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The Relation Between Anger Rumination, Provocation, and Aggressive Behavior

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THE RELATION BETWEEN ANGER RUMINATION, PROVOCATION, AND AGGRESSIVE BEHAVIOR

by

Joshua Stephen Bullock

A Dissertation
Submitted to the Graduate School
of The University of Southern Mississippi
in Partial Fulfillment of the Requirements
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ABSTRACT

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Maladaptive, excessive anger rumination, conceptualized as self-focused attention towards thoughts and feelings associated with the emotion of anger, has been linked to actual aggressive behaviors. In general, the emotional experience of anger in response to provocation is a well-known antecedent of aggression. Anger rumination may be associated with increased risk for aggressive behavior by maintaining and lengthening the experience of anger. It is therefore reasonable to posit that individuals high in anger rumination may be more inclined to expend greater effort to aggress in response to provocation compared to low ruminators. That is, high ruminators when angered may be more likely to perseverate at an effortful task required to gain access to an aggressive response compared to low-ruminators. Accordingly, the aim of this study was to test the notion that anger rumination is positively associated with a propensity to expend greater effort to aggress in response to provocation. Men and women (N = 123) participants interacted with an increasingly provocative fictitious opponent during a competitive reaction time game during which electric shock was administered and received. Aggressive behavior was defined in two ways: The mean level of shock selected and the total number of supposedly harmful shocks selected. Participants were assigned to one of two effort conditions. Specifically, half were be assigned to a low-effort condition in which all shock levels required minimal and equal effort to access. The other half were

assigned to a high-effort condition in which access to relatively greater levels of aggressive responding required engaging in an increasingly effortful task (i.e., a series of greater and greater button-presses to access respectively more intense shock levels). Before the task, anger rumination was elicited by having the "opponent" denigrate the participant through the use of false feedback on an ostensible measure of intelligence. After the task, dispositional anger rumination and trait anger were assessed using self-report measures. It was hypothesized that: requiring effortful responding would decrease aggressive behavior overall; anger rumination (controlling for trait anger) would be uniquely associated with aggressive behavior following provocation in the high-effort condition due to the continued activation of aggression-maintaining affect and cognitions (that is, participants high in trait rumination would be more motivated to respond aggressively when provoked and expend greater effort to aggress); and trait anger would be associated with aggression primarily in the low-effort condition controlling for anger rumination. Only hypothesis 1 was fully supported: requiring significant effort in order to aggress decreased the mean shock selected even at high levels of provocation, trait anger, and anger rumination. Anger rumination was found to be predictive of aggression; however no relationship emerged with effort condition. Trait anger was not significantly predictive of aggressive behavior. The lack of support for hypotheses 2 and 3 suggests that the aggression-dampening effects of the high-effort condition may override the aggression-promoting qualities of anger rumination. Future research could apply this finding to other moderating variables (such as impulsive aggression vs. instrumental aggression) to determine if the effects generalize to those groups. A future study could

also explore what aspects of the effort manipulation are responsible for the decreases in aggression noted in this study.

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CHAPTER I

INTRODUCTION

Rumination is a complex behavior that has been shown to influence numerous psychological phenomena (e.g., executive functioning, depression, aggression, and social anxiety). Although aggression has been experimentally linked to anger rumination (e.g., Borders, Barnwell & Earleywine, 2007; Vasquez, Bartsch, Pedersen, & Miller, 2007) the processes responsible are not known. One possible explanation for this relationship is the perseverative, anger-maintaining nature of ruminative thought. The goal of this study is to examine the relationship between anger rumination, provocation, and the motivation to engage in aggressive behavior using a modified version of a well-validated laboratory measure of aggression: the Taylor Aggression Paradigm (Taylor, 1967). In this paper, a brief review of emotions and anger will be discussed. Next, rumination and its correlates, as well as aggression and provocation, will be described. This will lead to an examination of the impact of rumination on aggression followed by the rationale for this study.

Background

Angry Emotions

A number of different definitions for emotion as well as theoretical models for the genesis of specific emotions have been proposed. The Cognitive-Motivational-Relational theory (Lazarus, 1991), for example, holds that emotions have "a clear, personally significant, relational content, an appraisal of personal harm, threat, challenge, or benefit, the potential for action readiness, and physiological changes" (Lazarus, 1991 p. 820). Thus, if an individual perceives a situation as harmful or threatening, and also

experiences a sense of physiological arousal, the resulting emotional response will be expressed as anger.

In his neo-associationist model of anger, Berkowitz (1990) also identifies the importance of cognition in the activation of anger; however, this theory puts greater emphasis on the importance of negative affect. In Berkowitz's model, negative affect primes anger or aggression related memories and ideas, leading to angry or aggressive responding. This contrasts with Lazarus' theory of emotion, in that the complex thoughts and attributions thought to lead to anger are not initially present in anger-provoking situations. Instead, a more automatic associative process between a network of thoughts and feelings related to anger, aggression, and negative affect leads to an angry reaction. Only after this initial response do higher cognitive processes become influential.

In order to support his theory, Berkowitz reviews research in which women were put into physically uncomfortable positions and asked to rate attitudes toward their mothers, significant others, and acquaintances (Monteith, Berkowitz, Kruglanski, & Blair, 1990). There was a significant effect of the discomfort manipulation, which resulted in increased negative affect, on participants' self-reported anger and irritation. Effects on the attitudes they espoused about their significant others and acquaintances were also noted. Participants who experienced greater discomfort reported more anger and irritation in general and reported more specific anger toward significant others and acquaintances, although not toward their mothers. This finding lends credence to the idea that negative affect alone is capable of priming anger. This idea is important in understanding the role ruminative thought plays in maintaining anger and aggression.

Rumination

There is a body of research suggesting that persistent negative affect can ultimately promote negative outcomes such as aggression or depression (Bushman, Bonachi, Pedersen, Vasquez, & Miller, 2005; Watkins & Baracaia, 2001). Rumination is thought to play a central role in the relationship between emotions and behaviors by maintaining the activation of negative emotions after they typically would have dissipated. Rumination has been defined as "…self-focused attention towards one's own thoughts and feelings" (Bushman et al., 2005 p. 970). Rumination has been hypothesized to function as a coping or problem-solving mechanism, although not an effective one (Watkins & Moulds, 2005). This is because rumination tends to be more abstract than concrete. This means that the content of ruminative thought deals more with nonspecific, global themes and ideas. In contrast, non-ruminative problem solving is geared to specific problems and situations. For example, after receiving a poor grade, a ruminator might think, "I'm a failure academically;" whereas a non-ruminator might think, "I've done poorly on this one test." Thus, because of its failure to concretely address specific problems, ruminative thought is not an effective means of problem solving.

Some individuals are more likely than others to engage in rumination instead of more effective coping behaviors (Collins & Bell, 1997). Thus the tendency to ruminate has been conceptualized as trait-like in nature and existing along a continuum. High-rumination individuals are more apt to introspect on thoughts and feelings associated with anger or sadness and low-rumination individuals are more apt to allow these emotions to dissipate (Collins & Bell, 1997).

Research has implicated rumination as playing a role in such diverse phenomena as maladaptive romantic jealousy (Carson & Cupach, 2000), depression (Crane, Barnhofer, & Williams, 2007; Nolen-Hoeksema, McBride, & Larson, 1997; Nolen-Hoeksema, & Morrow, 1991; Rusting & Nolen-Hoeksema, 1998), displaced aggression (Bushman et al., 2005), and athlete aggression (Maxwell, 2004). The largest body of research has focused on rumination on depressive thoughts and rumination on anger. Although these two types of rumination both involve self-focused, repetitive thought, there are indications that anger rumination and depressive rumination exist as separate constructs with distinct negative consequences (Peled & Moretti, 2007). In both cases, however, ruminative thought can lead to the deepening of either anger or depression largely because of its circular nature. In anger rumination, for example, the original trigger of the angry mood is rehearsed repeatedly, fueling the angry mood leading to further rumination (Rusting & Nolen-Hoeksema, 1998). That is, because negative affect provokes rumination and rumination maintains negative affect, ruminative thought has a tendency to perpetuate itself.

Factors Affecting Rumination

Many circumstantial and demographic factors can provoke or inhibit ruminative thought. In high-rumination individuals, rumination typically occurs in response to an event or situation that promotes negative affect, especially those situations that involve important, blocked goals (Borders, Barnwell, & Earleywine, 2007). Blocked goals can be related to both external events (e.g., ruminating on specific blocked goals or problems) and internal events (e.g., self-criticism or feelings of worthlessness; Watkins & Moulds, 2005).

Some gender differences have been observed in rumination. In the case of anger rumination, men have been shown to ruminate more about an anger provoking stimulus if they are told they will be able to retaliate against the source of that provocation (Knoblock-Westerwick & Alter, 2006). Women, conversely, may engage in activities to dissipate their anger when told that they would be able to retaliate in the future (Knoblock-Westerwick & Alter, 2006). It has been theorized that, because men are culturally expected to aggress against their provokers, they ruminate to maintain angry feelings until the opportunity to aggress arises. Women, in contrast, are expected not to aggress in response to provocation, and thus dissipate to avoid having to do so. In contrast, rumination on depressive thoughts and triggers appears to be more common and intense in women than it is in men (Rusting & Nolen-Hoeksema, 1998).

Factors that decrease, dissipate, or resolve ruminative thought include distraction (Rusting & Nolen-Hoeksema, 1998), and reframing (i.e., viewing the rumination-promoting situation from a different perspective; Ray, Wilhelm, & Gross 2008). In support of the notion that distraction and reframing dissipate rumination, laboratory research has suggested that an expressive writing paradigm is effective at dissipating the negative effects of rumination (Sloan, Marx, Epstein, & Dobbs, 2008). Ironically, attempting to actively suppress thoughts of anger or sadness actually increases rumination on these thoughts (Miller, Pederson, Earleywine, & Pollock, 2003).

Why Ruminate?

Some research has been conducted on the reasons individuals ruminate. Watkins and Baracaia (2001) explored the reasons for rumination in dysphoric ruminators using both qualitative and quantitative methods. Tendency to ruminate was positively

correlated with tendency to identify positive benefits to ruminative thought. The most commonly cited perceived positive benefits involved using ruminative thoughts to better understand one's problems or situation. In open-ended interviews and measures, even high ruminators identified negative aspects of rumination as well as positive, indicating some ambivalence toward ruminative thoughts.

A similar study of metacognition related to ruminative thought found that angry ruminators often held a combination of both positive and negative beliefs about their own rumination (Simpson & Papageorgiou, 2003). Common negative beliefs among trait ruminators about anger rumination focus on concerns that ruminative thoughts prolonged anger, whereas positive beliefs included hopes that their ruminative thoughts would prepare them for future conflict or provide some form of emotional release (Simpson & Papageorgiou, 2003).

Eliciting and Measuring Rumination

In non-ruminators, angry feelings have been shown to typically dissipate approximately 10 minutes after the occurrence of an anger-provoking event in the laboratory (Denson, Miller, & Pederson, 2006). However, these feelings can be prolonged even in non-ruminators. A number of procedures have been designed to elicit rumination in laboratory studies. One common method of inducing rumination in research participants is to ask them to write about or think about specific anger or sadness eliciting situations (Bushman et al., 2005; Ray, Wilhelm, & Gross, 2008).

Several different scales have been developed to measure rumination. These scales are typically self-report measures of ruminative cognition. The Ruminative Response Scale (RRS) and the Rumination on Sadness Scale (RSS) are commonly used measures

of depressive rumination (Roelofs, Muris, Huibers, Peeters, & Arntz, 2006). Both scales were shown to have very good internal consistency and moderate test-retest stability. Evidence of construct validity was established for both scales through modest significant correlations between rumination scores and scores on measures of negative affect.

Anger rumination can be measured using the rumination subscale of the Displaced Aggression Questionnaire (DAQ; Denson, Pedersen, & Miller, 2006). This questionnaire has been shown to distinguish between rumination in general and anger-specific rumination (Denson, Pedersen, & Miller, 2006). The DAQ has also been shown to have high levels of internal consistency (α = .95) and test-retest stability. The DAQ was validated by correlating it with other measures aggression and rumination as well as through experimental studies in displaced aggression (Denson, Miller, & Pederson, 2006).

The Dissipation-Rumination scale (Caprara, 1986) is a 20-item measure of anger rumination. It is an adequately reliable measure of rumination, and has been shown to predict aggressive behavior in a laboratory setting. A similar measure is the Anger Rumination Scale (ARS; Sukhodolsky, Golub & Cromwell, 2001), which is a 19-item measure of rumination on anger. The scale focuses on a general pattern of ruminative cognition rather than rumination on a specific anger-provoking event. The ARS has adequate internal consistency and test-retest consistency (Sukhodolsky et al., 2001). Its validity was demonstrated through correlations with measures of related characteristics (e.g., trait anger, negative affectivity). In sum, a variety of well-validated measures exist to examine both dysphoric and anger rumination.

