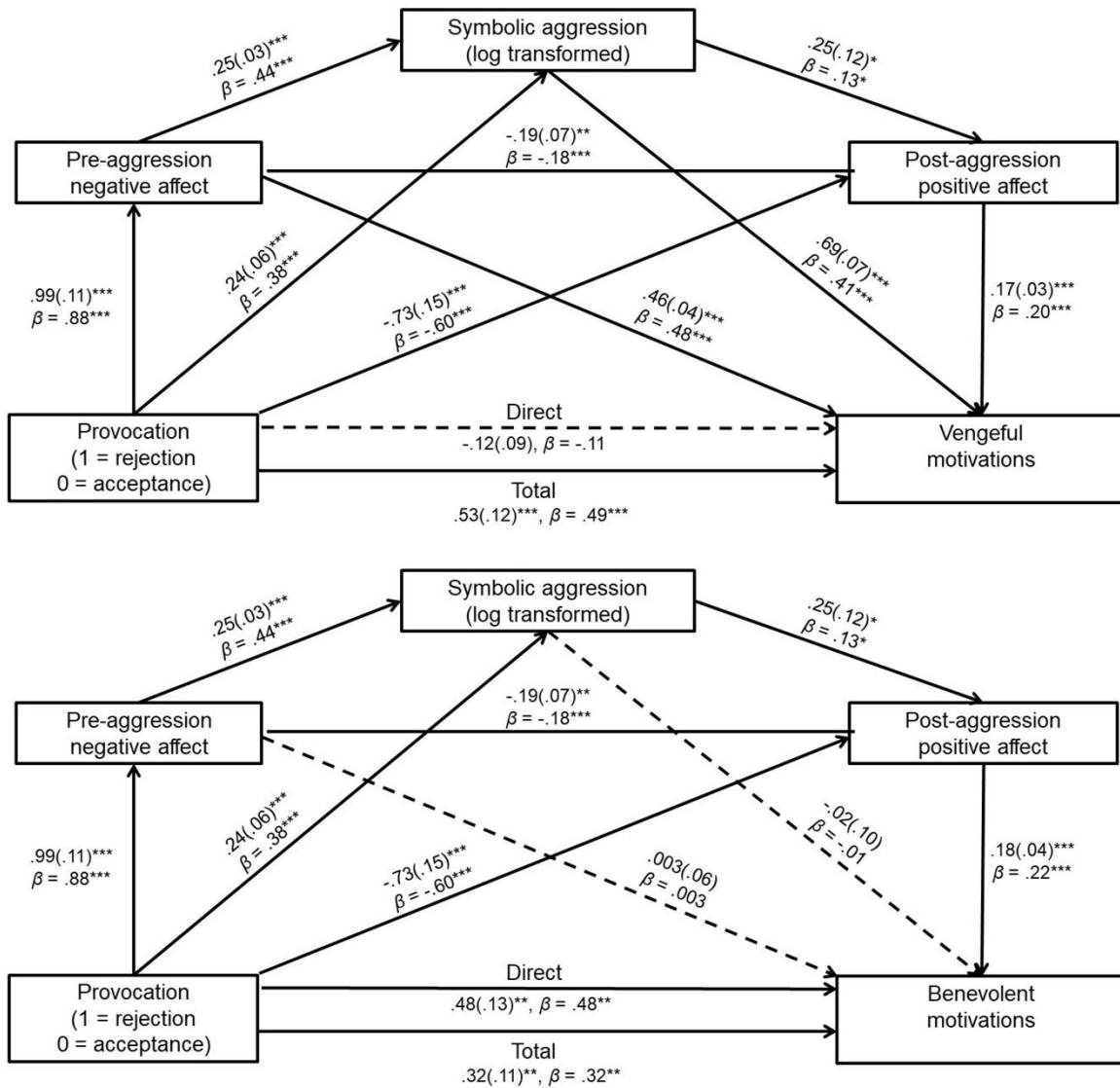
4.2.4.2. Benevolent motivations. The model was significant, $F(4, 290) =$

5.72, $p < .001$, and explained 7.3% of the variance in benevolent motivations. Total effect was significant, $b = .32$, $SE = .11$, $p = .005$, 95% CI [.098; .547], so was the direct effect, $b = .48$, $SE = .13$, $p < .001$, 95% CI [.220; .742]. The indirect effect of pre-aggression negative affect, symbolic aggression, and post-aggression positive affect was significant, $b = .01$, $SE = .007$, 95% CI [.0002; .029]. Thus, interpersonal rejection elicited negative affect, which then predicted greater symbolic aggression. The more participants were aggressive was related to greater positive affect, which later predicted greater benevolent motivations toward the provocateur (see Figure 3).

4.2.4.3. Avoidant motivations. The model was significant, $F(4, 290) = 140.20$, $p < .001$, and explained 65.9% of the variance in avoidant motivations. The total effect was significant, $b = 1.74$, $SE = .10$, $p < .001$, 95%CI [1.53; 1.94], so was the direct effect, $b = 1.13$, $SE = .10$, $p < .001$, 95%CI [.938; 1.33]. Indirect effect of pre-aggression negative affect, symbolic aggression, and post-aggression positive affect was insignificant, $b = -.002$, $SE = .003$, 95%CI [-.010; .002]. As in Study 2, the post-aggression positive affect was unrelated to the subsequent motivation to avoid the provocateur, $p = .294$.

Figure 3

Serial Mediation Models with Vengeful and Benevolent Motivations as Outcomes, Study 2



Note. Values represent unstandardized and standardized regression coefficients and standard errors in parentheses.

* $p < .05$; ** $p < .01$; *** $p < .001$.

4.3. Discussion

Study 2 replicated Study 1’s findings in the context of real-life experience of social rejection. We observed significant differences in positive and negative affect assessed before and after symbolic revenge, suggesting that participants’ affective

state improved after a symbolic revenge (as in Chester & DeWall, 2017). Post-aggression positive affect subsequently predicted both vengeful and benevolent motivations but was unrelated to avoidant motivations. In Study 3 we sought to replicate these results on a larger sample of participants using an alternative measure of aggression to further generalize our findings. We aimed to test these predictions on Prolific as this research platform provides more diverse respondents than Amazon Mechanical Turk (Peer et al., 2017).

5. Study 3

Study 3 sought to replicate previous studies using a different aggression measure: The Gruesome Images Aggression Task (Chester et al., 2019; Dyduch-Hazar & Mrozinski, 2023; Gollwitzer & Bushman, 2012). In this task, participants are asked to assign a number of distressing images for another individual to thoroughly describe. Participants are therefore led to believe their aggressive behavior affects another individual's well-being. Predictions were analogical to previous studies. Pre-registration for this study is available at: <https://aspredicted.org/6cyj-w7sv.pdf>.

5.1. Method

5.1.1. Participants

Participants were 326 adults recruited from the Prolific academic website, an online research platform (<https://www.prolific.com/>). Following the preregistration plan, we excluded data from three participants who were suspicious about the presence of their partner. All remaining participants met our preregistered exclusionary criteria. Analyses were conducted on 323 participants (159 female, 161 male, 2 non-binary and 1 that did not disclose their gender; age: $M = 36.55$, $SD = 11.99$). Participants were 79.6% White, 11.8% Asian, 4.6% Black, 2.5% "Other". Five participants preferred not to disclose their ethnicity.

5.1.2. Procedure

After consenting, participants reported their age, gender, and ethnicity. As in Study 1, participants wrote an essay about a time they were angry (as in Chester & DeWall, 2017) and were informed the essay will be allegedly evaluated by another Prolific worker. Participants later evaluated their partner's essay. Depending upon random assignment, participants were informed their essay scored 10/35 points ($N = 161$) or 30/35 points ($N = 162$). As in Study 1, below each graph we included the comment from the fictitious partner. Participants then reported their current positive and negative affect, which served both as manipulation check and pre-aggression affect the measurement. Participants were subsequently informed that either themselves or their partner will get to describe some images (a supposed measure of mental visualization abilities). They were informed that the system will determine which of them (participant or partner) will need to describe these images and which one will pick the number of images the other will have to describe. In reality, participants were always assigned to the role of the person responsible for selecting the number of images. Participants were informed that their alleged partner must describe each of the assigned images using at least 100 characters as otherwise the partner will not complete the study. After determining the number of images (0-9), participants again reported their current positive and negative affect, and then completed a measure of their current motivations toward their partner. Participants then responded to other measures which are not reported here (see OSF project page). A debriefing followed.

5.1.3. Measures

Aggression was assessed as a number of gruesome images (0-9) assigned by participants for description to their partner (Gollwitzer & Bushman, 2012).

Positive and negative affect were measured as in Study 2 (Carlsmith et al., 2008).

Motivations toward the provocateur were assessed as in Studies 1 and 2 (McCullough et al., 2006).

5.2. Results

5.2.1. Transformation of aggression measure

Kolmogorov–Smirnov test showed that the distribution of the number of aversive images did not meet the assumption of normality, $k(323) = .21, p < .001$. Thus, as in previous studies, we applied logarithmic transformation (after adding 1 to all values to transform 0 values) to reduce skewness and kurtosis of the images count (see Supplementary Table 4). This transformation was not pre-registered.

5.2.2. Descriptive statistics and manipulation checks

Descriptive statistics, internal consistencies of measures, and zero-order correlations between study variables are summarized in Table 5 and Supplementary Table 22. Gender differences in study variables are presented in Supplementary Table 23⁴. Participants who received negative feedback reported that they felt greater negative affect, $t(321) = 11.07, d = 1.13, p < .001$, and lesser positive affect, $t(319) = -15.32, d = -1.05, p < .001$, than participants who received positive feedback. Furthermore, participants who received negative feedback were more aggressive than participants who received positive feedback, $t(321) = 7.67, d = 0.86, p < .001$. These results indicate that our provocation manipulation was effective.

⁴ Male participants reported higher vengeful motivations than female participants.

Controlling for gender did not change the pattern of results in subsequent analyses.

Table 5*Descriptive Statistics and Zero-Order Correlations Between Study Variables, Study 3*

Variable	<i>M</i>	<i>SD</i>	α	1.	2.	3.	4.	5.	6.	7.	8.
1. Pre-aggression positive affect	2.96	1.38	.93	-							
2. Pre-aggression negative affect	2.58	1.32	.86	-.66***	-						
3. Aggression (raw score)	2.96	3.11	-	-.43***	.46***	-					
4. Aggression (log transformed)	.45	.35	-	-.37***	.44***	.95***	-				
5. Post-aggression positive affect	3.17	1.20	.90	.51***	-.31***	-.03	-.04	-			
6. Post-aggression negative affect	2.10	1.08	.82	-.53***	.71***	.47***	.43***	-.42***	-		
7. Vengeful motivations	1.94	.88	.86	-.23***	.42***	.41***	.41***	.02	.37***	-	
8. Benevolent motivations	3.26	.90	.94	.25***	-.27***	-.26***	-.21***	.10	-.27***	-.33***	-
9. Avoidant motivations	2.74	1.13	.87	-.41***	.54***	.33***	.32***	-.23***	.47***	.53***	-.42***

Note. *** $p < .001$. Raw score = images count without logarithmic transformation. Log transformed = images count after logarithmic transformation.

