

Spring 5-1-2021

Proposed Subtypes of Anger Rumination: Brooding and Reflection and Their Associations with Aggression

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PROPOSED SUBTYPES OF ANGER RUMINATION: BROODING AND
REFLECTION AND THEIR ASSOCIATIONS WITH AGGRESSION

by

Fayth C. Walbridge

A Thesis
Submitted to the Graduate School,
the College of Education and Human Sciences
and the School of Psychology
at The University of Southern Mississippi
in Partial Fulfillment of the Requirements
for the Degree of Master of Arts

Approved by:

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May 2021

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2021

Published by the Graduate School



ABSTRACT

Rumination maintains, exacerbates, and is related to several maladaptive outcomes including negative affect (e.g., sadness, anger), symptoms of depression, and aggression in samples of nonclinical and clinical populations across developmental periods (e.g., McLaughlin & Nolen-Hoeksema, 2011; Nolen-Hoeksema, 1991; Nolen-Hoeksema, 1996; Thomsen, 2006; Peled & Moretti, 2007; Yang, et. al., 2014). Recently, the construct of sadness rumination has been conceptualized as two distinct subtypes, reflection and brooding (Treyner, Gonzalez, & Nolen-Hoeksema, 2003). Brooding is considered maladaptive because feelings and situations are viewed through a negativistic lens and reflection is viewed as adaptive and uses a problem-solving approach (Lopez, 2010; Burwell & Shirk, 2007; Smith & Alloy, 2009; Treyner, et al., 2003). The current study aimed to expand upon this past research and examine whether a two-factor model of rumination (brooding and reflection) is relevant for anger rumination and examine which subtype is associated with different forms of aggression. Results revealed that a two-factor model of anger rumination was a better fit than a one-factor model. Furthermore, this study found that brooding significantly associated with increases in physical and relational aggression and reflection was significantly associated with decreases in physical and relational aggression. However, reflection and not brooding was determined to be significantly associated with elevated levels of verbal aggression. Importantly, sex did not moderate the relationship between brooding and the different forms of aggression. Overall, these findings provide evidence of brooding and reflection subtypes for anger rumination and increases the specificity of how risk factors for

aggression are conceptualized, thus informing future directions for research and treatment.

ACKNOWLEDGMENTS

I would like to thank my committee chair and major professor, Dr. Stephanie Smith. Thank you for all of the support you have provided me throughout this entire process. I would also like to express my sincere gratitude to my thesis committee members, Dr. Joye Anestis and Dr. Eric Dahlen, the feedback you provided me for my thesis project has been invaluable. Finally, I would like to thank my incredible colleagues within my program.

DEDICATION

This thesis project is dedicated to my parents, brothers, and Grandma Lorrie.

Thank you all for inspiring me to pursue my dreams and for your continuous support. I wouldn't be where I am without all of you.

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LIST OF ABBREVIATIONS

<i>ARS</i>	Anger Rumination Scale
<i>BPAQ</i>	Buss Perry Aggression Questionnaire
<i>DASS-21</i>	Depression Anxiety Stress Scale
<i>SRASBM</i>	Self-Report of Aggression & Social Behavior Measure

CHAPTER I – INTRODUCTION

Rumination is a maladaptive cognitive response style that involves repetitive and intrusive self-focused attention on negative internal states, moods, thoughts, or feelings (Barber, Maltby, & Macaskill, 2005; Lyubomirsky & Nolen-Hoeksema, 1995). Past research has found that rumination enhances negative thinking, impair problem-solving, prompt problematic behaviors (e.g., self-harm, binge eating, and binge drinking), negatively impact social relationships, impair the management of daily stressors, increase the duration of depressive episodes, and heighten the experience of anger (Hoeksema, Wisco, Lyubomirsky, 2008; Lyubomirsky, Tucker, Caldwell, & Berg, 1999; Nolen-Hoeksema, 1996; Nolen-Hoeksema,). Some research has examined rumination to general negative affective states (e.g. Trapnell & Campbell, 1999) while other studies have focused on rumination to specific moods (e.g., Anestis, Anestis, Selby, & Joiner, 2009; Papageorgiou & Wells, 2004; Peled & Moretti, 2010), primarily examining rumination to feelings of sadness and the impact this negative response style has on the emergence and maintenance of depression. Ruminating to anger has received less research attention, but studies have been consistent in finding an association between anger rumination and forms of aggression (e.g., Smith, Stephens, Repper, & Kistner, 2016; Anestis, et al., 2009; Bushman, 2002; Peled & Moretti, 2007; Rusting & Nolen-Hoeksema, 1998). Specifically, anger rumination has been found to maintain and intensify anger and increase aggressive outcome as opposed to using other emotion regulation strategies (i.e., distraction; Anestis, et al., 2009; Nolen-Hoeksema, 1996; Peled & Moretti, 2010).

More recently, there have been refinements to the construct of rumination and studies have demonstrated that sadness rumination has two distinct subtypes: reflection

and brooding. In fact, previous work has shown that reflection is adaptive and uses a more problem-solving approach whereas brooding is maladaptive and considers feelings and situations through an anxious or gloomy lens (Treynor, et al., 2003). These two subtypes have different relationships with depression both in their ability to predict depression and whether it explains sex differences in depression symptoms (Treynor, et al., 2003). To our knowledge, this two-factor model of rumination has not yet been applied to anger rumination. A better understanding of brooding and reflection as potential subtypes of anger rumination could offer an important refinement to the anger rumination research literature and inform future clinical and research directions.

Models of Rumination

There have been two models proposed in understanding rumination and its contributory role to maladaptive outcomes: a general model and specificity model. In the general model, rumination is not specific to any particular emotion or context (e.g. “it is hard for me to shut off thoughts about myself”; Trapnell & Campbell, 1999; Verona, 2005) and it has been shown to significantly increase or maintain negative emotions including fear, sadness, and hostility (Borders, Earleywine, & Archana, 2010; Verona, 2005). In contrast, a specificity model of rumination examines rumination in response to specific negative moods (i.e., anger and sadness) and its prediction of distinct outcomes (e.g., depression, aggression; Nolen-Hoeksema, 1991; Nolen-Hoeksema, et al., 2008; Peled & Moretti, 2010).

Smith and Alloy (2009) found that ruminating on a specific mood (i.e., sadness) is useful and distinct from the general rumination model because it is parsimonious, mood-state focused, and predicts more specific mental health outcomes (i.e., depression). In

fact, Peled and Moretti (2010) proposed a higher-order factor of general rumination and two lower-order factors, anger and sadness rumination, finding that anger rumination was associated with aggression, while sadness rumination was associated with depressed mood in a sample of college undergraduates. These findings supporting the concept of anger and sadness rumination as distinct constructs (Peled & Moretti, 2010); similar results were found in sample of clinic-referred adolescents (Peled & Moretti, 2007). Gilbert and colleagues (2005) determined that sadness rumination was associated with increased depression symptoms when both anger and sadness rumination were measured in a college undergraduate sample; however, this study only focused on depression as an outcome measure. In a community sample of children, it was discovered that anger rumination was significantly associated with increased aggression and rumination to sadness was significantly associated with a decrease in aggression (Harmon, Stephens, Repper, Driscoll, Kistner, 2019). It appears that the specificity model provides a better understanding of what types of rumination increase the risk of specific outcomes, which could help inform more targeted treatments.

Sadness Rumination

Nolen-Hoeksema's response styles theory (1991; 1996) defined rumination as the pervasive and unintentional dwelling on feelings, causes, or outcomes of emotional distress. Two different styles of responding to depressed mood have been proposed by Nolen-Hoeksema (1991): (1) focusing inward on its symptoms, causes, and consequences referred to as a ruminative response style, or (2) focusing outward on events or activities unrelated to the source of the distress referred to as a distracting response style. Several mechanisms have been proposed explaining how rumination increases and prolongs

emotional distress, particularly depression. Specifically, rumination enhances negativistic thinking and interferes with effective problem-solving and instrumental behaviors that may improve the situation. Additionally, it has been suggested that individuals who are prone to a ruminative response style might be predisposed to interpersonal conflict by behaving in a hopeless, apathetic, or pessimistic style that irritates others, thus leading to less social support, which in turn exacerbates depression symptoms (Flynn, Kecmanovic, & Alloy, 2010; Nolen-Hoeksema & Davis, 1999).