The Relationship of Rumination to Anxiety and Depression

Depressive rumination has been found to lead to longer-lasting and more serious depressive symptoms (Crane, Barnhofer, & Williams, 2007). In a study examining the emotional effects of a natural disaster, individuals who ruminated to cope with depressive symptoms were more likely to remain depressed both several days and several weeks after the earthquake (Nolen-Hoeksema, & Morrow, 1991). In another study, rumination directly preceding and during the death of a loved one was associated with poorer adjustment and longer lasting bereavement (Nolen-Hoeksema, McBride, & Larson (1997).

Rumination and worry are "closely allied cognitive processes" (Hong, 2007, p. 286), but appear to differ in specific and important ways. A common conceptualization of the difference between the two constructs depicts rumination as a persistent focus on past events whereas worry is viewed as a persistent focus on future events (Hong, 2007). Hong also identifies a number of other similarities and distinguishing factors. Worry is correlated with both depressive and anxious symptoms, whereas rumination correlates exclusively with depressive symptoms (Hong 2007).

Although distinct from the worry associated with most anxiety disorders, rumination does appear to play a specific role in social anxiety, wherein it is viewed as a component of "post-event processing" (PEP; Kocovski & Rector, 2007, p. 112). In PEP, rumination about a recent social interaction occurs in socially anxious individuals following the event. This rumination is theorized to help maintain the fear of social interactions in social phobia by affecting the formation of memories of prior social events. Residual negative affect from the social situation becomes associated with

memories of the event formed during PEP. The resulting memories are "dominated by negative self-perception" (Clark & Wells, 1995, p. 75). An experimental study examining the relationship between ruminative self-focus and social anxiety suggests that rumination does indeed exacerbate social anxiety symptoms (Vassilopoulos, 2008). In this study, participants who reported both low and high social anxiety were assigned to complete a task that either required them to ruminate analytically (i.e., thinking about specific symptoms or events) or experientially (i.e., thinking about more general bodily sensations). Self-report ratings of social anxiety symptoms were obtained following task completion. Ruminative thought on social anxiety worsened symptoms only in the evaluative, analytic thought condition. In contrast, non-analytical, experiential thinking about symptoms actually led to a reduction in social anxiety symptoms. This finding suggests that the analytical and self-evaluative components of ruminative thought may be particularly responsible for its deleterious effects in social anxiety.

The Relationship of Rumination to Cognitive Functioning

Rumination has also been associated with cognitive inflexibility. In one research study, trait-ruminators were found to make significantly more perseverative errors on the Wisconsin Card Sorting Task than did non-ruminators. Moreover, ruminators appeared to have difficulty adjusting to changes in the environment compared to non-ruminators (Davis & Nolen-Hoeksema, 2000). A recent study explored the relationship between rumination and executive functioning using a Stroop Task. The Stroop Task is an interference task in which participants must "inhibit or override the tendency to produce a more dominant or automatic response" (Philippot & Brutoux, 2008, p. 222). Results indicated that rumination did inhibit executive functioning, but only in dysphoric

individuals. Specifically, induced rumination was found to impair inhibition, but, in contrast with Davis and Nolen-Hoeksema, (2000) induced ruminative thought alone did not have a significant effect on flexibility as measured by the Stroop task. It was found that the presence of dysphoria in general did have an impairing effect on cognitive flexibility.

In another study examining depressive rumination and executive functioning, depressed participants underwent either a rumination induction manipulation or a distraction manipulation and were then required to perform a random number generation task that involved executive functioning. Depressed participants had trouble with the random number generation task while ruminating, whereas non-depressed ruminators did not. Both depressed and non-depressed participants in the distraction groups did not display executive functioning problems. This finding suggested that, in depressed individuals, rumination appears to dampen executive functioning (Watkins & Brown, 2002).

Ruminative self-focus has also been associated with difficulties in solving social problems (Watkins & Moulds, 2005), but only when the rumination was abstract in nature (i.e., more conceptual or generalized). Conversely, self-focused rumination on concrete scenarios or situations appeared to improve, rather than inhibit problem solving. This finding implicates the abstract nature of ruminative self-focus as being responsible for the problem solving deficits noted in some ruminators. While there is considerable evidence that rumination adversely affects executive functioning and problem solving, much of the research in this area has focused on rumination on depressive symptoms. It remains unclear as to whether angry ruminators display the same deficiencies.

Functional magnetic resonance imaging (fMRI) has been used to examine the neurobiology of emotional processing in depressed individuals. In one such study, depressed and euthymic individuals were exposed to personally relevant negative emotional prompts while their brain function was observed via fMRI (Siegle, Steinhaur, Thase, Stenger, & Carter, 2002). Depressed participants displayed longer-lasting activation of the amygdala than did control participants. This long lasting activation coincided with self-reported rumination (Siegle et al., 2002), suggesting that problems with amygdalar inhibition may play a role in depressive rumination.

The Relationship of Rumination to Physiology

Ruminative thought has been experimentally associated with cardiovascular symptoms. Blood pressure and pulse rate have been observed to increase following emotional provocations (Glynn, Christenfeld, & Gerin, 2002). Typically these physiological symptoms return to baseline following the removal of the emotional stressor. However, in individuals induced to ruminate on the stressor, the return to baseline was slower and both systolic and diastolic blood pressure remained higher than in individuals who did not ruminate. This delayed return to baseline blood pressure may increase the risk for future cardiovascular disease (Glynn et al., 2002).

These effects have also been observed with rumination on events that occurred weeks or months prior. In another study exploring rumination and cardiovascular symptoms, women were asked to recall an unresolved anger-provoking event and then either engage in a distracting task or sit quietly for a period of time. Participants in the distraction condition ruminated less than those in the quiet-sitting group. Participants who self-distracted displayed a quicker return to baseline than did participants who ruminated,

further supporting the connection between rumination and cardiovascular symptoms (Neumann, Waldstein, Sollers, Thayer, & Sorkin, 2004). Finally, research has indicated that rumination acts as a moderator between blood pressure and personality variables such as avoidance and assertion (Hogan & Linden, 2004).

Aggression and Its Antecedents

Rumination has been associated with aggression in several research studies, and this relationship is central to the current study. Before discussing this relationship, aggression in general must be discussed. Aggression has been defined as "any behavior directed toward another individual that is carried out with the immediate intent to cause harm" (Anderson & Bushman, 2002, p. 28). Aggressive behavior ranges in severity from milder examples such as verbal insults or hurtful gossip to lethal physical violence. Aggression can further be subdivided into proactive and reactive types. Proactive or "cold blooded" aggression refers to using aggressive behavior in order to achieve goals, such as using physical violence to intimidate a rival. Conversely, reactive aggression is more impulsive and emotional in nature, and occurs in response to threats or provocations (Brendgen, Vitaro, Boivin, Dionne, & Perusse, 2006).

Numerous factors contribute to the likelihood that a given individual will engage in aggressive behavior. These include social learning variables, cognitive variables, personality variables, and provocation (Anderson & Bushman, 2002). Situational factors that can provoke aggressive behavior include frustration (Anderson & Bushman, 2002), and unpleasant environmental factors such as physical pain or discomfort, high temperatures, or sensory factors such as loud noise (Berkowitz, 1993). Social learning through the modeling of aggressive behavior can also contribute to engagement in future

aggressive behavior (Anderson & Bushman, 2002). Alcohol consumption has also been associated with aggressive behavior and, although the mechanism is not fully understood, it likely involves the disinhibiting effect of alcohol intoxication (McCloskey & Berman, 2003). A number of personality factors besides trait rumination have been implicated in aggressive behavior. These factors include trait anger, narcissism, neuroticism, and low self-esteem (Bettencourt, Talley, Valentine, & Benjamin, 2006; Kingsbury, 1978). Deficits in executive functioning have also been associated with aggressive behavior, by mediating the relationship between temperament and physical aggression (Giancola, Roth, & Parrot, 2006).

Aggression and Provocation

Provocations are another important contributing factor to aggressive behavior, particularly reactive aggressive behavior (Bettencourt et al., 2006). In experimental research on provocations and aggression, adults and children competing against a fictitious opponent received increasingly high levels of electric shock and retaliated in kind (Chermack, Berman, & Taylor, 1997). This method of provocation has been effective in a number of other studies using the same paradigm (McCloskey & Berman, 2003; Giancola, 2004). A similar relationship between provocation and aggression was confirmed in children using a laboratory paradigm for measuring aggression (Stadler, Rohrmann, Steuber, & Poustka, 2006). Provocation was also found to increase anger in the children examined in this study.

Aggression following provocation has been found to be different than aggression under neutral conditions. The presence of provocation appears to alter the relationship between personality variables and aggressive behavior. Neuroticism, a personality

variable that has been linked to aggressive behavior, appears to increase aggressive responding only under provocative conditions. In a condition without provocation, neuroticism appears to have little effect on aggression (Bettencourt et al, 2006). Provocation has also been illustrated to moderate the effects of gender on aggression. Bettencourt and Miller's meta-analysis on gender differences in aggression (1996) cites the finding that men are generally found to be more aggressive than women according to the available paradigms measuring aggression. However, this difference almost disappears in conditions wherein participants are provoked before aggressing.

The Relation of Rumination to Anger and Aggression

A number of studies have implicated anger rumination as playing a significant role in aggression, particularly in the phenomenon of displaced aggression. For example, research participants induced to ruminate on a major insult were found to respond with greater aggression to a later, more minor provocation (Bushman et al., 2005). This effect persisted even 8 hours later. In another study, a writing paradigm was used to induce ruminative thought following a major insult. Following rumination, the level of displaced aggression displayed by participants was then measured. This study further confirmed the relationship between rumination and aggression, indicating that anger rumination contributed significantly to displaced aggression (Denson, Pedersen, & Miller 2006).

In a recent exploration of rumination and displaced aggression, Vasquez and colleagues (2007) applied the displaced aggression model to a prison-sentencing task. Participants watched a 60-second clip of a violent bank robbery and were asked to either ruminate by writing an essay about the specifics of the video, or to self-distract by completing unrelated questionnaires. Participants were then either frustrated through

exposure to an unrelated frustrating stimulus (having to wait for the researcher to repair a malfunctioning VCR) or not frustrated. Following this manipulation, participants were asked to determine the length of a prison sentence for the bank robbers in the video. Results indicated that, consistent with previous displaced aggression findings, participants who had ruminated about the priming violent video and then encountered the frustrating stimulus selected a more severe prison sentence than those who had not ruminated or had not been frustrated. This finding also supports the existence of a relationship between rumination and displaced aggression.

In further examination of rumination and aggression, a series of laboratory studies were conducted to examine the influence of personality variables (i.e., irritability, emotional vulnerability, and rumination) and self-esteem threat on aggression (Caprara, Barbaranelli, Colombo, Politi, & Valerio, 1987). In these studies, participants completed questionnaires measuring their emotional vulnerability, irritability, and rumination, and then received a self-esteem threat manipulation in the form of negative feedback from a confederate. Participants were then given an option to punish the confederate via electric shock during a cover task. Results suggested that trait rumination is a major contributing factor in retaliatory aggression. High ruminators, as measured by the Dissipation-Rumination Scale (Caprara, 1986), were more aggressive than high dissipaters even after partialing out emotional vulnerability and self-esteem threat.

Rumination has also been observed to act as a moderator between aggression and other constructs. Rumination was identified as a moderator in a study exploring the relationship between alcohol consumption, alcohol consumption expectancies, and aggressive behavior. Participants completed measures of the above constructs. Analysis

of self-report data indicated that, in addition to its role in displaced aggression, anger rumination did act, along with aggression expectancies, to moderate the relationship between alcohol consumption and alcohol related aggression (Borders, Barnwell, & Earleywine, 2007).

In another example, Bushman (2002) induced rumination in a study involving catharsis, rumination, and aggression. Participants in this study were provoked through negative criticism of an essay they had written and were then shown a picture of the supposed evaluator and told to think about him or her while hitting a punching bag. The punching bag manipulation presented an opportunity for participants to cathartically address negative feelings about their essay feedback. Participants then participated in a competitive task in which they delivered a noxious stimulus (a loud noise) to an opponent. The punching bag manipulation was effective in inducing anger rumination, with participants reporting more anger after hitting the punching bag and thinking about their evaluator. Participants who ruminated with the punching bag were found to be more aggressive in a competitive task than those who did not, further supporting the connection between anger rumination and aggression. Taken together, the above studies indicate a general pattern of association between aggression and rumination.

This relationship between rumination and aggression has been hypothesized to originate with the initial provocation. Provocations give rise to an increase in negative affect, which in turn activates “a network of aggression-related thoughts and tendencies” (Miller et al., 2003, p. 83). Rumination maintains this negative affect and thus continues to activate this network of aggression-related cognitions long after the activation would normally have dissipated (Miller et al., 2003).

The Current Study

According to Miller's (2003) theoretical model, the aggressive responding observed in ruminators is the result of anger activation prolonged by rumination. However, it is unclear what role the perseverative nature of ruminative thought plays in aggression over and above the effects of anger. This is an area in which only limited experimental research has been conducted. Most studies of perseverance and rumination have centered on depressive rumination rather than anger rumination. Moreover, very little laboratory research in general has been conducted on the motivation to exert effort to aggress after provocation. The current study will examine the impact of anger rumination on motivation to aggress.