5.2.2. Aggression-related mood improvement: Moderation analysis

As in previous studies, we ran a 2 (feedback: negative vs. positive) x 2 (affect: negative vs. positive) x 2 (time: pre-aggression vs. post aggression) mixed ANOVA. This analysis was not pre-registered. We observed a significant three-way interaction (see Table 6), showing significant differences in pre-aggression and post-aggression positive and negative affect among provoked participants (see Supplementary Table 24). Post-aggression positive affect was significantly higher than pre-aggression positive affect, $F(1, 318) = 71.23, p < .001, \eta^2_p = .183$, and post-aggression negative affect was significantly lower than pre-aggression negative affect, $F(1, 318) = 83.76, p < .001, \eta^2_p = .209$. Among unprovoked participants, post-aggression positive affect was significantly lower than pre-aggression positive affect, $F(1, 318) = 17.51, p < .001, \eta^2_p = .052$, so was post-aggression negative affect compared to pre-aggression negative affect, $F(1, 318) = 15.70, p < .001, \eta^2_p = .047$ (see Figure 1). These results further replicate findings from Studies 1 and 2.

Table 6

Summary Statistics for Mixed ANOVA on Participant's Mood, Study 3 (Model $df = 1, 318$)

Effect	<i>F</i>	<i>p</i>	η^2_p
Negative feedback (between)	.06	.800	.0001
Affect (within)	64.37	<.001	.168
Pre/Post (within)	18.34	<.001	.055
Negative feedback X Affect	179.23	<.001	.360

Negative feedback X Pre/Post	33.45	<.001	.095
Affect X Pre/Post	49.24	<.001	.134
Negative feedback X Affect X Pre/Post	63.57	<.001	.167

5.2.3. Consequences of post-aggression positive affect: Serial mediation analyses

Finally, we examined whether negative feedback elicited (pre-aggression) negative affect, which then predicted acts of aggression, which subsequently predicted (post-aggression) positive affect, which then predicted (a) vengeful, (b) benevolent, and (c) avoidant motivations toward the provocateur. Serial mediation analyses were conducted using PROCESS 4.2 for SPSS (Model 6; Hayes, 2022). All serial mediation coefficients are summarized in Supplementary Table 25 (models with log-transformed aggression values) and Supplementary Table 26 (models with raw-score aggression values).

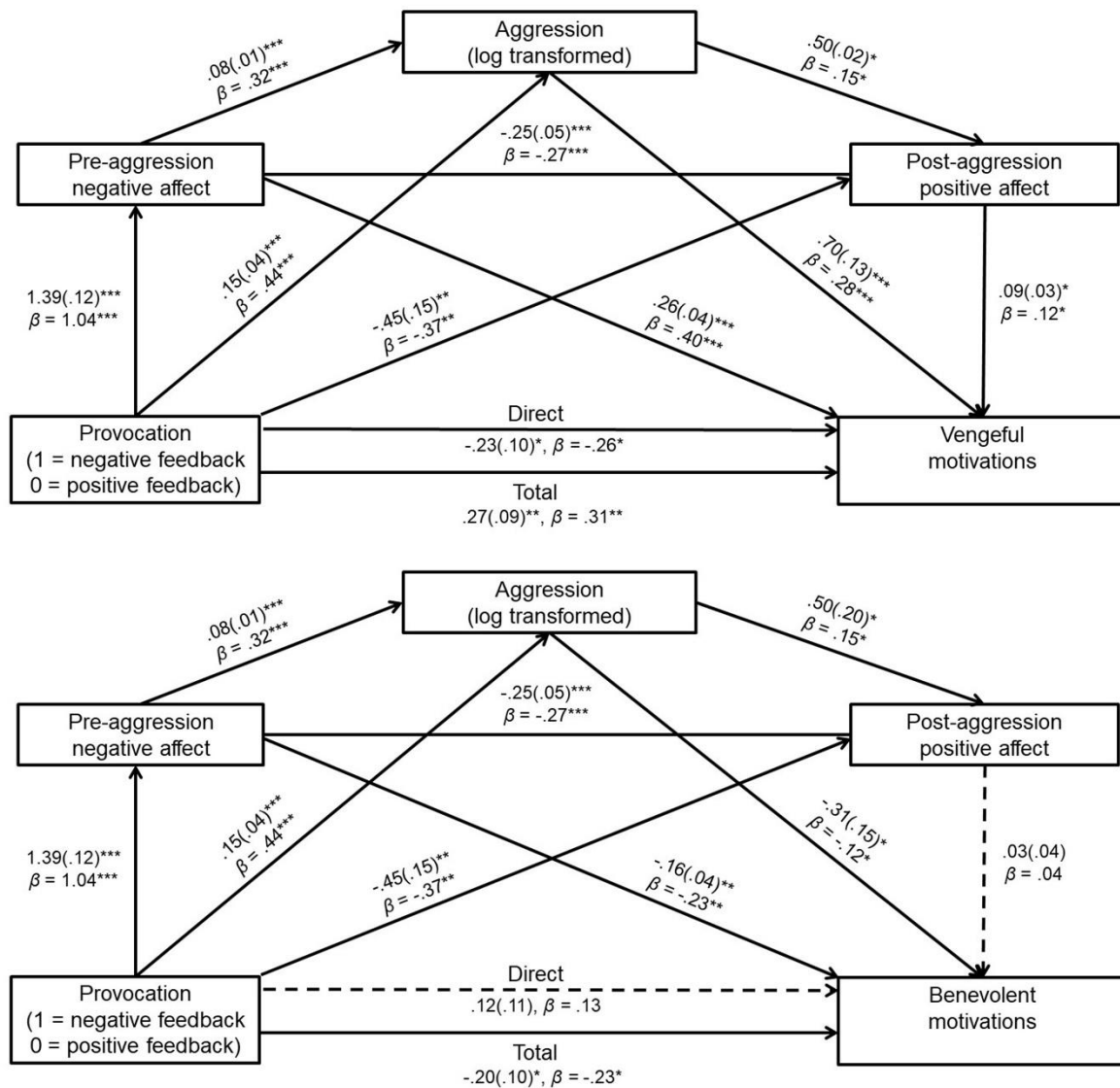
5.2.3.1. Vengeful motivations. The model was significant, $F(4, 317) = 29.01$, $p < .001$, and explained 26.8% of the variance in the vengeful motivations. The total effect was significant, $b = .27$, $SE = .09$, $p = .005$, 95%CI [.082; .461], so was the direct effect, $b = -.23$, $SE = .10$, $p = .023$, 95%CI [-.433; -.031]. The indirect effect of pre-aggression negative affect, aggression, and post-aggression positive affect was significant, $b = .005$, $SE = .004$, 95%CI [.002; .0151]. Thus, receiving negative feedback elicited negative affect, which then predicted greater aggression. The more participants were aggressive was related to greater subsequent positive affect which ultimately was associated with greater subsequent desire to take revenge (see Figure 4).

5.2.3.2. Benevolent motivations. The model was significant, $F(4, 317) = 9.00$, $p < .001$, and explained 8.4% of the variance in benevolent motivations. The total effect was significant, $b = -.20$, $SE = .10$, $p = .037$, 95%CI [-.406; -.012], but the direct effect was not, $b = .12$, $SE = .11$, $p = .304$, 95%CI [-.0111; .0354]. The indirect effect of pre-aggression negative affect, aggression, and post-aggression positive affect did not reach significance, $b = .001$, $SE = .003$, 95%CI [-.003; .0009]. Post-aggression positive affect was unrelated to benevolent motivations toward the partner, $p = .482$ (see Figure 4).

5.2.3.3. Avoidant motivations. The model was significant, $F(4, 315) = 34.80$, $p < .001$, and explained 30.6% of the variance in avoidant motivations. The total effect was significant, $b = .65$, $SE = .12$, $p < .001$, 95%CI [.416; .892], but direct effect was not, $b = -.06$, $SE = .12$, $p = .599$, 95%CI [-.321; .185]. The indirect effect of pre-aggression negative affect, aggression, and post-aggression positive affect was insignificant, $b = -.005$, $SE = .004$, 95%CI [-.015; .0005]. Post-aggression positive affect was unrelated to avoidant motivations, $p = .628$.

Figure 4

Serial Mediation Models with Vengeful and Benevolent Motivations as Outcomes, Study 3



Note. Values represent unstandardized and standardized regression coefficients with standard errors in parentheses.

* $p < .05$; ** $p < .01$; *** $p < .001$.

5.3. Discussion

To conclude, Study 3 further replicated previous work (Chester & DeWall, 2017) on mood improving qualities of retaliatory aggression. Moreover, we observed that post-aggression positive affect predicted greater subsequent vengeful motivations toward the provocateur. The more aversive images participants assigned

for their partner to describe, the better they felt, and more strongly desired to further seek revenge. The positive affect associated with revenge was unrelated to the motivation to avoid the provocateur. Unlike what we expected, post-aggression positive affect was unrelated to benevolent motivations toward the provocateur.

6. General Discussion

Revenge is a complex phenomenon that is preceded, accompanied, and followed by varied emotional responses (for reviews see: Chester, 2017; Jackson et al., 2019; Schumann & Ross, 2010). Previous research (Chester & DeWall, 2017) demonstrated that revenge effectively improves one's affective state. However, it remains unclear whether the pleasure from revenge-taking has implications for subsequent motivations towards the provocateur. To address this gap, we conducted three studies that tested the overarching prediction that the positive affect that arises from revenge would predict greater subsequent vengeful and benevolent motivations toward the provocateur.

Greater aggression was associated higher self-reported positive affect⁵, which corroborates previous works linking aggression to positively-valenced affective states (Chester, 2017; Ramírez et al., 2005). Yet greater aggression was also related to higher self-reported negative affect (Carlsmith et al., 2008), and these associations were even stronger. Retaliatory aggression was therefore bittersweet: a short-lasting pleasure was intermingled with persisting feelings of irritation (Eadeh et al., 2017). Moreover, we observed that the path from provocation to post-aggression positive affect was routinely negative, which suggests that these negative feelings were not

⁵ For serial mediation models including Voodoo Doll Task (DeWall et al., 2013), these associations were only observed in models using log-transformed values.

only consequence of acting aggressively but could also stem from receiving negative feedback or experiencing social rejection. It is also noteworthy to mention that in Studies 2 and 3 aggression did not correlate with post-aggression positive affect (see Tables 3 and 5). These null associations were observed in previous research (Chester et al., 2019; Dyduch-Hazar, 2024). It is plausible that our studies were underpowered to detect this sensible correlation and Study 1 did so, because of the experimental setup (combination of negative feedback manipulation and symbolic aggression assessment).

We routinely observed that among provoked participants post-aggression positive affect was higher than pre-aggression positive affect, whereas post-aggression negative affect was lower than pre-aggression negative affect. Conversely, among unprovoked participants, post-aggression positive affect was lower than pre-aggression positive affect. Post-aggression negative affect, on the other hand, was lower than pre-aggression negative affect (Study 3) or did not significantly differ (Studies 1 and 2). Thus, after having an opportunity to aggress, negative affect decreased and positive affect increased among provoked participants as demonstrated by Chester and DeWall (2017; Studies 5 and 6). We therefore replicated their findings on mood-improving qualities of revenge. That being said, we underline that we merely compared means in pre-aggression and post-aggression affect. Doing so does not establish causality. Given that aggression was not included in these analyses, it is plausible that observed changes in positive and negative affect could be a consequence of time alone.

