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Violence Risk: Anger Rumination's Association with Pre- and Post-Hospitalization Violence

THESIS

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by

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DEDICATION

To

My family, friends, and fiancé

in recognition of their worth.

A quote about this journey:

“We keep moving forward,

opening new doors,

and doing new things,

because we're **curious**

and **curiosity** keeps leading us down new paths”

~ Walt Disney

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ABSTRACT OF THE THESIS

Violence Risk: Anger Rumination's Association with Pre- and Post-Hospitalization Violence

by

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Anger rumination has not been well examined with regard to violence risk. It is a common sequel to anger experiences, and it likely facilitates imagined violence; however, no previous study has examined that interrelationship. The current study investigates anger rumination as a possible mechanism through which anger is related to violent behavior in a secondary analysis of data from the MacArthur Violence Risk study, which was conducted with 1,136 civil commitment patients, before and after hospital discharge. Anger proclivity was assessed via BPRS hostility, anger rumination was measured using items of the Novaco Anger Scale, and imagined violence was measured with the Schedule of Imagined Violence. Violence, pre-hospitalization and post-hospitalization, was indexed by the MacArthur project measure. Correlational analyses, mediation analyses, and moderated mediation analyses were conducted. Anger rumination significantly predicted pre- and post-hospitalization violence, when controlling for age, sex, race, child abuse, and anger proclivity, and partially mediated the relation between anger proclivity and violence. Imagined violence and anger rumination were also highly inter-related. When imagined violence was added to the model, it was a significant predictor of pre-hospitalization violence, however, it did not moderate the association of anger rumination with pre- or post-hospitalization violence. Anger rumination may be a mechanism through which anger

incites violent behavior. Future research should investigate the association between anger rumination and imagined violence, with attention given to revenge planning as a link.

CHAPTER ONE: Introduction

Anger, aggression, and violence are seen as some of the most significant problems faced by society. On the one hand, anger is neither necessary nor sufficient for aggression – a person can be aggressive without being angry, and a person can be angry and not necessarily become aggressive. However, on the other hand, when anger is dysregulated (i.e., failure to regulate anger experience or its expression to meet survival, performance, or environmental needs; Novaco, 2007), it can lead to adverse outcomes that include extreme aggression and violence (e.g., Moeller, Novaco, Heinola, & Hougaard, 2015; Novaco, 2011; Sturup, Monahan, & Kristianson, 2013).

A necessary step toward reducing dysregulated anger and its potential consequences on aggression and violence is to better understand the ways in which anger dysregulation influences subsequent violent behavior. That is, there may be specific processes through which anger dysregulation affects violence, or perhaps there are components of anger regulation that are particularly influential. The purpose of the present research was to study, in a longitudinal manner, one such potential process, namely anger rumination, understood as repetitive thinking about an anger-evoking event. Anger rumination can maintain and even increase anger following an anger-evoking event (Bushman, Bonacci, Pedersen, Vasquez, & Miller, 2005; Pedersen et al., 2011).

While there are many reasons why anger rumination could be linked to violence (e.g., Caprara et al., 2013; Massa, Eckhardt, Sprunger, Parrott, & Subramani, 2019; Smith, Stephens, Repper, & Kistner, 2016), these links have yet to be adequately examined, especially in populations at particularly high risk for anger dysregulation and violence, such as hospitalized psychiatric patients. The present study pursues its inquiry in a study

of emergency commitment (non-forensic) psychiatric patients, examining the association of anger rumination with violent behavior retrospectively and prospectively.

The literature on anger and violent behavior in psychiatric populations is first reviewed. Then, anger rumination's relationship to violent behavior and aggressive behavior more broadly is presented. Another important factor, imagined violence (i.e., thoughts or daydreams of harming another individual; Grisso, Davis, Vesselinov, Appelbaum, & Monahan, 2000), is then presented as an interrelated process. Pertinent to violence prediction, historical and demographic characteristics are discussed as covariates in accounting for the effects of anger and anger rumination on violent behavior.

CHAPTER TWO: Literature Review

Anger and Violent Behavior with Psychiatric Populations

Anger is widely considered to be a basic emotion, meaning that anger is universal to all people and serves as an adaptive function in dealing with fundamental life tasks (Ekman, 1999). The phenomenological experience of anger elicits an approach or attack motivation, and anger spurs action in an attempt to attain a goal that has been prevented in some fashion (Lench & Levine, 2008; Novaco, 2011). This motivation can focus one's attention on situational aspects that are threatening of goal prevention, creating a bias to remember angering details stronger. The memory bias structure can then affect future behavior by instigating aggressive or violent behavior. A variety of psychiatric disorders display such memory biases, such as paranoid psychoses, anxiety disorders, and post-traumatic stress disorder, which have also been linked to anger (Novaco, 2010).

Studies of anger as a correlate and predictor of violence have typically taken one of two methodological approaches. In one, violence is measured concurrently with anger, and

in the other, violence is measured after anger. Within these two approaches, anger has been measured via self-report and violence has been assessed via multiple indicators: self-report, informant, or official records. In prospective studies, these indicators may be collected weeks, months, or years after an initial baseline assessment.

As an example of concurrent measurement, McNiel, Eisner, and Binder (2003), conducted a study involving anger, aggressive attributional style, and violence with patients in a major psychiatric inpatient unit. Aggressive attributional style is a pattern of thinking in which one projects persistent external hostile ascriptions onto others, resulting in a predisposition to react violently. Patients' anger, as measured by the Cognitive subscale of the Novaco Anger Scale (NAS; Novaco, 2003), was assessed after admission to the hospital, and violence was assessed retrospectively with the MacArthur Violence Risk study instrument, a widely used measure for violent behavior (Monahan et al., 2001). When controlling for age, substance related disorders, bipolar disorders, depressive disorders, and schizophrenic disorders, anger significantly predicted pre-admission violent behavior, even more so than aggressive attributional style. In another hospitalized inpatient sample, Moeller and colleagues (2015) tested the retrospective validity of a self-reported anger measure, the Novaco Anger Scale, and its relation to violence as measured by hospital staff observations. Higher anger scores were related to more retrospective aggressive and violent incidents, such as throwing an object at another person or direct physical aggression toward another person.

Moeller and colleagues (2015) also assessed the relation between anger and violence prospectively during hospitalization. The NAS predictive validity of violence during hospitalization was significant, with every 1-point increase on the NAS relating to a

4% increase in aggressive and violent incidents, which is quite strong given the NAS is 60 items total. Abidin and colleagues (2013) also examined the relation between anger and psychiatric inpatient violence, when they were assessing the strengths and protective factors of newly developed, structured, professional judgment instruments. A one item self-reported anger measure from the PANSS Supplemental Aggression Risk scale and official hospital records of violence were collected during participants' hospitalizations. During hospitalization, self-reported anger was correlated with harm to others with an odds ratio of 2.6. In another relevant study, anger was systematically assessed among hospitalized, developmentally disordered inpatients (Novaco & Taylor, 2004). Anger, measured by one staff rated and three self-report measures including the NAS, significantly predicted assaults post-hospital admission, even when controlling for multiple other characteristics (e.g., age, length of stay, IQ, violence offense history, personality).

Of greater interest, though, is anger's association with post-hospitalization violence in the community. In two additional studies, self-reported anger was predictive of violence in the community when assessed upon release, 20 weeks later. Patients with higher anger scores at the time of hospitalization were twice as likely to commit violent acts in their community after returning compared to patients with lower anger scores (Doyle, Carter, Shaw, & Dolan, 2012; Monahan et al., 2001). In another study, Swogger, Walsh, Homaifar, Caine, and Conner (2012) assessed anger using the MacArthur Violence Risk Study data that assessed adults under inpatient hospitalization, then followed the adults afterward for one year. Analyses were conducted to predict group membership for patients who committed violent acts and adults who did not commit violent acts during the follow up period. The violence groups were further differentiated into self-directed violent, other

directed violent, and co-occurring violent individuals. Inpatient anger levels indeed varied across the groups, such that anger (as measured by the Cognitive subscale of the NAS) predicted membership in each violent group relative to the non-violent reference group.