The Taylor Aggression Paradigm (TAP) (Taylor, 1967) has been successfully used to measure aggressive behavior in studies examining anger rumination (Bushman, 2002). The TAP measures aggression using a competitive reaction time paradigm cover task. Participants compete in a number of reaction time trials against a fictitious opponent. After each trial that the participant ostensibly wins, he or she is given the option to select a level of aversive stimulus to deliver to their supposed opponent (e.g., loud noise or electric shock). Aggression level is measured by the intensity of aversive stimulus selected by the participant during the reaction time trials.

A modified version of the TAP has been developed to examine whether restricting access to a "weapon" would affect aggression in response to provocation (Broman-Fulks, Hudson, Bobrycki,, Ratliff, Sloan, Bradley, Clark, & Wells, 2002). In order to select increasingly aggressive levels of electric shock, participants had to press a button an increasingly large number of times. This forced participants to "work harder" in order to

select more aggressive shock levels. Preliminary findings indicated that, even in the face of escalating provocation, participants chose less labor intensive levels of shock over higher levels of shock that required more button presses to activate. Participants in a low-effort group wherein each shock option required only one button press to activate responded to escalating provocation with escalating levels of electric shock. No differences in shock selection were found between participants who believed that their opponent had to exert effort to aggress and those who believed that their opponent could select shocks freely. Overall, it appears that requiring a participant to exert effort to gain access to more intense aggressive responses lowers the probability of the occurrence of aggression. The current study will also use this paradigm to examine the relation between anger rumination and aggression.

Study Rationale and Aims

As requiring effort to access a weapon has been initially shown to decrease aggressive behavior, it logically follows that interventions that present a similar requirement of effort (e.g., handgun waiting periods, decreasing access to weapons among aggression-prone individuals) would decrease the likelihood of the occurrence of aggressive behavior. The purpose of this study was to further examine the above relationship between effort condition and aggressive behavior, specifically examining the possible intervention of anger rumination in this relationship. As described above, anger rumination has been shown to promote both aggression and possibly some perseverative behavior. These qualities could potentially promote an increase in aggressive behavior despite increased effort requirements. If indeed this is the case, findings could inform

future interventions to prevent aggressive behavior such as screening for a tendency toward anger rumination in individuals at risk to aggress.

Thus, this study examined the unique contribution of anger rumination over and above trait anger on aggression as measured by TAP, when a higher level of effort to aggress is required. To this end:

1. Levels of anger and anger rumination in study participants were obtained through self-report measures.
2. All participants were angered using an anger-induction protocol (described below)
3. Following anger induction, participants completed the TAP with either a high-effort or low-effort requirement to aggress. Participants were increasingly provoked via shock feedback.

Hypotheses

Hypothesis 1: As observed in Broman-Fulks et al. (2002) it is hypothesized that requiring effortful responding will decrease aggressive responding even at high levels of provocation.

Hypothesis 2: Because of the anger-sustaining nature of ruminative thought, it is hypothesized that higher levels of anger rumination will uniquely predict higher levels of aggression in response to provocation in the high-effort group. These effects are expected to persist after the effects of anger are controlled.

Hypothesis 3: It is expected that anger rumination will not be uniquely associated with aggression when trait anger is controlled in the low-effort condition. However, trait

anger is expected to be positively associated with aggressive responding in this condition controlling for anger rumination, especially under high levels of provocation.

CHAPTER II

METHOD

Participants

A total of 150 undergraduate students participated in this study. Data from 27 participants were excluded after debriefing suggested that they were not fully deceived. Of the remaining participants, 83 were female and 40 were male. Ages ranged from 18-51 years (M = 20.9, SD = 4.6). 56.9% of participants identified as African-American, 39.8% identified at Caucasian, 1.6% identified as Hispanic, and 1.6% identified their race as "other." Volunteers were recruited to participate in a study on "Personality matching and joint performance on a reaction time task." This study title was used to mask the true purpose of the study, and to provide a cover task for the false negative feedback used to elicit anger rumination. Participants received credit in psychology courses in exchange for participation.

Measures

Assessment of Anger Rumination.

Dissipation-Rumination Scale. Trait rumination was assessed using the Dissipation-Rumination Scale (DRS; Caprara, 1986). The DRS is a 20-item measure of anger rumination used to identify the tendency to either ruminate or dissipate anger. Five of the 20 items are distracter items. The DRS is scored on a 6-point Likert-like scale with responses ranging from *completely false for me* to *completely true for me*. This scale has been validated through several experiments. The scale was validated experimentally, with higher rumination scores predicting higher levels of aggression as long as 24 hours after

provocation (Caprara, 1986). The DRS was the primary measure of anger rumination used in this study. The Cronbach's α from this administration of the scale was .91.

Assessment of Anger

State-Trait Anger Expression Inventory-2 – Trait Anger Scale. The Trait Anger scale of the State-Trait Anger Expression Inventory-2 (STAXI-2; Spielberger, 1999) was used to measure trait anger. The STAXI-2 is a widely used 57-item measure of anger. This scale measures state anger, trait anger, and anger expression. The trait anger scale is 10-item scale measuring respondents "general feelings" of anger. The full STAXI displayed high internal consistency (α = .85), and the trait anger scale's internal consistency was comparable (α = .86). The STAXI-2 has been validated through strong correlations with other measures of anger and hostility (Suris & Coccaro, 2008).

Differential Emotions Scale. The Differential Emotions Scale (DES; Izard, 1972) was used as a very brief anger manipulation check following provocation. This scale is a very brief visual analogue measure of mood states, including anger, happiness, sadness, fear, and anxiety. Respondents rate a list of "feeling" words by marking a horizontal line representing a continuum from *not at all* to *very much*. The respondent is instructed to place a mark on the line indicating how much or little they are feeling that emotion at the current moment. The scale is scored by measuring the area of line up to the mark made by participants in increments of $1/10^{th}$ of an inch.

Validation Measures of Anger Rumination

Two other measures of anger rumination, the Displaced Aggression Questionnaire and the Anger Rumination Scale, were also administered in order to validate the DRS. The DRS was used as the primary measure of anger rumination in this study because of

its length, previous association with aggressive behavior (Caprara, 1986), and because other available anger rumination scales measure other constructs in addition to anger rumination. The psychometric properties of these two scales are described below.

Displaced Aggression Questionnaire. The DRS was validated in part through the Displaced Aggression Questionnaire (DAQ; Denson, Pedersen, & Miller, 2006). The DAQ is composed of 31 items and is scored on a 7-point bi-polar Likert-type scale, with responses ranging from *extremely characteristic of me* to *extremely uncharacteristic of me*. It has been validated through a series of experimental paradigms with test scores predicting actual displaced aggression in the laboratory, with beta weights ranging from .26 to .34 (Denson, Pedersen, & Miller, 2006). The scale is divided into three subscales: "Anger Rumination" (10 items), composed of items measuring the tendency to remember and dwell on previous provocations and anger-inducing events; "Revenge Planning" (11 items), composed of items asking about fantasies of revenge as well as beliefs and behaviors related to revenge; and "Displaced Aggression" (10 items), composed of items about taking out one's anger on innocent others. The anger rumination scale and revenge planning scale to a lesser degree are expected to be associated with DRS. The displaced aggression scale is not predicted to be as strongly associated with the DRS because it is a separate although related construct. Internal consistency for DAQ total scores (α = .97), anger rumination (α = .95), revenge planning (α = .94), and displaced aggression (α = .93) were all high.

Anger Rumination Scale. To further examine the validity of the DRS, a second anger rumination scale was administered. The Anger Rumination Scale (ARS; Sukhodolsky, Golub, & Cromwell, 2006), is composed of 19 items and is scored on a 4-

point Likert-type scale, with responses ranging from *almost always* to *never*. Validity was established through correlation with other measures of anger and rumination (Sukhodolsky, Golub, & Cromwell, 2006) including the STAXI-II (r = .57) and Measure of Negative Affectivity (r =.54).

The ARS is divided into four subscales. These subscales are "Understanding Causes" (4 items), which relates to attempts why anger and anger provoking situations occur; "Angry Memories" (5 items), which relates to the tendency to hold onto memories of anger or anger provoking situations; "Angry Afterthoughts" (6 items), which involves cognitively returning to memories of previous anger-provoking situations and continuing to focus on their content; and "Thoughts of Revenge" (4 items), which relates to a tendency to fantasize about getting revenge. All four of these subscales are expected to be associated with the DRS. Internal consistency coefficients for were found to be strong for the total ARS measure (α = .96), angry memories subscale (α = .91), angry afterthoughts subscale (α = .92), understanding causes subscale (α = .80), and thoughts of revenge subscale (α = .84).

Procedure

The participants were randomly assigned to one of two effort conditions. One group completed the TAP with the high-effort (HE) shock selection requirement and the other completed the TAP with the low-effort (LE) selection procedures in the paradigm. Upon arrival at the laboratory, the researcher greeted the participant and escorted him or her to a room labeled "Subject A" and informed him or her that the opponent had already begun completing paper work. Informed consent was then obtained (see Appendix A). After the informed consent process, the researcher informed the participant that he or she

was “Subject A,” and would be working with Subject B in the adjoining room. The participant then completed a set of demographic questionnaires.

Next, the researcher began a procedure designed to induce anger in the participants. Two standard neuropsychology tasks (a computer version of the Wisconsin Card Sorting Task and a pen-and-paper version of the Trail Making Task) were administered. These tasks were not used as part of data analyses, but rather as part of the anger induction. The purpose of these tasks was to provide an impetus for the experimenter to provided false, presumably anger-inducing negative performance feedback to participants. The DES was also administered following the completion of these tasks. The researcher then told the participant that he (the researcher) “Needed to compare both subjects’ test results to before beginning the reaction time task.” This provided a cover-task for the false feedback. After a five minute delay, the researcher returned to the participant’s room with a sheet of paper bearing an apparently hand-drawn bell curve diagram which was given to the participant and ostensibly Subject B. The researcher next attached finger tip electrodes to the index and middle fingers of the participant’s non-dominant hand via Velcro strips. The participant was told, “Please hold your hand still on the table for the rest of the task. You will use your other hand for the reaction-time task, and to fill out a few remaining questions.”

The researcher then excused himself to go to the control room and read the following script over an intercom:

> Subjects A and B, we have completed just about everything in the study so far except for the reaction time game. Results of almost all of the testing so far indicates that the two of you are very similar. The only difference we found was

> on the card-matching test, which we believe is a measure intellectual capacity or intelligence. If you look at the diagram that I put in each of your rooms, you will notice that Subject A performed a bit below average, while Subject B performed a little above average. Otherwise, your test performance was very similar. Now then, we're ready to go on with calibrating the reaction-time task.

Following the delivery of this information, the researcher began the shock threshold procedure (see Appendix C). Increasing levels of electric shock (by 100 microamperes) were administered. The researcher stopped the procedure when the participant rated the shock as *definitely very unpleasant* and did not want to receive any higher level. This shock level was the upper shock pain threshold. The procedure was then repeated for the fictitious opponent, using an audio recording to simulate the opponent's responses. In order to avoid confounding by gender, the participant interacted with a same-sex opponent. This was accomplished by playing gender-matched audio files and referring to the opponent as "he" or "she" throughout, as appropriate.

After the threshold procedure, the researcher played recorded instructions for the TAP over the intercom (see Appendix C). Following the conclusion of these instructions, the researcher then asked Subject A if he or she was ready to begin. At this point the anger rumination induction commenced. After a brief pause, the researcher also asked if Subject B was ready to continue. At this point, the researcher played a voice recording in which Subject B said: "I'm ready, and I'm pretty sure I'm going to beat Subject A on the reaction game just like I did on the intelligence test." To prevent the participant from responding to this induction before the TAP, the researcher immediately said, "Okay, I'm going to turn off the intercom so we can get the task going. Please fill out the DES form

once again to determine continued match and we'll begin." Upon completion of the DES, the researcher began the TAP.

Note that that the anger induction procedure was piloted on 4 graduate students prior to beginning data collection in order to gauge how anger-eliciting this induction was (rated on a 6-point scale from *not at all* to *extremely*) and to determine whether or not aspects of the script need to be modified. Responses ranged from 4-6. Some minor modifications were made to the script in order to increase believability.

During the TAP, participants were ostensibly competing against an opponent at holding down a spacebar and attempting to release it more quickly than their opponent when prompted via a message on a computer screen. Participants were told that if they were slower than the opponent they would receive an electric shock of an intensity selected by the opponent. Participants were told that if participants were faster than their opponent they would be given the option to deliver an electric shock to their opponent of an intensity of their choosing. The participant used the computer's keyboard to select a shock. The justification given to participants for the use of electric shocks is that the shocks are motivating sensory stimuli to increase performance in the reaction time task. Shock levels ranged from 0-20, with the 10 shock being equal to the upper threshold defined during the threshold task, the 9 shock being equal to 95% of this threshold, 8 to 90%, 7 to 85%, and so on. The 20 was described as representing "an extremely painful shock twice the intensity of the pain threshold that could cause minor tissue damage that will quickly heal." Thus, the 20 was defined as an unequivocally aggressive response. Participants may also select a 0 option, which delivers no shock to the opponent, although this option has only infrequently been selected in previous research.