Furthermore, we took findings of Chester and DeWall (2017) forward and found that revenge not only helped participants improve their affective state, but that post-aggression positive affect predicted subsequent motivations toward the

provocateur. Across the board, we observed that revenge-related feelings of pleasure and satisfaction predicted greater desire for subsequent revenge-taking. These findings correspond to research on the compulsive-like properties of aggression (Golden et al., 2017; Golden & Shaham, 2018; see also Couppis & Kennedy, 2008) and provide further empirical support for the reinforcement model of revenge (Chester et al., 2018), which proposes that positive affect experienced during and shortly after aggression reinforces aggressive behavior (see also: Berkowitz, 1974). These findings offer us a better insight into the dynamics of vicious cycles of violence such as blood feuds or intergroup conflicts (Bar-Tal, 2013). Prospective research would do well to take them further and longitudinally investigate whether some people can compulsively seek aggressive encounters due to experienced pleasure from harming others. This could be the case for sadistic individuals, as they tend to harm others to feel better (Chester et al., 2019).

Post-aggression positive affect was also associated (albeit less consistently) with greater benevolent motivations toward the provocateur. Studies 1 and 2 showed that the more participants were aggressive was related to greater positive affect, which eventually was associated with a greater subsequent motivation to forgive the provocateur. These studies used the Voodoo Doll Task (DeWall et al., 2013) as a measure of (symbolic) aggression. We did not observe these relationships in Study 3, which employed Gruesome Images Aggression Task (Gollwitzer & Bushman, 2012). In this task, participants are led to believe their actions (assigning distressing images for a thorough description) impact another individual. It is plausible that symbolic revenge without accountability for the well-being of the provocateur magnified feelings of pleasure (which then fostered benevolent motivations). Previous research showed that people dislike punishing others but to a lesser extent

if they punish a provocateur (Eder et al., 2021). In fact, observing a provocateur in pain from a punishment administered by a computer seems to be as pleasant (Dyduch-Hazar et al., 2024) as witnessing their suffering from one's own retaliatory punishment (Mitschke & Eder, 2021).

Although inconsistent, our findings provide an initial empirical support for the affective counterbalancing model (Chester & Martelli, 2019), which proposes that revenge-related positive feelings help to counter provocation-related negative feelings, thus allowing prosocial intentions to unfurl. Our findings are, however, preliminary, because we measured motivations toward the provocateur only after assessing aggression. As such, we cannot know whether acting aggressively in response to provocation factually allows prosocial motivations to unravel or simply feeling good after aggression makes one more prone to act in a benevolent manner. Future research should take our findings further and examine participants' motivations toward the provocateur in multiple time intervals using, for example, an approach-avoidance task as an implicit measure of motivations (Aubé et al., 2019). Moreover, we observed that post-aggression negative affect also predicted benevolent motivations towards the provocateur. These results corroborate previous work showing that participants induced with a negative affect were more prone to forgive a hypothetical transgression than those in a neutral affective state (Marks et al., 2013). They also align with evidence suggesting that experiencing negative affect may motivate benevolent activities out of desire to feel better (Cialdini et al., 1973).

Vengeful and benevolent motivations were intercorrelated in two of our studies. These intercorrelations were previously observed (McCullough et al., 2006; see also Förster et al., 2019). We treated vengeful and benevolent motivations as distinct ones, but it is plausible that participants held contradictory attitudes toward

the provocateur. For instance, the direct path from provocation to vengeful motivations became consistently more negative, whereas the direct path between provocation and benevolent motivations became more strongly positive (Studies 2 and 3). Although we expected provocation to predict increases in vengeful motivations, it is possible that participants held more complex motivations toward the provocateur. For example, provocation could make participants feel emotionally resigned and therefore motivated to withdraw from the provocateur rather than fantasize about getting back at them (Ren et al., 2016). In a similar vein, participants could perceive the negative feedback as justified despite feeling bad after receiving it. Having such an attribution could make them prone to act less vengefully (and more benevolently) toward the partner. Remaining direct effect could then reflect these unaccounted associations. This possibility remains unknown as our serial mediation models do not account for these (and other) possible effects (Bullock et al., 2010). Thus, more work is needed to better understand how complex revenge-related emotional responses facilitate subsequent motivations toward the provocateur.

6.1. Limitations

Despite providing a few novel insights, this research was limited by a number of issues. First, all three studies we conducted online, which can limit the generalizability of findings. For example, we cannot rule out that some participants were suspicious about the presence of their partners (Studies 1 and 3). Even so, they were still emotionally influenced by the actions of their fictitious partners: participants who received negative feedback reported lower positive and higher negative affect than participants who received positive feedback. Another limitation of this research is the self-reported assessment of affect. This is because people tend to mispredict their affective states (Carlsmith et al., 2008). They might also be motivated to

underreport post-aggression positive affect. Employing less conspicuous measurement of positive and negative affect (Eder et al., 2021; Mitschke & Eder, 2021) could further improve validity of our findings.

We acknowledge that unprovoked participants in Studies 1 and 3 could not well refer to items assessing benevolent motivations as the online interactions were short-lasting. However, people form bonds with strangers (Williams et al., 2000) and being rejected by strangers is a painful experience (Eisenberger et al., 2003) which motivates aggression (Chester & DeWall, 2017). Prospective works could overcome this limitation by measuring motivations toward the provocateur in a behavioral manner. For instance, Tangram Help/Hurt Task allows to assess both antisocial and prosocial behaviors towards another individual (Saleem et al., 2015). Furthermore, our findings are mostly based on the Voodoo Doll Task (DeWall et al., 2013), which assesses aggression symbolically - sticking pins into the doll does not cause a harm to the target. While we provided additional empirical evidence using the Gruesome Images Aggression Task (Gollwitzer & Bushman, 2012), future research would benefit from replicating our findings using a laboratory-based measure of aggression such as the Competitive Reaction Time Task (Taylor, 1967).

In the present research, we assessed benevolent motivations toward the provocateur and not an actual forgiveness. Forgiveness is a self-initiated *process* (Enright, 2001) that takes time (McCullough et al., 2010) as it involves change of feelings and attitudes toward another person (Förster et al., 2019). Prospective research would do well to examine relationships between revenge-related changes in affect and changes in motivations towards the provocateur over time. Such an approach would also aid in establishing causality - our tests of serial mediation do not provide such as these tests are correlational (Fiedler et al., 2018). Even more, they

do not prove that variable (or set of variables) is genuine and unique mediator (Fiedler et al., 2011), because of plausible (and unobservable) confounders between the mediator(s) and the outcome(s) (Bullock et al., 2010; Rohrer, 2019). Our serial mediation model is an extension of previously tested one, including manipulating both provocation and inability to repair one's affective state (Chester & DeWall, 2017, Study 3). Though it gives us more confidence about the reliability of observed relationships, we cannot rule out the possibility that different causal models could account for associations between our variables (Fiedler et al., 2018). Our findings therefore serve as a starting point for further research that would more comprehensively and rigorously examine how pleasure of revenge shapes subsequent motivations toward the provocateur.

6.2. Future Research Directions

We found that revenge-related positive affect is related to both vengeful and benevolent motivations towards the provocateur. However, people seek revenge not only to repair their affective state (Gollwitzer & Bushman, 2012). For example, revenge might serve as a tool to eliminate potential menaces (McCullough et al., 2013) or restore a sense of personal power after transgression (Fischer et al., 2022). Reaching either of these goals can bring avengers back towards the affective balance. Future research should therefore examine how certain revenge-related goals are related to subsequent motivations towards the provocateur. For instance, transgressors' understanding of the revenge-related message can be fulfilling to the victim (Funk et al., 2014) and consequently foster their willingness to forgive. On the other hand, establishing or maintaining social dominance through revenge can promote further acts of revenge.

We examined revenge in a dyadic context, which did not allow us to extrapolate our findings to an exceedingly relevant area of intergroup conflict. Prospective research should extend our findings into an intergroup domain to examine how the pleasure of revenge shapes intergroup relations. This could be particularly insightful in the context of intractable intergroup conflicts, which include repeated patterns of violence (Bar-Tal, 2013). Negative emotions play a crucial role in such conflicts (Gross et al., 2013), fueling intergroup aggression, which then provides temporary relief from persistent tension. This intensive, albeit short-lasting pleasure elicited by aggression, may partly explain the perseverance of intergroup conflicts. Emotion regulation strategies are proven to be effective in reducing conflict-related negative emotions (Halperin et al., 2013) and group members can be motivated to regulate their group-based emotions to pursue ingroup goals (Goldenberg et al., 2016).

8. References

- Anderson, C., John, O. P., & Keltner, D. (2012). The personal sense of power. *Journal of Personality, 80*, 313–344.
<https://doi.org/10.1111/j.1467-6494.2011.00734.x>
- Aubé, B., Rougier, M., Muller, D., Ric, F., Yzerbyt, V. (2019). The online-VAAST: A short and online tool to measure spontaneous approach and avoidance tendencies. *Acta Psychologica, 201*, Article 102942.
<https://doi.org/10.1016/j.actpsy.2019.102942>
- Bar-Tal, D. (2013). *Intractable conflicts: Socio-psychological foundations and dynamics*. Cambridge University Press.
<https://doi.org/10.1017/CBO9781139025195>
- Berkowitz, L. (1974). Some determinants of impulsive aggression: Role of

- mediated associations with reinforcements for aggression. *Psychological Review*, *81*, 165–176. <http://dx.doi.org/10.1037/h0036094>
- Berkowitz, L. (1989). Frustration-aggression hypothesis: Examination and reformulation. *Psychological Bulletin*, *106*(1), 59–73.
<https://doi.org/10.1037/0033-2909.106.1.59>
- Berridge, K. C., & Kringelbach, M. L. (2008). Affective neuroscience of pleasure: Reward in humans and animals. *Psychopharmacology*, *199*(3), 457–480.
<https://doi.org/10.1007/s00213-008-1099-6>
- Brüne, M., Juckel, G., & Enzi, B. (2013). “An eye for an eye”? Neural correlates of retribution and forgiveness. *PLoS ONE* *8*:e73519.
<https://doi.org/10.1371/journal.pone.0073519>
- Bullock, J. G., Green, D. P., & Ha, S. E. (2010). Yes, but what’s the mechanism? (don’t expect an easy answer). *Journal of Personality and Social Psychology*, *98*(4), 550–558. <https://doi.org/10.1037/a0018933>
- Bushman, B. J., & Baumeister, R. F. (1998). Threatened egotism, narcissism, self-esteem, and direct and displaced aggression: Does self-love or self-hate lead to violence? *Journal of Personality and Social Psychology*, *75*, 219–229.
<http://dx.doi.org/10.1037/0022-3514.75.1.219>
- Bushman, B. J., Baumeister, R. F., & Phillips, C. M. (2001). Do people aggress to improve their mood? Catharsis beliefs, affect regulation opportunity, and aggressive responding. *Journal of Personality and Social Psychology*, *81*(1), 17–32. <https://doi.org/10.1037//0022-3514.81.1.17>
- Buss, A. H. (1961). *The psychology of aggression*. John Wiley & Sons Inc.
<https://doi.org/10.1037/11160-000>

