EFFECTS OF ANGRY RUMINATION AND DISTRACTION IN INTIMATE PARTNER VIOLENT MEN

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A Dissertation

Presented to

The Faculty of the Department

of Psychology

University of Houston

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In Partial Fulfillment

Of the Requirements for the Degree of

Doctor of Philosophy

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By

Andrea L. Potthoff

May, 2016

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ABSTRACT

Although the tendency to ruminate is related to the frequency of intimate partner violent (IPV) perpetration (Sotelo & Babcock, 2013), it is unclear how intimate partner violent men react emotionally and physiologically during angry rumination. The current study is the first to experimentally manipulate rumination and distraction in a violent sample. Using the rumination and distraction paradigm developed by Nolen-Hoeksema and Morrow (1993), IPV and nonviolent (NV) men underwent an anger induction and were randomly assigned to either ruminate or distract. Both groups were expected to show an increase in physiological arousal and self-reported anger during rumination and a decrease in physiological arousal and self-reported anger during distraction. Self-reported anger was predicted to mediate the change in physiological arousal. IPV men were hypothesized to experience increased effects of rumination compared to NV men. The present study also explored IPV men's tendency to ruminate (trait rumination). As predicted, the results demonstrate an increase in heart rate from baseline to post-rumination. No change in physiological arousal was observed in the distraction condition over time. Surprisingly, both conditions resulted in an increase in self-reported anger. Self-reported anger could not be tested as a mediator of physiological arousal because the basic requirements of mediation were not established. No difference self-reported anger was found between IPV and NV men. Trait rumination was found to be positively correlated with IPV frequency, depressive symptoms, and anxious symptoms. From a theoretical and clinical perspective, the effects of angry rumination in IPV men, and a violent sample in general, must be examined in order to understand the sequence of events that lead to an act of IPV and develop effective interventions for perpetrators.

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Introduction

Intimate partner violence (IPV) is a global human rights issue, in which victimization results in severe physical and psychological consequences (Coker et al., 2002; Simmons, Knight, & Menard, 2015). Past research focused on perpetrators of IPV has explored psychological and physiological correlates of IPV perpetration (Birkley & Eckhardt, 2015; Jackson, Sippel, Mota, Whalen, & Schumacher, 2015; Okuda, Olfson, Wang, Rubio, Xu, & Blanco, 2015). However, experimental research on IPV perpetrators is limited and experiments exploring the role of anger in IPV are even scarcer. The role of anger in IPV is controversial, with some researchers claiming IPV is the result of a desire for power and control, not a response to anger (Gondolf & Russel, 1986; Mcmurran & Gilchrist, 2008). However, there is strong evidence that focusing on one's anger causes an increase in physical aggression (Bushman, 2002) and it is doubtful that IPV is an exception to this rule. More research is needed to assess the role of anger in IPV in order to determine appropriate interventions (Price & Rosenbaum, 2009). Using the rumination vs. distraction experimental paradigm developed by depression researchers, the present study seeks to investigate differences in emotions and physiological arousal following angry rumination or distraction in IPV men.

Rumination

Rumination is defined as engaging in behavior or thoughts that are focused on one's distress. This can include thinking about the symptoms, causes, and results of one's current mood state (Nolen-Hoeksema, 1991). According to the response styles theory (Nolen-Hoeksema, 1991), individuals who engage in rumination when in a negative mood state will experience a longer, and more severe negative mood compared to individuals who do not

engage in rumination. The last two decades of research in this area has provided strong evidence that rumination is not an adaptive or helpful type of thinking (Lyubomirsky, Caldwell, & Nolen-Hoeksema, 1998). There is evidence that rumination is a risk factor for a number of psychological disorders, including depression (Nolen-Hoeksema, McBride, & Larson, 1997; Nolen-Hoeksema & Morrow, 1991), anxiety (McLaughlin & Nolen-Hoeksema, 2011; Segerstrom Tsao, Alden, & Craske, 2000), substance use (Nolen-Hoeksema & Harrell, 2002), borderline personality disorder (Baer & Sauer, 2011), and eating disorders (Nolen-Hoeksema, Stice, Wade, & Bohon, 2007), as well as aggressive behavior (Caprara, 1986; Maxwell, 2004) and IPV specifically (Sotelo & Babcock, 2013).