Wins, losses, and opponent shock selections were pre–programmed and computer-controlled. Participants were determined to "lose" on 50% of trials and "win" on 50% of trials. Participants completed 28 trials with the opponent's shocks becoming increasingly more provocative. The 28 trials consisted of an initial trial followed by four provocation blocks of six trials each. Average shock during the first block was 2.5 (2s and 3s), followed by blocks averaging 5.5 (5s and 6s), 8.5 (8s and 9s), and 8.5. Intermediate shock levels between the first three blocks (4 and 7) were used to smooth the transition between blocks. Shock feedback of 20 from the opponent was included between the third and fourth blocks. Of course, the participant was programmed to win this trial, so the 20 shock was never administered. The inclusion of this trial was intended to be highly provocative and to elicit counter-aggression.

In the high-effort group, participants were required to press the space bar an increasing number of times to set higher shocks. Participants had to press the space bar 10 times to set a 1 shock, 20 times to set a 2 shock, 30 times to set a 3 shock, and so on to 200 times to select a 20 shock. Participants were informed via computer monitor about the shock level they have earned access to. The participants were free to stop button-presses at any time once a particular shock level was reached. Participants in the low-effort TAP condition were able to access all shocks with equal effort by simply selecting a shock choice with a single button press. Aggression was defined by the shock level selected for the opponent to receive on trials the participant "wins." Two shock indices were used as outcome variables: a) average shock selected on each block, and b) number of extreme (20) shocks selected per block.

Following completion of the TAP, the participant completed a post-task questionnaire, which included items asking about performance on the reaction time trials and about his or her perceptions regarding the purpose of the experiment (Appendix B), anger rumination measures, and the STAXI-2. The post-task questionnaire was designed to determine if the deception necessary for the TAP was successful. Participants who did not accept the cover task or know the true purpose of the study were excluded from the data set for analysis purposes. Following completion of the post-task questionnaire, participants were debriefed, asked not to share details with other participants and dismissed.

CHAPTER III

RESULTS

Descriptive Statistics

Means, standard deviations, and measures of skew and kurtosis were computed for all measures of anger rumination and anger rumination subscales, the STAXI-II Trait Anger Scale, and both shock indices (Table 1). Chi square tests were performed in order to determine if the participants in the two effort conditions differed as a function of ethnicity and gender. No significant differences were found for either gender or ethnicity. Independent samples *t*-tests were also performed to determine if participants in the high and low effort conditions differed in their levels of age, trait anger, or anger rumination. No differences between groups were found for trait anger or age. However, significant between groups differences emerged among all three measures of anger rumination. DRS total scores were significantly higher in the low-effort condition ($M = 44.10$, $SD = 18.08$) than in the delayed access condition ($M = 39.18$, $SD = 12.78$; $t\ [120] = 1.73$, $p < .05$. Similarly, DAQ total scores were significantly higher in the low-effort condition ($M = 81.95$. $SD = 41.98$) than in the delayed access condition ($M = 41.98$, $SD = 29.37$; $t\ [120] = 2.51$, $p < .05$). Consistent with the other anger rumination measures, ARS scores were higher in the low-effort condition ($M = 37.84$, $SD = 15.56$) than in the delayed access condition ($M = 30.72$, $SD = 11.12$) by a significant margin, $t\ (120) = 2.90$, $p < .05$.

Table 1

Descriptive Statistics

Measures	*n*	*M*	*SD*	Skew	Kurtosis
DRS	122	63.06	16.65	0.38	-0.31
DAQ	122	73.83	37.12	1.08	0.43
Anger Rumination	122	23.91	13.60	0.83	-0.25
Revenge Planning	122	24.36	15.36	1.38	1.10
Displaced Aggression	122	25.56	13.19	1.13	0.64
ARS	122	34.34	13.97	1.02	0.23
Angry Afterthoughts	122	10.84	5.04	0.92	-0.31
Thoughts of Revenge	122	6.33	2.92	1.53	1.93
Angry Memories	122	8.96	4.18	1.06	0.07
Understanding Causes	122	8.21	3.20	0.60	-0.45
STAXI-II T	121	17.80	5.92	0.97	0.57
Mean Shock	123	4.96	2.22	-0.01	-0.01
Total 20s	123	1.36	3.92	4.60	22.77

Note. DAQ = Displaced Aggression Questionnaire, ARS = Anger Rumination Scale, DRS = Dissipation-Rumination Scale, STAXI-II T = State-Trait Anger Expression Inventory-II Trait Anger Scale.

Bivariate Correlations

Bivariate correlations (Table 2) were computed between the mean shock level selected across all trials, the total 20s selected across all trials, anger rumination measure total scores (DAQ total score, ARS total score, and DRS total score) and Trait Anger as measured by the STAXI. All measures of anger rumination and trait anger were correlated positively, and both shock indices were positively correlated with each other,

as expected. All measures of anger rumination except for DAQ Revenge Planning were significantly correlated with average shock selected on the TAP, however, only the DRS was significantly correlated with total 20 shocks selected.

DES Anger Pre/Post

Recall that this study included an anger induction component, in which participants received false, negative feedback on a performance task and then were denigrated about their supposed performance. In order to determine if this provocation effectively induced anger in participants, a repeated measures ANOVA was conducted examining state anger as measured by the DES before and after participants received false feedback on their WCST performance and heard the provocation sound clip. DES anger scores before provocation (M = 3.84, SD = .71) were lower than scores following provocation (M = 6.25, SD = .94), and this difference was significant, $F\ (1,119)$ = 9.91, $p < .05$. This finding indicated that the provocation induction was successful in inducing state anger in participants. A multiple regression was also conducted in order to determine if there was any effect of trait anger or rumination proneness on the difference between pre and post anger. This regression model did not significant predict a difference in anger intensity in response to the induction based either on anger rumination or trait anger.

Table 2

Intercorrelations between Rumination Measures and Subscales, Anger Measures, and Aggression Measures

Measures	DRS	DAQ	D1	D2	D3	ARS	A1	A2	A3	A4	STAXI	Mean Shock	Total 20s
DRS	---	.81**	.79**	.81**	.53**	.77**	.71**	.76**	.70**	.65**	.70**	.34**	.19*
DAQ		---	.91**	.91**	.82**	.91**	.86**	.86**	.83**	.76**	.80**	.21*	.08
D1			---	.78**	.62**	.91**	.87**	.79**	.86**	.76**	.72**	.22*	.04
D2				---	.58**	.84**	.78**	.87**	.76**	.65**	.73**	.24**	.10
D3					---	.64**	.61**	.59**	.55**	.58**	.65**	.09	.07
ARS						---	.95**	.89**	.91**	.87**	.72**	.25**	.07
A1							---	.80**	.82**	.79**	.68**	.27**	.02
A2								---	.77**	.70**	.67**	.25**	.14
A3									---	.69**	.67**	.18*	.07
A4										---	.60**	.20*	.03
STAXI T											---	.19*	.06
Mean Shock												---	.52**
Total 20s													---

Note. DRS = Dissipation Rumination Scale, DAQ = Displaced Aggression Questionnaire, D1 = DAQ Anger Rumination, D2 = DAQ Revenge Planning, D3 = DAQ Displaced Aggression, ARS = Anger Rumination Scale, A1 = ARS Angry Afterthoughts, A2 = ARS Thoughts of Revenge, A3 = ARS Angry Memories, A4 = ARS Understanding Causes, STAXI T= State Trait Anger Expression Inventory II – Trait Anger Scale

* $p < .05$, ** $p < .0$

DRS Validation

In order to examine the validity of the Dissipation-Rumination Scale, a two step hierarchical multiple regression analysis was performed with DRS total scores as the dependent variable. The STAXI-II Trait Anger subscale was entered in step one. The second step included subscales from the Anger Rumination Scale (Understanding Causes, Angry Memories, Thoughts of Revenge, and Angry Afterthoughts) and subscales from the Displaced Aggression Questionnaire (Anger Rumination, Revenge Planning, and Displaced Aggression). Results of this regression can be viewed in Table 3, and β weights and associated statistics can be viewed in Table 4.

Table 3

Significance of ARS Validation Regression Model

Step	R	R^2	ΔF	df (reg.)	df (res.)
1	.70	.50	115.47*	1	118
2	.86	.73	14.00*	7	111

Note. df reg. = degrees of freedom (regression), df res. = degrees of freedom (residual)
*$p < .001$

Table 4

B Weights and Associated Statistics for DRS Validation Regression Model

Predictor	ΔR^2	β	t
Step 1	.50*		
Trait Anger		.70*	10.75
Step 2	.24*		

Table 4 (continued).

Predictor	ΔR^2	β	t
ARS Angry Afterthoughts		-.09	-0.79
ARS Thoughts of Revenge		.12	1.07
ARS Angry Memories		-.13	-1.18
ARS Understanding Causes		.03	0.31
DAQ Anger Rumination		.46*	3.67
DAQ Revenge Planning		.41*	3.73
DAQ Displaced Aggression		-.05	-0.74

Note. *$p < .001$

Both steps 1 and 2 predicted significant variance in anger rumination as measured by the DRS. As can be seen in Table 3, trait anger was found to significantly predict anger rumination in Step 1, $t = 10.75$, $p < .001$, $\beta = .70$. This is consistent with theoretical expectations, given the interrelatedness of anger and anger rumination as constructs. This significant overlap between anger and anger rumination, and the anger rumination subscales can be seen in Table 5.

Table 5

Step 1 Excluded Variables DRS Validation Regression Model

Predictor	β *in*	*T*
Step 1		
ARS Angry Afterthoughts	.43*	7.44
ARS Thoughts of Revenge	.52*	7.01

Table 5 (continued).

Predictor	*β in*	*t*
ARS Angry Memories	.41*	5.10
ARS Understanding Causes	.33*	0.31
DAQ Anger Rumination	.58*	3.67
DAQ Revenge Planning	.63*	3.73
DAQ Displaced Aggression	.11	1.32

Note. *$p < .001$

If entered in the first step, all subscales except DAQ displaced aggression would be significantly predictive of DRS total score. It appears that much of this overlap is due to trait anger. In Step 2, only two DAQ subscales, Anger Rumination ($t = 3.67$, $p < .001$, $\beta = .46$), and Revenge Planning ($t = 3.73$, $p < .001$, $\beta = .41$), were found to uniquely predict 24% of the variance in DRS total score over and above the effects of trait anger observed in step 1. The change in R^2 between steps 1 and 2 ($\Delta R^2 = .24$, $p < .001$) is significant and provides qualified support to the idea that the DRS is measuring a separate rumination construct beyond anger alone that seems uniquely associated with revenge planning and anger rumination as measured by the DAQ.

Multiple Regressions

Description of Multiple Regression Model

Two sets of multiple regression analyses were tested, with each set using a different shock index to measure aggression. The first group of regressions used the average level of shocks selected across TAP trials, whereas the second group of regressions used the total number of 20-shocks selected during TAP trials. Total DRS

score, a continuous variable, was selected as a measure of anger rumination. The trait-anger STAXI-II subscale, also a continuous variable, was used to measure trait anger. Effort condition and gender were both dummy coded (0 = low-effort condition, 1 = high-effort condition; 1 = male, 2 = female). To test the moderation effects postulated in hypothesis 2, an interaction term between effort condition and anger rumination was generated. Similarly, an interaction term between trait anger and effort condition was generated to test the moderation effect expected by hypothesis 3. Attempts to correct for skew in DRS and STAXI-II data via transformations did not significantly affect the outcome of the analyses. Multiple regression was selected as the data analysis procedure because of the continuous nature of the rumination and trait anger scales used, However, because the dependent variable (aggression across provocation blocks) was a repeated measure, it was impossible to analyze the data using a single multiple regression. In order to address this issue, the "sum/difference regression method" (Giancola, 2004, p. 548) was used.

Recall that, in order to provoke participants, increasingly severe shock feedback was presented in four blocks. In order to examine this within-subjects variable using this regression method, shocks selected during blocks 1 and 2 were summed into a single low provocation block, and shocks selected during blocks 3 and 4 were summed into a single high-provocation block. Using these high and low provocation blocks, two dependent variables were derived. Low and high blocks were summed into a single term representing shocks selected on all TAP trials (DV1), which was used to examine all between subjects effects, independent of provocation. To derive the second dependent variable (DV2), the difference between shocks selected in the high and low provocation

trials (High Block – Low Block) was calculated. DV2 allows for the examination of the within-subjects effects of provocation. This technique has been used previously and established as a multiple regression equivalent of repeated measures ANOVA; removing the need to dichotomize continuous variables (Giancola, 2004). Each of these DVs was regressed onto the same three step regression model. The model is as follows: Gender was included in the first step, effort condition, anger rumination and trait anger were added in the second step, and the interaction terms (anger rumination x effort condition and trait anger x effort condition) were entered in the third step.