- Carlsmith, K. M., Wilson, T. D., & Gilbert, D. T. (2008). The paradoxical consequences of revenge. *Journal of Personality and Social Psychology*, 95(6), 1316-1324. <https://doi.org/10.1037/a0012165>
- Carver, Ch. S., & Harmon-Jones, E. (2009). Anger is an approach-related affect: Evidence and implications. *Psychological Bulletin*, 135(2), 183-204. <https://doi.org/10.1037/a0013965183>
- Chester, D. S. (2017). The role of positive affect in aggression. *Current Directions in Psychological Science*, 26(4), 366-370. <https://doi.org/10.1177/0963721417700457>
- Chester, D. S., & DeWall, C. N. (2016). The pleasure of revenge: Retaliatory aggression arises from a neural imbalance toward reward. *Social Cognitive and Affective Neuroscience*, 11, 487-494. <https://doi.org/10.1093/scan/nsv082>
- Chester, D. S., & DeWall, C. N. (2017). Combating the sting of rejection with the pleasure of revenge: A new look at how emotions shape aggression. *Journal of Personality and Social Psychology*, 112, 413-430. <https://doi.org/10.1037/pspi0000080>
- Chester, D. S., DeWall, C. N., Derefinko, K. J., Estus, S., Lynam, D. R., Peters, J. R., Jiang, Y. (2016). Looking for reward in all the wrong places: Dopamine receptor gene polymorphisms indirectly affect aggression through sensation-seeking. *Social Neuroscience*, 11(5), 487-494. [10.1080/17470919.2015.1119191](https://doi.org/10.1080/17470919.2015.1119191)
- Chester, D. S., & DeWall, C. N., & Enjaian, B. (2019). Sadism and aggressive behavior: Inflicting pain to feel pleasure. *Personality and Social Psychology Bulletin*, 45(8), 1252-1268. <https://doi.org/10.1177/0146167218816327>
- Chester, D. S., & Lasko, E. N. (2019). Validating a standardized approach to the

- Taylor Aggression Paradigm. *Social Psychological and Personality Science*, 10(5), 620–631. <https://doi.org/10.1177/1948550618775408>
- Chester, D. S., Lynam, D. R., Milich, R., & DeWall, C. N. (2018). Neural mechanisms of the rejection–aggression link. *Social Cognitive and Affective Neuroscience*, 13(5), 501-512. <https://doi.org/10.1093/scan/nsy025>
- Chester, D. S., & Martelli, A. (2019). Why does revenge sometimes feel so good? In E. L. Worthington Jr., & N. G. Wade (Ed.), *Handbook of forgiveness* (pp. 43-51). Routledge.
- Cialdini, R. B., Darby, B. L., & Vincent, J. E. (1973). Transgression and altruism: A case for hedonism. *Journal of Experimental Social Psychology*, 9(6), 502–516. [https://doi.org/10.1016/0022-1031\(73\)90031-0](https://doi.org/10.1016/0022-1031(73)90031-0)
- Couppis, M. H., & Kennedy, C. H. (2008). The rewarding effect of aggression is reduced by nucleus accumbens dopamine receptor antagonism in mice. *Psychopharmacology*, 197(3), 449-456. <https://doi.org/10.1007/s00213-007-1054-y>
- De Quervain, D. J. F., Fischbacher, U., Treyer, V., Schellhammer, M., Schnyder, U., Buck, A., & Fehr, E. (2004). The neural basis of altruistic punishment. *Science*, 305, 1254-1258. <https://doi.org/10.1126/science.1100735>
- Denzler, M., Förster, J., & Liberman, N. (2009). How goal-fulfillment decreases aggression. *Journal of Experimental Social Psychology*, 45, 90–100. <https://doi.org/10.1016/j.jesp.2008.08.021>
- Derefinko, K., DeWall, C. N., Metze, A. V., Walsh, E. C., & Lynam, D. R. (2011). Do different facets of impulsivity predict different types of aggression? *Aggressive Behavior*, 37, 223–233. <https://doi.org/10.1002/ab.20387>

- DeWall, C. N., Finkel, E. J., Lambert, N. M., Slotter, E. B., Bodenhausen, G. V., Pond Jr, R. S., Renzetti, C. M., & Fincham, F. D. (2013). The voodoo doll task: Introducing and validating a novel method for studying aggressive inclinations. *Aggressive Behavior, 39*, 419-439. <https://doi.org/10.1002/ab.21496>
- Dyduch-Hazar, K. (2024). Sadism in the context of intergroup aggression. *Aggressive Behavior, 50*(1), Article e22128. <https://doi.org/10.1002/ab.22128>
- Dyduch-Hazar, K., Mitschke, V., & Eder, A. B. (2024, July 31). Schadenfreude after vicarious revenge: A facial EMG study [Paper presentation]. 25th World Meeting of the International Society for the Research on Aggression, Munich, Germany.
- Dyduch-Hazar, K., & Mrozinski, B. (2023). Satisfaction is mine: Revenge seeking following extrinsic reward. *The Journal of Social Psychology, 163*(1), 52-61. <https://doi.org/10.1080/00224545.2022.2090309>
- Eadeh, F., Peak, S., & Lambert, A. J. (2017). The bittersweet taste of revenge: On the negative and positive consequences of retaliation. *Journal of Experimental Social Psychology, 68*, 27-39. <https://doi.org/10.1016/j.jesp.2016.04.007>
- Eder, A. B., Krishna, A., & Mitschke, V. (2021). Sweet revenge feels less bitter: Spontaneous affective reactions after revenge taking. *Social Psychological and Personality Science, 12*(7), 1184-1192. <https://doi.org/10.1177/19485506211019923>
- Eisenberger, N. I., Lieberman, M. D., & Williams, K. D. (2003). Does rejection hurt? An fMRI study of social exclusion. *Science, 302*, 290–292. <http://dx.doi.org/10.1126/science.1089134>
- Enright, R. D. (2001). *Forgiveness is a choice: A step-by-step process for resolving anger and restoring hope*. American Psychological Association.

- Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G * Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, *39*, 175-191.
<https://doi.org/10.3758/BF03193146>
- Fiedler, K., Harris, C., & Schott, M. (2018). Unwarranted inferences from statistical mediation tests - An analysis of articles published in 2015. *Journal of Experimental Social Psychology*, *75*, 95–102.
<https://doi.org/10.1016/j.jesp.2017.11.008>
- Fiedler, K., Schott, M., & Meiser, T. (2011). What mediation analysis can (not) do. *Journal of Experimental Social Psychology*, *47*(6), 1231–1236.
<https://doi.org/10.1016/j.jesp.2011.05.007>
- Fischer, M., Twardawski, M., Strelan, P., & Gollwitzer, M. (2022). Victims need more than power: Empowerment and moral change independently predict victims' satisfaction and willingness to reconcile. *Journal of Personality and Social Psychology* *123*(5), 518-536. <http://dx.doi.org/10.1037/pspi0000291>
- Förster, D. E., Billingsley, J., Russell, V. M., Burnette, J. L., Smith, A., Ohtsubo, Y., McGauley, T. G., Schug, J., Lieberman, D., & McCullough, M. E. (2019). Forgiveness takes place on an attitudinal continuum from malevolence to benevolence: Toward a closer union of forgiveness theory and measurement. *Journal of Personality and Social Psychology*, *119*(4), 861-880.
<https://doi.org/10.31234/osf.io/wkvhn>
- Fritz, M. S., & Mackinnon, D. P. (2007). Required sample size to detect the mediated effect. *Psychological Science*, *18*(3), 233–239.
<https://doi.org/10.1111/j.1467-9280.2007.01882.x>

- Funk, F., McGeer, V., & Gollwitzer, M. (2014). Get the message: Punishment is satisfying if the transgressor responds to its communicative intent. *Personality and Social Psychology Bulletin*, *40*(8), 986–997.
<https://doi.org/10.1177/0146167214533130>
- Gardner, W. L., Pickett, C. L., & Brewer, M. B. (2000). Social exclusion and selective memory: How the need to belong influences memory for social events. *Personality and Social Psychology Bulletin*, *26*, 486–496.
<http://dx.doi.org/10.1177/0146167200266007>
- Golden, S. A., Heins, C., Venniro, M., Caprioli, D., Zhang, M., Epstein, D., & Shaham, Y. (2017). Compulsive addiction-like aggressive behavior in mice. *Biological Psychiatry*, *82*(4), 239–248.
<https://doi.org/10.1016/j.biopsych.2017.03.004>
- Golden, S. A., & Shaham, Y. (2018). Aggression addiction and relapse: A new frontier in psychiatry. *Neuropsychopharmacology*, *43*(1), 224–225.
<https://doi.org/10.1038/npp.2017.173>
- Goldenberg, A., Halperin, E., van Zomeren, M., & Gross, J. J. (2016). The process model of group-based emotion: Integrating intergroup emotion and emotion regulation perspective. *Personality and Social Psychology Review*, *20*(2), 118–141. <https://doi.org/10.1177/1088868315581263>
- Gollwitzer, M., & Bushman, B. (2012). Do victims of injustice punish to improve their mood? *Social Psychological and Personality Science*, *3*(5), 572–580.
<https://doi.org/10.1177/1948550611430552>
- Gross, J. J., Halperin, E., & Porat, R. (2013). Emotion regulation in intractable conflicts. *Current Directions in Psychological Science*, *22*(6), 423–429.
<https://doi.org/10.1177/0963721413495871>

- Halperin, E., Porat, R., Tamir, M., & Gross, J. J. (2013). Can emotion regulation change political attitudes in intractable conflicts? From the laboratory to the field. *Psychological Science, 24*(1), 106-111.
<https://doi.org/10.1177/0956797612452572>
- Hayes, A. F. (2022). *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach (Vol. 3)*. The Guilford Press.
- Jackson, J. C., Choi, V. K., & Gelfand, M. J. (2019). Revenge: A multilevel review and synthesis. *Annual Review of Psychology, 70*, 319-345.
<https://doi.org/10.1146/annurev-psych-010418-103305>
- Krämer, U. M., Jansma, H., Tempelmann, C., & Münte, T. F. (2007). Tit-for-tat: The neural basis of reactive aggression. *Neuroimage, 38*(1), 203-211.
<https://doi.org/10.1016/j.neuroimage.2007.07.029>
- Lambert, A. J., Peak, S. A., Eadeh, F. R., & Schott, J. P. (2014). How do you feel now? On the perceptual distortion of extremely recent changes in anger. *Journal of Experimental Social Psychology, 52*, 82-95.
<https://doi.org/10.1016/j.jesp.2014.01.004>
- Lawler, K. A., Younger, J. W., Piferi, R. L., Jobe, R. L., Edmondson, K. A., & Jones, W. H. (2005). The unique effects of forgiveness on health: An exploration of pathways. *Journal of Behavioral Medicine, 28*(2), 157-167.
<https://doi.org/10.1007/s10865-005-3665-2>
- Maner, J. K., DeWall, C. N., Baumeister, R. F., & Schaller, M. (2007). Does social exclusion motivate interpersonal reconnection? Resolving the “porcupine problem.” *Journal of Personality and Social Psychology, 92*, 42–55.
<http://dx.doi.org/10.1037/0022-3514.92.1.42>
- Marks, M. J., Trafimow, D., Busche, L. K., & Oates, K. N. (2013). A function of