Summary. Cumulative, previous work on anger and violence provides consistent evidence for a strong relation between anger, both concurrently and prospectively with violence among psychiatric patients. However, previous work does not directly address the important question of why such associations exist, such as underlying links between anger and violent behavior. Theoretically, the phenomenological experience of anger (i.e., trying to overcome a blocked goal) should end with either achieving the thwarted goal or disengagement from the emotion. However, since anger predicted violence over time, it suggests that for at least some individuals, the emotional experience of anger could be sustained over time, and perhaps lead to their later violence. Anger rumination may reflect one such tendency that could sustain anger.

Anger Rumination, Aggression, and Violence

Anger rumination is the tendency to dwell on anger-evoking events by providing continuous attention to the provocation (Novaco, 1994), that could work to prolong the experience of anger, and thus serve as a process through which anger becomes violence. In past studies, anger rumination has typically been assessed through self-report measures or through experimental induction. These types of measurement are typically utilized with a cross-sectional design and limited aggression outcomes (i.e., laboratory derived aggression), so anger rumination serving as a link between anger and violence has yet to be adequately addressed.

Anger rumination as a mediator of anger and violent behavior. Despite anger rumination being a potentially important component of anger, somewhat surprising, anger rumination has not been adequately studied in regard to predicting violence. The few studies that have assessed anger rumination and violence generally find that higher levels of anger rumination relate to higher levels of violent behavior. In these cases, violent behavior has been assessed via self-report (e.g., the Revised Conflict Tactics Scale), peer sociometric nominations, and agency records in the form of behavioral write ups (Caprara et al., 2013; Massa et al., 2017). However, these studies generally did not include anger as a predictor, so the mediational function of anger rumination has not been assessed.

Among the larger body of work, significant associations have occurred between anger rumination and aggression. This relation is particularly important for clinical populations. For instance, a study conducted by Martino and colleagues (2015) examined the relation between emotion dysregulation, anger rumination, and aggressive proneness in a clinical sample of patients with Borderline Personality Disorder. Anger rumination significantly predicted aggression proneness above and beyond that of emotion dysregulation. Another example is with a sample of clinic-referred adolescents with severe conduct problems (Peled & Moretti, 2010). Anger, anger rumination, and physical and verbal aggression were assessed concurrently via self-report measures. Anger and anger rumination were significantly correlated ($r = .50, p < .001$). Anger rumination significantly predicted both anger and aggressive behavior and anger also independently predicted aggressive behavior. This result could imply a bi-directional relation between anger and anger rumination for multiple reasons: anger and anger rumination were highly related, anger can be a precursor to aggression, and anger rumination can be a precursor to

aggression as well. The relation between anger and anger rumination in regard to aggressive behavior should be examined further to discern their interrelations.

Another population where anger rumination is relevant is with offenders, as they are at higher risk for aggression. Smith and colleagues (2016) assessed adolescent males who were incarcerated in a maximum security facility for juvenile offenders. Anger and anger rumination were assessed through self-report measures, and aggression was measured by behavioral write-ups of rule violations at the facility. Anger rumination was significantly related to initial levels aggression for those who were high in trait anger. Over time, however, a marginally significant effect was found where the change in aggression was highest for those high in anger and low in anger rumination. However, since this effect was marginal and with a juvenile offender sample, further longitudinal research should be conducted to assess if this is also the case with adult psychiatric patients.

Together, extant work suggests that anger, on average, predicts anger rumination. Anger rumination, in turn, generally predicts aggression and may predict actual violent behavior. These links, moreover, are often observed among high risk populations, such as clinical or offender individuals. What studies have yet to adequately do though, is formally test anger rumination as a mediator of anger and violence. Knowledge of anger rumination's role, would be highly valuable as a target for aggression and violence reduction, as treatments can focus on changing the dysfunctional thought process.

Methodological challenges when studying anger, anger rumination, and violence.

Although previous work gives merit to suspect that anger rumination serves as a mediator of the relation between anger and violence, any test of the associations between anger rumination and violence needs to take into account how their links have been assessed in

prior studies. That is, most studies have relied on self-report measures or experimental inductions of anger rumination and assessed aggressive behaviors that are often mild, such as allocating hot sauce for a supposed confederate to eat (e.g., Anestis, Anestis, Selby, & Joiner, 2009; Vasquez et al., 2013). While these studies allow for ascertaining the basic associations between anger rumination and aggression, establishing pathways to violence necessitate a longitudinal design. This is the case because the temporal nature of longitudinal studies allows for the ability to establish causality—meaning that developments or changes in variables can be detected and controlled over time. Additionally, violence inherently has a low base rate, so a longitudinal design will allow time for violent behavior to be captured.

In experimental paradigms that induce anger rumination and then assess aggression (e.g., Pedersen et al., 2011; Vasquez et al., 2013), participants are provoked in some way, generally with a difficult cognitive task, followed by an attack on their character. Then, rumination is usually induced through a writing task where participants are prompted to think about the act and either free respond or respond to specific prompts about the event. Finally, participants are given an opportunity to aggress, such as by delivering a noise blast during an online task, evaluation, or perceived physical punishment to a confederate. For instance, in a study conducted by Pedersen and colleagues (2011), participants were provoked by completing a difficult anagram task, and then instructed to write for 20 minutes about their actions, feelings, and interactions with others in the experiment thus far. Participants that angrily ruminated and were triggered with a negative comment (“I thought a college student would do better”), assigned the confederated longer times to place their hand in painfully cold water.

Instructions to angrily ruminate are unlikely to have the same effect on aggressive behavior as would naturally occurring anger rumination. In the real world, there are individual differences and contextual factors bearing on whether anger rumination occurs and to what extent. Someone who is experimentally assigned to an anger rumination condition who does not ruminate in daily life, may not exhibit aggressive behavior in a manner that is representative of naturally occurring phenomena.

Other validity issues also pose a concern with previous work on anger rumination and aggression. An ecological validity issue may be present as a laboratory manipulation bears little resemblance to how events occur in the real world. For example, allocating hot sauce for another participant to eat or writing a bad evaluation of a research assistant likely does not translate to kicking a caretaker or physically assaulting someone with a weapon. Previous studies' measurements of aggression may be unrealistic in capturing more extreme behaviors of aggression, since they are contrived in a laboratory setting. With an ecological validity issue, also comes an issue of external validity. We do not know if these findings translate to and across other situations, stimuli, and especially people since many experimental designs have used an undergraduate student sample. There could even be an issue with an internal validity, meaning the process by which anger rumination translates to aggressive behavior in the laboratory may be completely different than when angrily ruminating in the real world. What is needed, therefore, is the use of a longitudinal design that assesses an individual's predisposition to angrily ruminate. This design would give the ability to assess the validity issues raised, by taking an initial assessment of anger rumination tendencies and prospectively assessing aggressive behavior.

Summary. Past empirical research suggests that anger rumination and aggressive behavior are significantly related, but few studies have assessed the relation between anger rumination and violence. What remains missing, is an empirical test of whether anger rumination is a particularly important process relating to violence, above and beyond that of anger alone. It could be the case that the overarching emotion of anger accounts for the effects seen in anger rumination and aggression studies, but anger has not been adequately covaried in past research, so that conjecture cannot be made. Anger rumination has also not been tested as a mediational mechanism between anger and violent behavior with a psychiatric hospitalized population where violence is of greater concern.

Anger, Anger Rumination, and Violence: Interrelationships and Correlates

The risk for violence is multifactorial, meaning many aspects can affect one's propensity to commit violence. Thus, when studying psychiatric inpatients' violence, it is important to consider other characteristics, particularly those that may correlate with anger rumination, in order to ascertain their unique contributions to violence. Variables of interest in the current study include a potential moderator of anger rumination and violence (i.e., imagined violence), historical background (i.e., child abuse), and demographic variables (i.e., sex, neighborhood disadvantage, and age).