Concurrent and longitudinal studies using samples across different developmental periods examining sadness rumination as a risk factor of depression-related outcomes have been done. Indeed, rumination has been found to be associated with the duration and intensity of depression symptoms whereas distraction has been determined to alleviate negative feelings, as one's focus is placed elsewhere and oftentimes on more enjoyable activities (Nolen-Hoeksema, 2000; Spasojevic, & Alloy 2001; Nolen-Hoeksema, Morrow, & Fredrickson, 1993; Nolen-Hoeksema, 1991). Experimental studies have also provided evidence of the causality between sadness rumination and an increase in depression symptoms (Lyubomirsky & Nolen-Hoeksema, 1995; Morrow & Nolen-Hoeksema, 1990). Morrow and Nolen-Hoeksema (1990) for example, induced a depressed mood (i.e., participants read a sad story and were instructed to imagine the events happening to them) in participants who were randomly assigned to different response styles (e.g., active distraction, passive distraction, active rumination, and passive rumination). It was found that those participants who were assigned to the distraction conditions had lower self-reported ratings of depressed mood than those participants assigned to the rumination conditions. Additionally, in cross-sectional studies, individuals

who scored higher on measures of sadness rumination evidenced increases in depression symptoms (Cheung, Gilbert, & Irons, 2004; Conway, Csank, Holm, & Blake, 2000; Garnefski, Legerstee, Kraaji, van den Kommer, & Teerds, 2002; Watinks, 2004; Ziegert & Kistner, 2002). This research on the association of sadness rumination and depression was extended to samples across different developmental periods (e.g., Lopez, 2010; Abela, Brozina, & Haigh, 2002; Schwartz & Koenig, 1996). It appears that rumination to sadness has a contributory role in the development and maintenance of depression; this relationship has been established in age-diverse samples using a variety of research designs (i.e., cross-sectional, longitudinal, experimental).

Anger Rumination

As mentioned previously, research on rumination has expanded to include examining this response style to other negative moods including anger and how this may impact subsequent behavior. Anger rumination is the propensity to unintentionally dwell on an angry mood or past angering event or its causes and consequences and is viewed as an independent construct within anger phenomenology (Sukhodolsky, Golub, & Cromwell, 2001). The primary distinction between anger and anger rumination is that anger is a negative emotion with psychological components, cognitive components, emotional components, and action tendencies (Kassinove & Sukhodolsky, 1995) and anger rumination is thinking about this emotion (Sukhodolsky, et al., 2001). In fact, prior studies have determined that anger rumination is moderately correlated with anger, intensifies the feeling of anger, and predicts aggression-related behaviors above and beyond trait anger (Peled & Moretti, 2010; Sukhodolsky, et al., 2001).

Rumination after an angering event is correlated with not only increased levels of anger but also aggressive outcomes. Indeed, Rusting and Nolen-Hoeksema (1998) elicited an angry mood through an imagination task in college students, following which participants ruminated or used distraction. Those who ruminated reported significantly higher anger than those who were in the distraction condition. Similar findings were revealed by Pedersen and colleagues (2011) where anger was incited in college students by insulting them and more anger was reported by those participants who ruminated on the provocation than those participants who were distracted by writing about their college campus. Both self-reported anger and aggression scores (i.e., intensity and duration of noise blasts directed at a confederate giving negative feedback) were significantly greater for college undergraduate participants instructed to hit a punching bag and think about the individual that criticized them (rumination condition), than participants who engaged in physical fitness exercises (distraction condition) or participants who were asked to sit quietly (control condition; Bushman, 2002). Using a similar experimental design, it was shown that rumination following an anger-provoking situation increased the likelihood of aggression even if the aggression was not directed at the provocateur, but at a clumsy confederate (i.e., displaced aggression; Bushman, et al., 2005). Additionally, Collins and Bell (1997) found that participants were identified as high or low ruminators by a self-report measure (i.e., Dissipation-Rumination Scale) and those participants who were high-ruminators displayed increased levels of aggression, as measured by the deduction of points, and delivering a loud noise an ‘opponent’ after receiving negative feedback.

Correlational studies using self-reported anger rumination measures have also found an association between anger rumination and different forms of aggression.

Anestis and colleagues (2009) findings revealed that anger rumination predicted physical and verbal aggression, however, anger rumination was not associated with anger. Several other studies have replicated the finding that anger rumination is associated with physical and verbal aggression or reactive and proactive aggression in samples of adolescents and adults (Peled & Moretti, 2007; Peled & Moretti, 2010; White & Turner, 2014). The research evidence available strongly suggests that anger rumination is potentially a risk factor of different forms of aggression so having a more refined conceptualization of this construct will help inform future research and clinical work.

Subtypes of Rumination

More recently, the conceptualization of rumination has changed and thought to encompass two subtypes: brooding and reflection (Treynor, et al., 2003). Reflection is likely more adaptive, as it is characterized as neutrally introspective and uses problem-solving to alleviate negative feelings and gain insight into one's problems. Thus, reflection may be used as a coping mechanism to deal with and overcome stressful life events that trigger negative moods (Treynor, et al., 2003). Importantly, reflection may be prompted by and lead to negative affect in the concurrently, however it may reduce negative affect overtime through effective problem-solving (Treynor, et al., 2003). While brooding is regarded as more maladaptive subtype and involves self-blame, moody pondering, and a passive comparison to unachievable standards (Treynor, et al., 2003). Treynor and colleagues (2003) proposed initial support for these two subtypes of rumination when a two-factor solution comprising reflection and brooding was revealed on the Ruminative Response Scale (RRS), which is a self-report measure assessing cognitive response styles to depressed mood in adults (Nolen-Hoeksema & Marrow,

1991). Further evidence of these subtypes has been gleaned by studies finding different patterns of associations between the reflection and brooding and depression symptoms. Indeed, Treynor and colleagues (2003) study determined that brooding was positively associated with more depressive symptoms scores both concurrently and longitudinally and reflection was associated with an increase of depressive symptoms concurrently, but negatively correlated with depressive symptoms longitudinally, which was attributed to its more problem-solving orientation. These findings were further supported by a study by Burwell and Shirk (2007) revealed that brooding was correlated with the development of depression symptoms longitudinally whereas reflection was not. This study also found that brooding was linked to maladaptive coping strategies and reflection was associated with adaptive coping strategies in response to stress (Burwell & Shirk, 2007). Lopez and colleagues (2009) found that brooding was linked to depression symptoms whereas reflection was not. Interestingly, a unique association was found between negative affect and brooding but not reflection (Lopez, 2010). Finally, Ciarocco and colleagues (2010) conducted a series of studies where undergraduate participants received negative feedback upon completion of a task (i.e., word search or creative task). For participants who engaged in goal-oriented rumination or reflection (e.g., thinking about how to approach the task differently for a better outcome), their performance improved. However, for those participants who engaged in state-rumination or brooding (e.g., focusing on their shortcomings and how that might impact future goals), their performance deteriorated. These findings indicate that rumination might be beneficial when the purpose is to self-correct for goal attainment and maladaptive if the focus is on

past failings that are unlikely to change, emphasizing the importance of understanding the maladaptive and adaptive dimensions of rumination.

No known studies have examined if these subtypes extend to different forms of context-specific rumination (i.e., anger rumination) and how they relate to relevant maladaptive outcomes (i.e., aggression). However, it has been suggested that brooding may be correlated with anger, which is a predictor of aggression (Sukhodolsky, et al., 2001). A measure of anger rumination (i.e., Anger Rumination Scale) has four subscales that were termed angry afterthoughts, angry memories, thoughts of revenge, and understanding of causes. The angry afterthoughts factor comprises items covering content about the maintenance of angering thoughts and the re-enactment of an angry episode and two of these items with the highest loadings were thought to reflect brooding, suggesting a more complex factor structure of anger rumination that is worthy of further evaluation (Sukhodolsky et al., 2001).

Sex Differences in Rumination and Maladaptive Outcomes

Sex differences in sadness rumination are well-established where the majority of research has shown that women are more likely to ruminate to sadness compared to men (Broderick & Korteland, 2002; Lopez, et al. 2009; Nolen-Hoeksema & Jackson, 2001). Relatedly, rumination is linked with lengthier and more intense periods of depressed moods in women and not men (Allgood-Merten, Lewinsohn, & Hops, 1990; Nolen-Hoeksema 1995; Rusting & Nolen Hoeksema, 1998). Additionally, socialized masculinity is negatively associated rumination (Wupperman & Neumann, 2006). Further, females are permitted or even expected to outwardly express this emotion whereas males are encouraged to employ problem-solving as a way to alleviate sadness

(Zahn-Waxler, Cole, & Barrett, 1991; Wupperman & Neumann, 2006). With respect to subtypes of sadness rumination, women have higher levels of reflection and brooding in comparison to men. Interestingly, brooding has been found to mediate the relationship between sex differences and depressive symptoms, suggesting that sex differences within brooding account for higher levels of depression in women (Treyner et al., 2003). Lopez et al. (2009) furthered this research on sadness rumination to children (grades 2nd through 7th) and found that girls compared to boys had increased levels of both subtypes of aggression and brooding, is linked with a vulnerability for depression.

However, no sex differences have been found between men and women with anger rumination and these results have been replicated in studies with adolescents (Maxwell, 2004; Sukhodolsky, et al., 2001, Peled & Moretti, 2010). In contrast Maxwell and colleagues (2005) determined that men in Hong Kong ruminated on anger more than women. Furthermore, different subscales on the Anger Rumination Scale have been found to have sex differences. Specifically, men had higher score than women on the thoughts of revenge subscale of the Anger Rumination Scale (Sukhodolsky et al., 2001). Although both men and women have similar tendencies to ruminate to anger, the type of aggression that is subsequently elicited may be different. Women's anger rumination has been found to be correlated with relational aggression compared to physical aggression whereas in men, anger rumination has been shown to correlate at equivalent strengths with physical and relational aggression (Peled, 2006). These patterns of results appear to correspond to the sex differences found across different forms of aggression. Previous research has demonstrated that males have higher levels of physical aggression compared to females (Burton, Hafetz, & Henninger, 2007; Buss and Perry 1992) and women and

men show similar levels of relational aggression during emerging adulthood (Bailey & Ostrov, 2008; Linder, Crick, & Collins, 2002; Loudin, Loukas, & Robinson, 2003).