- forgiveness: Exploring the relationship between negative mood and forgiving. *SAGE Open*, 1-9. <https://doi.org/10.1177/2158244013507267>
- McCullough, M. E., Kurzban, R., & Tabak, B. A. (2013). Cognitive systems for Revenge and forgiveness. *Behavioral and Brain Sciences*, 36(1), 1-58. <https://doi.org/10.1017/S0140525X11002160>
- McCullough, M. E., Luna, L. R., Berry, J. W., Tabak, B. A., & Bono, G. (2010). On the form and function of forgiving: Modeling the time-forgiveness relationship and testing the valuable relationships hypothesis. *Emotion*, 10(3), 358–376. <https://doi.org/10.1037/a0019349>
- McCullough, M. E., Rachal, K. C., Sandage, S. J., Worthington, E. L., Jr., Brown, S. W., & Hight, T. L. (1998). Interpersonal forgiveness in close relationships II: theoretical elaboration and measurement. *Journal of Personality and Social Psychology*, 75, 1586-1603. <https://doi.org/10.1037//0022-3514.75.6.1586>
- McCullough, M. E., Root, L. M., & Cohen, A. D. (2006). Writing about the benefits of an interpersonal transgression facilitates forgiveness. *Journal of Consulting and Clinical Psychology*, 74(5), 887–897. <https://doi.org/10.1037/0022-006X.74.5.887>
- Mitschke, V., & Eder, A. B. (2021). Facing the enemy: Spontaneous facial reactions towards suffering. *Psychophysiology*, 58(8), Article e13835. <https://doi.org/10.1111/psyp.13835>
- Peer, E., Brandimarte, L., Samat, S., Acquisti, A. (2017). Beyond the Turk: Alternative platforms for crowdsourcing behavioral research. *Journal of Experimental Social Psychology*, 70, 153–163. <https://doi.org/10.1016/j.jesp.2017.01.006>
- Ramírez, J. M., Bonniot-Cabanac, M.-C., & Cabanac, M. (2005). Can

- aggression provide pleasure? *European Psychologist*, 10, 136–145.
<http://dx.doi.org/10.1027/1016-9040.10.2.136>
- Ren, D., Wesselmann, E., & Williams, K. D. (2016). Evidence for another response to ostracism: Solitude seeking. *Social Psychological and Personality Science*, 7(3), 204–212. <https://doi.org/10.1177/1948550615616169>
- Robbins, T. W., & Everitt, B. J. (1996). Neurobehavioural mechanisms of reward and motivation. *Current Opinion in Neurobiology*, 6(2), 228-236.
[https://doi.org/10.1016/s0959-4388\(96\)80077-8](https://doi.org/10.1016/s0959-4388(96)80077-8)
- Rohde-Brown, J., & Rudestam, K. E. (2011). The role of forgiveness in divorce adjustment and the impact of affect. *Journal of Divorce & Remarriage*, 52(2), 109-124. <https://doi.org/10.1080/10502556.2011.546233>
- Rohrer, J. (2019, October 3). *Indirect effect ex machina*. Retrieved from:
<https://www.the100.ci/2019/10/03/indirect-effect-ex-machina/>
- Saleem, M., Anderson, C. A., & Barlett, Ch. P. (2015). Assessing helping and hurting behaviors through the Tangram Help/Hurt Task. *Personality and Social Psychology Bulletin*, 1-18. <https://doi.org/10.1177/0146167215594348>
- Schumann, K., & Ross, M. (2010). The benefits, costs, and paradox of revenge. *Social and Personality Psychology Compass*, 4(12), 1193-1205.
<https://doi.org/10.1111/j.1751-9004.2010.00322.x>
- Schwartzner, J. J., Ricci, L. A., & Melloni, R. H., Jr. (2013). Prior fighting experience increases aggression in Syrian hamsters: Implications for a role of dopamine in the winner effect. *Aggressive Behavior*, 39(4), 290–300.
<https://doi.org/10.1002/ab.21476>
- Singer, T., Seymour, B., O'Doherty, J.P., Stephan, K.E., Dolan, R. J., & Frith, Ch. D. (2006). Empathic neural responses are modulated by the perceived fairness of

- others. *Science*, 439(7075): 466-469. <https://doi.org/10.1038/nature04271>
- Strelan, P., Di Fiore, C., & Van Prooijen, J-W. (2017). The empowering effect of punishment on forgiveness. *European Journal of Social Psychology*, 47(4), 472-487. <https://doi.org/10.1002/ejsp.2254>
- Strelan, P., & Van Prooijen, J.-W. (2013). Retribution and forgiveness: The healing effects of punishing for just deserts. *European Journal of Social Psychology*, 43(6), 544-553. <https://doi.org/10.1002/ejsp.1964>
- Strelan, P., van Prooijen, J-W., & Gollwitzer, M. (2020). When transgressors intend to cause harm: The empowering effects of revenge and forgiveness on victim well-being. *British Journal of Social Psychology*, 59, 447-469. <https://doi.org/10.1111/bjso.12357>
- Taylor, S. P. (1967). Aggressive behavior and physiological arousal as a function of provocation and the tendency to inhibit aggression. *Journal of Personality*, 3, 297–310. <https://doi.org/10.1111/j.1467-6494.1967.tb01430.x>
- Threadgill, A. H., & Gable, P. A. (2020). Revenge is sweet: Investigation of the effects of approach-motivated anger on the RewP in the motivated anger delay (MAD) paradigm. *Human Brain Mapping*, 41(17), 5032-5056. <https://doi.org/10.1002/hbm.25177>
- Tunison, E., Sylvain, R., Sterr, J., Hiley, V., & Carlson, J. M. (2019). No money, no problem: Enhanced reward positivity in the absence of monetary reward. *Frontiers in Human Neuroscience*, 13, Article 41. <https://doi.org/10.3389/fnhum.2019.00041>
- Quansah, J. E., & Gagnon, J. (2023). Toward an integrative approach to the study of positive-affect-related aggression. *Perspectives on Psychological Science*, 1-14. <https://doi.org/10.1177/17456916231200421>

- Williams, K. D. (2009). Ostracism: A temporal need-threat model. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 41, pp. 275–314). Academic Press.
- Williams, K. D. Cheung, Ch. K. T., & Choi, W. (2000). Cyberostracism: Effects of being ignored over the Internet. *Journal of Personality and Social Psychology*, 79(5), 748-762. <https://doi.org/10.1037//0022-3514.79.5.748>
- Worthington, E. L., Jr., & Wade, N. G. (1999). The psychology of unforgiveness and forgiveness and implications for clinical practice. *Journal of Social and Clinical Psychology*, 18(4), 385–418. <https://doi.org/10.1521/jscp.1999.18.4.385>

Supplementary Table 1

Estimates from Post-Hoc Monte Carlo Power Analysis for Serial Mediation Models with Vengeful Motivations as Outcome, Study 1

	X	M1	M2	Y	Power (N = 242)
X	-				X > M1 > Y = 0.95
M1	.23	-			X > M2 > Y = 0.16
M2	.16	.46	-		X > M1 > M2 > Y = 0.95
Y	-.01	.60	.56	-	
<i>SD</i>	.50	1.07	.63	1.16	

Note. X = Provocation (1 = yes, 0 = no); M1 = Pre-aggression negative affect; M2 = Aggression (log transformed); Y = Vengeful motivations

	X	M1	M3	Y	Power (N = 242)
X	-				X > M1 > Y = 0.95
M1	.23	-			X > M3 > Y = 0.97
M3	-.23	.06	-		X > M1 > M3 > Y = 0.40
Y	-.01	.60	.30	-	
<i>SD</i>	.50	1.07	1.18	1.16	

Note. X = Provocation (1 = yes, 0 = no); M1 = Pre-aggression negative affect; M3 = Post-aggression positive affect; Y = Vengeful motivation

	X	M2	M3	Y	Power (N = 242)
X	-				X > M2 > Y = 0.71
M2	.16	-			X > M3 > Y = 0.91
M3	-.23	.18	-		X > M2 > M3 > Y = 0.59
Y	-.01	.56	.30	-	
<i>SD</i>	.50	.63	1.18	1.16	

Note. X = Provocation (1 = yes, 0 = no); M2 = Aggression (log transformed); M3 = Post-aggression positive affect; Y = Vengeful motivations

Supplementary Table 2

Estimates from Post-Hoc Monte Carlo Power Analysis for Serial Mediation Models with Benevolent Motivations as Outcome, Study 1

	X	M1	M2	Y	Power (N = 242)
X	-				X > M1 > Y = 0.90
M1	.23	-			X > M2 > Y = 0.01
M2	.16	.46	-		X > M1 > M2 > Y = 0.05
Y	-.08	.21	.07	-	
<i>SD</i>	.50	1.07	.63	.83	

Note. X = Provocation (1 = yes, 0 = no); M1 = Pre-aggression negative affect; M2 = Aggression (log transformed); Y = Benevolent motivations

	X	M1	M3	Y	Power (N = 242)
X	-				X > M1 > Y = 0.86
M1	.23	-			X > M3 > Y = 0.82
M3	-.23	.06	-		X > M1 > M3 > Y = 0.33
Y	-.08	.21	.22	-	
<i>SD</i>	.50	1.07	1.18	.83	

Note. X = Provocation (1 = yes, 0 = no); M1 = Pre-aggression negative affect; M3 = Post-aggression positive affect; Y = Benevolent motivations

	X	M2	M3	Y	Power (N = 242)
X	-				X > M2 > Y = 0.06
M2	.16	-			X > M3 > Y = 0.86
M3	-.23	.18	-		X > M2 > M3 > Y = 0.56
Y	-.08	.07	.22	-	
<i>SD</i>	.50	.63	1.18	.83	

Note. X = Provocation (1 = yes, 0 = no); M2 = Aggression (log transformed); M3 = Post-aggression positive affect; Y = Benevolent motivations

Supplementary Table 3

Estimates from Post-Hoc Monte Carlo Power Analysis for Serial Mediation Models with Avoidant Motivations as Outcome, Study 1

	X	M1	M2	Y	Power (N = 242)
X	-				X > M1 > Y = 0.95
M1	.23	-			X > M2 > Y = 0.17
M2	.16	.46	-		X > M1 > M2 > Y = 0.91
Y	.23	.58	.44	-	
<i>SD</i>	.50	1.07	.63	1.10	

Note. X = Provocation (1 = yes, 0 = no); M1 = Pre-aggression negative affect; M2 = Aggression (log transformed); Y = Avoidant motivations

	X	M1	M3	Y	Power (N = 242)
X	-				X > M1 > Y = 0.96
M1	.23	-			X > M3 > Y = 0.05
M3	-.23	.06	-		X > M1 > M3 > Y = 0.02
Y	.23	.58	.001	-	
<i>SD</i>	.50	1.07	1.18	1.10	

Note. X = Provocation (1 = yes, 0 = no); M1 = Pre-aggression negative affect; M3 = Post-aggression positive affect; Y = Avoidant motivations

	X	M2	M3	Y	Power (N = 242)
X	-				X > M2 > Y = 0.72
M2	.16	-			X > M3 > Y = 0.08
M3	-.23	.16	-		X > M2 > M3 > Y = 0.04
Y	.23	.44	.001	-	
<i>SD</i>	.50	.63	1.18	1.10	

Note. X = Provocation (1 = yes, 0 = no); M2 = Aggression (log transformed); M3 = Post-aggression positive affect; Y = Avoidant motivations

Supplementary Table 4

Distribution Statistics For Pins and Images Counts After Logarithmic Transformation.