Potential moderator of anger rumination and violence. Imagined violence, which consists of thoughts or daydreams about hurting another (Grisso et al., 2000), may represent an important corollary of dysregulated anger and anger rumination that also has implications for violence. Imagined violence does not necessitate a repetitive thought structure like anger rumination does, but they both can consist thinking of violent acts. Past

research has rarely considered the potential relationship between imagined violence and anger rumination when studying their independent links to violence. For example, Poon and Wong (2018) tested whether experimentally manipulated aggressive fantasy affects a person's tendency to ruminate. Imagined aggressive behavior was induced by instructing some individuals to think of a person whom they despised and then "envisage aggressive actions" toward that person, while other individuals were instructed to imagine what they would be doing on the coming Wednesday. Then, anger rumination was assessed via a modified version of the Sukhodolsky et al. (2001) Anger Rumination Scale, adapted to measure anger rumination as experienced in the study procedure. Participants who imagined violence reported significantly higher levels of anger rumination and lower subjective well-being than participants who did not imagine violence (Poon & Wong, 2018). The study did not include a measure of aggressive behavior, and anger rumination was assessed after the induction of imagined violence. Due to this design, we cannot discern whether imagined violence is a separate facet of anger or if imagined violence and anger rumination are two components of anger. The design also does not provide insight on whether imagined violence accompanies anger rumination or if anger rumination induces imagined violence after a provocation.

One possibility worth investigating is whether imagined violence represents a severe form of anger rumination rather than being a separable construct. Anger rumination can have components that involve planning retaliation and harming another individual (Denson et al., 2006). Frequently imagining violence could induce anger rumination's revenge planning component. Perhaps imagined violence even moderates anger rumination's association with violence, such that those who angrily ruminate and imagine

violence will have more violent behavior than those who do not. A number of studies have found an association between imagining violence and violent behavior (e.g., Grisso et al., 2000; Moeller, Gondan, & Novaco, 2017; Persson, Sturup, Belfrage, & Kristiansson, 2018; Watt, Kohphet, Oberin, & Keating, 2013). In the MacArthur Violence Risk study, psychiatric inpatients were assessed at multiple time points with the Schedule of Imagined Violence (SIV; Grisso et al., 2000) being utilized as one of numerous measures. The SIV asks respondents if they had daydreams or thoughts of harming an individual in the past two months and about characteristics of this imagined violence. Hospitalized patients reported imagined violence at twice the rate of community residents. In addition, reporting this imagined violence in the hospital significantly related to committing violence within the community 20 weeks after discharge (Grisso et al., 2000). In another investigation, Moeller and colleagues (2017) assessed male forensic patients' imagined violence with the SIV, self-reported anger as measured by the NAS, and aggression via a staff rated aggression measure. Patients who imagined violence, had significantly higher anger scores and committed more physically aggressive acts both retrospectively and prospectively when compared to patients who did not imagine violence. Imagined violence also independently contributed to both anger and aggressive behavior. The result with imagined violence appears to have a similar role as anger rumination in regard to anger and aggressive behavior. Both have independently contributed to violence and have shown to be highly related to cognitive, behavioral, and arousal subscales of anger. Perhaps the combination of imagined violence with anger rumination is particularly important—meaning that patients who angrily ruminate and imagine violence will have higher levels of violent behavior than their counterparts who do not endorse that combination. Further research should aim to

identify their discrete and also combined contributions to violence.

Historical background. For many individuals, violence is a learned pattern of responding to adversities (Bandura, 1978). Individuals exposed to childhood abuse are at higher risk for engaging in a range of externalizing problems, including delinquency, crime, and violence, later in life (Cecil, Viding, Barker, Guiney, & McCroy, 2014). Aggressive and retaliatory responses and violent interactions may have been learned from childhood, leading to their common occurrence in the face of stress, challenge, and even ambiguous interactions (that are interpreted as requiring an aggressive response) later (Cecil et al., 2014). Maltreatment also contributes to a host of other psychiatric disorders that can alter anger responses and violence in a range of situations. Retrospective studies of violent psychiatric offenders often indicate that many have histories of severe child abuse and other traumas in their history (Fehon, Grilo, & Lipschitz, 2005; Maxfield & Widom, 1996).

Child abuse exposure could facilitate violence via the creation of content for future imagined violence, the provision of behavioral scripts relevant for aggressive behavior, or ruminative and intrusive memories of negative anger-provoking experiences. Empirical evidence has shown that anger dysregulation mediated the relationship between child abuse and later committing physical, sexual, and emotional intimate partner violence (Iverson, McLaughlin, Adair, & Monson, 2014). Since child abuse has shown significant associations with violence, it will be used as a control variable in the study to account for those associations.

Demographics. Other important correlates of violence are demographic. First, men are more seriously and repeatedly violent than are women (Archer, 2004; Hiday et al., 1998). This pattern has emerged across measures and populations such as people with

severe mental illness, those in the military, and relationship partners (Hiday et al., 1998; Morse, 1995; Langhinrichsen-Rohling, Neidig, & Thorn, 1995). In the MacArthur Violence Risk study (data from which are used for the present study), during the first 20 weeks after hospitalization, a higher percentage of men (21.4%) than women (15.2%) committed at least one violent act (Monahan et al., 2001). Second, neighborhood disadvantage contributes to differences in violent behavior. In the MacArthur Violence Risk study, during a year-long follow up period after hospitalization, patients who resided in highly disadvantaged neighborhoods committed violence with an odds ratio of 1.7 when compared to patients who resided in low or medium disadvantaged neighborhoods (Monahan et al., 2001), which was conjectured to be due to inadequate resources necessary for survival. In the current study, neighborhood disadvantage was not included in the dataset, so neighborhood disadvantage was assessed via race because high disadvantage neighborhoods were comprised of 85% Black patients (Monahan et al., 2001). And third, age is likely to be of importance when predicting violence as well. Risky behavior and criminal offending (which often includes acts of violence) increase through adolescence, peak in late adolescence and then taper off steeply from there (Gottfredson & Hirschi, 1990). In other words, those in their late teen years are more likely to be violent than children and adults. They may also be highly likely to experience anger or anger rumination, placing them at risk, in turn, for violence.

Summary, Research Aims, and Hypotheses

While a link between anger and violent behavior has been demonstrated in past research, the ways in which anger dysregulation influences subsequent violent behavior have not been fully examined. Since anger rumination has been found to be significantly

related to aggressive behavior, it may be one anger dysregulatory process that is a particularly important contributor to violence in conjunction with other dispositional variables, such as imagined violence, child abuse, and other personal background factors.

The aims of the present study are twofold. Aim 1: investigate if hospitalized psychiatric patients' anger rumination acts as a mechanism through which anger influences violent behavior prior to hospitalization and after being discharged from the hospital.

Hypothesis 1.1: Anger rumination will be significantly associated with violence pre- and post-hospitalization when controlling for age, sex, race, child abuse, and anger. Hypothesis 1.2: Anger rumination will partially mediate the association between anger and pre- and post-hospitalization violence.

Aim 2: Assess the inter-relationship between anger rumination and imagined violence, and then their corresponding association with violence. Hypothesis 2.1: Anger rumination and imagined violence will be significantly inter-related. Hypothesis 2.2: Imagined violence will moderate the association between anger rumination and violence, such that patients who imagine violence and angrily ruminate will have higher levels of pre- and post-hospitalization violence than patients who do not display that combination.

CHAPTER THREE: Method

The data were acquired from the MacArthur Violence Risk Study (Monahan et al., 2001), which sought to identify key risk factors for psychiatric patient violence in the community and thereby develop a violence risk assessment instrument for clinicians. The project, which resulted in the Classification of Violence Risk instrument (Monahan et al., 2006), consisted, first, of many years of preparation and measurement development to culminate in a one-year longitudinal investigation of a large sample of civil commitment

patients, first assessed in hospital and then after they were discharged to the community. Five follow-up interviews were conducted post-discharge, in 10-week intervals (Monahan et al., 2001). During patients' hospital stay, baseline data on numerous variables (demographical, personal history, clinical psychiatric, psychosocial, psychometric, and previous violence) were collected via a semi-structured interview. This typically occurred within five days after admission. Length of hospital stays were no longer than 145 days. Pre-hospitalization violence was reported at baseline, and post-hospitalization was reported at five follow up interviews.