Current Study

This study sought to refine the construct of anger rumination to determine when this maladaptive response style is linked with different forms of aggression (i.e., physical and relational). The two subtypes of rumination have been examined in the context of their prediction of internalizing symptoms (e.g., depression), but no known research has examined the relationship between the two subtypes of rumination and other maladaptive outcomes (e.g., aggression). A more in-depth understanding of anger rumination will inform treatments regarding what emotion regulation strategies to promote and what to avoid when coping with strong emotions that increase the risk of aggression.

The present study was an extension of studies that have found evidence for two subtypes of rumination in response to sadness (Burwell & Shirk, 2007; Lopez et al., 2009; Treynor et al., 2003). Results from both exploratory and confirmatory factor analyses have revealed a two-factor structure of sadness rumination representing brooding and reflection and prior studies have found that brooding and not reflection significantly predict elevated levels of depression symptoms in samples of children, adolescents, and adults (Burwell & Shirk, 2007; Lopez et al., 2009; Treynor et al., 2003). This study aimed to replicate these results for anger rumination and to examine whether a two-factor model of rumination (reflection and brooding) is a better fit to the data than a one-factor model of rumination. Another aim of this study was to examine the relationship between the two subtypes of rumination and different forms of aggression, as anger rumination is a risk factor for physical, relational, and verbal aggression (Anestis,

et al., 2009; Peled & Moretti, 2010). Given the unique association between brooding and depression and the link between anger rumination and aggression, it was predicted that brooding will significantly predict physical, verbal, and relational aggression. Per previous research, anger was included as a covariate, given the strong correlation between anger and aggression (e.g., Border & Lu, 2016). Other potential covariates (e.g., age, race, symptoms of depression and anxiety) were included in the model if correlated with different outcome variables.

The present study also analyzed the moderating effect of sex on the relationships between brooding and two forms of aggression (i.e., relational and physical). Sex differences have been found in sadness rumination and the two subtypes of rumination with women reporting higher levels of brooding than men (Broderick & Korteland, 2002; Lopez, et al. 2009; Nolen-Hoeksema & Jackson, 2001; Treynor, et al., 2001). In contrast to these findings for sadness rumination, most research has found that men and women employ similar levels of anger rumination (Maxwell, 2004; Sukhodolsky, et al., 2001, Peled & Moretti, 2010), with exception of men having higher scores on the Thoughts of Revenge subscale of the ARS (Sukhodolsky, et al., 2001). Additionally, in emerging adulthood men are more physically aggressive than women (Bailey & Ostrov, 2008). Although no sex differences have been found for relational aggression during this developmental period (Linder et al. 2002; Loudin et al. 2003), anger rumination in women has been found to more strongly correlate with relational aggression than physical aggression (Peled, 2006). Thus, it was hypothesized that sex will moderate the relationship between brooding and two forms of aggression (i.e., physical and relational aggression) where the relationship between brooding and relational aggression was

predicted to be stronger for women and the association between brooding and physical aggression was expected to be stronger for men.

CHAPTER II – METHODOLOGY

Participants

A total of 146 participants completed the entirety of this study's procedures, which surpassed the number of participants needed to detect medium sized effects according to an a priori power analysis (Cohen's $f^2 = .15$, $\alpha = .05$, power .9; Faul, et al., 2007). Participants were 31.5% male and 68.5% female with ages ranging from 17-52 years ($M = 20.34$ years; $SD = 5.19$). Forty-six percent of participants were Freshman, 25.3% were Sophomores, 13.0% were Juniors, and 15.1% were Seniors at the time of completing this study. A small minority of participants (2.1%) indicated they had previously been diagnosed with a psychological disorder (e.g., depression, anxiety, ADHD) for which they were currently taking prescription medications (e.g., stimulants, antidepressants; 0.7%). The racial composition of participants is 52.74% white/Caucasian 37.7% black/African American, 3.4% Asian, 2.7% biracial, and 3.4% other. Overall, the demographics of our sample are representative of the student population at the University where this study took place.

Measures

The Self-Report of Aggression & Social Behavior Measure (SRASBM; Morales & Crick, 1998)

The SRASBM is a 56-item self-report measure that assesses aggression-related behaviors. This measure contains six scales: relational aggression, physical aggression, relational victimization, physical victimization, exclusivity, and prosocial behavior. Items are rated on a 7-point Likert type scale ranging from 1 ("not at all true") to 7 ("very

true”), with higher scores indicating a greater likelihood of aggressive behavior, victimization, prosocial behavior, or exclusivity. Several studies have found adequate internal consistency for this measure, with Cronbach alpha coefficients ranging from .70 to .87 for the total measure (Bailey & Ostrov, 2008; Goldstein, Young, & Boyd, 2008; Lento-Zwolinski, 2007; Linder et al., 2002; Miller & Lyman, 2003; Murray-Close, Ostrov, Nelson, Crick, & Coccaro., 2010; Ostrov & Houston, 2008; Schad, Szewedo, Antonishak, Hare, & Allen., 2008) and .87 for the relational aggression and .82 for the physical aggression subscales (Clifford, 2007). The stability estimate at nine months was excellent for relational aggression ($r = .91$) (Murray-Close, et. al., 2010). Relational aggression and physical aggression subscales were used to measure different forms of aggression for the purposes of this study. Cronbach’s Alpha results for this study’s sample revealed good internal consistency for the relational aggression scale ($\alpha = .85$) and excellent internal consistency for the physical aggression scale ($\alpha = .92$) of the SRASBM.

Buss Perry Aggression Questionnaire (BPAQ; Buss & Perry, 1992)

The BPAQ is a 29- item measure that assesses four dimensions: anger, hostility, physical aggression, and verbal aggression. Items are scored on a 5-point scale ranging from 1 (“extremely uncharacteristic of me”) to 5 (“extremely characteristic of me”). The internal consistency for this measure has evidenced good internal consistency $\alpha = .89$. In addition, the internal consistency for each dimension has been found to be adequate with alpha coefficients of .85 for physical aggression, .72 for verbal aggression, .77 for the hostility subscale, and .83 for anger. This measure was used to capture physical aggression, verbal aggression, and anger for the purposes of this study (Buss & Perry,

1992). Cronbach's alpha results for this study's sample revealed acceptable internal consistency for the physical aggression scale ($\alpha = .79$) and the anger scale ($\alpha = .76$) and good internal consistency for the verbal aggression scale ($\alpha = .80$) on the BPAQ.

The Anger Rumination Scale (ARS: Sukhodolsky et al., 2001)

The ARS is a 25-item self-report measure that assesses one's tendency to think about current anger-provoking situations and to recall past anger episodes. The ARS is comprised of 4 subscales: angry afterthoughts, thoughts of revenge, angry memories, and understanding causes. Items are scored on a 4-point Likert type scale ranging from 1 ("almost never) to 4 ("almost always"). Prior studies have found the internal consistency alpha coefficient to be .93 for the total measure, with item-total correlations ranging from .39 to .75 (Sukhodolsky, et al., 2001). The retest reliability coefficient was reported to be .77, which is indicative of good stability of the anger rumination construct over a 1-month period.

For this study, brooding and reflection subscales were comprised of items from the ARS and developed according to the method previously used in the extant literature including methods outlined in the Lopez and colleagues (2010) paper. Specifically, five independent raters who are members of the Childhood Neurodevelopmental Disorder Lab were given all of the items on the ARS and asked to categorize applicable items on the ARS as either brooding or reflection using definitions outlined by Treynor and colleagues (2003). Specifically, reflection was regarded as neutrally valenced and encapsulated by a tendency "to engage in contemplation; to reflect; to ponder" (Woolf, p.1004, 1981) in order "to deal with and attempt to overcome problems and difficulties" using a more problem-solving approach (Woolf, p. 248, 1981; Treynor, et al., 2003). Brooding was

defined as moody pondering or thinking gloomily about a situation and was considered more maladaptive, as it focused on feelings evoked during an upsetting or angering event through a negativistic lens (Woolf, p.140, 1981; Treynor, et al., 2003). They were also given examples of Reflection and Brooding items and instructed on what qualities an item would need to have in order to be categorized as Reflection or Brooding. Agreement of at least 80% or higher across all raters was needed for an item to be included on either subscale. Independent raters categorized 6 items as brooding ($\alpha = .84$) and 6 items as reflection ($\alpha = .86$) and their classification of items can be found in Table 1.