Research exploring the effects of rumination has generally used the experimental paradigm developed by Nolen-Hoeksema and Morrow (1993) to study depression. In this design, dysphoric and nondysphoric participants are randomly assigned to ruminate or distract. Those in the rumination condition are asked to focus on the meanings, causes, and consequences of their current emotional state. Specific prompts, such as "Think about the level of motivation you feel right now, " are displayed on a computer monitor. These prompts are purposefully neutral and thus, they should not have any effect on people who are not already experiencing some negative affect. The alternative condition, distraction, where participants are asked to focus on prompts unrelated to their current mood state (e.g., "Think about the layout of your favorite shopping center"), is expected to temporarily divert participants' attention from any negative affect, and thus, those experiencing negative affect should feel a temporary relief to some degree. Distraction involves diverting one's attention from his or her negative affect to pleasant or neutral thoughts that are engaging and result in positive reinforcement without causing harm to the individual (Nolen-Hoeksema, 1991).

Neither the rumination nor distraction condition have an effect on participants that are not already experiencing or have been induced to experience negative affect of some kind. However, depressed or dysphoric individuals experience an exacerbation of their negative mood state during rumination and a temporary decrease during distraction (Donaldson & Lam, 2004; Lavender & Watkins, 2004; Lyubomirsky et al., 1998; Lyubomirsky & Nolen-Hoeksema, 1993; Nolen-Hoeksema & Morrow, 1993; Watkins & Moulds, 2005). Similarly, nondysphoric participants who undergo a negative mood induction and are randomly assigned to ruminate or distract show the same pattern as dysphoric participants (Broderick, 2005).

In the case of depression, using alternative types of thinking over time, such as focusing on positive thoughts or distracting oneself, have been shown to decrease one's depressive symptoms (Broderick, 2005; Nolen-Hoeksema, 1991). For example, in a 30-day longitudinal study, Nolen-Hoeksema and Morrow (1991) found that individuals who endorsed a ruminative response style (e.g., I sit at home and think about how I feel) when experiencing a depressed mood have longer and more severe depressive episodes compared to individuals who endorsed a distraction response style (e.g., I do something I enjoy).

It is unclear how depressive rumination influences physiological arousal as few studies have been published on the subject (Siegle & Thayer, 2004). Vickers and Vogeltanz-Holm (2003) found that depressed and nondepressed individuals induced to ruminate show an increase in systolic blood pressure, an indication of increased physiological arousal. However, depression status had no effect on one's physiological response to rumination, and thus, an increase in systolic blood pressure may not be unique to depressive rumination (Bermudez & Perez-Garcia, 1996).

Angry Rumination

Angry rumination is defined as the process of retaining and perseverating on hostile thoughts and/or thoughts of vengeance. Rusting and Nolen-Hoeksema (1998) were the first to apply the rumination vs. distraction experiment to the study of anger. Following an anger induction task, participants were randomly assigned to either ruminate or distract. Rumination was found to increase anger, whereas distraction decreased anger or had no effect on anger. The authors argue that the results support the idea that rumination influences anger in a similar way to its effect on depression.

Research has shown that angry rumination results in more aggressive behavior. For example, Bushman (2002) showed that after making participants angry, participants who were assigned to punch a bag and ruminate showed more aggression than participants who were assigned to punch a bag and distract.

There is also clear evidence that higher levels of rumination result in an increase in aggressive behavior (Caprara, 1986). More recent research finds that this association is present between angry rumination and physical aggression, verbal aggression, hostility (Anestis Anestis, Selby, & Joiner, 2009), and aggressive responses to insults or provocations (Bushman, Bonacci, Pedersen, Vasquez, & Miller, 2005; Collins & Bell, 1997).

Not only does angry rumination change self-reported emotion, it also results in physiological changes. Research has shown that the state of anger results in increased blood pressure (Everson, Goldberg, Kaplan, Julkunen, & Salonen, 1998), and this arousal is found upon recall of the anger-inducing event (Lampert, Jain, Burg, Batsford, & McPherson, 2000) and can be maintained through rumination (Gerin, Davidson, Christenfeld, Goyal, & Schwartz, 2006). Participants who were asked to distract following an anger-inducing event

showed greater blood pressure recovery than participants who were instructed to ruminate (Gerin et al., 2006). The authors theorize that rumination serves to maintain the psychological and physiological experience of an event, leading to a prolonged state of physiological activation. There appears to be much overlap between the physiological effects of different types of rumination suggesting that the physiological response to rumination may not vary, with depressed, anxious, and angry rumination all serving to increase physiological arousal (Siegle & Thayer, 2004).

Few studies have explored the role of angry rumination in the context of IPV, with previous studies exploring only self-reported trait rumination. First, Dewhurst, Moore, and Alfano (1992) found that IPV perpetrators were more likely to ruminate over interpersonal harm than were sex offenders. Sotelo and Babcock (2013) found that high trait rumination predicted the frequency of aggressive acts in IPV men. However, no studies have experimentally manipulated angry rumination to explore the effects on emotional arousal and physiological reactivity in IPV men.