In addition to the above, two more DVs were calculated and used in additional regression analyses. These regressions examined between-subjects effects at high and low levels of provocation individually, with the low-provocation DV being the sum provocation blocks 1 and 2, and the high-provocation DV being the sum of blocks 3 and 4. As above, the same three step regression model was used for the Low/High regressions. Gender was included in the first step, effort condition, anger rumination and trait anger were added in the second step, and the interaction terms (anger rumination x effort condition and trait anger x effort condition) were entered in the third step.

In summary, two sets of four multiple regressions, each with a different dependent variable were conducted. The first set of regressions used mean shock as an aggression index and the second set used total 20 shocks as an aggression index. The first regression in each set used DV1 (blocks 1 and 2 + blocks 3 and 4) as its dependent variable. The second regression in each set used DV2 (blocks 3 and 4 – blocks 1 and 2) as the dependent variable. The third regression in each set used the low provocation blocks (block 1 + block 2) as a dependent variable, and the fourth regression used the high

provocation blocks (block 3 + block 4) as the dependent variable. Thus, a total of eight regressions were computed in the study (2 shock indices x 4 DVs).

Regressions Using Mean Shock as a Shock Index

DV1/DV2 regressions. Regression models examining mean shocks selected during the TAP as DVs was conducted first. DV1 was regressed onto the 3-step multiple regression model. As noted above, this model examines between groups main and interaction effects independent of within groups effects. DV1 regression model results are presented in the left side of Table 6 and β weights and associated statistics are presented in the left side of Table 7.

The second step of the regression (entry of main effects of effort condition, trait anger, and anger rumination) was the only step that accounted for a significant amount of variance in mean shock across provocation groups F (4,115) = 11.96, $p < .001$, $R^2 = .24$. Effort condition ($t = -5.42$, $p < .001$, $\beta = -.43$) was found to be a significant predictor of mean shock in this model, with participants in the high effort condition selecting lower mean shocks than those assigned to the low-effort group.

Table 6

Significance of DV1/DV2 Regression Model – Mean Shock

	DV1					DV2				
Step	*R*	R^2	*ΔF*	*df reg.*	*df res.*	*R*	R^2	*ΔF*	*df reg.*	*df res.*
1	.10	.01	1.25	1	118	.15	.02	2.72	1	118
2	.54	.29	15.38*	3	115	.38	.15	5.56*	3	115
3	.55	.31	.93	2	113	.41	.17	1.61	2	113

Note. df reg. = degrees of freedom (regression), df res. = degrees of freedom (residual)

* $p < .001$

Table 7

β Weights and Associated Statistics for DV1/DV2 Multiple Regression Model – Mean Shock

	DV1			DV2		
Predictor	ΔR^2	β	T	ΔR^2	β	t
Step 1	.01			.02		
Gender		.10	1.12		-.15	-1.66
Step 2	.28**			.12*		
Gender		.60	0.75		-.15	-1.65
Effort Condition		-.43**	-5.42		-.35**	-4.02
Trait Anger		-.13	-1.18		-.04	-0.36
Rumination		.35*	3.05		.04	0.04
Step 3	.03			.02		
Gender		.05	0.64		-.14	-1.58
Effort Condition		-.71*	-2.62		-.41	-1.37
Trait Anger		-.27	-1.71		.13	0.76
Rumination		.42*	2.77		-.16	-0.96
Rum. X Effort		-.16	-0.50		.60	1.77
Ang. X Effort		.44	1.28		-.53	-1.40

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

Anger rumination ($t = 3.05$, $p < .01$, $\beta = .35$) also accounted for unique variance in mean shock independent of provocation, with higher levels of rumination associated with higher levels of average shock selected. Trait anger and gender were not uniquely

predictive of mean shock, and no significant moderation effects were noted for either interaction term.

In order to examine the effect of provocation on the above relationships, DV2 was regressed onto the same 3-step model described above. Again, only the second step of the regression accounted for a significant amount of variance in mean shock between the high and low provocation blocks $F(4, 115) = 4.93$, $p < .01$, $R^2 = .15$. Effort condition significantly accounted for a unique portion of the variance in mean shock selected between high and low provocation blocks. The dampening effect on aggression in the high-effort condition, noted in the DV1 model, was found to persist despite provocation ($t = -4.02$, $p < .001$, $\beta = -.35$). Conversely, the significant, aggression-promoting effect noted for anger rumination in the DV1 model was not noted in this model: anger rumination did not account for a significant amount of the variance between provocation blocks. Similarly, gender, trait anger, and neither interaction term were insignificant.

Low/high provocation regressions – mean shocks. To examine the variables at each level of provocation, a separate multiple regression analysis was conducted at each of the (low/high) levels of provocation. In the first of these analyses, the mean shocks selected during the block of low provocation trials were regressed onto the same 3-step regression model used above (recall: Step 1: Gender; Step 2: Effort Condition, Rumination, Trait Anger; Step 3: Effort/Rumination, Effort/Anger interaction terms). Results of these regressions for mean shock are presented in Table 8 and β weights and associated statistics are presented in Table 9.

Both the first step (F (1, 118) = 4.32, $p < .05$, $R^2 = .04$) and second step (F (4, 115) = 8.62, $p < .001$, $R^2 = .23$) of this regression were significantly predictive of

aggression across the trials that compose the low provocation block. In the first step, gender was found to predict unique variance in aggression ($t = 2.08$, $p < .05$, $\beta = .19$), with men selecting higher levels of shock on average than women.

Table 8

Significance of Low/High Multiple Regression Model – Mean Shock

	Low					High				
Step	*R*	R^2	ΔF	*df reg.*	*df res.*	*R*	R^2	ΔF	*df reg.*	*df res.*
1	.19	.04	4.32*	1	118	.03	.00	0.09	1	118
2	.48	.23	9.73**	3	115	.54	.29	15.53**	3	115
3	.51	.26	2.24	2	113	.54	.01	0.43	2	113

Note. df reg. = degrees of freedom (regression), df res. = degrees of freedom (residual)

* $p < .05$, ** $p < .001$

In the second step, both effort condition ($t = -3.66$, $p < .001$, $\beta = -.30$) and rumination ($t = 3.08$, $p < .01$, $\beta = .36$) significantly predicted aggression. High-effort group members selected lower shocks than their low-effort counterparts, and higher anger rumination scores again predicted higher aggression scores. No significant effects were noted for trait anger or for the Effort x Rumination interaction term. The Effort x Trait Anger interaction term accounted for a significant amount of unique variance in Step 3, but the entry of the interaction terms in Step 3 did not significantly contribute to the model on the whole ($\Delta F = 2.24$, $p > .05$, $R^2 = .03$) giving this finding questionable importance.

In the final regression in this set, mean shocks selected during the high provocation trials were regressed onto the same three step model. Results are depicted on right side of Tables 8 and 9. Only the second step was significant F (4, 115) = 11.68, $p <$

.001, R^2= .29. As in the low provocation block, participants assigned to the high-effort group (t = -5.85, p < .001, β = -.47) selected lower levels of shock on average and participants who indicated higher levels of rumination (t = 2.53, p < .05, β = .29) selected higher levels of shock. No significant effects were noted for gender, trait anger, or either interaction term.

Table 9

β Weights and Associated Statistics for Low/High Multiple Regression Model – Mean Shock

	Low Provocation			High Provocation		
Predictor	ΔR^2	β	t	ΔR^2	β	t
Step 1	.04*			.00		
Gender		.19*	2.08		.03	0.30
Step 2	.20***			.29***		
Gender		.14	1.66		-.00	-0.05
Effort Condition		-.30***	-3.66		-.47***	-5.85
Trait Anger		-.12	-1.06		-.12	-1.07
Rumination		.36**	3.08		.29*	2.53
Step 3	.03			.01		
Gender		.13	1.52		-.01	-0.10
Effort Condition		-.59	-2.10		-.71*	-2.59
Trait Anger		-.36	-2.23		-.17	-1.05
Rumination		.54***	3.48		.28*	1.81
Rum. X Effort		-.47	-1.47		.09	0.29
Ang. X Effort		.76	2.12		.16	0.47

Note. * p < .05, ** p <.01, *** p <.001

Regressions Using 20 Shock as a Shock Index

DV1/DV2 regressions – 20 shocks. Recall that, during the presentation of TAP instructions, participants were told that setting a 20-level shock for their opponent would be severely painful and could cause mild tissue damage, thus the selection of a 20 shock was considered definitely aggressive. In order to corroborate results observed using mean shock, the number of 20 shocks selected was used as a second index of aggression. Both total 20s across provocation blocks (DV1) and the difference between the number of 20s selected at the low and high provocation blocks (DV2) were regressed onto the same three-step regression model described above.

DV1 regression model results are presented in the left side of Table10 and β weights and associated statistics are presented in the left side of Table 11. The general pattern of results observed for DV1 using the mean shock aggression index is maintained in the current regression as well. The second step was the only one of the three to significantly predicted the number of 20 shocks selected across all provocation blocks F (4, 115) = 2.96, p <.05, R^2 = .09.

Table 10

Significance of DV1/DV2 Regression Model – Total 20 Shocks

	DV1					DV2				
Step	*R*	R^2	*ΔF*	*df reg.*	*df res.*	*R*	R^2	*ΔF*	*df reg.*	*df res.*
1	.15	.02	2.66	1	118	.02	.00	0.03	1	118
2	.31	.09	3.01*	3	115	.24	.06	2.38	3	115
3	.35	.08	1.88	2	113	.29	.09	1.69	2	113

Note. df reg. = degrees of freedom (regression), df res. = degrees of freedom (residual)

* p < .05

Table 11

β Weights and Associated Statistics for DV1/DV2 Multiple Regression Model – Total 20 Shocks

	DV1			DV2		
Predictor	ΔR^2	β	t	ΔR^2	β	T
Step 1	.02			.00		
Gender		.15	1.63		.15	0.16
Step 2	.07*			.06		
Gender		.11	1.21		.05	0.56
Effort Condition		-.18†	1.94		-.18†	-1.98
Trait Anger		-.16	-1.26		.21	1.62
Rumination		.27*	2.09		-.20	-1.50
Step 3	.03			.03		
Gender		.11	1.21		.06	0.64
Effort Condition		.17	0.55		-.24	-0.78
Trait Anger		-.26*	-1.47		.40*	2.22
Rumination		.45**	2.67		-.41*	-2.35
Rum. X Effort		-.63*	-1.81		.64	1.82
Ang. X Effort		.26	0.66		-.57	-1.43

Note. † = Approaches Significance, * $p < .05$, ** $p < .001$

Rumination again accounted for a significant portion of unique variance in the model ($t = 2.09$, $p < .05$, $\beta = .27$), indicating that as anger rumination increases the number of 20s selected increases as well. Effort condition did not explain a significant

amount of unique variance in 20 shocks, but it did approach significance (t = -1.94, p > .05, β = -.18). This result suggested that participants in the high-effort condition may have selected fewer 20 shocks, but it cannot be stated with 95% certainty. Consistent with findings from the mean shock DV1 model, gender, trait anger, and the Anger x Effort and Rumination x Effort interaction terms did not significantly contribute to the model.

Results for DV2 are listed in the right side of Table 10. β weights and associated statistics are presented in the right side of Table 11. No significant linear relationship emerged when DV2 was regressed onto the model using total 20s as an aggression index.

Low/high provocation regressions – 20 shocks. To examine the variables at each level of provocation, a separate multiple regression was conducted at each (low/high) level of provocation. In the first regression, Total 20 shocks selected during the block of low provocation trials were regressed onto the same 3-step regression model used in previous analyses (Step 1: Gender; Step 2: Effort Condition, Rumination, Trait Anger; Step 3: Effort/Rumination, Effort/Anger interaction terms). Results of this regression are presented in the left side of Table 12 and *B* weights and associated statistics are presented in the left side of Table 13.

Only the second step of the regression significantly predicted aggressive behavior $F(3, 115) = 2.60$, $p < .05$, $R^2 = .08$. Only rumination was uniquely predictive of aggression in this step (t = 2.48, $p < .05$, $\beta = .32$) with higher rumination scores promoting the selection of more 20 shocks. Gender, effort condition and the interaction between trait anger and effort condition did not uniquely account for aggressive behavior in the model. Trait anger and the interaction between rumination and effort condition

were both significant in the third step, but that step did was not significantly predictive of aggression in the total model.

Table 12

Significance of Low/High Multiple Regression Model – Total 20 Shocks

	Low					High				
Step	*R*	R^2	*ΔF*	*df reg.*	*df res.*	*R*	R^2	*ΔF*	*df reg.*	*df res.*
1	.14	.02	2.27	1	118	.14	.02	2.50	1	118
2	.29	.08	2.68*	3	115	.31	.10	3.21*	3	115
3	.36	.13	2.88	2	113	.33	.11	0.91	2	113

Note. df reg. = degrees of freedom (regression), df res. = degrees of freedom (residual)

* $p < .05$

Results of the high provocation block regression, depicted in the right sides of tables 12 and 13, differed somewhat from the previous regression. Again, only the second step in the model was a significant predictor of aggressive behavior $F(3, 115) = 3.21$, $p < .05$, $R^2 = .10$. However, in contrast to the results of the low-provocation block regression, effort condition ($t = -2.46$, $p < .05$, $\beta = -.22$) uniquely predicted the number of 20 shocks selected by participants, with high-effort group members selecting significantly lower numbers of 20s. Gender, anger rumination, trait anger, and the interaction terms did not account for a significant portion of unique variance in the model.

