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**Anger Rumination and Effortful Control: Mediation Effects on Reactive but not Proactive
Aggression**

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Abstract

Anger rumination and self-regulation deficits have been previously identified as risk factors for aggression. We hypothesized that anger rumination would relate to reactive but not proactive aggression, and that this association would be mediated by lower levels of trait self-regulation. Undergraduate students ($N = 359$) completed self-report measures of anger rumination, effortful control, and aggression. Mediation was tested using PROCESS (Hayes, 2012). After controlling for proactive aggression, anger rumination was associated with reactive aggression, and this relationship was partially mediated by effortful control. Anger rumination was also uniquely related to proactive aggression, but without mediation by effortful control. Gender did not moderate these relationships. Effortful control may be a viable treatment target for reactive aggression, whereas addressing anger rumination may help reduce both reactive and proactive aggression.

Key words: anger, rumination, self-regulation, effortful control, aggression, reactive, proactive

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1. Introduction

Anger rumination and self-regulation deficits have been independently identified as risk factors for aggression (e.g., DeWall, Baumeister, Stillman, & Gailliot, 2007). Anger rumination refers to the unintentional tendency to dwell on and mentally rehearse one's angry moods and experiences, as well as their causes and consequences (Sukhodolsky, Golub, & Cromwell, 2001). In contrast to sadness rumination, anger rumination has been demonstrated to uniquely predict relational and overt forms of aggression in young adults, beyond effects of anger itself (Peled & Moretti, 2010).

Self-regulation broadly refers to the capacity to modulate emotion, cognition, and behavior in the service of goals (Karoly, 1993). It has been conceptualized as both a temperament-based trait (e.g., Rothbart & Bates, 2006) and a limited-capacity resource that can be depleted by taxing tasks (e.g., DeWall et al., 2007). In recent years, a variety of studies have linked both state and trait self-regulation deficits with aggression (e.g., Ellis, Rothbart, & Posner, 2004; DeWall et al., 2007). One useful framework for studying self-regulation is effortful control, which reflects the efficiency of executive functions, including the ability to shift and focus attention, inhibit dominant responses, and activate behavior even when intrinsic motivation is lacking (Rothbart & Bates, 2006). Effortful control shows substantial development from toddlerhood and becomes increasingly stable across situations and time (Rothbart, 2007).

Anger rumination may lead to increases in aggression by interfering with or depleting self-regulation capacity. Whitmer and Banich (2010) found that those who ruminate on anger experience executive function difficulties, including switching attention from ruminative

thoughts to a new mental set, and inhibiting irrelevant long-term memories. Denson (2009) proposed that trying to manage the aversive, intrusive mental processes involved in anger rumination depletes capacity-limited self-regulation resources, increasing aggression risk.

Based on this work, we propose that recurrent anger rumination tendencies result in persistently compromised effortful control, leaving one more chronically at risk for aggression, particularly reactive aggression. Reactive aggression is an anger-driven, retaliatory response to perceived provocation or threat. In contrast, proactive aggression refers to “coldblooded” instrumental offensive behavior. In youth, reactive aggression is often associated with internalizing symptoms and self-regulatory deficits including lower effortful control, whereas proactive aggression is associated with normal to high levels of effortful control, positive outcome expectancies for aggression, and affiliation with deviant peers (Card & Little, 2006; Rathert, Fite, Gaertner, & Vitulano, 2011; White, Jarrett, & Ollendick, 2013).

There are few studies on effortful control and reactive versus proactive aggression in adults. However, experimental evidence suggests that self-control training (e.g., using one’s non-dominant hand for everyday tasks) reduces aggressive responding to provocation (Finkel, DeWall, Slotter, Oaten, & Foshee, 2009). Further, individuals who receive self-control training report less anger than do controls (Denson, Capper, Oaten, Friese, & Schofield, 2011).

Wilkowski and Robinson (2008, 2010) proposed that effortful control might ameliorate anger and reactive aggression in those prone to anger rumination by interrupting the rumination, enabling non-hostile re-appraisal of situations and suppression of aggression. Similarly, Dewall, Finkel, and Denson (2011) argued that self-control failures are primarily involved in reactive aggression. These perspectives suggest that excessive rumination leads to reactive rather than proactive aggression, and that this relationship may be mediated by poorer effortful control.

To our knowledge, this question has not been explored via simultaneous consideration of reactive and proactive aggression.

We sought to test this theoretical model in young adults, hypothesizing that individual differences in anger rumination tendencies would relate to reactive but not proactive aggression, and this association would be mediated by reduced trait effortful control. Although prior research suggests that males are higher in some forms of aggression than females (e.g., Bailey & Ostrov, 2008), gender has not been well-investigated as a possible moderator of associations between rumination, effortful control, and aggression. Thus a secondary goal was to consider gender differences in anger rumination, self-regulation, and aggression subtypes, and the potential moderating role of gender in their associations.