Participants

The sample consisted of 1,136 inpatients at psychiatric facilities in three locations: Worcester, Massachusetts, Pittsburg, Pennsylvania, and Kansas City, Missouri (see Monahan et al., 2001, for details). Inclusion criteria were that the patient must be hospitalized by civil commitment, between the ages of 18-40, English speaking, White, Hispanic, or Black ethnicity, and meet diagnostic criteria for one of these primary diagnoses: depression, dysthymia, mania, schizophrenia, schizophreniform disorder, schizoaffective disorder, brief reactive psychosis, delusional disorder, alcohol or other drug abuse or dependence, or personality disorder.

Approximately 40% of the patients were involuntarily committed. The sample was 60% male; and 75% of the sample was between the age of 25 to 40 years, while 25% were younger, 18 to 24 years. Their ethnicity was 69% White, 29% Black, and 2% Hispanic. The primary diagnoses were: 40% depression, 24% alcohol or other drug abuse or dependence, 17% schizophrenia or schizoaffective disorder, 13% bipolar disorder, 4% other psychotic disorders, and 2% personality disorder (Monahan et al., 2001).

Measures

Anger Rumination Index. A composite measure was created from items of the Novaco Anger Scale (NAS; Novaco, 1994; 2003). The NAS is a self-report measure that assesses anger disposition, developed and validated for use with clinical as well as general populations (Novaco, 1994). It has been independently validated with diverse populations pertinent to violence and found to have good test-retest reliability and excellent internal reliability. (e.g., Baker, Van Hasselt, & Sellers, 2008; Doyle & Dolan, 2006; Hornsveld, Muris, Kraaimaat, 2011; Lindqvist, Daderman, & Hellstrom, 2005; Mills, Kroner, & Forth, 1998). The NAS contains three subscales, Cognitive, Arousal, and Behavioral, with 16 items each. Items are rated on a three-point scale (1 “never true”, 2 “sometimes true”, and 3 “always true”). In the Cognitive subscale, four items have a designated “rumination” theme: “Once something makes me angry, I keep thinking about it,” “I can’t sleep when something wrong has been done to me,” “When someone makes me angry, I keep thinking about getting even,” “I feel like I am getting a raw deal out of life”. Additionally, there are two items in the Arousal subscale that are relevant to rumination: “When I get angry, I stay angry for hours,” and “When I think about something that makes me angry, I get even more angry”. These six items were tested for use as an anger rumination index.

Anger (Hostility – Brief Psychiatric Rating Scale, BPRS Hostility; Overall & Gorham, 1962). The BPRS consists of a semi-structured interview that assesses 18 psychiatric conditions, each rated on a 7-point scale. The BPRS “Hostility” item (rated as “animosity, contempt, belligerence, disdain for other people outside the interview situation”) was used to index for anger, because hostility has been conceptualized by aggression scholars as an enduring attitudinal disposition toward anger and aggressive behavior (e.g., Buss, 1961).

Hostility is also strongly associated with aggressive and violent incidents (e.g., Amore et al., 2008; Carr, Rosenfeld, & Rotter, 2019; Calegario et al., 2014; Raja & Azzoni, 2005). The rating of “hostility” is a clinical judgement based on the patient’s verbal report of feelings and behaviors toward other people during the past two weeks (1 “not reported/not observed”, 2 “very mild”, 3 “mild”, 4 “moderate”, 5 “moderately severe”, 6 “severe”, and 7 “extremely severe”). BPRS hostility has very good inter-rater reliability, with $r = .86$ for a clinical sample (Overall & Gorham, 1962).

Schedule of Imagined Violence (SIV; Grisso et al., 2000). The SIV is a structured 8-item scale, where endorsement of the first item (“Do you ever have daydreams or thoughts about physically hurting or injuring some other person”) leads to seven follow-up questions about the characteristics of imagined violence: recency, frequency, chronicity, similarity or diversity in type of harm, focus (target or general), escalating or diminishing, and proximity to target. Patients who endorse the first item, indicating that they have imagined violence in the past two months, were coded as SIV+, while patients who did not endorse imagined violence in the past two months were coded as SIV-. This dichotomous measure served as the main SIV index for the present study. Grisso and colleagues (2000) reported 30% of patients were SIV+ at the baseline hospital interview. In independent studies, SIV+ status ranged from about 18% to 33% of participants having reported a violent daydream in the past two months (Watt et al., 2013; Nagtegaal, Rassin, & Muris, 2006). Furthermore, Grisso and colleagues (2000) also found that patients with higher symptom severity, as assessed by the BPRS, were more likely to be SIV+. For the present study, in addition to SIV +/-, the seven follow-up items were used to assess the inter-relationship between imagined violence and anger rumination. These individual items had

either Likert-type scales (e.g., frequency was rated on a scale of 1 “about once in the past two months” to 7 “several times a day”), or were scored dichotomously (e.g., proximity to target which was rated 0 “no” and 1 “yes”).

Child Abuse (Monahan et al., 2001). The child abuse measure is comprised of 6 items from the family history section of the hospital intake interview. Sample items include, “Thinking about when you were a child, did your parents beat or hit you with something hard?” or “Thinking about when you were a child, did your parents injure you with a knife, gun, or other weapon?”. The items were scored on a six-point scale, and responses were: 0 “never”, 1 “once”, 2 “twice”, 3 “sometimes”, 4 “frequently”, and 5 “most of the time”. In the current study, frequency of child abuse was used (“When you were a child, did your parents ever beat or really hurt you?”) so as to not introduce a problem of non-discrete, item overlap (i.e., if a child was admitted to the hospital, by default they were also injured badly enough to need a doctor).

Violence (Monahan et al., 2001). Violence is operationalized in the MacArthur Violence Risk Study as an act resulting in physical injury, a sexual assault, or a threat that was made while holding a weapon (Monahan et al., 2001). The items are derived and modified from the Conflict Tactics Scale (Straus, 1979). Many subsequent studies on violent behavior by psychiatric patients in the community have used the MacArthur violence index (e.g., Monahan et al., 2005; Doyle & Dolan, 2006; Doyle et al., 2012). Three sources were used to obtain information on the prevalence and details of violence: interviews with the patients, interviews with collateral individuals, and official records (i.e. police and hospital records). Patients and collaterals were asked if the patient engaged in violence during the past 10 weeks. Interview questions described types of violent acts, followed by an

additional question assessing frequency, if an affirmative response was given. For example, “Have you thrown something at anyone?”. The response was scored dichotomously, either yes or no. Then, a follow up question was asked: “What was the number of times you threw something at anyone?”, in which the frequency was recorded. For the present study, the dichotomous ratings of pre-hospitalization violence and post-hospitalization violence were used. A composite for post-hospitalization violence was created by summing the violence count at each follow up interview, which created a year aggregate count variable for all violent acts. This variable was then recoded to a dichotomous measure, where 0 meant a patient was not violent in the year follow up and 1 meant the patient was violent during the year follow up.

Procedure

In the original study, baseline interviews were conducted with patients after admission to the hospital. The data were obtained by extensively trained research assistants, and interrater reliability was established (cf., Monahan et al., 2001). Five follow-up interviews were conducted at 10-week intervals after hospital discharge. These interviews were conducted with the patient either in-person or by telephone, and an interview with a collateral informant was also taken at each follow-up time point. Attrition rates for the follow-up interviews were: 26% at follow-up 1, 2% at follow-up 2, 4% at follow-up 3, 2% at follow-up 4, and 2% at follow-up 5. A detailed description of their procedure can be found in Monahan et al. (2001).