Parenthesized Values Represent Distribution Statistics Prior to Transformation

Statistics	Study 1	Study 2	Study 3
Skewness	.08 (1.43)	.73 (1.78)	.10 (.88)
Kurtosis	-1.42 (.67)	-1.02 (1.70)	-1.31 (-.61)
Measure	Number of pins stuck in a doll	Number of pins stuck in a doll	Number of assigned images

Supplementary Table 5*Descriptive Statistics for Key Variables From Study 1, by Condition*

Variable	Negative feedback condition		Positive feedback condition		Provoked > Unprovoked	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>d</i>	<i>95% CI</i>
Pre-aggression positive affect	2.52	1.26	3.73	1.01	1.06	[-1.50; -.927]
Pre-aggression negative affect	4.56	2.68	2.19	1.08	0.46	[.227; .760]
Symbolic aggression (raw score)	15.71	18.43	8.85	13.75	0.42	[2.74; 10.97]
Symbolic aggression (log transformed)	.83	.66	.62	.58	0.33	[.050; .368]
Post-aggression positive affect	2.84	1.18	3.39	1.12	0.48	[-.841; -.255]
Post-aggression negative affect	2.33	1.01	2.12	1.14	0.19	[-.068; .481]
Vengeful motivations	2.54	1.15	2.58	1.17	0.03	[-.331; .258]
Benevolent motivations	3.28	.83	3.41	.82	0.15	[-.348; .073]
Avoidant motivations	3.31	.95	2.80	1.18	0.47	[.241; .786]

Supplementary Table 6*Descriptive Statistics for Key Variables From Study 1, by Gender*

Variable	Male		Female		Male > Female	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>d</i>	<i>95% CI</i>
Pre-aggression positive affect	3.17	1.28	3.06	1.32	0.08	[-.222; .441]
Pre-aggression negative affect	2.59	1.10	2.28	1.00	0.29	[.086; .636]
Symbolic aggression (raw score)	12.82	16.38	11.65	16.97	0.07	[-3.11; 5.44]
Symbolic aggression (log transformed)	.77	.62	.66	.65	0.13	[-.048; .277]
Post-aggression positive affect	3.22	1.15	2.97	1.22	0.21	[-.056; .553]
Post-aggression negative affect	2.35	1.13	2.06	1.00	0.27	[.004; .560]
Vengeful motivations	2.68	1.19	2.39	1.09	0.25	[-.009; .586]
Benevolent motivations	3.33	.81	3.36	.86	0.03	[-.244; .186]
Avoidant motivations	3.14	1.06	2.93	1.15	0.18	[-.066; .502]

Supplementary Table 7

*Descriptive Statistics for Positive and Negative Affect Assessed Before and After Aggression
From Study 1, by Condition*

Condition	Pre/Post	Affect	<i>M</i>	<i>SE</i>	<i>95%CI</i>
Negative social feedback	Pre-Aggression	Positive	2.52	.10	[2.31; 2.72]
		Negative	2.68	.09	[2.49; 2.87]
	Post-Aggression	Positive	2.84	.10	[2.64; 3.05]
		Negative	2.33	.09	[2.13; 2.52]
Positive social feedback	Pre-Aggression	Positive	3.73	.10	[3.53; 3.94]
		Negative	2.19	.09	[2.00; 2.37]
	Post-Aggression	Positive	3.39	.10	[3.19; 3.60]
		Negative	2.12	.09	[1.93; 2.32]

Supplementary Table 8*Summary of Indirect Effects with Log-Transformed Symbolic Aggression Measure, Study 1*

Vengeful motivations			
Indirect effects	<i>b</i>	<i>SE</i>	<i>95% CI</i>
X > M1 > Y	.24	.07	[.106; .408]
X > M2 > Y	.04	.04	[-.040; .144]
X > M3 > Y	-.11	.04	[-.208; -.045]
X > M1 > M2 > Y	.08	.02	[.033; .141]
X > M1 > M3 > Y	.002	.008	[-.014; .019]
X > M2 > M3 > Y	.005	.007	[-.004; .023]
X > M1 > M2 > M3 > Y	.009	.005	[.001; .022]
Total indirect effect	.27	.11	[.047; .515]

Benevolent motivations			
Indirect effects	<i>b</i>	<i>SE</i>	<i>95% CI</i>
X > M1 > Y	.09	.03	[.034; .175]
X > M2 > Y	-.006	.01	[-.043; .012]
X > M3 > Y	-.09	.04	[-.191; -.022]
X > M1 > M2 > Y	-.01	.01	[-.044; .017]
X > M1 > M3 > Y	.001	.006	[-.011; .016]
X > M2 > M3 > Y	.004	.006	[-.003; .020]

X > M1 > M2 > M3 > Y	.007	.004	[.001; .019]
Total indirect effect	.0004	.05	[-.120; .107]

Avoidant motivations

Indirect effects	<i>b</i>	<i>SE</i>	95% <i>CI</i>
X > M1 > Y	.23	.07	[.102; .389]
X > M2 > Y	.03	.03	[-.023; .101]
X > M3 > Y	.03	.03	[-.036; .105]
X > M1 > M2 > Y	.05	.02	[.016; .098]
X > M1 > M3 > Y	-.0006	.003	[-.009; .005]
X > M2 > M3 > Y	-.001	.002	[-.008; .003]
X > M1 > M2 > M3 > Y	-.002	.002	[-.009; .003]
Total indirect effect	.34	.09	[.159; .537]

Note. X = feedback condition (1 = negative social feedback, 0 = positive social feedback), M1 = pre-aggression negative affect, M2 = symbolic aggression (log transformed), M3 = post-aggression positive affect.

Supplementary Table 9*Summary of Indirect Effects with Raw Score Symbolic Aggression Measure, Study 1*

Vengeful motivations			
Indirect effects	<i>b</i>	<i>SE</i>	<i>95% CI</i>
X > M1 > Y	.29	.08	[.128; .470]
X > M2 > Y	.07	.03	[.009; .155]
X > M3 > Y	-.14	.04	[-.247; -.063]
X > M1 > M2 > Y	.03	.01	[.009; .066]
X > M1 > M3 > Y	.01	.009	[-.005; .033]
X > M2 > M3 > Y	.006	.007	[-.003; .025]
X > M1 > M2 > M3 > Y	.002	.002	[-.001; .009]
Total indirect effect	.27	.11	[.043; .504]

Benevolent motivations			
Indirect effects	<i>b</i>	<i>SE</i>	<i>95% CI</i>
X > M1 > Y	.09	.03	[.037; .172]
X > M2 > Y	-.02	.02	[-.092; .008]
X > M3 > Y	-.09	.04	[-.186; -.022]
X > M1 > M2 > Y	-.01	.01	[-.036; .005]
X > M1 > M3 > Y	.007	.006	[-.003; .023]
X > M2 > M3 > Y	.004	.005	[-.002; .018]

X > M1 > M2 > M3 > Y	.001	.002	[-.001; .007]
Total indirect effect	-.016	.06	[-.158; .097]

Avoidant motivations

Indirect effects	<i>b</i>	<i>SE</i>	<i>95% CI</i>
X > M1 > Y	.26	.07	[.116; .418]
X > M2 > Y	.05	.02	[.005; .119]
X > M3 > Y	.01	.03	[-.053; .088]
X > M1 > M2 > Y	.02	.01	[.006; .050]
X > M1 > M3 > Y	-.001	.003	[-.010; .005]
X > M2 > M3 > Y	-.0006	.002	[-.006; .004]
X > M1 > M2 > M3 > Y	-.0003	.001	[-.002; .001]
Total indirect effect	.35	.09	[.166; .547]

Note. X = feedback condition (1 = negative social feedback, 0 = positive social feedback), M1 = pre-aggression negative affect, M2 = symbolic aggression (raw score), M3 = post-aggression positive affect.

Supplementary Table 10

Estimates from Post-Hoc Monte Carlo Power Analysis for Serial Mediation Models with Vengeful Motivations as Outcome, Study 2

	X	M1	M2	Y	Power (N = 295)
X	-				X > M1 > Y = 1.00
M1	.44	-			X > M2 > Y = 0.94
M2	.38	.52	-		X > M1 > M2 > Y = 1.00
Y	.24	.62	.62	-	
SD	.50	1.11	.63	1.07	

Note. X = Provocation (1 = yes, 0 = no); M1 = Pre-aggression negative affect; M2 = Symbolic aggression (log transformed); Y = Vengeful motivations

	X	M1	M3	Y	Power (N = 295)
X	-				X > M1 > Y = 1.00
M1	.44	-			X > M3 > Y = 0.98
M3	-.32	-.24	-		X > M1 > M3 > Y = 0.52
Y	.24	.62	.07	-	
SD	.50	1.11	1.21	1.07	

Note. X = Provocation (1 = yes, 0 = no); M1 = Pre-aggression negative affect; M3 = Post-aggression positive affect; Y = Vengeful motivations

	X	M2	M3	Y	Power (N = 295)
X	-				X > M2 > Y = 1.00
M2	.38	-			X > M3 > Y = 0.76
M3	-.32	-.07	-		X > M2 > M3 > Y = 0.12
Y	.24	.62	.07	-	
SD	.50	.63	1.21	1.07	

Note. X = Provocation (1 = yes, 0 = no); M2 = Symbolic aggression (log transformed); M3 = Post-aggression positive affect; Y = Vengeful motivations

Supplementary Table 11

Estimates from Post-Hoc Monte Carlo Power Analysis for Serial Mediation Models with Benevolent Motivations as Outcome, Study 2

	X	M1	M2	Y	Power (N = 295)
X	-				X > M1 > Y = 0.10
M1	.44	-			X > M2 > Y = 0.05
M2	.38	.52	-		X > M1 > M2 > Y = 0.06
Y	.16	.04	.06	-	
<i>SD</i>	.50	1.11	.63	.99	

Note. X = Provocation (1 = yes, 0 = no); M1 = Pre-aggression negative affect; M2 = Symbolic aggression (log transformed); Y = Benevolent motivations

	X	M1	M3	Y	Power (N = 295)
X	-				X > M1 > Y = 0.05
M1	.44	-			X > M3 > Y = 0.95
M3	-.32	-.24	-		X > M1 > M3 > Y = 0.48
Y	.16	.04	.15	-	
<i>SD</i>	.50	1.11	1.21	.99	

Note. X = Provocation (1 = yes, 0 = no); M1 = Pre-aggression negative affect; M3 = Post-aggression positive affect; Y = Benevolent motivations

	X	M2	M3	Y	Power (N = 295)
X	-				X > M2 > Y = 0.07
M2	.38	-			X > M3 > Y = 0.96
M3	-.32	-.07	-		X > M2 > M3 > Y = 0.15
Y	.16	.06	.15	-	
<i>SD</i>	.50	.63	1.21	.99	