2. Method

2.1 Participants

We recruited an undergraduate, mixed-gender sample ($N = 359$; 72.4% female) at a public southeastern U.S. university ranging in age from 18 to 23 years ($M = 19.13$, $SD = 1.21$). The sample was 84.7% White, 10.3% Asian, and 5% from other minority groups

2.2 Measures

2.2.1 Anger rumination

Anger Rumination Scale (ARS; Sukhodolsky et al., 2001). A 19-item self-report questionnaire examining the degree to which individuals tend to focus on angry mood, the ARS has good internal consistency, test-retest reliability, and convergent validity (Maxwell, Sukhodolsky, Chow, & Wong, 2005; Sukhodolsky et al. 2001). Item responses are made on a 4-point Likert scale. The total Anger Rumination score was used in the present study (Cronbach's $\alpha = .94$).

2.2.2 Effortful control

Adult Temperament Questionnaire (ATQ; Rothbart, Ahadi, & Evans, 2000; Evans & Rothbart, 2009). A 177-item instrument with items rated on a 7-point scale, the ATQ contains four principal scales: negative affect, extraversion, effortful control, and orienting sensitivity. For the purposes of this study, the Effortful Control (EC) scale was used as a measure of self-regulation. The 35-item EC scale assesses attentional, inhibitory, and activation control, and has demonstrated convergent and discriminant validity for undergraduate samples (Evans & Rothbart, 2007, 2009). In the present study, $\alpha = .89$ for the EC scale.

2.2.3 Reactive and proactive aggression

Reactive Proactive Aggression Questionnaire (RPQ; Raine, Dodge, Loeber, Gatzke-Kopp, Lynam, Reynolds et al., 2006). The RPQ is a 23-item measure that asks participants to rate each question in terms of frequency on a 3-point scale, with 12 items indexing proactive aggression (e.g., “Had fights with others to show who was on top”), and 11 items on reactive aggression (e.g., “Reacted angrily when provoked by others”). The two scales have demonstrated validity in adolescent and undergraduate student samples (Raine et al., 2006). The RA and PA scales tend to be moderately correlated (Miller & Lynam, 2006), consistent with similar measures. In the present study, both Reactive ($\alpha = .82$) and Proactive ($\alpha = .86$) scales were used.

2.3 Procedure

The study was approved by the university institutional review board and participants gave consent prior to participation. All measures were completed as part of a larger, confidential online survey for which participants earned extra credit in their Psychology classes and a chance to enter a raffle drawing for nominal cash prizes.

2.4 Data Analyses

Zero-order correlations were examined first. To test the prediction that effortful control mediates the relationship between anger rumination and reactive aggression, hierarchical regression analyses of total effect (c), direct effect (c'), and bootstrapped bias-corrected 95% confidence intervals of the indirect effect (ab) were computed using the PROCESS macro in SPSS (Hayes, 2012) with 5000 bootstrapped samples following Preacher and Hayes (2008). Confidence intervals that do not contain zero indicate a significant indirect effect (mediation). Continuous predictors were mean-centered prior to analysis. In addition to gender, proactive aggression was included as a covariate to evaluate the unique association of reactive aggression, and vice versa, and a gender-by-anger rumination term was added to test for moderation by gender.¹

3. Results

Sample descriptive statistics and zero-order correlations are presented in Table 1. Males reported higher proactive aggression than females, and effortful control was higher for older than younger students. Neither age nor gender was associated with anger rumination. However, anger rumination was positively associated with both reactive and proactive aggression, and inversely associated with effortful control.

Gender did not moderate the relationships between effortful control, anger rumination, and aggression for either proactive or reactive subtypes, and omitting gender from the models did not change the general pattern of results, thus we present analyses excluding gender (using PROCESS model 4, basic mediation). As illustrated in Figure 1, after controlling for proactive aggression, anger rumination was associated with reactive aggression, and this relationship was

¹ We followed a standard approach of covarying proactive aggression to test for unique associations with reactive aggression and vice versa, and otherwise adhered to recommendations of Simmons, Nelson, & Simonsohn (2011) in collecting and analyzing data.

partially mediated by effortful control. Anger rumination also was associated with proactive aggression after controlling for reactive aggression; however, this association was not mediated by effortful control.

4. Discussion

The association between anger rumination tendencies and reactive aggression was partially mediated by lower trait effortful control, whereas proactive aggression was not associated with effortful control, and mediation was not observed for proactive aggression. This observation extends prior research on state-dependent rumination and self-control (e.g., Denson, 2009), suggesting the mediational pattern also applies across general rumination-aggression tendencies and contexts. Moreover, our findings are consistent with theoretical conceptualizations of unique relations among effortful control, rumination, and reactive aggression (e.g., Wilkowski & Robinson, 2008).

Unexpectedly, anger rumination was also uniquely associated with proactive aggression. This observation may correspond to previous work showing anger predicts bullying (Espelage, Bosworth, and Simon, 2001), a type of proactive aggression characterized by more interpersonal hostility than instrumental proactive aggression (Coie, Dodge, Terry, & Wright, 1991).