Table 1

Subtype Classification of Rumination Items

ARS Rumination Item	Item Type	Original ARS Subscale
1. I ruminate about my past anger experiences	Brooding	Angry Memories
2. I ponder about the injustices that have been done to me	Brooding	Angry Memories
4. I have long living fantasies of revenge after the conflict is over	Brooding	Thoughts of Revenge
5. I think about certain events from a long time ago and they still make me angry	Brooding	Angry Memories
7. After an argument is over, I keep fighting with this person in my imagination	Brooding	Angry Afterthoughts
15. When someone makes me angry, I can't stop thinking about how to get back at this person	Brooding	Thoughts of Revenge
9. Whenever I experience anger, I keep thinking about it for a while	Reflection	Angry Afterthoughts
10. I have times when I cannot stop being preoccupied with a particular conflict	Reflection	Understanding Causes
11. I analyze events that make me angry	Reflection	Understanding Causes
12. I think about the reasons people treat me badly	Reflection	Understanding Causes
18. When something makes me angry, I turn this matter over and over again in my mind	Reflection	Angry Afterthought
19. I re-enact the anger episode in my mind after it has happened	Reflection	Angry Afterthoughts

Covariates

Trait anger was captured by the anger scale ($\alpha = .83$) of the Buss Perry Aggression Questionnaire (BPAQ; Buss & Perry, 1992). Other covariates (e.g., age, race, depression, anxiety) were obtained from the demographic form or the anxiety scale ($\alpha = .84$) and depression scale ($\alpha = .91$) of the Depression Anxiety Stress Scale-21 (DASS-21; Lovibond & Lovibond, 1995). Cronbach's alpha results for this study's sample revealed excellent internal consistency for the items on the anxiety scale ($\alpha = .90$) and depression scale ($\alpha = .90$) on the DASS-21.

Procedure

Data were collected online from undergraduate college students at a mid-sized southcentral university in the United States, as part of a larger study (IRB approval number:16090602). This study answered a novel set of research questions and required modification to the original IRB protocol. Data collection for this study began on August 2019 and continued until December 2020. All measures were completed online via Qualtrics, an experience management platform that aids in the gathering and analyzing of data, as posted on SONA, a cloud-based participant pool management software. Measures were administered in the same order for all participants starting with the demographics form, followed by the ARS, the DASS-21, the SRASBM, and finally the BPAQ. Undergraduates who completed the study received course credits that were either required for course completion or were used as extra-credit depending on the preference set by the course instructor.

CHAPTER III - RESULTS

Quality Control Checks

Quality-control questions were used to measure attentiveness, accuracy, and consistency of responding by participants and were inserted throughout the study questionnaire by asking participants to select certain answers (e.g., select answer 2 for this item). A final validity question was inserted at the end of the questionnaire asking participants if they had answered all questions to the best of their ability. They were informed that their response to this item did not impact whether or not they received credit for participation but helped assess the quality of the data. If the participant's responses appeared inconsistent or inaccurate (e.g., not responding to similar questions in the same manner or responding in a particular pattern) or did not pass the quality control questions, their data was not included in the study analyses. Based on criteria set by previous studies (Oppenheimer et al., 2009), participants who failed more than two of the six quality control checks or responded that they did not answer all questions to the best of their ability were removed from the sample. In total, data from 5 participants were not included in this study due to their responses appearing inconsistent or inaccurate. Specifically, one participant responded no to the final question revealing that they did not believe that they answered the questions truthfully and to the best of their ability. Additionally, four participants were not included for responding in an inconsistent manner or failing instructions to manipulation checks.

Table 2

Descriptive Statistics and Correlations of Study Variables

Variables	<i>M(SD)</i>	1	2	3	4	5	6	7	8	9	10	11
1.Reflection	2.04 (.69)		.75**	.28**	.28**	.38**	.44**	.52**	-.08	.53**	.45**	-.18*
2. Brooding	1.769 (.61)			.42**	.46**	.42**	.37**	.55**	.02	.51**	.50**	-.15
3. Relational Aggression (SRASBM)	1.58 (.94)				.76**	.39**	.13	.43**	.12	.49**	.40**	-.01
4. Physical Aggression (SRASBM)	1.59 (.94)					.60**	.19*	.50**	-.04	.48**	.38**	.07
5.Physical Aggression (BPAQ)	2.18 (.73)						.51**	.68**	-.14	.42**	.35**	-.10
6.Verbal Aggression (BPAQ)	2.77 (.91)							.58**	-.19*	.22**	.22**	-.20*
7.Anger	2.30 (.90)								.07	.50**	.37**	-.09
8.Sex										.13	-.02	.05
9.Anxiety	1.60 (.52)										.63**	-.14
10. Depression	1.63 (.53)											-.17*
11.Age	20.34 (5.20)											

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

Preliminary Analyses

Prior to conducting analyses, all variables were examined for missing data and descriptive statistics were run to determine if variable scores were within the expected range and aligned with previous studies using undergraduate samples. There was a low percentage of data missing (i.e., <2%) thus, no further actions were taken, as the influence of missing data would be negligible (Meyers et al, 2013). Univariate outliers were examined using boxplots, histograms, and z-score distributions, and no univariate outliers were found. Further, mahalanobis distances were examined and no potential multivariate outliers were noted. The histogram of standardized residuals indicated that the data contained normally distributed errors. The scatterplot of standardized predicted values demonstrated that the data met the assumptions of homogeneity of variance and linearity. Additionally, the data met the assumptions of independent error which was tested by examining the Durbin-Watson values. To examine the normality of the data, skewness and kurtosis of study variables were examined. The physical and relational aggression subscales on the Self-Report of Aggression & Social Behavior Measure, were determined to be positively skewed. To correct for the skewness of this measure, items were transformed using the Blom transformation; the most commonly used rank-based normalization procedure and best method to approximate normality for non-normally distributed data (Beasley et al., 2009). Importantly, the same analyses were run without transforming these variables and a similar pattern of significant results were found. Means, standard deviations and correlations between study variables using the non-transformed variables are presented in Table 2.

Main Study Analyses

Confirmatory Factor Analyses

To test the hypothesis that anger rumination is best conceptualized as having two distinct subtypes two Confirmatory Factor Analyses were run using Mplus 8.5 (Muthén & Muthén, 1998-2017) software. Specifically, a one-factor anger rumination model comprising 12 items and a two-factor model consisting of a 6-item Brooding subscale and a 6-item Reflection subscale were run and compared. The maximum likelihood (ML) estimator, the recommended approach for data that are normally distributed (Li, 2016), was applied to these data to estimate model parameters (Muthén & Muthén, 1998-2017). Several fit indices were examined to determine fit of these models to our data including, chi-square statistic ($p\text{-value} \geq .05$ indicates good fit), Comparative Fit Index, (CFI values between .80 to .89 indicating adequate fit and values $>.95$ indicating good fit; Bentler, 1990), Tucker–Lewis index (TLI values between .80 to .89 indicating adequate fit and values $>.95$ indicating good fit; Tucker & Lewis, 1973), and Root Mean Square Error of Approximation (RMSEA values between .08 to .10 indicates moderate fit; $<.08$ indicates good fit; Steiger, 1990). To determine if the two-factor model outperformed the one-factor model, a chi-square difference test was run, and values for the Akaike Information Criterion (AIC; Akaike, 1974) and Bayesian Information Criterion (BIC; Schwarz, 1978) were examined. The model with more degrees of freedom (or less constrained model) is rejected if there is a significant chi-square difference test and smaller AIC and BIC values indicate a better fitting model.

The one-factor model of anger rumination demonstrated a good fit to the data, as evidenced by the following fit indices: $\chi^2(54) = 78.19, p = .017$; CFI = .96; TLI = .956 and RMSEA = .06. The two-factor model demonstrated an excellent fit to the data, as evidenced by the following fit indices: $\chi^2(53) = 64.27, p = .138$; CFI = .98; TLI = .98 and RMSEA = .04. The results of a chi-square difference test indicated that the two-factor model was a significantly better fit to the data than the one-factor model, $\chi^2(1) = 13.9, p < .001$. Furthermore, both the AIC and BIC values were smaller for the two-factor model compared to the one-factor model. Given these findings, brooding and reflection were entered as separate predictors in the subsequent regression and moderation analyses. The results of the CFAs for the one-factor and two-factor models are shown in Table 3.

Table 3

Confirmatory Factor Analysis

Model Fit Index	One-Factor Model	Two-Factor Model
χ^2	78.17	64.27
p	0.017	0.138
TLI	0.96	0.98
CFI	0.96	0.98
RMSEA	0.06	0.04

Hierarchical Linear Regression Analyses

The second hypothesis was that brooding and not reflection would be significantly predictive of all forms of aggression. To test this hypothesis, a series of hierarchical multiple regression models were run where sex, age, anger, depression, and anxiety were entered as covariates in the first step of the model, brooding and reflection

were entered in the second step of the model as independent variables, and relational aggression (Model 1) and physical aggression (Model 2) scores from the SRASBM and physical aggression (Model 3) and verbal aggression (Model 4) scores from the BPAQ were entered in separate models as dependent variables. Given the strong correlation between brooding and reflection, the variance inflation factor (VIF) and tolerance were examined to ensure that there were no issues with multicollinearity. Given the VIF was below 10 and Tolerance was above 0.10 for both brooding and reflection (Brooding: Tolerance = .39, VIF = 2.54; Reflection: Tolerance = .37, VIF = 2.59), the parameters of the regression analyses were able to be reliably estimated. Four hierarchical linear regressions were used so we could examine how much variance brooding and reflection uniquely accounted for in the models across aggression outcomes. For model 1, the covariates were found to significantly contribute to the regression model, $F(5,139) = 12.07, p < .001$, and explained 30.3% of the variance in relational aggression on the SRASBM. Adding brooding and reflection to the model explained an additional 34.1% of the variance in relational aggression on the SRASBM and this change in R^2 was significant, $F(2,137) = 3.94, p = .022$. For model 2, the covariates were found to significantly contribute to the regression model, $F(5,139) = 12.02, p < .001$, and accounted for 27.7% of the variance in physical aggression on the SRASBM. Adding brooding and reflection to the model explained an additional 34.1% of the variance in physical aggression on the SRASBM and this change in R^2 was significant, $F(2,137) = 7.80, p = .001$. For model 3, the covariates were found to significantly contribute to the regression model, $F(5,137) = 28.32, p < .001$, and accounted for 49% of the variance in

physical aggression on the BPAQ. Adding brooding and reflection to the model explained an additional 48.7% of the variance in physical aggression on the BPAQ; however, this change in R^2 was not significant, $F(2,135) = .61, p = .546$. Finally, for model 4, the covariates were found to significantly contribute to the regression model, $F(5,139) = 19.56, p < .001$, and accounted for 41.3% of the variance in verbal aggression on the BPAQ. Adding brooding and reflection to the model explained an additional 43.7% of the variance in verbal aggression on the BPAQ and this change in R^2 was marginally significant, $F(2,137) = 2.91, p = .058$.