Note. X = Provocation (1 = yes, 0 = no); M2 = Symbolic aggression (log transformed); M3 = Post-aggression positive affect; Y = Benevolent motivations

Supplementary Table 12

Estimates from Post-Hoc Monte Carlo Power Analysis for Serial Mediation Models with Avoidant Motivations as Outcome, Study 2

	X	M1	M2	Y	Power (N = 295)
X	-				X > M1 > Y = 1.00
M1	.44	-			X > M2 > Y = 0.92
M2	.38	.52	-		X > M1 > M2 > Y = 1.00
Y	.69	.65	.55	-	
<i>SD</i>	.50	1.11	.63	1.25	

Note. X = Provocation (1 = yes, 0 = no); M1 = Pre-aggression negative affect; M2 = Symbolic aggression (log transformed); Y = Avoidant motivations

	X	M1	M3	Y	Power (N = 295)
X	-				X > M1 > Y = 1.00
M1	.44	-			X > M3 > Y = 0.07
M3	-.32	-.24	-		X > M1 > M3 > Y = 0.03
Y	.69	.65	-.28	-	
<i>SD</i>	.50	1.11	1.21	1.25	

Note. X = Provocation (1 = yes, 0 = no); M1 = Pre-aggression negative affect; M3 = Post-aggression positive affect; Y = Avoidant motivations

	X	M2	M3	Y	Power (N = 295)
X	-				X > M2 > Y = 1.00
M2	.38	-			X > M3 > Y = 0.57
M3	-.32	-.07	-		X > M2 > M3 > Y = 0.09
Y	.69	.55	-.28	-	
<i>SD</i>	.50	.63	1.21	1.25	

Note. X = Provocation (1 = yes, 0 = no); M2 = Symbolic aggression (log transformed); M3 = Post-aggression positive affect; Y = Avoidant motivations

Supplementary Table 13*Descriptive Statistics for Key Variables from Study 2, by Condition*

Variable	Social rejection condition		Social acceptance condition		Rejected > Accepted	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>d</i>	<i>95% CI</i>
Pre-aggression positive affect	2.66	1.29	3.93	.96	1.11	[-1.54; -1.01]
Pre-aggression negative affect	2.46	1.11	1.47	.87	0.99	[.766; 1.22]
Symbolic aggression (raw score)	14.18	18.40	4.54	12.01	0.62	[6.06; 13.20]
Symbolic aggression (log transformed)	.76	.65	.27	.51	0.26	[.358; .628]
Post-aggression positive affect	2.92	1.18	3.71	1.11	0.69	[-1.05; -.524]
Post-aggression negative affect	2.31	1.09	1.54	.93	0.76	[.532; .998]
Vengeful motivations	2.32	1.11	1.79	.96	0.51	[.291; .771]
Benevolent motivations	3.25	.88	2.93	1.04	1.93	[.098; .547]
Avoidant motivations	3.44	.91	1.70	.92	0.32	[1.53; 1.94]

Supplementary Table 14*Descriptive Statistics for Key Variables From Study 2, by Gender*

Variable	Male		Female		Male > Female	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>d</i>	<i>95% CI</i>
Pre-aggression positive affect	3.40	1.26	3.15	1.35	0.19	[-.050; .551]
Pre-aggression negative affect	1.98	1.17	1.96	1.04	0.01	[-.239; .274]
Symbolic aggression (raw score)	9.50	16.45	9.30	16.13	0.01	[-3.54; 3.94]
Symbolic aggression (log transformed)	.51	.64	.52	.63	0.01	[-.154; .138]
Post-aggression positive affect	3.44	1.19	3.17	1.23	0.22	[-.010; .545]
Post-aggression negative affect	1.97	1.17	1.88	.96	0.08	[-.167; .330]
Vengeful motivations	2.07	1.06	2.04	1.08	0.02	[-.220; .274]
Benevolent motivations	3.13	.94	3.05	1.04	0.08	[-.153; .302]
Avoidant motivations	2.47	1.24	2.70	1.25	0.18	[-.517; .057]

Supplementary Table 15*Manipulation Check Data From the Need Threat Scale of Study 2, by Condition*

Threat	Rejected <i>M (SD)</i>	Accepted <i>M (SD)</i>	Rejected > Accepted	<i>d</i>	<i>α</i>
Belonging threat	3.89 (.86)	1.81 (.84)	$t(293) = 20.88^{***}$	2.44	.91
Control threat	3.87 (.87)	2.58 (.66)	$t(293) = 14.29^{***}$	1.67	.78
Meaningful existence threat	3.57 (.98)	1.87 (.84)	$t(293) = 15.84^{***}$	1.86	.89
Self-esteem threat	3.85 (1.09)	2.01 (.87)	$t(293) = 15.87^{***}$	1.86	.93
Positive affect	2.06 (1.20)	4.15 (.81)	$t(293) = -17.32^{***}$	2.04	.96
Negative affect	3.45 (1.02)	1.50 (.88)	$t(293) = 17.39^{***}$	2.04	.93
Felt rejection	4.08 (.91)	1.55 (1.06)	$t(293) = 21.90^{***}$	2.56	.92

Note. *** $p < .001$.

Supplementary Table 16

*Descriptive Statistics for Positive and Negative Affect Assessed Before and After Aggression
From Study 2, by Condition*

Condition	Pre/Post	Affect	<i>M</i>	<i>SE</i>	<i>95%CI</i>
Social rejection	Pre-Aggression	Positive	2.66	.09	[2.47; 2.84]
		Negative	2.46	.08	[2.30; 2.62]
	Post-Aggression	Positive	2.92	.09	[2.74; 3.11]
		Negative	2.31	.08	[2.14; 2.47]
Social acceptance	Pre-Aggression	Positive	3.93	.09	[3.75; 4.12]
		Negative	1.47	.08	[1.30; 1.63]
	Post-Aggression	Positive	3.71	.09	[3.52; 3.90]
		Negative	1.54	.08	[1.38; 1.71]

Supplementary Table 17*Summary of Indirect Effects with Log-Transformed Symbolic Aggression Measure, Study 2*

Vengeful motivations			
Indirect effects	<i>b</i>	<i>SE</i>	<i>95% CI</i>
X > M1 > Y	.45	.07	[.314; .617]
X > M2 > Y	.16	.05	[.059; .289]
X > M3 > Y	-.12	.03	[-.213; -.061]
X > M1 > M2 > Y	.17	.03	[.107; .251]
X > M1 > M3 > Y	-.03	.01	[-.070; -.006]
X > M2 > M3 > Y	.01	.007	[.0002; .029]
X > M1 > M2 > M3 > Y	.01	.006	[.0003; .027]
Total indirect effect	.65	.09	[.466; .847]
Benevolent motivations			
Indirect effects	<i>b</i>	<i>SE</i>	<i>95% CI</i>
X > M1 > Y	.003	.06	[-.119; .121]
X > M2 > Y	-.007	.02	[-.062; .038]
X > M3 > Y	-.13	.04	[-.241; -.050]
X > M1 > M2 > Y	-.007	.02	[-.059; .039]
X > M1 > M3 > Y	-.03	.01	[-.077; -.004]

X > M2 > M3 > Y	.01	.008	[.0001; .031]
X > M1 > M2 > M3 > Y	.01	.007	[.0002; .029]
Total indirect effect	-.15	.07	[-.321; -.012]

Avoidant motivations

Indirect effects	<i>b</i>	<i>SE</i>	<i>95% CI</i>
X > M1 > Y	.38	.06	[.262; .525]
X > M2 > Y	.09	.03	[.030; .170]
X > M3 > Y	.02	.03	[-.027; .093]
X > M1 > M2 > Y	.09	.02	[.042; .158]
X > M1 > M3 > Y	.007	.009	[-.007; .029]
X > M2 > M3 > Y	-.002	.003	[-.010; .002]
X > M1 > M2 > M3 > Y	-.002	.003	[-.010; .002]
Total indirect effect	.60	.08	[.447; .771]

Note. X = rejection condition (1 = rejection, 0 = acceptance), M1 = pre-aggression negative affect, M2 = symbolic aggression (log transformed), M3 = post-aggression positive affect.

Supplementary Table 18*Summary of Indirect Effects with Raw Score Symbolic Aggression Measure, Study 2*

Vengeful motivations			
Indirect effects	<i>b</i>	<i>SE</i>	<i>95% CI</i>
X > M1 > Y	.54	.08	[.382; .718]
X > M2 > Y	.06	.03	[.002; .143]
X > M3 > Y	-.13	.04	[-.231; -.067]
X > M1 > M2 > Y	.09	.02	[.043; .148]
X > M1 > M3 > Y	-.03	.01	[-.071; -.002]
X > M2 > M3 > Y	.005	.005	[-.002; .018]
X > M1 > M2 > M3 > Y	.006	.005	[-.002; .020]
Total indirect effect	.53	.09	[.364; .719]
Benevolent motivations			
Indirect effects	<i>b</i>	<i>SE</i>	<i>95% CI</i>
X > M1 > Y	.03	.05	[-.082; .138]
X > M2 > Y	-.02	.02	[-.083; .003]
X > M3 > Y	-.13	.04	[-.230; -.051]
X > M1 > M2 > Y	-.03	.02	[-.084; .004]
X > M1 > M3 > Y	-.03	.01	[-.069; -.001]

X > M2 > M3 > Y	.004	.005	[-.002; .017]
X > M1 > M2 > M3 > Y	.006	.005	[-.002; .018]
Total indirect effect	-.17	.07	[-.343; -.036]

Avoidant motivations

Indirect effects	<i>b</i>	<i>SE</i>	<i>95% CI</i>
X > M1 > Y	.43	.06	[.306; .578]
X > M2 > Y	.03	.02	[.0007; .079]
X > M3 > Y	.01	.02	[-.034; .082]
X > M1 > M2 > Y	.04	.02	[.011; .090]
X > M1 > M3 > Y	.004	.007	[-.009; .022]
X > M2 > M3 > Y	-.0007	.001	[-.004; .001]
X > M1 > M2 > M3 > Y	-.001	.002	[-.006; .002]
Total indirect effect	.53	.07	[.393; .693]

Note. X = rejection condition (1 = rejection, 0 = acceptance), M1 = pre-aggression negative affect, M2 = symbolic aggression (raw score), M3 = post-aggression positive affect.