Proactive aggression was higher in males than females, consistent with prior research (Bailey & Ostrov, 2008); however, no gender difference was observed in reactive aggression. As previously demonstrated in U.S. samples, rumination was consistent between men and women (Rusting & Nolen-Hoeksema, 1998; Sukhodolsky et al., 2001), possibly in contrast to other cultures (e.g., Maxwell et al., 2005). The observed patterns of relationships between anger rumination, effortful control, and aggression were not moderated by gender, suggesting that by adulthood they are consistent across males and females. Effortful control correlated with age,

suggesting it continues to develop in early adulthood, consistent with studies of executive network maturation (Rothbart & Rueda, 2005).

There are some noteworthy limitations of the present study. First, data were collected concurrently, limiting causal inferences, and retrospective self-report measures are vulnerable to biases. Replication is required with longitudinal designs and other types of measures (e.g., behavioral observation of aggression). Second, observed mediation by effortful control was limited in magnitude, and its importance may vary by context. Third, future studies should distinguish the extent to which rumination depletes one's *capacity* to self-regulate (e.g., Denson, 2009) versus one's motivation to do so (Inzlicht & Schmeichel, 2012). Finally, anger rumination may be uniquely related to specific types of proactive aggression.

Although tentative, our findings have potential implications for intervention efforts based on functional subtypes of aggression. Specifically, effortful control may be a viable treatment target for reactive but not proactive aggression in adults. Further research must determine whether effortful control capacity in adults can be modified via existing or novel self-regulation training approaches (e.g., attention network training, Rothbart & Rueda, 2005; self-control exercises, Denson, Capper et al., 2011; aggression replacement training, Goldstein & Glick, 1987). In contrast, interventions specifically targeting anger rumination (e.g., distraction) might help reduce both reactive and proactive aggression.

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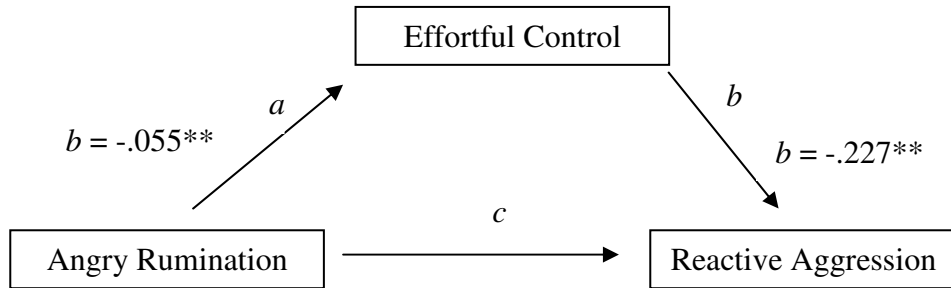
Table 1*Zero-order Correlations among Study Variables*

	Mean	SD	1	2	3	4	5	6
1. Gender	.28	.49	-					
2. Age in Years	19.13	1.21	-.09	-				
3. Angry Rumination	1.74	.52	.04	.09	-			
4. Effortful Control	4.34	.70	.04	.11*	.31**	-		
5. Reactive Aggression	6.65	3.66	.06	.09	.53**	-.32**	-	
6. Proactive Aggression	1.60	2.66	.19**	.00	.35**	-.21**	.50**	-

Note. Gender was coded female = 0, male = 1. * $p < .05$, ** $p < .01$.

Figure 1

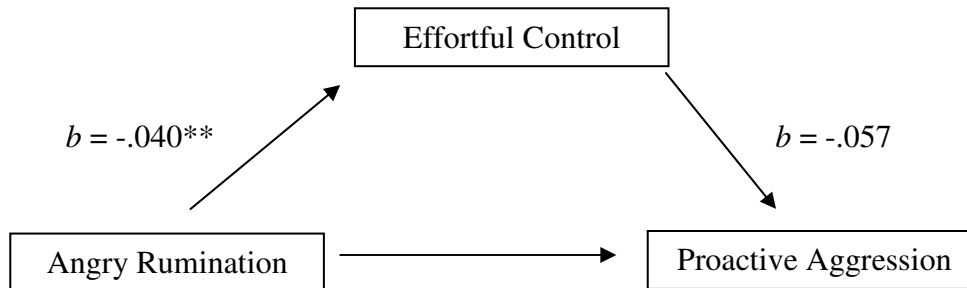
Mediation of angry rumination and aggression subtypes by effortful control.



Total effect (*c*): $b = .148$, $SE = .016$, $p < .001$

Direct effect (*c'*): $b = .136$, $SE = .017$, $p < .001$

Indirect effect (*ab*): $b = .013$, $Boot SE = .005$, $CI_{95\%} = .004$ to $.024$, $pr_{ab} = .039$



Total effect (*c*): $b = .033$, $SE = .014$, $p < .05$

Direct effect (*c'*): $b = .031$, $SE = .015$, $p < .05$

Indirect effect (*ab*): $b = .002$, $Boot SE = .002$, $CI_{95\%} = -.001$ to $.007$, $pr_{ab} = .010$

Note. $*p < .05$, $**p < .01$.