With respect to how our predictor variables were associated with the four aggression outcome variables, brooding significantly predicted relational aggression on the SRASBM ($\beta = .30, t(137) = 2.68, p = .008$) and physical aggression on the SRASBM ($\beta = .41, t(137) = 3.72, p < .001$) in the expected direction; for every one unit increase in brooding, physical and relational aggression on the SRASBM *increased* by .41 and .30 units, respectively. However, brooding did not significantly predict verbal aggression on the BPAQ ($\beta = -.06, t(137) = -.56, p = .578$) and physical aggression on the BPAQ ($\beta = .08, t(135) = .79, p = .433$). Reflection significantly predicted relational aggression on the SRASMB ($\beta = -.25, t(137) = -.25, p = .026$) and physical aggression on the SRASBM ($\beta = -.35, t(137) = -3.25, p = .001$); for every one unit increase in reflection, physical and relational aggression on the SRASBM *decreased* by .35 and .25 units, respectively. Surprisingly, reflection significantly predicted verbal aggression on the BPAQ ($\beta = .23, t(137) = 2.23, p = .027$) but not in the expected direction; for every one unit increase in reflection, there was a .23 unit *increase* in verbal aggression on the BPAQ. Reflection did

not significantly predict physical aggression on the BPAQ ($\beta = -.10, t(135) = -1.09, p = .280$). Results of these hierarchical regression models are presented in Tables 4 and 5.

Table 4

Hierarchical Regression of Subtypes Predicting Aggression on the SRASBM

Variable	Relational Aggression SRASBM					Physical Aggression SRASBM				
	B	SE	β	R^2	ΔR^2	B	SE	β	R^2	ΔR^2
Step 1				.278	.30				.28	.30
Depression	0.21	0.12	0.16			0.12	0.12	.089**		
Anger	0.22	0.08	.24**			0.25	0.08	.28**		
Anxiety	0.43	0.16	.27**			0.47	0.16	0.30		
Sex	0.13	0.13	0.07			-0.16	0.13	-0.09		
Age	0.01	0.01	0.07			0.00	0.01	0.02		
Step 2				.307	.04				.341	.07
Depression	0.15	0.13	0.11			0.04	0.12	0.03		
Anger	0.20	0.08	.21*			0.22	0.08	.24**		
Anxiety	0.47	0.16	.30**			0.53	0.16	.34**		
Sex	0.07	0.13	0.04			-0.24	0.13	-0.13		
Age	0.01	0.01	0.06			0.00	0.01	0.01		
Reflection	-0.31	0.14	-.25*			-0.43	0.13	-.35**		
Brooding	0.41	0.15	.30**			0.55	0.15	.41**		

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

Table 5

Hierarchical Regression of Subtypes Predicting Aggression on the BPAQ

Variable	Verbal Aggression BPAQ					Physical Aggression BPAQ				
	B	SE	β	R^2	ΔR^2	B	SE	β	R^2	ΔR^2
Step 1				.392	.41				.49	.51
Depression	0.03	0.12	0.02			0.06	0.09	0.05		
Anger	0.63	0.08	.63**			0.51	0.06	.62**		
Anxiety	-0.19	0.16	-0.11			0.14	0.12	0.10		
Sex	-0.40	0.13	-.21**			-0.29	0.10	-.19**		

Table 6 (continued).

Age	-0.03	0.01	-.142*			0.00	0.01	-0.01		
Step 2				.408	.02				.487	.004
Depression	0.01	0.13	0.01			0.05	0.10	0.04		
Anger	0.58	0.08	.58**			0.52	0.06	.63**		
Anxiety	-0.29	0.16	-0.17			0.17	0.12	0.12		
Sex	-0.35	0.13	-.18**			-0.31	0.10	-.20**		
Age	-0.02	0.01	-0.13			0.00	0.01	-0.02		
Reflection	0.30	0.14	.23*			-0.11	0.10	-0.10		
Brooding	-0.09	0.15	-0.06			0.09	0.12	0.08		

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

Simple Moderation Models

To test the hypothesis that sex moderates the relationships between brooding and two different forms of aggression (relational and physical aggression), the SPSS PROCESS macro (v. 3.5) software package using Model 1 was used (Hayes, 2017). Age, depression, anxiety, reflection, and anger were all entered as covariates, sex was entered as a moderator, brooding was entered as a predictor variable, and physical aggression on the SRASBM and BPAQ and relational aggression on the SBRASBM were entered as dependent variables in three separate models. All variables were centered before they were entered into the models. Results revealed that the overall models were significant (physical aggression on SRASBM: $F(8,136) = 10.27, p < .001, R^2 = .38$; relational aggression on SBRASBM: $F(8,136) = 8.80, p < .001, R^2 = .34$; and physical aggression on BPAQ: $F(8,134) = 17.80, p < .001, R^2 = .52$). However, the interaction term comprised of brooding and sex did not significantly predict physical aggression on the SRASBM, $F(1,136) = 0.71, p = .401, \Delta R^2 = .0033$, relational aggression on the

SRASBM, $F(1,136) = 0.08$, $p = .776$, $\Delta R^2 = .0004$, and physical aggression on the BPAQ, $F(1,134) = .70$, $p = .4062$, $\Delta R^2 = .0025$).

Table 6

Simple Moderation Effects Outcome

	Moderator	<i>B</i>	<i>SE(B)</i>	<i>df</i>	<i>F</i>	<i>R</i> ²	ΔR^2
Relational Aggression (SRASBM)	Sex			8	8.80**	.34	
Brooding		.37	.22				
Sex		.07	.13				
Brooding*Sex		.06	.23		.08		.0004
Physical Aggression (SRASBM)	Sex			8	10.27**	.38	
Brooding		.43	.21				
Sex		-.23	.12				
Brooding*Sex		.18	.22		.71		.0033
Physical Aggression (BPAQ)	Sex			8	17.80**	.52	
Brooding		-.0025*	.16				
Sex		-.31**	.10				
Brooding*Sex		.14	.17		.70		.0025

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

CHAPTER IV – DISCUSSION

This study aimed to build on past research that has established rumination to sadness as a multifaceted construct consisting of two subtypes (brooding and reflection) that are differentially associated with depression-related outcomes. The goals of this study included evaluating whether this conceptualization of rumination to sadness could be applied to anger rumination and if these two subtypes had different patterns of associations with multiple forms of aggression, particularly if brooding increased the risk and reflection decreased the risk of this maladaptive outcome. Finally, this study aimed to examine the moderating effect of sex on the relationship between brooding and two different forms of aggression. A more in-depth understanding of anger rumination will inform treatments regarding what emotion regulation strategies to promote and what to avoid when coping with strong emotions that increase the risk of aggression. It also allows for future studies to have greater specificity in predicting aggression over time by disentangling how these subtypes may mitigate or worsen aggression in the short-term and long-term.

Following the methods employed in prior studies aiming to evaluate the multifaceted nature of rumination to sadness (e.g., Lopez et al., 2009), we found evidence that anger rumination may indeed have distinct subtypes (i.e., brooding and reflection) given the two-factor model of anger rumination significantly outperformed a one-factor model of anger rumination. However, it should be noted that both models fit our data well, which is undoubtedly a reflection of the strong psychometric properties of the Anger Rumination Scale (ARS) and previous research has found that the ARS is indeed

comprised of multiple factors (Sukhodolsky, et al., 2001). Interestingly, the majority of the items comprising our brooding scale corresponded to the Angry Memories and Thoughts of Revenge subscales of the ARS and the majority of items comprising our reflection scale corresponded to the Understanding of Causes subscale. Interestingly, Sukhodolsky and colleagues (2001) theorized that brooding items may be more likely to be found on the Angry Afterthoughts subscale of the ARS given its strong association with anger duration and these brooding items may be more predictive of aggression. Although only one item of the Angry Afterthoughts subscale was categorized as brooding by our independent raters, the remaining items do tap this concept of getting even for past injustices and perseverating on events that happened a long time ago.