The current study is a secondary data analysis of the MacArthur Violence Risk study data. The dataset is publicly available at <https://macarthur.virginia.edu/risk.html>. Age, sex, race, child abuse, the Novaco Anger Scale, the Brief Psychiatric Rating Scale—Hostility, and

the Schedule of Imagined Violence were abstracted from the hospital baseline data, along with pre-hospitalization violence. Violence data abstracted from each of the five follow-up interviews were combined to create a count of all violent acts that occurred post-hospitalization. Then, this count was dummy coded to represent the dichotomous post-hospitalization variable of non-violent and violent patients. These data were abstracted from the MacArthur Violence Risk database systematically (Andersen, Prause, and Silver, 2011).

Data Analysis Plan

Analyses were conducted in four separate phases. First, because the anger rumination index was not a pre-established, validated measure, a principal component analysis of the six candidate items was conducted to assess the reliability of the index and to refine it for use in the study. A one-factor solution was predicted and sought. If items did not fit the one factor solution (thus decreasing the reliability of the index) they were to be removed. This factor analysis was conducted using SPSS.

Second, correlations between the main analytical variables and demographic variables were conducted to assess their bivariate associations. To examine the interrelationship between anger rumination and imagined violence, correlations were conducted between the anger rumination index and individual items of the Schedule of Imagined Violence.

Third, analyses tested the main research question of whether anger rumination is a mediation mechanism through which anger relates to violence. Mediation analyses using ordinary least squares path analysis with Hayes' PROCESS macro for SPSS (Hayes, 2013) were conducted with anger rumination at baseline mediating the association between

anger proclivity (BPRS Hostility) at baseline with both pre- and post-hospitalization violence. Bias-corrected, 5,000 bootstrapped confidence intervals were obtained to assess the indirect effects (Hayes, 2013). Bootstrapping is suggested to enhance the replicability of a statistical test, because the statistical inference is drawn from a comparison distribution built by resampling from the current data to create a normal distribution (Cohen, Cohen, West, & Aiken, 2003). Anger proclivity was the predictor variable, anger rumination was the mediator, and the covariates were sex, race, age, and child abuse. The criterion variables were pre- and post-hospitalization violence. The model met all assumptions necessary for logistic regression (i.e., independent observations, little multicollinearity, etc.).

Fourth, the second research question, namely whether imagined violence influenced the association between anger rumination and violence, was addressed via a moderated mediation analysis. Moderated mediation is used when one wants to describe the conditional nature of a mechanism, such that one variable relays its effects onto another, and how these contingent effects interact (Hayes, 2013). In this case, a final series of moderated mediation analyses using PROCESS in SPSS were conducted. This was done to assess if the inter-relationship between anger rumination and imagined violence, conditioned on anger proclivity, was pertinent for predicting pre- and post-hospitalization violence. Again, anger proclivity served as the predictor, anger rumination as the mediator, and sex, race, age, and child abuse as covariates. Imagined violence was included as a moderator. The criterion variables of pre- and post-hospitalization violence met all assumptions.

CHAPTER FOUR: Results

Anger Rumination Index

A principal component analysis of the six anger rumination items selected from the NAS at baseline produced a one factor solution, with two items dropped: “I feel like I am getting a raw deal out of life” (eigenvalue = .59) and “I can’t sleep when something wrong has been done to me” (eigenvalue = .54) to boost internal reliability. The final 4-item scale ($M = 8.44$; $SD = 2.13$; $N = 1132$) has satisfactory internal reliability ($\alpha = .76$) and served as the rumination index for the analyses.

Correlations Among Study Variables

Correlations for the main analytical variables at baseline, along with pre-hospitalization and post-hospitalization violence are shown in Table 1. The intercorrelations of baseline scores for anger proclivity with anger rumination and imagined violence were statistically significant ($p < .001$), but small in magnitude. The association between anger rumination and imagined violence was more robust ($r = .35$). The inter-correlations with child abuse were also small but significant. Importantly, baseline anger rumination and anger proclivity were significantly related ($p < .001$) to both pre- and post-hospitalization violence, with stronger correlations for pre-hospitalization violence.

Because anger rumination had a substantial correlation with imagined violence (+/-), separate correlations were conducted using the individual SIV items. Anger rumination was positively and significantly related to SIV recency ($r = .19$, $p < .001$), frequency ($r = .24$, $p < .001$), similarity in type of harm ($r = .14$, $p = .01$), focus ($r = .14$, $p <$

.01), escalation ($r = .17, p < .01$), and proximity to target ($r = .19, p < .001$). Chronicity ($r = -.05$) was the only SIV item that was not significantly related to anger rumination.

Anger Rumination as a Potential Mediator

To assess anger rumination as a potential mediator between anger proclivity and violence, two mediation models were analyzed, one for pre-hospitalization violence and the other for post-hospitalization violence.

Pre-hospitalization Violence (Figure 1). A mediation analysis using ordinary least squares path analysis with Hayes' PROCESS macro for SPSS (Hayes, 2013) was conducted with anger rumination at baseline mediating the relationship between anger proclivity at baseline and pre-hospitalization violence. The model was significant and accounted for 17% of the variation, Nagelkerke R^2 , in pre-hospitalization violence. Anger proclivity, the predictor, is significantly predictive of anger rumination, the mediator [$a = .19, z(1118) = 6.87, p < .001$]. The direct path of anger proclivity [$c = .23, SE_{boot} = .04, p < .001; c' = .19, z(1118) = 5.06, p < .001$] was significant for pre-hospitalization violence, and anger rumination [$b = .28, z(1118) = 6.42, p < .001$] was significantly related to pre-hospitalization violence. These associations fit the requirement of mediation analysis. In then testing for mediation, anger rumination was found to partially mediate the relationship between anger proclivity and pre-hospitalization violence [$ab = .05, SE_{boot} = .01, 95\% CI_{boot} (.03, .08)$]. Of the covariates, age ($p = .03$) and sex ($p < .001$) remained significant predictors, while race and child abuse did not. Stated succinctly, for patients with high anger proclivity anger rumination heightened the likelihood of pre-hospitalization violence, but it was not the sole pathway through which that relationship was manifest.

While it was hypothesized that anger rumination predicts violent behavior, there may be a bi-directional effect between the variables, hence a hierarchical linear regression was conducted with pre-hospitalization violence predicting anger rumination at baseline. The covariates sex, race, age, and child abuse were entered on the first step and significantly accounted for 4.7% of the variation in anger rumination. When pre-hospitalization violence was entered on the second step, the ΔR^2 was significant ($p < .001$) and accounted for an additional 5% of variation in anger rumination. Pre-hospitalization violence was strongly associated with anger rumination assessed in hospital (semi-partial $r^2 = .23$).

Post-hospitalization Violence (Figure 2). Testing whether anger rumination at baseline mediated the relationship between anger proclivity at baseline and post-hospitalization violence, the results, were similar to the pre-hospitalization model. The mediation model was significant and accounted for 8% of the variation, Nagelkerke R^2 , in post-hospitalization violence. Anger proclivity was significantly related to anger rumination [$a = .17, z(532) = 4.15, p < .001$]; the direct path of anger proclivity to post-hospitalization violence was significant [$c = .18, SE_{boot} = .05, p < .001; c' = .16, z(532) = 3.46, p < .001$]; and anger rumination significantly predicted post-hospitalization violence [$b = .12, z(532) = 2.31, p = .02$]. Anger rumination was a partial mediator of the relationship between anger proclivity and post-hospitalization violence [$ab = .02, SE_{boot} = .01, 95\% CI_{boot} (.004, .05)$]. None of the covariates (age, sex, race, and child abuse) remained significant. Stated succinctly, for patients with high anger proclivity anger rumination heightened the likelihood of post-hospitalization violence, but it was not the sole pathway through which that relationship was manifest.