Table 13

β Weights and Associated Statistics for Low/High Multiple Regression Model – Total 20 Shocks

	Low Provocation			High Provocation		
Predictor	ΔR^2	β	t	ΔR^2	β	t
Step 1	.02			.02		
Gender		.14	1.51		.14	1.58
Step 2	.06*			.08*		
Gender		.09	0.98		-.12	1.32
Effort		-.11	-1.22		-.22*	-2.46
Condition						
Trait Anger		-.22	-1.73		-.09	-0.07
Rumination		.32*	2.48		.19	1.49
Step 3	.04			.01		
Gender		.09	0.95		.12	1.33
Effort		.24	0.79		.08	0.27
Condition						
Trait Anger		-.37*	-2.14		-.12	-0.67
Rumination		.56**	3.33		.30	1.74
Rum. X Effort		-.80*	-2.33		-.39	-1.11
Ang. X Effort		.43	1.10		.06	0.16

* $p < .05$, ** $p < .001$

CHAPTER IV

DISCUSSION

Interpretation of Findings

The purpose this study was to examine the relationship between anger rumination, provocation, and aggression in two conditions: one condition requiring a low level of effort to aggress and one condition requiring a high level of effort to aggress. It was hypothesized that a) participants in the high effort condition would respond with less aggression despite provocation; b) higher levels of anger rumination would uniquely increase aggressive responding in the high effort group over and above the effects of trait anger; and c) trait anger would be positively associated with aggressive responding in the low-effort condition controlling for trait anger, especially under high levels of provocation.

In order to test these hypotheses, anger rumination was measured using the Dissipation-Rumination Scale, a continuous self-report measure of anger rumination. This scale was validated via a two step multiple regression analysis incorporating a measure of trait anger, and then two other scales related to anger rumination. Results of this regression indicated qualified support for the validity of the DRS, with subscales measuring anger rumination and revenge planning predicting a significant amount of the variance in DRS scores over and above the effects of trait anger.

Aggression was measured via two indices: mean level of electric shock selected by participants and by the number of level 20 shocks selected by participants. Data were analyzed using a series of eight multiple regression analyses, examining the relationships

among variables independent of provocation, within provocation blocks, and at each level of provocation separately.

Hypothesis 1 was supported in all analyses using the mean shock index. Requiring increasing effort to aggress caused a significant reduction in mean shock independent of provocation, within provocation blocks, and at low and high levels of provocation. However, hypothesis 1 was only partially supported using total 20 shocks as an aggression index. Independent of provocation, effort group membership closely approached statistical significance, but no significant effect was found within provocation blocks. Results were similarly mixed at each provocation level. There was no effect for effort group membership at the low provocation level, whereas high effort group membership decreased the number of 20 shocks selected under high provocation.

Hypothesis 2 was not fully supported using either shock index. Across shock indices, higher levels of anger rumination were found to promote higher levels of aggression independent of provocation, and a similar aggression-promoting effect was noted in both low and high provocation conditions. However, anger rumination was not found to significantly affect the difference in aggression between low and high provocation blocks. Also unsupported was the postulated relationship among aggression, rumination, and effort condition postulated in hypothesis 2. Rumination was not found to increase or maintain aggression in the high-effort condition and, moreover, was not found to moderate the relationship between effort condition and aggression in any of the regressions.

Hypothesis 3 was unsupported. Trait anger was not a significant predictor of aggression at high levels of provocation or in any of the other regression models.

Additionally, there was no significant interaction noted between trait anger and effort condition. It is unclear why trait anger was not a significant predictor of aggression in any of the regression models, given the theoretical association between anger and aggression. It is possible that there was not a wide enough range in anger among participants in this study. Levels of trait anger among study participants were generally skewed leftward, suggesting relatively low levels of anger. The affect on aggression may have been more profound had more individuals identified severe or pathological levels of anger.

The above findings further support the aggression dampening effect of the required effort condition noted in Broman-Fulks and colleagues (2008) persisted in this current study as well, although more dramatically when mean shock was the aggression index. This effect appeared robust enough to overcome the aggression promoting effects of both provocation and anger rumination; although it should be noted that anger rumination did promote aggressive behavior. This is consistent with previous rumination/aggression research (Bushman et al., 2005; Denson, Pedersen, & Miller 2006).

The aggression decreasing effect of required effort was more questionable when the number of 20 shocks selected was used as an aggression index. Effort group membership was not entirely predictive of 20 shocks selected in the DV1 condition and not at all predictive of total 20 shocks selected in the DV2 condition. Group membership was also not predictive of aggression in the low provocation block, but was significantly predictive in the high provocation block. This finding could be accounted for by the general rarity of the selection of the 20 shock at the low provocation level, with only 9.8% of participants selecting a 20 shock in this block of trials. In contrast to this, a

significant aggression-decreasing effect was noted for group membership at the high provocation level, at which 30.1% of participants, having been repeatedly provoked by the opponent, selected 20 shocks. This suggests that there may be something different about the subset of participants who elected to set 20 shocks preemptively (i.e. prior to being provoked). These participants may not react in the same way to being required to exert effort to aggress as those who set 20 shocks following provocation.

Also of note was the role, or lack thereof, of gender in predicting aggressive behavior. Gender was only found to account for a unique portion of variance in aggression when low-provocation group mean shocks were regressed onto the 3 step regression model. This is consistent with Bettencourt and Miller's (1996) research on gender and aggression, as male/female differences in aggression tend to disappear following a provocation. The lack of gender effects in other low provocation/provocation independent analyses could be accounted for by the relatively uneven balance of genders (33% males vs. 67% females).

Contrary to expectations, increased ruminative thought did not promote increased aggression on the TAP in the high effort condition. There are several possible explanations for this finding. As noted above, the inconvenience of the high effort manipulation may have simply overcome any added perseveration promoted by higher levels of rumination. It is also possible that the perseveration that characterizes ruminative thought (e.g., repeatedly focusing on anger-provoking situations, not allowing angry feelings to dissipate over time) is markedly different from the kind of perseverative behavior that would result in a study participant continually responding to an effortful task. In other words, although high ruminators may continue to think perseveratively

about their anger, and even aggress more readily and intensely, they may not perseverate behaviorally in order to aggress. Additionally, it is also possible that the cover task: a test of reaction time was itself distracting enough to dissipate some of the angry rumination, although this is unlikely, given the competitive nature of the task and the frequent provocation shocks from the supposed opponent.

The finding that membership in the high-effort group decreases aggressive responding was clearly established through the above analyses. What is somewhat less clear is the "active ingredient" in the high-effort condition that resulted in this decrease. This paper has conceptualized "effort" as causing the decrease, but it is also possible that the decrease in selected shock could be the result of the increased time required to respond. High effort condition participants who selected all, or nearly all, 20 shocks invested a comparatively larger amount of time in the TAP (up to 40 minutes) than those who selected lower shocks (~20 minutes). Part of the decrease in aggression due to the high-effort condition could represent participants not only finding the repetitive task aversive or boring, but also wanting to complete the study as quickly as possible in order to attend to other engagements. This may have been especially true during the high provocation block, which was presented during the second half of the TAP's 28 trials.

Questions also remain about the universality of the aggression-dampening effects observed in this study. A variety of antecedents of aggressive behavior exist, DSM-IV TR (APA, 2000), for example, lists identifies pathological anger, irritability, or potentially aggressive behavior as associated features of a variety of different psychiatric disorders (e.g., Bipolar Disorder, Conduct Disorder, Antisocial Personality Disorder, Intermittent Explosive Disorder). Additionally, alcohol intoxication or other disinhibiting

stimuli can also serve as precursors to aggression (McCloskey & Berman, 2003). Requiring high levels of effort could potentially be more or less effective in decreasing aggressive behavior depending on the antecedent to aggression. Consider, for example, disorders in which aggressive responding is associated with impulsivity such as Bipolar Disorder or Intermittent Explosive Disorder. Theoretically, individuals with these diagnoses could potentially be more affected by the high effort-condition manipulation, either due to dissipation of the impulsive aggression, or through the impulsive selection of a more easily obtained low level shock. A similar effect would be expected in participants in a substance-induced state of disinhibition. Conversely, individuals who engage in more planful, instrumental aggressive behavior, (e.g., Antisocial Personality Disorder, Conduct Disorder) may be less affected by effort manipulations. Further research into these variations could help to further refine the understanding of the relationship between aggression and required effort.

Potential Contributions of the Current Study

One central question in interpreting the above results is how applicable these findings are to real-world aggression compared to aggression as measured in the laboratory by the TAP. Although the use of a laboratory paradigm does limit the study's ecological validity, the finding that denying easy access to a means to aggression tends to lower aggression does have applications to a variety of real world issues. Perhaps the prototypical example is gun control legislation, in which interventions such as a waiting periods or background checks, create situations in which potential firearm buyers must exert significant effort in order to access a weapon. The effectiveness of requiring an exertion of effort to aggress in decreasing aggressive responding, regardless of factors

such as tendency to ruminate on anger, provocation, or increased aggression, would appear to support the theoretical soundness of such interventions.

These findings have clinical implications in addition to the aforementioned public policy implications. Uncontrolled, pathological anger has been implicated as an antecedent to aggressive behavior (Bettencourt et al., 2006). This study's findings could support and inform treatment or risk management for psychiatric disorders associated with pathological anger, irritability, or aggression. Such interventions could include determining whether or not patients who are at risk to aggress own or have access to weapons; and negotiating, either with patients or family members, to make access more restricted or difficult (e.g., unloading guns, gun locks, locking knife drawers, etc). As discussed above, these interventions may be more successful with patients who experience aggressive behavior related to impulsivity.

Other contributions of the current study include the design of a novel paradigm for the induction of anger in the laboratory. Although previous studies have used negative feedback as a means of anger provocation previously, this study is the first to integrate that feedback into a laboratory paradigm of aggression measurement. This study also contributed to the body of evidence validating the Dissipation-Rumination Scale as a valid measurement of anger rumination.

Limitations of the Current Study

A central limitation of the current study was the complexity and conventions of the provocation cover task and anger rumination induction. In order for data from a given participant to usable, that participant was be required to believe both that they were competing against another, provoking individual, and that they were not involved in a

task measuring aggression. Given the subject pool, undergraduate psychology students, many participants were able to guess, at least partially, the true purpose of the study. This required the rejection of a larger than average number of participants (27), lowering power.

Another limitation involved the nature of the available anger rumination measures. The measures of anger rumination used in this study asked essentially retrospective questions about participants' anger rumination experiences (e.g., "I have had times when I could not stop being pre-occupied with a particular conflict"[Sukhodolsky, Golub, & Cromwell, 2001]). However, these measures do not measure current anger rumination in vivo. Although there was a manipulation check in this study to measure anger, the current study's design did not provide for an opportunity to include a manipulation check for the occurrence of rumination itself.

Future Research and Possible Variations

The high-effort/low-effort modification of the Taylor Aggression Paradigm is a promising area of potential future research. Other potential moderating variables including psychopathy could be explored using the same, or similar, research design. As previously mentioned, this relationship may function differently depending on the antecedents of aggressive behavior. A study comparing impulsive aggressors to instrumental aggressors using the high/low effort TAP could provide further information on the nature of factors affecting the relationship between aggression and effort condition. This research study could resemble the current study but incorporate a reward-based system in order to provoke instrumental aggression.

Additionally, in order to address the above-noted lack of an in vivo measure of rumination, a longitudinal component could be added to future aggression/anger rumination studies in order to better capture the long-term nature of anger rumination. Participants could be provoked via verbal insult and then invited back the following day at which time their level of anger would be assessed. This would give some idea of which individuals were actually ruminating. Alternatively, a periodic measure of anger during the task could be built into the SAP protocol, which would also better measure rumination in vivo. This could also involve further refining and testing the anger induction paradigm developed for this study (e.g., further testing of provocative language in order to maximize anger-induction while maintaining believability). A future study could incorporate continuous real-time feedback from the supposed participant (or an actual confederate) in order to continue to activate anger-related thoughts and feelings. Finally, given some of the questions about the connection between the perseverative nature of ruminative thought and perseverative behavior, research could be conducted further examining the effects of anger rumination on executive functioning. This could begin with some initial analyses of Wisconsin Card Sorting Test data collected during the provocation induction.

Conclusion

The purpose of this study was to examine the relationship among anger rumination, provocation, and aggressive behavior under two conditions: one requiring significant effort to aggress and one in which aggression required little to no effort. The main finding was that although anger rumination was associated with aggression, requiring significant effort in order to aggress decreased aggressive responding as

measured by mean shock even at high levels of provocation, trait anger, and anger rumination.