Additionally, the notion that rumination to sadness may comprise two distinct subtypes is further supported by findings that these subtypes are differentially associated with depression (Treynor et al., 2003; Burwell & Shirk, 2007; Lopez et al., 2009). The reflection subtype has been hypothesized to serve a protective function given its characterization as neutrally introspective and its association with adaptive coping strategies such as effective problem-solving (Treynor et al., 2003; Burwell & Shirk, 2007). In contrast, the brooding subtype has been hypothesized to increase the risk for depression given its perseveration on past failures and its association with maladaptive coping strategies such as voluntary disengagement or avoidance (Treynor, et al., 2003; Burwell & Shirk, 2007). Indeed, the results of this study are consistent with past studies linking brooding with the development and maintenance of depression symptoms over time and reflection with increasing the risk of depression in the short-term and decreasing

the risk of depression in the long-term (e.g., Treynor, et al., 2003). Specifically, this study found that brooding was positively predictive, and reflection was negatively predictive of relational aggression and physical aggression on the SRASBM. Surprisingly, reflection was also positively predictive of verbal aggression on the BPAQ. Given this finding, it is possible that reflection is only protective of more serious forms of aggression and not less serious forms of aggression. Further, it suggests reflection may lead to the solving of angering events through verbal conflict, which could subsequently lessen the risk of reacting to these angering events through physical altercations or plotting revenge by damaging the social relationships of others.

Contrary to our hypothesis, brooding was not found to be associated with either aggression scale on the BPAQ. This finding was especially surprising since brooding was predictive of physical aggression as measured by the SRASBM. Perhaps this pattern of results has something to do with the item content of these two measures. For example, the physical aggression subscale on the BPAQ contains more items that appear to capture reactive forms of aggression (e.g., “If I have to resort to violence to protect my rights, I will”; “If somebody hits me, I hit back”); behaviors that may better be explained or predicted by impulsivity or an ego threat rather than brooding. In contrast, the items comprising the physical aggression subscale on the SRASBM tend to insinuate a more proactive form of responding where brooding may involve establishing a plan for retribution if unfair treatment has been perceived. It does not appear that the differences in findings across these two measures of aggression are indicative of how the participants in our sample differentially responded to the items on these two measures given the

significant correlation found between the two physical aggression subscales (albeit the magnitude of the correlation was smaller than expected). Further, the means for the physical aggression subscales in our sample (physical aggression on SRASBM: $M = 9.52$ $SD = 5.88$; physical aggression on BPAQ: $M = 2.18$ $SD = .73$) are comparable to the means found for these subscales in other studies using samples of undergraduate students (physical aggression on SRASBM: $M = 4.74-5.56$ $SD = 2.39-3.27$; physical aggression on BPAQ: $M = 2.17-2.70$ $SD = .85-1.22$; Bailey & Ostrov, 2008; Webster, et al., 2013).

Finally, it was hypothesized that sex would moderate the relationship between brooding and two different forms of aggression such that associations between brooding and relational aggression would be stronger for women and associations between brooding and physical aggression would be stronger for men. These predictions were made based on findings from the sadness rumination research literature. Specifically, past studies have shown that women tend to engage in more sadness rumination compared to men (Broderick & Korteland, 2002; Nolen-Hoeksema & Jackson, 2001) and rumination in women is associated with longer and more severe depressed moods (Allgood-Merten, Lewinsohn, & Hops, 1990; Nolen-Hoeksema 1995). Furthermore, brooding explains the sex differences found in depression (Allgood-Merten, Lewinsohn, & Hops, 1990; Nolen-Hoeksema 1995). In contrast, men and women have been found to engage in similar levels of anger rumination (Maxwell, 2004; Sukhodolsky, et al., 2001, Peled & Moretti, 2010). However, men tend to have higher scores on the Thoughts of Revenge subscale of the ARS as compared to women (Sukhodolsky et al., 2001) and anger rumination is more strongly correlated with relational aggression than physical aggression in women (Peled,

2006). Sex differences are also evident for physical aggression but not relational aggression in emerging adulthood (Bailey & Ostrov, 2008). Contrary to these findings and our predictions, no evidence was found for the moderating effects of sex for brooding and its association with physical and relational aggression. It is important to note that most studies support the notion that there are no sex differences for anger rumination (Maxwell, 2004; Sukhodolsky, et al., 2001) However, since men are more likely to display physical forms of aggression in emerging adulthood (Bailey & Ostrov, 2008) and certain subscales of the ARS have shown higher scores for men versus women (Sukadolsky et al., 2001), it would be interesting if future studies examined whether certain ruminatory thoughts capturing brooding are more specific to men as opposed to women, which could potentially explain this sex difference in physical aggression.

Clinical Implications

The results of this study potentially have important clinical implications. Specifically, the refinement of the construct of anger rumination provides greater direction and specificity in the development of effective interventions for anger and aggression where brooding could be specifically targeted. Additionally, a more refined assessment of anger rumination could be incorporated into screenings for services to help evaluate who might likely benefit from these interventions.

The conceptualization of anger rumination as comprising two subtypes has important implications for interventions designed to target rumination to prevent or treat the emergence of psychological disorders. Indeed, Rumination Focused Cognitive Behavioral Therapy (RFCBT) is an evidenced-based treatment for depression and anxiety

and its primary goal is for clients to unlearn the reinforcing nature of unhelpful ruminatory thoughts and to replace these thoughts with more effective thinking and behavioral strategies (Watkins, 2018). Further, there is theoretical and empirical support that this intervention could be applied using a transdiagnostic approach to treat different disorders like social anxiety, PTSD, and substance use; and to reduce feelings of hostility and anger (Watkins, 2018). Although RFCBT does not specify that there are two subtypes of rumination (brooding and reflection), it does recognize that rumination may be maladaptive or adaptive. Thus, the growing body of evidence that suggests there are two subtypes of rumination may lead to more specificity by clearly defining what ruminatory thoughts are helpful versus unhelpful in the context of RFCBT.

Additionally, our study's findings could provide more insight as to why mindfulness may be effective in reducing rumination in response to negative moods. Prior studies have suggested that mindfulness may reduce ruminatory thought in response to anger and sadness, which in turn lessens the severity of depression symptoms and the occurrence of aggressive behaviors (Hofmann et al., 2010; Keng et al., 2011). These findings are expected given that mindfulness emphasizes the present moment, so the focus is shifted away from past events and rumination is the act of perseverating on past events that are distressing or did not go as planned (Donaldson et al. 2007; Alleva et al., 2014), thus the practice of mindfulness, if done well, is incompatible with rumination. Given that rumination has been found to mediate the impact mindfulness has on depression and aggression (Parmentier et al., 2019; Eisenlohr-Moul et al., 2016), it would be worthwhile for future research to examine if the subtypes of anger rumination may

help further elucidate the positive impact mindfulness has on aggression-related outcomes. Additionally, our findings what specific ruminatory thoughts should be avoided or actively ignored when practicing mindfulness.

Limitations and Future Directions

Importantly, this study is the only known study to provide initial evidence that anger rumination is comprised of two subtypes that may serve to either increase or decrease the risk of physical and relational aggression following an angering event. However, the results of this study should be considered while also recognizing the limitations of our study's design and what additional work should be done. First, this study relied on self-report measures to capture our variables of interest so it is possible that some participants underreported their engagement in behaviors that might be considered unfavorable or stigmatizing (e.g., aggression). However, this might be less of a concern given that online data provides participants a sense of anonymity. Additionally, reliance on a single method of data capture is likely to inflate our estimates of the relationships between our study variables (Podsakoff & Organ, 1986). Thus, future studies should consider the use of multi-method and multi-informant procedures to supplement the use of self-report data. For example, using methods like anger mood induction and randomizing participants to brooding or reflection conditions prior to giving them an opportunity to act aggressively towards a confederate could help determine the casual relationship between brooding and aggression. Ecological momentary assessment (EMA) methods could also be employed which would address the limitations of retrospective reporting (Shiffman et al., 2008).

Another potential limitation of this study was its reliance on a sample of undergraduate students from one university that enrolled in at least one psychology course, which also resulted in an overrepresentation of women in our sample. However, it is important to note that although our recruitment strategy focused on students enrolled in a psychology course, our sample was representative of the entire student body at the university where this study took place. Additionally, by using an undergraduate sample, we can be more confident that the self-report measures used in this study did a decent job of capturing our constructs of interest given there is good evidence of validity and reliability for these measures in this population. Considering the use of an undergraduate sample limits generalizability, these results should be replicated in studies using samples that have greater equivalency of men and women and it would be worthwhile to examine these hypotheses in clinical populations as well as in samples comprising participants from different developmental stages. This approach would allow for potentially elucidating why sex differences in aggression change across development and understanding the contributory role of brooding in the maintenance of aggression in youths and adults with psychological disorders.

Another potential limitation of this study is the nature of the items on the Anger Rumination Scale. While categorizing items on the ARS as brooding and reflection, there was less instances of 100% agreement among independent raters for those items categorized as reflection than those items categorized as brooding. Additionally, there were a greater number of items that independent raters considered to be brooding compared to reflection (brooding items meeting 80% agreement across raters were

excluded so there were an equivalent number of brooding and reflection items on our scales). This suggests that the psychological construct captured by the ARS is more aligned with brooding than reflection. It would be interesting if future studies compared the associations of aggression with subscales comprising items of rumination from other measures (CERQ) that better captured the definition of reflection (re-written to be specific to anger rumination versus general rumination) and subscales comprising items on the ARS that were unanimously rated as brooding across all independent raters.