Imagined Violence as a Moderator of Anger Rumination and Violent Behavior

In the final analyses, imagined violence was added as a moderator to assess whether the relationship between anger proclivity, anger rumination, and violent behavior varied as a function of imagined violence. Models were again conducted separately for pre- and post-hospitalization violence.

Pre-hospitalization Violence (Figure 3). When imagined violence was added as a moderator, the model was significant, accounting for 18% of the variation, Nagelkerke R^2 , in pre-hospitalization violence. Anger proclivity significantly predicted anger rumination [$a = .19$, $z(1116) = 6.89$, $p < .001$]. The direct path of anger proclivity [$c = .23$, $SE_{boot} = .04$, $p < .001$; $c' = .18$, $z(1116) = 4.76$, $p < .001$] was significant for pre-hospitalization violence. Imagined violence [$W = .52$, $z(1116) = 2.60$, $p < .01$], along with anger rumination [$b = .26$, $z(1116) = 4.47$, $p < .001$], were significantly associated with pre-hospitalization violence. Finally, the indirect path of anger rumination at both levels of imagined violence [SIV - = $.05$, $SE_{boot} = .01$, 95% $CI_{boot} (.02, .08)$; SIV + = $.04$, $SE_{boot} = .02$, 95% $CI_{boot} (.02, .08)$] was significantly related to pre-hospitalization violence. However, imagined violence did not emerge as a significant moderator of the relation between anger rumination and pre-hospitalization violence [$bW = -.01$, $SE_{boot} = .02$, 95% $CI_{boot} (-.04, .03)$]. Of the covariates, age ($p = .03$) and sex ($p < .001$) remained significant predictors, while race and child abuse did not. Thus, patients who had high levels of rumination and imagined violence did not, in combination, engage in more violence than patients without both tendencies.

Post-hospitalization Violence (Figure 4). A similar analysis for the prediction of post-hospitalization violence was conducted, and the final model significant accounted for 8% of the variation, Nagelkerke R^2 , in post-hospitalization violence. Anger proclivity, again,

significantly predicted both anger rumination [$a = .17, z(532) = 4.15, p < .001$] and post-hospitalization violence [$c = .18, SE_{boot} = .05, p < .001; c' = .15, z(532) = 3.21, p = .001$]. However, when imagined violence was added to this model, anger rumination [$b = .10, z(532) = 1.55, p = .12$] and imagined violence [$W = .40, z(532) = 1.71, p = .09$] became nonsignificant in predicting post-hospitalization violence, and the indirect path of anger rumination at both levels of imagined violence [SIV - = .02, $SE_{boot} = .01, 95\% CI_{boot} (-.005, .05)$; SIV + = .01, $SE_{boot} = .02, 95\% CI_{boot} (-.02, .05)$] did not have significant influence on post-hospitalization violence. No support for imagined violence as a moderator of the links between anger rumination and post-hospitalization violence [$bW = -.01, SE_{boot} = .02, 95\% CI_{boot} (-.04, .03)$] was found. None of the covariates (age, sex, race, and child abuse) remained significant predictors.

CHAPTER FIVE: SUMMARY AND CONCLUSIONS

The overarching goals of the current study were to assess whether the association between anger and violence was mediated by anger rumination in a psychiatric population and to test if anger rumination's association with violent behavior was moderated by imagined violence. Results from this secondary analysis of data from the MacArthur Violence Risk Project provide insight into how elements of anger dysregulation, namely anger rumination and imagined violence, potentially influence one another in regard to violent behavior in a high risk population.

Anger Rumination as a Mediator of Anger and Violence

Patients who have higher levels of anger proclivity endorse higher levels of anger rumination. In turn, that anger rumination is associated with patients' pre- and post-hospitalization violent behavior. These findings align with prior work showing that both

anger (e.g., Monahan et al., 2001; Novaco & Taylor, 2004) and anger rumination (e.g., Denson et al., 2006; Caprara et al., 2013, etc.) affect violent behavior and that anger rumination is related to aggression (e.g., White & Turner, 2014; Bettencourt, Talley, Benjamin, & Valentine, 2006). However, this study's findings further demonstrate, using both retrospective and prospective violence reporting, that anger rumination partially mediates the relationship between anger proclivity and violent behavior. Regarding pre-hospitalization violence, a bi-directional effect was found, suggesting that pre-hospitalization violence also predicts anger rumination. Past violent behavior may supply the content for which future anger rumination is centered upon and could be a contributing factor in why someone becomes civilly committed in the first place.

Anger rumination can act as a mechanism through which anger becomes violent behavior. Anger rumination may be an emotion regulation strategy, as Rusting and Nolen-Hoeksema (1998) have asserted, but its service in that regard can run amok. Emotions, pertinent to aggressive behavior (Anderson & Bushman, 2002), have been conceptualized as integral to a knowledge network that links together associated information, and, when activated, past events and beliefs are brought to mind that can enhance or prolong the emotion. If one were to consider anger rumination as an emotion regulation strategy, rumination could spread the activation network by bringing to mind past events and memories. In fact, some people believe that anger rumination helps them gain insight and cope with an angry mood (Simpson & Papageorgiou, 2003). However, this activation would produce an opposite effect of regulating emotion because recurrently thinking of anger-inducing events and memories can exacerbate anger further, making it more difficult to

diffuse (Rusting & Nolen-Hoeksema, 1998). This maintenance or even enhancement of anger, could then lead to successive aggressive or violent behavior.

Anger Rumination, Imagined Violence, and Violent behavior

Imagined violence and anger rumination were highly related, especially when each measured facet of imagined violence (recency, frequency, similarity in type of harm, focus, escalation, and proximity to target) besides chronicity (that is when the daydreams started) was considered. Of interest, anger rumination was most strongly related to the frequency of imagined violence or how often individuals report having daydreams of hurting another person. Recurrently thinking about injuring another person, could approximate the repetitious aspect (i.e., the repetitive thinking of an anger-evoking event) of anger rumination. Perhaps, then, repetition of thoughts can involve both thinking of the past and the future, making the repetition of thought itself predictive of violence rather than the content of such repetition, which would delineate anger rumination and imagined violence.

It was also hypothesized that imagined violence would moderate the association between anger rumination and violence, meaning that patients who angrily ruminated and had imagined violence would show more violent behavior than patients who did not endorse that combination. This conjecture was not supported by the data. Overall, imagined violence did not alter the extent to which anger rumination predicted violence. On their own, anger rumination and imagined violence significantly predicted pre-hospitalization violence, but imagined violence did not moderate the association between anger rumination and violent behavior. In regard to post-hospitalization violence, when imagined violence was added as a moderator, anger rumination no longer mediated the

relation between anger and violence, and imagined violence did not moderate the association between anger rumination and violence or predict violent behavior itself.

Given the interrelation and perhaps amalgamate nature of anger rumination and imagined violence, it is suspected that the constructs overlapped and split the variation explained in violence. For example, revenge planning is a facet of anger rumination in which one perseverates about anger inducing experiences in order to plan retribution. This retribution could include thoughts of physically harming another, which by definition would be imagined violence. Another example of how the constructs overlapped is that anger rumination has both retrospective and prospective qualities. Retrospective in the sense that there is repetitive focus on memories of anger-inducing events and re-experiencing anger related feelings (Sukhodolsky et al., 2001). Prospective in the sense that there are thoughts of revenge, or thinking of acts of retribution in response to the anger-evoking event (Sukhodolsky et al., 2001; Denson et al., 2006). The prospective aspect applies to both anger rumination and imagined violence through this revenge component. When taking these points into consideration, anger rumination and imagined violence are likely conflated as it may be too difficult to differentiate if a thought is ruminative or imagined violence when revenge is involved.

Study Limitations and Future Directions

Anger rumination was a key construct for this study, but it was operationalized in a limited manner due to the absence of a previously validated scale in the data set. The anger rumination index was a composite of rumination and duration themed items from the Novaco Anger Scale, but these items did not include my features of anger rumination, such as anger memories and thoughts of revenge. Future studies should utilize validated anger

rumination measures, such as those by Sukhodolsky et al., (2001) and Denson et al. (2006); the latter has separate anger rumination and revenge planning subscales.