APPENDIX A

UNIVERSITY OF SOUTHERN MISSISSIPPI

CONSENT DOCUMENT FOR RESEARCH PARTICIPANTS

TITLE OF STUDY: PERSONALITY MATCHING AND JOINT PERFORMANCE ON A REACTION TIME TASK

PARTICIPANT NAME _____

WHAT IS THE PURPOSE OF THE STUDY? The purpose of this study is to obtain a better understanding of how personality similarities affect a person's reaction time during an interactive game. If you agree to be in this study, you may be asked to answer some questions about your feelings and memories, be exposed to electrical stimuli, perform some tasks, and answer questions in response to your performance on these tasks. This study is part of a doctoral dissertation by Joshua Bullock M.A., and Dr. Mitchell Berman is supervising the project.

WHAT WILL I DO? You will take part in a reaction time task that involves the use of mild to moderate electrical stimulation (electric shock). You will take part in twenty-eight individual reaction time trials against another participant each of which may end with you receiving electrical stimulation. The highest possible shock that you can receive may be unpleasant or painful, and should your partner choose to select an extreme shock, you may experience some tissue damage which should heal quickly. You will also perform some other tasks that resemble card games or line tracing. You will also be asked to complete a number of questions about your feelings and behaviors. The entire study will take about one hour or a bit longer to complete. If you have recently used marijuana or a selective serotonin reuptake inhibitor (e.g., Lexapro, Celexa, Paxil, Prozac etc.) you cannot participate in this study.

WHAT ARE THE RISKS TO ME? Risks inherent in this study are minimal. You may experience mild to moderate discomfort from the electrical stimulation used in the attention task. If your partner chooses to select an extreme shock (20), you may experience some minor tissue damage which should heal quickly. You may get bored or tired during the sessions. Some questions may be sensitive in nature. For example, we will ask you about feelings and emotions you may have had in the past. You may feel uneasy after answering these questions.

WHO BENEFITS? The information obtained in this study will not directly benefit you. However, the results of the study may provide information about human personality and reaction time.

You will receive course credit for being in the study. You will receive four points of Experimetrix credit for your participation. If you do not meet the criteria for this study, or you choose not to participate, other research options for obtaining credit are available.

Credit may also be obtained through non-research options at your course instructor's discretion. You may prefer to discuss other options for obtaining credit with your instructor.

WHO WILL SEE MY INFORMATION? All information obtained during this study is confidential. That is, we protect the privacy of subjects by withholding their names and other identifying information from all persons not connected with this study. All information will be kept in a locked file cabinet or on an access-controlled computer. Data that we may report in scientific journals will not include any information that identifies you as a subject in this study. Five years after the final publication of this study, all study information will be destroyed.

VOLUNTARY PARTICIPATION. Your participation in this study is entirely voluntary. You may withdraw from being a research subject anytime, even after we tell you about the study. There is no penalty for withdrawing at any time. If you withdraw from this study voluntarily, you will receive course credit only for those aspects of the research that you have completed. Students here receive one "research credit" for each half-hour of participation. If you decide to not participate, you will receive one-half credit. If you stop after a half hour, you will receive one credit. If you finish the study, you will receive four credits for over 90 minutes of participation. Please keep your copy of this consent form for your records.

PARTICIPANT'S CONSENT. I have had the purposes and procedures of this study explained to me and have had the opportunity to ask questions. My questions have been answered to my satisfaction, and I am voluntarily signing this form. My signature shows my willingness to participate in this study under the conditions stated. If I have questions about this research study, I can contact Joshua Bullock or Mitchell E. Berman, Ph.D., at (601) 266-6509 In addition, if I have further questions about my rights as a participant in this research protocol, I understand that I may contact the Office of Research and Sponsored Programs at (601) 266-4119.

_____	_____	_____	_____
Participant's Signature	Date	Investigator's Signature	Date

_____	_____
Witness to Signature	Date

APPENDIX B

DEMOGRAPHIC QUESTIONNAIRE

Subject Number: _____ Date: ___/___/___

Age _____

Gender: _____Male
_____Female

Ethnic Group: _____Caucasian
_____African-American
_____Hispanic
_____Other (specify _____)

Highest academic degree? _____

Current occupation? _____

Please circle "Yes" or "No" for the following questions. If you answer yes, please describe in further detail in the space provided.

Are you currently taking any medication?

Yes No

_____

_____

_____

Have you ever been diagnosed with a psychotic disorder (e.g., Schizophrenia)?

Yes No

_____

_____

_____

Have you ever been diagnosed with panic disorder or another anxiety disorder?

Yes No

_____

_____

_____

Have you ever been diagnosed with bipolar disorder?

Yes No

_____

_____

_____

Post Task Questionnaire

Participant #: _____

PLEASE ANSWER THE FOLLOWING QUESTIONS. IF YOU DO NOT KNOW AN ANSWER PLEASE GIVE YOUR BEST GUESS.

1. Were you following any system with regard to the reaction-time key (e.g., were you pulling your finger up or to the side, etc.)? Please write a brief sentence.

2. Was it important for you to win?

Not at All 1 2 3 4 5 6 7 8 Very Much

3. Compared to most participants, how high were the shocks you set for your opponent
(circle one statement only).

a. I set much lower shocks than most people in the study
b. I set somewhat lower shocks than most people in the study
c. I set the same shocks as most people in the study
d. I set somewhat higher shocks than most people in the study
e. I set much higher shocks than most people in the study

4. Compared to most participants, how high were the shocks you set for your opponent
(circle one statement only).

a. I set much lower shocks than most people in the study
b. I set somewhat lower shocks than most people in the study
c. I set the same shocks as most people in the study
d. I set somewhat higher shocks than most people in the study
e. I set much higher shocks than most people in the study

5. Why did you choose the shock settings you did? Please explain.

6. How much did you feel in control of the situation?

Not at All 1 2 3 4 5 6 7 8 Very Much

7. How anxious were you during the task?

Not at All 1 2 3 4 5 6 7 8 Very Much

8. How concerned were you with what the experimenter thought of you?

Not at All 1 2 3 4 5 6 7 8 Very Much

9. How concerned were you with what your opponent thought of you?

Not at All 1 2 3 4 5 6 7 8 Very Much

10. How important is it for you to know your opponent?

Not at All 1 2 3 4 5 6 7 8 Very Much

11. How painful was the highest shock you took during the threshold procedure?

Not at All 1 2 3 4 5 6 7 8 Very Much

12. How much tissue damage do you think the 20 shock causes?

None 1 2 3 4 5 6 7 8 Very Much

13. If you did not receive a 20, how painful would you expect a 20 to be?

Not Painful 1 2 3 4 5 6 7 8 Extremely Painful

14. Did you know anything about this experiment before you participated (other than what the experimenter told you on the phone)? Please explain:

15. As best as you can recall, your opponent was: Male_____ Female_____

16. Your best guess about your opponent's age: _____ years old

17. How much did you feel your opponent was provoking you?

Not at All 1 2 3 4 5 6 7 8 Very Much

18. What do you think the purpose of this study is?

_____

_____

APPENDIX C

INSTRUCTIONS FOR SETTING SHOCK THRESHOLD

"Okay Subjects A and B, I'm going to turn on the microphone so that we can all hear each other."

"First, I will give you a series of shocks, increasing the intensity of each one. When the shock is first presented, it will be below your threshold and you will NOT feel it. As the intensity increases: first, you will become aware of it; second, it will feel like a tingling sensation; third, it will feel like a vibration; and finally, the shock will reach an intensity that is definitely painful. I want you to tell me two things: one, report when you first feel the shock, and two, report when you don't want anymore, that is, when it is DEFINITELY painful."

"Okay Subject A, let's begin with you. Tell me when you first feel the shock."
(pause for Subject A Response)
"Okay, Subject A, now tell me when you don't want anymore, that is, when the shock becomes very unpleasant. I will stop the upper threshold procedure when you tell me the shock is VERY unpleasant—that is, when you can't take anymore. PLEASE wait to stop until the shock is painful."
(Pause for Subject A Response)
"Okay Subject A, we'll stop there".

"Okay Subject B, it's your turn. Tell me when you first feel the shock."
(Play Subject B Sound File)
"Okay, now tell me when you don't want anymore, that is, when the shock becomes VERY unpleasant. I will stop the upper threshold procedure when you tell me the shock is very unpleasant. PLEASE wait to stop until the shock is painful."

(Play Subject B Sound File)

"Okay Subject B we'll stop there".

Low Effort TAP Instructions

"Okay Subject A and B. We'll do the task now. The purpose of this task is to determine the effect of personality matching on the speed with which a finger can be pulled off a reaction time key—the space bar on the computer. Two of you, situated in separate rooms, will be competing against each other to see who has the fastest reaction time. Both of you have the same apparatus in front of you and the same task to perform.

You will see the instructions "Wait, Get Ready, Hold Spacebar, and Release" on the computer screen. When the computer says to Hold Spacebar, you are to press and hold down the space bar. When the release signal comes on the screen, you are to remove your finger from the space bar as fast as you can. Of course, you both will receive the release signal at the same time. The object of each trial is to get your finger off the space bar as fast as possible in order to beat your competitor.

The person who does not get his/her finger off in the shortest time, that is, the person with the slower reaction time, will receive a shock. There are 12 different intensities of shock you can receive if you have the slower reaction time: 0 through 10 and a 20. The degree of shock you actually receive depends upon the degree of shock your opponent chooses to store in the apparatus before the trial begins."

"Before each trial, when you see the instructions to choose a shock, you will immediately set the amount of shock you wish your opponent to receive if you should be faster on the coming trial. You will do this by briefly pressing, just once, one of the 12 buttons at the top of the keyboard. The 1-button corresponds to the least intense shock possible. The 10-button corresponds to the shock level each of you judged most unpleasant during the preliminary trials. The 20-button will administer an EXTREMELY PAINFUL shock twice the intensity of the shock each of you judged most unpleasant in the preliminary trials. This shock may cause minor tissue damage that will quickly heal, but will have no permanent effects. If you press the 0-button, NO shock will be delivered."

"After you have set the amount of shock you wish your opponent to receive on the coming trial, the actual trial will begin. You will see the signal to press the reaction-time key. At some time after this, the release signal will flash and you are to remove your finger as fast as possible. At the end of each trial you will be informed by a message on the computer screen about the level of shock set by the other person as well as whether you won or lost the particular trial. The slower person will get a shock of the intensity that was chosen by the other person. The faster person will not receive the shock that was set by the other person. If either of you lift your finger off the space bar before the release signal comes on, a message saying 'Subject released space bar too soon' will come on and the two of you will repeat the trial.

"To summarize: When the signal comes on, you are to briefly set the amount of shock you wish your competitor to receive if (he/she) should be slower on the coming trial. You will then press the space bar down and hold it down when signaled, until the 'release' signal flashes. At this time, you are to remove your finger as fast as possible. The slower person on that trial will receive the shock set by (his/her) competitor. The faster person will not receive the shock, but will see the level of shock set for them by their opponent via a message on the computer screen. It is important that both of you set the shock level as soon as instructed, and respond to the release signal AS FAST AS YOU CAN."

Okay, I am going to turn on the computer monitors for both of you, and we'll start the task. Give me a 'thumbs up' if you can see your monitor."

High Effort TAP Instructions – Differences are in bold.

"Okay Subject A and B. We'll do the task now. The purpose of this task is to determine the effect of personality matching on the speed with which a finger can be pulled off a reaction time key—the space bar on the computer. Two of you, situated in separate rooms, will be competing against each other to see who has the fastest reaction time. Both of you have the same apparatus in front of you and the same task to perform.

You will see the instructions “Wait, Get Ready, Hold Spacebar, and Release” on the computer screen. When the computer says to Hold Spacebar, you are to press and hold down the space bar. When the release signal comes on the screen, you are to remove your finger from the space bar as fast as you can. Of course, you both will receive the release signal at the same time. The object of each trial is to get your finger off the space bar as fast as possible in order to beat your competitor.

The person who does not get his/her finger off in the shortest time, that is, the person with the slower reaction time, will receive a shock. There are 12 different intensities of shock you can receive if you have the slower reaction time: 0 through 10 and a 20. The degree of shock you actually receive depends upon the degree of shock your opponent chooses to store in the apparatus before the trial begins.”

“Before each trial, when you see the instructions to choose a shock, you will set the level of shock you wish your opponent to receive if you should be faster on the coming trial. You will do this by briefly pressing, just once, one of the 12 buttons at the top of the keyboard. The 1-button corresponds to the least intense shock possible. The 10-button corresponds to the shock level each of you judged most unpleasant during the preliminary trials. The 20-button will administer an EXTREMELY PAINFUL shock twice the intensity of the shock each of you judged most unpleasant in the preliminary trials. This shock may cause minor tissue damage that will quickly heal, but will have no permanent effects. If you press the 0-button, NO shock will be delivered. **On the computer screen, you will see a display indicating which shocks are available for you to select. You will notice that, to begin with, only the 0 button will be available. In order to select higher shocks you must continue pressing the space bar until the shock you would like to select becomes available. Once it does, you may press one the corresponding button on the top of the keyboard to select it.”**

“After you have set the amount of shock you wish your opponent to receive on the coming trial, the actual trial will begin. You will see the signal to press the reaction-time key. At some time after this, the release signal will flash and you are to remove your finger as fast as possible. At the end of each trial you will be informed by a message on the computer screen about the level of shock set by the other person as well as whether you won or lost the particular trial. The slower person will get a shock of the intensity that was chosen by the other person. The faster person will not receive the shock that was set by the other person. If either of you lift your finger off the space bar before the release signal comes on, a message saying ‘Subject released space bar too soon’ will come on and the two of you will repeat the trial.