Finally, it is notable that the majority of the items comprising our brooding scale corresponded to the Angry Memories and Thoughts of Revenge subscales of the ARS and the majority of items comprising our reflection scale corresponded to the Understanding of Causes subscale of the ARS. Given that the four-factor structure of the ARS is widely supported (e.g., Sukhodolsky et. al., 2001; Maxell, 2004), it would be worthwhile to examine which four subscales (i.e., Angry Afterthoughts, Thoughts of Revenge, Angry Memories, and Understanding Causes) have better predictive utility of aggressive behaviors and if they outperform our brooding scale.

Conclusion

In conclusion, this study was the first to evaluate the existence of two subtypes of rumination (brooding and reflection) in anger rumination. These results offer support for brooding and reflection subtypes of anger rumination. Additionally, the findings suggest that brooding may be more maladaptive than reflection, as it is associated with increases in physical and relational aggression. Finally, sex was not found to moderate the relationships between brooding and relational and physical aggression. Importantly, the

conceptualization of anger rumination as two subtypes (brooding and reflection) could lead to better specificity in determining who is at more risk for aggressive behavior and greater specificity in matching clients to treatment.

APPENDIX A – The Self-Report of Aggression & Social Behavior Measure

Directions: This questionnaire is designed to measure qualities of adult social interaction and close relationships. Please read each statement and indicate how true each is for you, now and during the last year, using the scale below. Select the appropriate number on the scale from 1 to 7. IMPORTANT. Remember that your answers to these questions are completely anonymous, so please answer them as honestly as possible!

1 2 3 4 5 6 7
 Not at All True Sometimes True Very True

1) I usually follow through with my commitments.

1 2 3 4 5 6 7
 Not at All True Sometimes True Very True

2) I have threatened to break up with my romantic partner in order to get him/her to do what I wanted.

1 2 3 4 5 6 7
 Not at All True Sometimes True Very True

3) My romantic partner tries to make me feel jealous as a way of getting back at me.

1 2 3 4 5 6 7
 Not at All True Sometimes True Very True

4) It bothers me if my romantic partner wants to spend time with his/her other friends.

1 2 3 4 5 6 7
 Not at All True Sometimes True Very True

5) I try to get my own way by physically intimidating others.

1 2 3 4 5 6 7
 Not at All True Sometimes True Very True

6) I have a friend who ignores me or gives me the "cold shoulder" when s/he is angry with me.

1 2 3 4 5 6 7
 Not at All True Sometimes True Very True

16) I would rather spend time alone with a friend than be with other friends too.

1 2 3 4 5 6 7
Not at All True Sometimes True Very True

17) A friend of mine has gone "behind my back" and shared private information about me with other people.

1 2 3 4 5 6 7
Not at All True Sometimes True Very True

18) My romantic partner has pushed or shoved me in order to get me to do what s/he wants.

1 2 3 4 5 6 7
Not at All True Sometimes True Very True

19) I try to make sure that other people get invited to participate in group activities.

1 2 3 4 5 6 7
Not at All True Sometimes True Very True

20) I try to make my romantic partner jealous when I am mad at him/her.

1 2 3 4 5 6 7
Not at All True Sometimes True Very True

21) When someone makes me really angry, I push or shove the person.

1 2 3 4 5 6 7
Not at All True Sometimes True Very True

22) I get mad or upset if a friend wants to be close friends with someone else.

1 2 3 4 5 6 7

Not at All True Sometimes True Very True

23) When I have been angry at, or jealous of someone, I have tried to damage that person's reputation by gossiping about him/her or by passing on negative information about him/her to other people.

1 2 3 4 5 6 7
Not at All True Sometimes True Very True

24) When someone does something that makes me angry, I try to embarrass that person or make them look stupid in front of his/her friends.

1 2 3 4 5 6 7

Not at All True Sometimes True Very True

25) I am willing to give advice to others when asked for it.

1 2 3 4 5 6 7
Not at All True Sometimes True Very True

26) My romantic partner has threatened to physically harm me in order to control me.

1 2 3 4 5 6 7
Not at All True Sometimes True Very True

27) When I have been mad at a friend, I have flirted with his/her romantic partner.

1 2 3 4 5 6 7
Not at All True Sometimes True Very True

28) When I am mad at a person, I try to make sure s/he is excluded from group activities (going to the movies or to a bar).

1 2 3 4 5 6 7
Not at All True Sometimes True Very True

29) I have a friend who tries to get his/her own way with me through physical intimidation.

1 2 3 4 5 6 7
Not at All True Sometimes True Very True

30) I get jealous if my romantic partner spends time with her/his other friends, instead of just being alone with me.

1 2 3 4 5 6 7
Not at All True Sometimes True Very True

31) I make an effort to include other people in my conversations.

1 2 3 4 5 6 7
Not at All True Sometimes True Very True

32) When I have been provoked by something a person has said or done, I have retaliated by threatening to physically harm that person.

1 2 3 4 5 6 7
Not at All True Sometimes True Very True

33) My romantic partner has threatened to break up with me in order to get me to do what s/he wants.

1 2 3 4 5 6 7

Not at All True Sometimes True Very True

34) It bothers me if a friend wants to spend time with his/her other friends, instead of just being alone with me.

1 2 3 4 5 6 7
Not at All True Sometimes True Very True

35) My romantic partner doesn't pay attention to me when s/he is mad at me.

1 2 3 4 5 6 7
Not at All True Sometimes True Very True

36) I have threatened to share private information about my friends with other people in order to get them to comply with my wishes.

1 2 3 4 5 6 7
Not at All True Sometimes True Very True

37) I make other people feel welcome.

1 2 3 4 5 6 7
Not at All True Sometimes True Very True

38) When my romantic partner wants something, s/he will ignore me until I give in.

1 2 3 4 5 6 7
Not at All True Sometimes True Very True

39) When someone has angered or provoked me in some way, I have reacted by hitting that person.

1 2 3 4 5 6 7
Not at All True Sometimes True Very True

40) I have cheated on my romantic partner because I was angry at him/her.

1 2 3 4 5 6 7
Not at All True Sometimes True Very True

41) I get mad or upset if my romantic partner wants to be close friends with someone else.

1 2 3 4 5 6 7
Not at All True Sometimes True Very True

42) I have a friend who excludes me from doing things with her/him and her/his other friends when s/he is mad at me.

1 2 3 4 5 6 7
Not at All True Sometimes True Very True

43) I am usually willing to lend my belongings (car, clothes, etc.) to other people.

1	2	3	4	5	6	7
Not at All True			Sometimes True			Very True

44) I have threatened to physically harm other people in order to control them.

1	2	3	4	5	6	7
Not at All True			Sometimes True			Very True

45) I have spread rumors about a person just to be mean.

1	2	3	4	5	6	7
Not at All True			Sometimes True			Very True

46) When a friend of mine has been mad at me, other people have "taken sides" with her/him and been mad at me too.

1	2	3	4	5	6	7
Not at All True			Sometimes True			Very True

47) I would rather spend time alone with my romantic partner and not with other friends too.

1	2	3	4	5	6	7
Not at All True			Sometimes True			Very True

48) I have a friend who has threatened to physically harm me in order to get his/her own way.

1	2	3	4	5	6	7
Not at All True			Sometimes True			Very True

49) I am a good listener when someone has a problem to deal with.

1	2	3	4	5	6	7
Not at All True			Sometimes True			Very True

50) I have a natural talent for influencing people. I am not good at influencing people.

1	2	3	4	5	6	7
Not at All True			Sometimes True			Very True

51) My romantic partner has tried to get his/her own way through physical intimidation.

1	2	3	4	5	6	7
Not at All True			Sometimes True			Very True

52) I give my romantic partner the silent treatment when s/he hurts my feelings in some way.

1	2	3	4	5	6	7
Not at All True			Sometimes True			Very True

53) When someone hurts my feelings, I intentionally ignore them.

1	2	3	4	5	6	7
Not at All True			Sometimes True			Very True

54) I try to help others out when they need it.

1	2	3	4	5	6	7
Not at All True			Sometimes True			Very True

55) If my romantic partner makes me mad, I will flirt with another person in front of him/her.

1	2	3	4	5	6	7
Not at All True			Sometimes True			Very True

56) I have intentionally ignored a person until they gave me my way about something.

1	2	3	4	5	6	7
Not at All True			Sometimes True			Very True

57) I have pushed and shoved others around in order to get things that I want.

1	2	3	4	5	6	7
Not at All True			Sometimes True			Very True

APPENDIX B – Anger Rumination Scale

Directions: Everyone gets angry and frustrated occasionally but people differ in the ways that they think about their episodes of anger. Statements below describe different ways that people may be recalling or thinking about their anger experiences. Please, read each statement and then respond by circling the appropriate number for each statement. There are no right or wrong answers in this questionnaire, and your honest responses that best describe yourself are very important. Please, respond to all items.