Supplementary Table 19

Estimates from Post-Hoc Monte Carlo Power Analysis for Serial Mediation Models with Vengeful Motivations as Outcome, Study 3

	X	M1	M2	Y	Power (N = 323)
X	-				X > M1 > Y = 1.00
M1	.52	-			X > M2 > Y = 0.96
M2	.39	.44	-		X > M1 > M2 > Y = 1.00
Y	.16	.42	.41	-	
<i>SD</i>	.50	1.32	.35	.88	

Note. X = Provocation (1 = yes, 0 = no); M1 = Pre-aggression negative affect; M2 = Aggression (log transformed); Y = Vengeful motivations

	X	M1	M3	Y	Power (N = 323)
X	-				X > M1 > Y = 1.00
M1	.52	-			X > M3 > Y = 0.53
M3	-.27	-.31	-		X > M1 > M3 > Y = 0.81
Y	.16	.42	.02	-	
<i>SD</i>	.50	1.32	1.20	.88	

Note. X = Provocation (1 = yes, 0 = no); M1 = Pre-aggression negative affect; M3 = Post-aggression positive affect; Y = Vengeful motivations

	X	M2	M3	Y	Power (N = 323)
X	-				X > M2 > Y = 1.00
M2	.39	-			X > M3 > Y = 0.10
M3	-.27	-.04	-		X > M2 > M3 > Y = 0.02
Y	.16	.41	.02	-	
<i>SD</i>	.50	.35	1.20	.88	

Note. X = Provocation (1 = yes, 0 = no); M2 = Aggression (log transformed); M3 = Post-aggression positive affect; Y = Vengeful motivations

Supplementary Table 20

Estimates from Post-Hoc Monte Carlo Power Analysis for Serial Mediation Models with Benevolent Motivations as Outcome, Study 3

	X	M1	M2	Y	Power (N = 323)
X	-				X > M1 > Y = 0.96
M1	.52	-			X > M2 > Y = 0.51
M2	.39	.44	-		X > M1 > M2 > Y = 0.53
Y	-.12	-.27	-.21	-	
SD	.50	1.32	.35	.90	

Note. X = Provocation (1 = yes, 0 = no); M1 = Pre-aggression negative affect; M2 = Aggression (log transformed); Y = Benevolent motivations

	X	M1	M3	Y	Power (N = 323)
X	-				X > M1 > Y = 0.99
M1	.52	-			X > M3 > Y = 0.03
M3	-.27	-.31	-		X > M1 > M3 > Y = 0.06
Y	.12	-.27	.10	-	
SD	.50	1.32	1.20	.90	

Note. X = Provocation (1 = yes, 0 = no); M1 = Pre-aggression negative affect; M3 = Post-aggression positive affect; Y = Benevolent motivations

	X	M2	M3	Y	Power (N = 323)
X	-				X > M2 > Y = 0.91
M2	.39	-			X > M3 > Y = 0.34
M3	-.27	-.04	-		X > M2 > M3 > Y = 0.06
Y	-.12	-.21	.10	-	
SD	.50	.35	1.20	.90	

Note. X = Provocation (1 = yes, 0 = no); M2 = Aggression (log transformed); M3 = Post-aggression positive affect; Y = Benevolent motivations

Supplementary Table 21

Estimates from Post-Hoc Monte Carlo Power Analysis for Serial Mediation Models with Avoidant Motivations as Outcome, Study 3

	X	M1	M2	Y	Power (N = 323)
X	-				X > M1 > Y = 1.00
M1	.52	-			X > M2 > Y = 0.47
M2	.39	.44	-		X > M1 > M2 > Y = 0.49
Y	.29	.54	.32	-	
SD	.50	1.32	.35	1.13	

Note. X = Provocation (1 = yes, 0 = no); M1 = Pre-aggression negative affect; M2 = Aggression (log transformed); Y = Avoidant motivations

	X	M1	M3	Y	Power (N = 323)
X	-				X > M1 > Y = 1.00
M1	.52	-			X > M3 > Y = 0.16
M3	-.27	-.31	-		X > M1 > M3 > Y = 0.26
Y	.29	.54	-.23	-	
SD	.50	1.32	1.20	1.13	

Note. X = Provocation (1 = yes, 0 = no); M1 = Pre-aggression negative affect; M3 = Post-aggression positive affect; Y = Avoidant motivations

	X	M2	M3	Y	Power (N = 323)
X	-				X > M2 > Y = 1.00
M2	.39	-			X > M3 > Y = 0.91
M3	-.27	-.04	-		X > M2 > M3 > Y = 0.22
Y	.29	.32	-.23	-	
SD	.50	.35	1.20	1.13	

Note. X = Provocation (1 = yes, 0 = no); M2 = Aggression (log transformed); M3 = Post-aggression positive affect; Y = Avoidant motivations

Supplementary Table 22*Descriptive Statistics for Key Variables of Study 3, by Condition*

Variable	Negative social feedback condition		Positive social feedback condition		Provoked > Unprovoked	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>d</i>	<i>95% CI</i>
Pre-aggression positive affect	2.07	1.05	3.87	1.05	1.05	[-2.03; -1.56]
Pre-aggression negative affect	3.28	1.21	1.89	1.03	1.13	[1.14; 1.64]
Aggression (raw score)	4.34	3.49	1.59	1.86	2.80	[2.13; 3.36]
Aggression (log transformed)	.59	.36	.31	.28	0.86	[.208; .352]
Post-aggression positive affect	2.85	1.16	3.51	1.17	1.16	[-.916; -.406]
Post-aggression negative affect	2.61	1.08	1.60	.83	0.96	[.795; 1.21]
Vengeful motivations	2.09	.93	1.80	.80	0.87	[.094; .475]
Benevolent motivations	3.16	0.89	3.38	0.91	0.90	[-.416; -.021]
Avoidant motivations	3.08	1.02	2.41	1.15	1.08	[.426; .902]

Supplementary Table 23*Descriptive Statistics for Key Variables From Study 3, by Gender*

Variable	Male		Female		Male > Female	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>d</i>	<i>95% CI</i>
Pre-aggression positive affect	2.91	1.31	3.02	1.44	0.07	[-.417; .192]
Pre-aggression negative affect	2.60	1.31	2.51	1.32	0.06	[-.194; .384]
Aggression (raw score)	3.06	3.18	2.84	3.06	0.07	[-.461; .912]
Aggression (log transformed)	.47	.35	.43	.36	0.11	[-.047; .110]
Post-aggression positive affect	3.27	1.10	3.10	1.27	0.14	[-.091; .434]
Post-aggression negative affect	2.12	1.07	2.05	1.06	0.06	[-.171; .298]
Vengeful motivations	2.05	.96	1.80	.73	0.29	[.058; .437]
Benevolent motivations	3.22	.88	3.29	.92	0.07	[-.269; .129]
Avoidant motivations	2.77	1.10	2.68	1.15	0.07	[-.165; .332]

Supplementary Table 24

*Descriptive Statistics for Positive and Negative Affect Assessed Before and After Aggression
From Study 3, by Condition*

Condition	Pre/Post	Affect	<i>M</i>	<i>SE</i>	<i>95%CI</i>
Negative social feedback	Pre-Aggression	Positive	2.07	.08	[1.91; 2.24]
		Negative	3.27	.09	[3.10; 3.45]
	Post-Aggression	Positive	3.27	.09	[3.10; 3.45]
		Negative	2.61	.07	[2.46; 2.76]
Positive social feedback	Pre-Aggression	Positive	3.87	.08	[3.70; 4.03]
		Negative	1.90	.09	[1.72; 2.07]
	Post-Aggression	Positive	3.49	.09	[3.30; 3.67]
		Negative	1.61	.07	[1.46; 1.76]

Supplementary Table 25*Summary of Indirect Effects with Log-Transformed Aggression Measure, Study 3*

Vengeful motivations			
Indirect effects	<i>b</i>	<i>SE</i>	<i>95% CI</i>
X > M1 > Y	.36	.07	[.238; .519]
X > M2 > Y	.11	.03	[.044; .199]
X > M3 > Y	-.04	.02	[-.095; -.003]
X > M1 > M2 > Y	.08	.02	[.043; .138]
X > M1 > M3 > Y	-.03	.01	[-.071; -.003]
X > M2 > M3 > Y	.007	.005	[.0002; .020]
X > M1 > M2 > M3 > Y	.005	.004	[.0002; .015]
Total indirect effect	.50	.08	[.355; .667]
Benevolent motivations			
Indirect effects	<i>b</i>	<i>SE</i>	<i>95% CI</i>
X > M1 > Y	-.22	.07	[-.371; -.089]
X > M2 > Y	-.05	.02	[-.111; -.0007]
X > M3 > Y	-.01	.02	[-.067; .025]
X > M1 > M2 > Y	-.03	.02	[-.082; -.0006]
X > M1 > M3 > Y	-.01	.01	[-.046; .021]

X > M2 > M3 > Y	.002	.004	[-.005; .011]
X > M1 > M2 > M3 > Y	.001	.003	[-.003; .009]
Total indirect effect	-.33	.07	[-.484; -.188]

Avoidant motivations

Indirect effects	<i>b</i>	<i>SE</i>	<i>95% CI</i>
X > M1 > Y	.56	.08	[.398; .739]
X > M2 > Y	.05	.03	[.003; .129]
X > M3 > Y	.04	.02	[-.002; .102]
X > M1 > M2 > Y	.04	.02	[.003; .095]
X > M1 > M3 > Y	.03	.02	[-.001; .072]
X > M2 > M3 > Y	-.006	.019	[-.019; .0006]
X > M1 > M2 > M3 > Y	-.005	.005	[-.015; .0005]
Total indirect effect	.72	.004	[.551; .902]

Note. X = feedback condition (1 = negative social feedback, 0 = positive social feedback), M1 = pre-aggression negative affect, M2 = aggression (log transformed), M3 = post-aggression positive affect.

Supplementary Table 26*Summary of Indirect Effects with Raw Score Aggression Measure, Study 3*

Vengeful motivations			
Indirect effects	<i>b</i>	<i>SE</i>	<i>95% CI</i>
X > M1 > Y	.36	.07	[.227; .509]
X > M2 > Y	.14	.04	[.064; .233]
X > M3 > Y	-.04	.02	[-.098; -.002]
X > M1 > M2 > Y	.08	.02	[.042; .149]
X > M1 > M3 > Y	-.03	.01	[-.070; -.002]
X > M2 > M3 > Y	.01	.007	[.0004; .028]
X > M1 > M2 > M3 > Y	.006	.004	[.0002; .017]
Total indirect effect	.53	.08	[.377; .704]
Benevolent motivations			
Indirect effects	<i>b</i>	<i>SE</i>	<i>95% CI</i>
X > M1 > Y	-.19	.07	[-.338; -.062]
X > M2 > Y	-.09	.03	[-.179; -.034]
X > M3 > Y	-.02	.02	[-.078; .022]
X > M1 > M2 > Y	-.06	.02	[-.114; -.022]
X > M1 > M3 > Y	-.01	.01	[-.053; .017]

X > M2 > M3 > Y	.005	.006	[-.006; .019]
X > M1 > M2 > M3 > Y	.003	.004	[-.003; .013]
Total indirect effect	-.38	.07	[-.542; -.237]

Avoidant motivations

Indirect effects	<i>b</i>	<i>SE</i>	<i>95% CI</i>
X > M1 > Y	.55	.08	[.391; .736]
X > M2 > Y	.07	.03	[.011; .159]
X > M3 > Y	.04	.02	[.0001; .114]
X > M1 > M2 > Y	.04	.02	[.008; .101]
X > M1 > M3 > Y	.03	.02	[.0001; .077]
X > M2 > M3 > Y	-.01	.007	[-.029; .0001]
X > M1 > M2 > M3 > Y	-.007	.005	[-.019; .0001]
Total indirect effect	.74	.09	[.574; .928]

Note. X = feedback condition (1 = negative social feedback, 0 = positive social feedback), M1 = pre-aggression negative affect, M2 = aggression (raw score), M3 = post-aggression positive affect.