As a secondary data analysis, the study was also limited by other constraints from the original project. The measure for anger in the current study was anger proclivity, using a surrogate measure for anger with the BPRS hostility item; other studies have also used this as a quasi-measure for anger (e.g., Calegario et al., 2014; Raja & Azzoni, 2005). The alternative measure that was considered was the Behavioral subscale of the NAS, which does not have overlapping items with the anger rumination index as it was comprised of items from the Cognitive and Arousal subscales of the NAS. Because both measures would have been from the same instrument, there would be shared method variance. Thus, BPRS Hostility measure was deemed the appropriate index to avoid that contamination and provide a valid surrogate of anger proclivity, as hostility is conceptualized as anger's attitudinal disposition (Novaco, 1994, 2011).

Our hypothesis that anger rumination failed to maintain its mediational relationship between anger to post-hospitalization violence, once imagined violence was included as a moderator, could also have occurred for many reasons. Once imagined violence was added, there could have been too many variables in the model, which could have produced multicollinearity among the constructs and also reduced power.

To further understanding of the intricacies of anger rumination and imagined violence, the association should be investigated qualitatively. For instance, high anger participants could be interviewed about both their anger rumination and imagined violence experiences. First, anger could be induced by having participants think about an event that made them very angry in the past, which has been shown to be an effective way

of inducing anger—self-reported and physiological responses (Siedlecka & Denson, 2019). Once immersed in the emotion, one can ask if they continued thinking about the provocation, and, if so, probe to extract themes about anger rumination and imagined violence. Example items could be what thoughts did the participants have, how often did the participants have these thoughts, or do these thoughts help the participants cope with an angry mood? A similar structure can be asked to assess imagined violence, such as after this event, did the participants ever have thoughts or daydreams about hurting another individual? If so, one can ask about the content of the imagined violence, how often they thought about it, and other aspects. To assess revenge—the potentially overlapping facet of anger rumination and imagined violence—standardized provocations could be given. Standardized provocations have been used in past research to identify the kind of situations that would induce anger (Novaco, 2003). These provocations would be modified and provide an anger-evoking scenario to then assess the participant's thoughts of and propensity for revenge with a Likert scale. This design could assess if the thoughts of revenge component is sustaining the association between anger rumination and imagined violence or if there are other aspects, such as frequency, that are more important for their association.

Another constraint was the public nature of the dataset. Private identifiable information, such as the patients' zip codes, was not included that could have been useful to control for in the analyses. For instance, neighborhood disadvantage could have been used as a covariate. In the original study, when neighborhood disadvantage was assessed for its association to violence, community violence was significantly higher in highly disadvantaged neighborhoods, with no significant difference between White and Black

people in committing violence (Monahan et al., 2001). Additionally, psychiatric setting could also have been used as a covariate, however, hospital location information was not included in the dataset. Since patients were spread across three different hospital sites, there could be potential local history effects based on the cities they were in, which could have affected the outcome measures. For instance, in the late 1990s when this data was collected, Kansas City had a much higher violent crime rate of about 1700-2000 per 100,000 residents when compared to Pittsburgh at 800-900 and Worcester at 900-1000 (Federal Bureau of Investigation, 2020). The city size could also contribute to higher violence rates because past research has shown that bigger cities have more violent crime and underreporting of violent crime than both smaller cities or rural areas (Glaeser & Sacerdote, 1999). Furthermore, controlling for this could also help mitigate potentially nested data effects — as patients resided in hospitals, which resided in different states.

Regarding external validity, study participants were civil commitment patients, and future studies should assess the association between anger rumination and violence in forensic, offender, or prisoner populations, for whom rumination and potential violence are often significant concerns (e.g., Ruddle, Pina, & Vasquez, 2017). Forensic populations likely have traumatic life histories, diminished activity schedules, and anger schemas that influence both anger rumination and imagined violence (Novaco, 2011). Past research has also shown that forensic populations generally have higher anger levels, more imagined violence, and engage in more violent behavior when compared to other populations (e.g., Doyle & Dolan, 2006, Moeller et al., 2017).

Conclusions

In closing, the current study offers insight into a potential mechanism through which anger becomes violent behavior in psychiatric populations. Engaging in anger rumination, which is directly related to levels of anger, predicts the extent to which psychiatric patients engage in violent behavior, both pre- and post-hospitalization. Furthermore, anger rumination is significantly related to imagined violence, which affects subsequent violent behavior. More broadly, anger rumination may serve as a key mechanism in anger dysregulation, and, insofar as it is possible to alter anger rumination, its attenuation may also help to reduce violent behavior. Future research could strive to develop interventions specifically for these violence-related psychological processes.

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Table 1

Descriptive Statistics and Inter-correlations Between Study Variables

	1	2	3	4	5	6
1. Child Abuse	-	.11***	.10**	.11***	.06*	.03
2. Anger (BPRS Hostility)	-	-	.22***	.18***	.19***	.18***
3. Anger Rumination	-	-	-	.35***	.25***	.14**
4. Imagined Violence (SIV +/-)	-	-	-	-	.19***	.14**
5. Pre-hospitalization Violence	-	-	-	-	-	.17***
6. Post- hospitalization Violence	-	-	-	-	-	-

Note. * $p < .05$, ** $p < .01$, *** $p < .001$; Child Abuse at baseline, Anger (BPRS Hostility: Brief Psychiatric Rating Scale Hostility) at baseline; Anger Rumination at baseline, SIV +/- : Schedule of Imagined Violence at baseline, Pre-Hospitalization Violence, Post-Hospitalization Violence

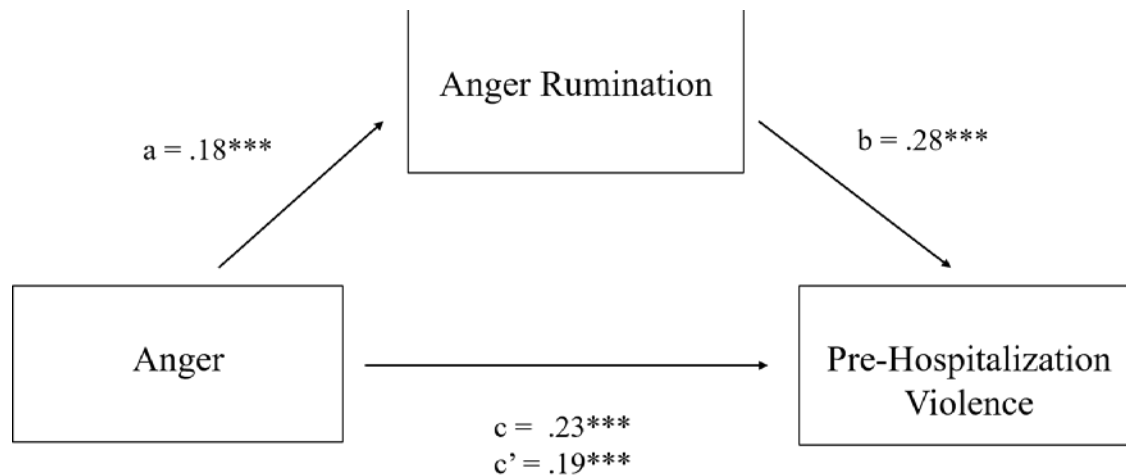


Figure 1. Mediation Model for Pre-Hospitalization Violence. Values shown are unstandardized regression coefficients, with significant paths, $p < .05$, bolded. * $p < .05$, ** $p < .01$, *** $p < .001$. Indirect effect estimate of $ab = .05$ with a significant, bootstrapped confidence interval of $ab (.03, .08)$. Covariates included in the model were age ($p = .02$), sex ($p < .001$), race ($p = .17$), and child abuse ($p = .16$).