- 1) I ruminate about my past anger experiences.
1 - Almost never 2 - Sometimes 3 - Often 4 - Almost always
- 2) I ponder about the injustices that have been done to me.
1 - Almost never 2 - Sometimes 3 - Often 4 - Almost always
- 3) I keep thinking about events that angered me for a long time.
1 - Almost never 2 - Sometimes 3 - Often 4 - Almost always
- 4) I have long living fantasies of revenge after the conflict is over.
1 - Almost never 2 - Sometimes 3 - Often 4 - Almost always
- 5) I think about certain events from a long time ago and they still make me angry.
1 - Almost never 2 - Sometimes 3 - Often 4 - Almost always
- 6) I have difficulty forgiving people who have hurt me.
1 - Almost never 2 - Sometimes 3 - Often 4 - Almost always
- 7) After an argument is over, I keep fighting with this person in my imagination.
1 - Almost never 2 - Sometimes 3 - Often 4 - Almost always
- 8) Memories of being aggravated pop into my mind before I fall asleep.
1 - Almost never 2 - Sometimes 3 - Often 4 - Almost always
- 9) Whenever I experience anger, I keep thinking about it for a while.
1 - Almost never 2 - Sometimes 3 - Often 4 - Almost always
- 10) I have times when I cannot stop being preoccupied with a particular conflict.
1 - Almost never 2 - Sometimes 3 - Often 4 - Almost always

- 11) I analyze events that make me angry.
1 - Almost never 2 - Sometimes 3 - Often 4 - Almost always
- 12) I think about the reasons people treat me badly.
1 - Almost never 2 - Sometimes 3 - Often 4 - Almost always
- 13) I have daydreams and fantasies of violent nature.
1 - Almost never 2 - Sometimes 3 - Often 4 - Almost always
- 14) I feel angry about certain things in my life.
1 - Almost never 2 - Sometimes 3 - Often 4 - Almost always
- 15) When someone makes me angry, I can't stop thinking about how to get back at this person.
1 - Almost never 2 - Sometimes 3 - Often 4 - Almost always
- 16) When someone provokes me, I keep wondering why this should have happened to me.
1 - Almost never 2 - Sometimes 3 - Often 4 - Almost always
- 17) Memories of even minor annoyances bother me for a while.
1 - Almost never 2 - Sometimes 3 - Often 4 - Almost always
- 18) When something makes me angry, I turn this matter over and over again in my mind.
1 - Almost never 2 - Sometimes 3 - Often 4 - Almost always
- 19) I re-enact the anger episode in my mind after it has happened.
1 - Almost never 2 - Sometimes 3 - Often 4 - Almost always

APPENDIX C – Buss Perry Aggression Questionnaire

Directions: Using the 5 point scale shown below, indicate how uncharacteristic or characteristic each of the following statements is in describing you. Place your rating in the box to the right of the statement.

1= extremely uncharacteristic of me
2= somewhat uncharacteristic of me
3= neither uncharacteristic nor characteristic of me
4= somewhat characteristic of me
5= extremely characteristic of me

- 1) Some of my friends think I am a hothead
- 2) If I have to resort to violence to protect my rights, I will.
- 3) When people are especially nice to me, I wonder what they want.
- 4) I tell my friends openly when I disagree with them.
- 5) I have become so mad that I have broken things.
- 6) I can't help getting into arguments when people disagree with me.
- 7) I wonder why sometimes I feel so bitter about things.
- 8) Once in a while, I can't control the urge to strike another person.
- 9) I am an even-tempered person.
- 10) I am suspicious of overly friendly strangers.
- 11) I have threatened people I know.
- 12) I flare up quickly but get over it quickly.
- 13) Given enough provocation, I may hit another person.
- 14) When people annoy me, I may tell them what I think of them.
- 15) I am sometimes eaten up with jealousy.
- 16) I can think of no good reason for ever hitting a person.

- 17) At times I feel I have gotten a raw deal out of life.
- 18) I have trouble controlling my temper.
- 19) When frustrated, I let my irritation show.
- 20) I sometimes feel that people are laughing at me behind my back.
- 21) I often find myself disagreeing with people.
- 22) If somebody hits me, I hit back.
- 23) I sometimes feel like a powder keg ready to explode.
- 24) Other people always seem to get the breaks.
- 25) There are people who pushed me so far that we came to blows.
- 26) I know that "friends" talk about me behind my back.
- 27) My friends say that I'm somewhat argumentative.
- 28) Sometimes I fly off the handle for no good reason.
- 29) I get into fights a little more than the average person.

APPENDIX D – Depression Anxiety Stress Scale

Please read each statement and select a number 0, 1, 2, or 3 that indicates how much the statement applied to you over the past week. There are no right or wrong answers.

Do not spend too much time on any statement.

The rating scale is as follows: 0 Did not apply to me at all 1 Applied to me to some degree, or some of the time 2 Applied to me to a considerable degree, or a good part of the time 3 Applied to me very much, or most of the time

- 1) I found it hard to wind down.
0 - Not at all 1 - Some of the time 2 - Good part of the time 3 - Most of the time
- 2) I was aware of the dryness in my mouth.
0 - Not at all 1 - Some of the time 2 - Good part of the time 3 - Most of the time
- 3) I couldn't seem to experience any positive feeling at all.
0 - Not at all 1 - Some of the time 2 - Good part of the time 3 - Most of the time
- 4) I experienced breathing difficulty (e.g., excessively rapid breathing, breathlessness in the absence of physical exertion).
0 - Not at all 1 - Some of the time 2 - Good part of the time 3 - Most of the time
- 5) I found it difficult to work up the initiative to do things.
0 - Not at all 1 - Some of the time 2 - Good part of the time 3 - Most of the time
- 6) I tended to over-react to situations.
0 - Not at all 1 - Some of the time 2 - Good part of the time 3 - Most of the time
- 7) I experienced trembling (e.g., in the hands).
0 - Not at all 1 - Some of the time 2 - Good part of the time 3 - Most of the time
- 8) I felt that I was using a lot of nervous energy.
0 - Not at all 1 - Some of the time 2 - Good part of the time 3 - Most of the time
- 9) I was worried about situations in which I might panic and make a fool of myself.
0 - Not at all 1 - Some of the time 2 - Good part of the time 3 - Most of the time
- 10) I felt that I had nothing to look forward to.
0 - Not at all 1 - Some of the time 2 - Good part of the time 3 - Most of the time

- 11) I found myself getting agitated.
0 - Not at all 1 - Some of the time 2 - Good part of the time 3 - Most of the time
- 12) I found it difficult to relax.
0 - Not at all 1 - Some of the time 2 - Good part of the time 3 - Most of the time
- 13) I felt down-hearted and blue.
0 - Not at all 1 - Some of the time 2 - Good part of the time 3 - Most of the time
- 14) I was intolerant of anything that kept me from getting on with what I was doing.
0 - Not at all 1 - Some of the time 2 - Good part of the time 3 - Most of the time
- 15) I felt I was close to panic.
0 - Not at all 1 - Some of the time 2 - Good part of the time 3 - Most of the time
- 16) I was unable to become enthusiastic about anything.
0 - Not at all 1 - Some of the time 2 - Good part of the time 3 - Most of the time
- 17) I felt I wasn't worth much as a person.
0 - Not at all 1 - Some of the time 2 - Good part of the time 3 - Most of the time
- 18) I felt that I was rather touchy.
0 - Not at all 1 - Some of the time 2 - Good part of the time 3 - Most of the time
- 19) I was aware of the action of my heart in the absence of physical exertion (e.g., sense of heart rate increase, heart missing a beat).
0 - Not at all 1 - Some of the time 2 - Good part of the time 3 - Most of the time
- 20) I felt scared without any good reason.
0 - Not at all 1 - Some of the time 2 - Good part of the time 3 - Most of the time
- 21) I felt that life was meaningless.
0 - Not at all 1 - Some of the time 2 - Good part of the time 3 - Most of the time

APPENDIX E –Demographic Questionnaire

Student ID Please enter your USM student ID without the w (e.g., 555555).

2) What is your age?

3) What is your sex?

- Male
- Female

4) What is your race?

- White/Caucasian
- Black/African American
- Asian
- Biracial _____
- Other _____

5) What is your ethnicity?

Hispanic

Non-Hispanic

6) What is your classification?

Freshman

Sophomore

Junior

Senior

7) Have you ever been diagnosed with a mental illness (e.g., depression, anxiety, ADHD)?

Yes

No

8) Do you take any prescription medications for a mental illness (e.g., stimulant, antidepressant)?

Yes

No

9) Have you ever been diagnosed with a neurological condition (e.g., seizures/epilepsy, cerebral palsy, brain tumor)?

Yes

No

10) Have you ever had a head injury with loss of consciousness?

Yes

No

11) Sensor electrodes for EEG recording must be able to reach the scalp, so we ask that you describe your hairstyle. Please select all that apply.

Short

Medium

Long

Dreadlocks

Cornrows

Braids

Afro

Bald

Shaved

12) Describe your hair texture:

- Fine
- Thick
- Coarse

13) How many alcoholic beverages do you consume on average per day?

- None
- 1-2
- 3-4
- 5 or more

14) How many cigarettes do you smoke on average per day?

- 1-3
- 4-7
- 7-9
- 10 or more

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