“To summarize: When the signal comes on, you are to briefly set the amount of shock you wish your competitor to receive if (he/she) should be slower on the coming trial**. If you wish to select a shock higher than 0, you must continue to press the space bar until your desired shock becomes available on the screen.** After you set the shock, you will then press the space bar down and hold it down when signaled, until the 'release' signal flashes. At this time, you are to remove your finger as fast as possible. The slower

person on that trial will receive the shock set by (his/her) competitor. The faster person will not receive the shock, but will see the level of shock set for them by their opponent via a message on the computer screen. It is important that both of you set the shock level as soon as instructed, and respond to the release signal AS FAST AS YOU CAN."

Okay, I am going to turn on the computer monitors for both of you, and we'll start the task. Give me a 'thumbs up' if you can see your monitor.

APPENDIX D

INSTITUTIONAL REVIEW BOARD APPROVAL FORM

THE UNIVERSITY OF SOUTHERN MISSISSIPPI

Institutional Review Board

118 College Drive #5147
Hattiesburg, MS 39406-0001
Tel: 601.266.6820
Fax: 601.266.5509
www.usm.edu/irb

HUMAN SUBJECTS PROTECTION REVIEW COMMITTEE
NOTICE OF COMMITTEE ACTION

The project has been reviewed by The University of Southern Mississippi Human Subjects Protection Review Committee in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services (45 CFR Part 46), and university guidelines to ensure adherence to the following criteria:

- The risks to subjects are minimized.
- The risks to subjects are reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered regarding risks to subjects must be reported immediately, but not later than 10 days following the event. This should be reported to the IRB Office via the "Adverse Effect Report Form".
- If approved, the maximum period of approval is limited to twelve months. Projects that exceed this period must submit an application for renewal or continuation.

PROTOCOL NUMBER: **28110311**
PROJECT TITLE: **The Relation Between Anger Rumination, Provocation, and Aggressive Behavior**
PROPOSED PROJECT DATES: **11/01/08 to 10/31/2010**
PROJECT TYPE: **Dissertation or Thesis**
PRINCIPAL INVESTIGATORS: **Josh Bullock**
COLLEGE/DIVISION: **College of Education & Psychology**
DEPARTMENT: **Psychology**
FUNDING AGENCY: **N/A**
HSPRC COMMITTEE ACTION: **Expedited Review Approval**
PERIOD OF APPROVAL: **11/06/08 to 11/05/09**

Lawrence A. Hosman

Lawrence A. Hosman, Ph.D.
HSPRC Chair

11-10-08
Date

REFERENCES

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (Revised 4th ed.). Washington, DC: Author.

Anderson, C.A., & Bushman, B.J. (2002). Human aggression. *Annual Review of Psychology, 53*, 27-51.

Bettencourt, B.A., & Miller, N. (1996). Gender differences in aggression as a function of provocation: A meta-analysis. *Psychological Bulletin*, *119*, 422-447.

Bettencourt, B.A., Talley, A., Valentine, J., & Benjamin, A.J. (2006). Personality and aggressive behavior under provoking and neutral conditions: A meta-analytic review. *Psychological Bulletin*, *132*, 751-777.

Berkowitz, L. (1990). On the formation and regulation of anger and aggression: A cognitive-neoassociationistic analysis. *Aggressive Behavior*, *45*(4), 494-503.

Berkowitz, L. (1993). *Aggression: Its causes consequence and control*. New York: McGraw-Hill.

Borders, A., Barnwell, S., Earleywine, M. (2007). Alcohol-aggression expectancies and disposition rumination moderate the effect of alcohol consumption on alcohol-related aggression and hostility. *Aggressive Behavior*, *33*, 327-338.

Brendgen, M., Vitaro, F., Boivin, M., Dionne, G., & Perusse, D. (2006). Examine genetic and environmental effects on reactive versus proactive aggression. *Developmental Psychology*, *6*, 1299-1312.

Broman-Fulks, J. J., Hudson, B.L., Bobrycki, L.A., Ratliff, B., Sloan, P.A., Bradley, T.P.,

& Berman, M.E. (2002, September). *Effect of restricted "weapon" access on retaliatory aggression.* Poster presented at the annual meeting of the Mississippi Psychological Association, Biloxi, MS.

Bushman, B.J. (2002). Does venting anger feed or extinguish the flame? Catharsis, rumination, distraction anger, and aggressive responding. *Personality and Social Psychology Bulletin*, *28*, 724-731.

Bushman, B.J., Bonacci, A.M., Pedersen, W.C., Vasquez, E.A., & Miller, N. (2005). Chewing on it can chew you up: Effects of rumination on triggered displaced aggression. *Journal of Personality and Social Psychology*, *88*, 969-983.

Caprara, G.V. (1986). Indicators of aggression: The dissipation-rumination scale. *Personality and Individual Differences*, *7*, 763-769.

Caprara, G.V., Barbaranelli, C., Colombo, G., Politi, A., & Valerio, P. (1987). Emotional susceptibility, irritability, and hostile rumination as correlates of coronary heart disease. *Personality and Individual Differences*, *19*, 569-575.

Carson, C.L. & Cupach, W.R. (2000). Fueling the flames of the green-eyed monster: The role of ruminative thought in reaction to romantic jealousy. *Western Journal of Communication*, *64*, 308-329.

Chermack, S.T., Berman, M.E., & Taylor, S.P. (1997). Effects of provocation on emotions in aggression in males. *Aggressive Behavior, 23*, 1-10.

Clark, D.M., & Wells, A. (1995). A cognitive model of social phobia. In R.G. Heimberg, M.R. Liebowitz, D.A. Hope, & F.R. Scnheier, (Eds.), *Social phobia: Diagnosis, assessment and treatment* (pp. 63-93). New York: Guilford Press.

Collins, K., & Bell, R. (1997). Personality and aggression: The dissipation-rumination

scale. *Personality and Individual Differences*, *22*, 751-755.

Crane, C., Barnhofer, T., & Williams, M.G. (2007). Reflection, brooding, and suicidality: A preliminary study of different types of rumination in individuals with a history of major depression. *British Journal of Clinical Psychology*, *46*, 497-504.

Davis, R.N., & Nolen-Hoeksema, S. (2000). Cognitive inflexibility among ruminators and nonruminators. *Cognitive Therapy and Research*, *24*, 699-711.

Denson, T.F., Pedersen, W.C., & Miller N. (2006). The displaced aggression questionnaire. *Journal of Personality and Social Psychology*, *6*, 1032-1051.

Giancola P.R. (2004). Executive Functioning and Alcohol-Related Aggression. *Journal of Abnormal Psychology 113*, 541-555.

Giancola, P.R., Roth, R.M., & Parrot, D.J. (2006). The mediating role of executive functioning in the relation between difficult temperament and physical aggression. *Journal of Psychopathology and Behavioral Assessment*, *28*(4), 211-221.

Glynn, L.M., Christenfeld, N., Gerin, W. (2002). The role of rumination recovery from reactivity: Cardiovascular consequences of emotional states. *Psychosomatic Medicine*, *64*, 714-726.

Hogan, B.E., & Linden, W. (2004). Anger response styles and blood pressure: At least don't ruminate about it! *Annals of Behavioral Medicine*, *27*(1), 38-49.

Hong, R.Y. (2007). Worry and rumination: Differential associations with anxious and depressive symptoms and coping behavior. *Behaviour Research and Therapy*, *45*, 277-290.

Izard, C. (1972). *Patterns of emotions: A new analysis of anxiety and depression.* New York: Academic Press.

Kingsbury, S.J. (1978). Self esteem of victim and the intent of third-party aggression in the reduction of hostile aggression. *Motivation and Emotion*, *2*, 177-189.

Knobloch-Westerwick, S., & Alter, S. (2006). Mood adjustment to social situations through mass media use: How men ruminate and women dissipate angry moods. *Human Communication Research*, *32*, 58-73.

Kocovski, N.L. & Rector, N.A. (2007). Predictors of post-event rumination related to social anxiety. *Cognitive Behaviour Therapy*, *36*, 112-122.

Lazarus, R. (1991). Progress on a cognitive-motivation-relational theory of emotion. *American Psychologist*, *46*(8), 819-834.

Maxwell, J.P. (2004). Anger rumination: An antecedent of athlete aggression? *Psychology of Sport and Exercise*, *5*, 279-289.

McCloskey, M., & Berman, M. E. (2003). Alcohol intoxication and self-aggressive behavior. *Journal of Abnormal Psychology*, *112*, 306-311.

Miller, N., Pedersen, W., Earleywine, M., & Pollock, V. (2003). A theoretical model of triggered displaced aggression. *Personality and Social Psychology Review*, *7*, 75-97.

Monteith, M., Berkowitz, L., Kruglanski, A., & Blair, C. (1990). *The influence of physical discomfort on experienced anger and anger-related ideas, judgments, and memories*. Unpublished manuscript.

Neumann, S.A., Waldstein, S.R., Sollers, J., Thayer, J.F., & Sorkin, J.D. (2004). Hostility and distraction have differential influences on cardiovascular recovery from anger recall in women. *Health Psychology*, 2004, *23*, 631-640.

Nolen-Hoeksema, S., McBride, A., & Larson, J. (1997). Rumination and psychological

distress among bereaved partners. *Journal of Personality and Social Psychology*, *72*, 855-862.

Nolen-Hoeksema, S., & Morrow, J. (1991). A prospective study of depression and posttraumatic stress symptoms after a natural disaster: The 1989 Loma Prieta earthquake. *Journal of Personality and Social Psychology*, *61*, 115-121.

Peled, M., & Moretti, M., (2007). Rumination on anger and sadness in adolescence: Fueling of fury and deepening of despair. *Journal of Clinical Child and Adolescent Psychology*, *36*, 66-75.

Philippot, P., & Brutoux, F. (2008). Induced rumination dampens executive processes in dysphoric young adults. *Journal of Behavior Therapy*, *39*, 219-227.

Ray, R.D., Wilhelm, F.H., & Gross, J.J. (2008). All in the mind's eye? Anger rumination and reappraisal. *Journal of Personality and Social Psychology*, *94*, 133-145.

Roelofs, J., Muris, P., Huibers, M., Peeters, F., & Arntz, A. (2006). On the measurements of rumination: A psychometric evaluation of the ruminative response scale and the rumination on sadness scale in undergraduates. *Journal of Behavior Therapy*, *37*, 299-313.

Rusting, C.L., & Nolen-Hoeksema, S. (1998). Regulation responses to anger: Effects of rumination and distraction on angry mood. *Journal of Personality and Social Psychology*, *74*, 790-803.

Sielge, G.J., Steinhauer, S.R., Thase, M.E., Stenger, V.A., & Carter, C.S. (2002). *Biological Psychiatry*, *51*, 693-707.

Simpson, C., Papageorgiou, C. (2003). Metacognitive beliefs about rumination in anger. *Cognitive and Behavioral Practice*, *10*, 91-94.

Sloan, D.M., Marx, B.P., Epstein, E.M., & Dobbs, J.L. (2008). Expressive writing buffers against maladaptive rumination. *Emotion, 8*, 302-306.

Speilberger, C.D. (1999). *Manual for the state-trait anger expression inventory STAXI-2*. Odessa, FL: Psychological Assessment Resources.

Stadler, C., Rohrmann, S., Steuber, S., & Poustka, F. (2006). Effects of provocation on emotions and aggression: An experimental study with aggressive children. *Swiss Journal of Psychology*, *65*(2), 117-124.

Sukhodolsky, D.G., Golub, A., & Cromwell, E.N. (2001). Development and validation of the anger rumination scale. *Personality and Individual Differences*, *31*, 689-700.

Suris, A., & Coccaro, E.F. (2008). Aggression measures. In J.R. Rush, M.B. First, & D. Blacker, (Eds.), *Handbook of psychiatric measures* (pp. 731-744). Arlington, VA: American Psychiatric Publishing.

Taylor, S.P. (1967). Aggressive behavior and physiological arousal as a function of provocation and the tendency to inhibit aggression. *Journal of Personality*, *35*, 297-310.

Vasquez, E.A., Bartsch, V.O., Pedersen, W.C., & Miller, N. (2007). The impact of aggressive priming, rumination, and frustration on prison sentencing. *Aggressive Behavior*, *33*,477-485.

Vassilopoulos, S. (2007). Social anxiety and ruminative self-focus. *Journal of Anxiety Disorders, 22*, 860-867.

Watkins, E., & Baracaia, S. (2001). Why do people ruminate in dysphoric moods? *Personality and Individual Differences*, *30*, 723-734.

Watkins, E., & Brown, R.G. (2002). Rumination and executive function in depression:

An experimental study. *Journal of Neurology, Neurosurgery, & Psychiatry*, *72*(3), 400-402.

Watkins, E., & Moulds, M. (2005). Distinct modes of ruminative self-focus: Impact of abstract versus concrete rumination on problem solving in depression. *Emotion*, *5*, 319-328.