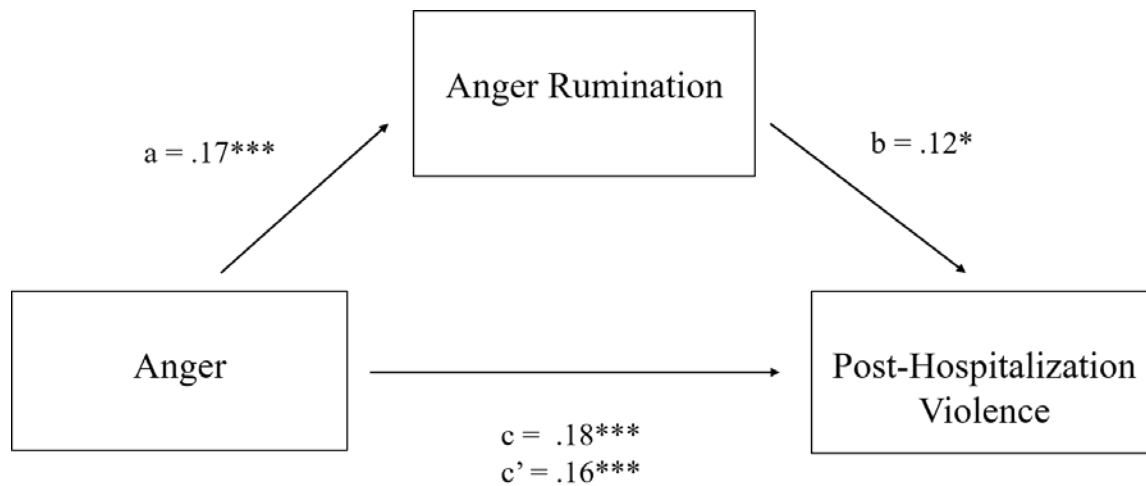
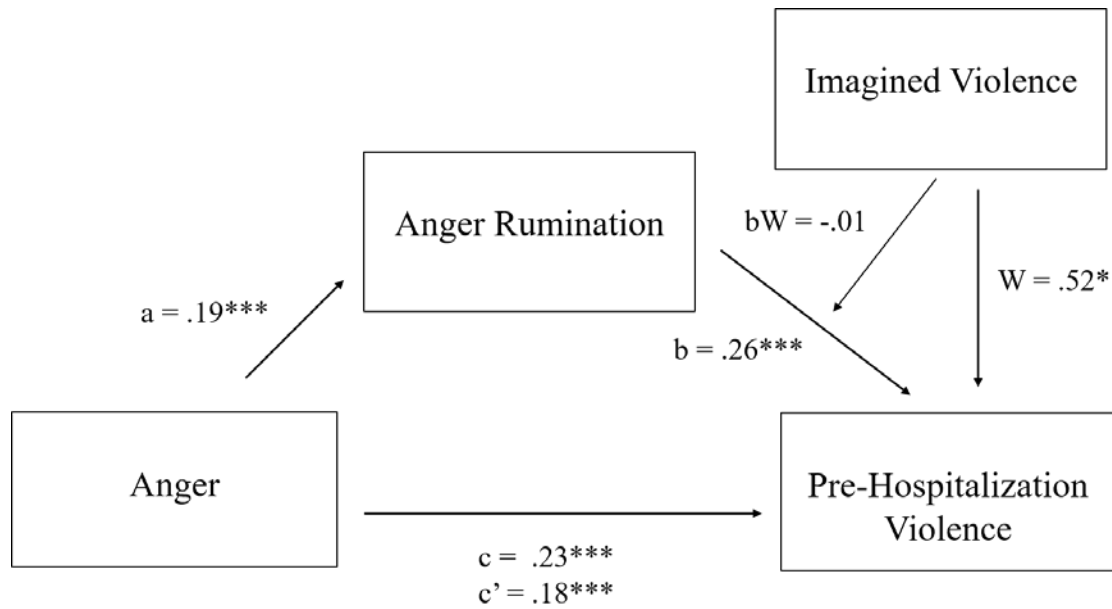


Figure 2. Mediation Model for Post-Hospitalization Violence. Values shown are unstandardized regression coefficients, with significant paths, $p < .05$, bolded. * $p < .05$, ** $p < .01$, *** $p < .001$. Indirect effect estimate of $ab = .02$ with a significant, bootstrapped confidence interval of $ab (.004, .05)$. Covariates included in the model were age ($p = .45$), sex ($p = .15$), race ($p = .11$), and child abuse ($p = .57$).



*Figure 3. Moderated Mediation Model for Pre-Hospitalization Violence. Values shown are unstandardized regression coefficients, with significant paths, $p < .05$, bolded. * $p < .05$, ** $p < .01$, *** $p < .001$. Indirect effect estimate of ab when $SIV = 0$ is .05 with a significant, bootstrapped confidence interval of ab (.02, .08), when $SIV = 1$ is .04 with a significant, bootstrapped confidence interval of ab (.02, .08). Index of moderated mediation of the predictor (b) at moderator (W) is -.01 with bootstrapped confidence interval of (-.04, .03). Covariates included in the model were age ($p = .03$), sex ($p < .001$), race ($p = .26$), and child abuse ($p = .24$).*

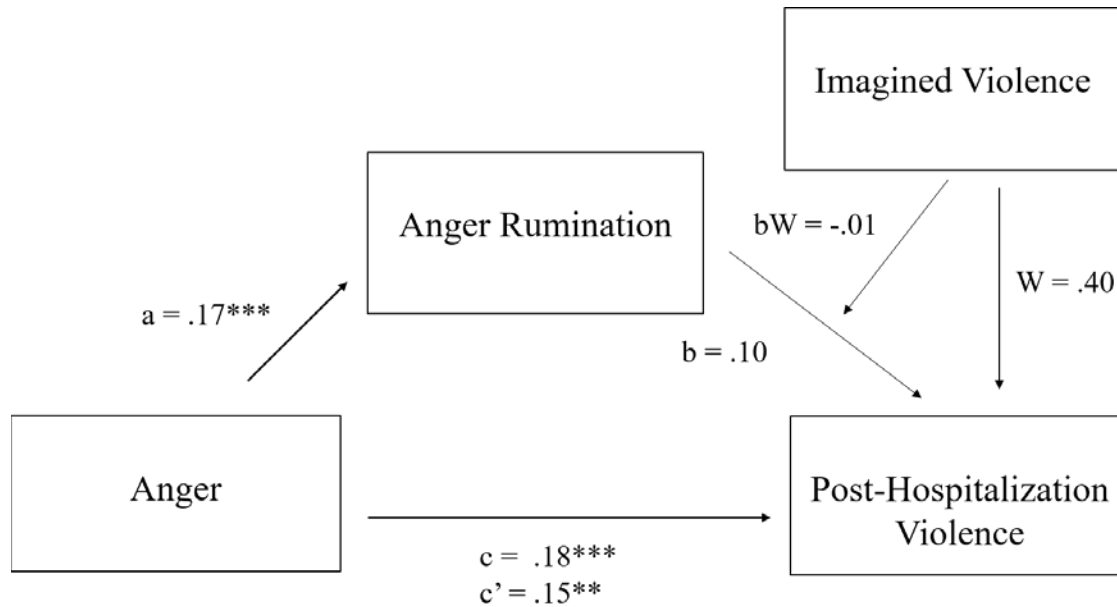


Figure 4. Moderated Mediation Model for Post-Hospitalization Violence. Values shown are unstandardized regression coefficients, with significant paths, $p < .05$, bolded. * $p < .05$, ** $p < .01$, *** $p < .001$. Indirect effect estimate of ab when $SIV = 0$ is .02 with a bootstrapped confidence interval of ab (-.005, .05), when $SIV = 1$ is .01 with a bootstrapped confidence interval of ab (-.02, .05). Index of moderated mediation of the predictor (b) at moderator (W) is -.01 with bootstrapped confidence interval of (-.05, .03). Covariates included in the model were age ($p = .52$), sex ($p = .12$), race ($p = .15$), and child abuse ($p = .67$).