Perseverative Cognition Hypothesis

Both angry and depressive rumination are hypothesized to prolong negative mood states as a result of focusing on one's distress (Peled & Moretti, 2007). Moreover, there is a high correlation ($r = .74$) between participants' tendency to engage in angry and sad rumination (Peled & Moretti, 2007; Peled & Moretti, 2010). Because of this high correlation, several researchers have hypothesized an underlying ruminative tendency, or trait rumination (Gilbert, Cheung, Irons, & McEwan, 2005; Peled & Moretti, 2007, Peled & Moretti, 2010). According to Brosschot, Gerin, and Thayer (2006), the perseverative cognition hypothesis speculates that rumination moderates the physiological and

psychological consequences of stressors because it prolongs the affective and physiological response to the stressor. They define perseverative cognition "as the repeated or chronic activation of the cognitive representation of one or more psychological stressors" (p. 114). Included under this definition are depressive rumination, angry rumination, and worry. They propose that the act of perseverating is a means of problem solving in stress-inducing situations, but does not often result in productive outcomes. Evolutionarily, perseveration may have had an activating effect, preparing an organism for a "fight or flight" response (Tallis & Eysenck, 1994). However, in our current world, in which we are faced with fewer immediate threats, perseveration has become detrimental. The physiological consequences of this activating effect in the absence of a real environmental threat result in both physical (e.g., blood pressure, immune response) and mental health (depression, anxiety disorders) problems (Brosschot, et al., 2006).

Others disagree with the idea of a general ruminative tendency, stating that different types of rumination may activate different pathways and result in different thoughts, feelings, physiological responses, and behaviors (Peled & Moretti, 2007; Peled & Moretti, 2010). Using path analysis, Peled and Moretti (2007, 2010) found that depressive rumination uniquely predicted depressed mood while angry rumination uniquely predicted aggression, suggesting they are distinct constructs. When angry and depressive rumination are covaried, only depressive rumination predicts depressive symptoms (Gilbert et al., 2005). Angry and depressive rumination also differ by gender; the frequency of angry rumination appears equal across genders (Maxwell, 2004), whereas women engage in approximately twice as much depressive rumination compared to men (Butler & Nolen-Hoeksema, 1994).

The present study seeks to test the perseverative cognition hypothesis in IPV perpetrators by determining the correlation between IPV perpetrators' trait rumination and outcomes of different types of rumination. Depressive symptoms, for example, are an outcome of depressive rumination (Nolen-Hoeksema & Morrow, 1991). Therefore IPV perpetrators with high trait rumination should also show high depressive symptoms. Similarly, these IPV perpetrators with high trait rumination should also show elevated anxiety symptoms, as anxious rumination (worrying) has been shown to predict anxiety symptoms in community and clinical samples (Segerstrom, et al., 2000). Finally, IPV perpetrators' tendency to engage in rumination should be correlated with the frequency of aggressive acts, including IPV, as high trait rumination is correlated with anger and anger expression (Sukhodolsky, Golub, & Cromwell, 2001). Should IPV perpetrators' trait rumination be consistently related to these outcomes (depressive symptoms, anxiety symptoms, frequency of IPV), these findings would support the perseverative cognition hypothesis.

Previous research has shown that angry rumination results in increased physiological arousal (Everson et al., 1998). Denson (2009) proposed that, in general, individuals are motivated to stop ruminating, but in order to do so, they must down-regulate the physiological experience of anger. Due to the link between trait rumination and the frequency of IPV (Sotelo & Babcock, 2013), perhaps many IPV perpetrators do not or are unable to discontinue rumination and persistent angry rumination then results in an IPV act. Possibly IPV perpetrators with high trait rumination are more physiologically affected by the act of rumination and thus cannot disengage, continuing to ruminate until anger is expressed in the form of a violent act against their partner. This hypothesis is in line with the general

model of aggression proposed by Anderson and Bushman (2002). Anderson and Bushman state that following anger induction, an individual's cognitive, affective, and physiological states will influence one another until a cognitive appraisal of the situation is made and action is taken. If an individual engages in rumination, their physiological arousal will be maintained or even increase (Everson et al., 1998). Hence, the current study will explore the moderating effect of high trait rumination on IPV perpetrators' physiological changes during angry rumination. We hypothesize that participants with high trait rumination will show greater physiological arousal in the rumination condition than participants with low trait rumination. If IPV perpetrators with high trait rumination are more psychologically affected by the act of rumination, they should also be more susceptible to the negative outcomes of all types of rumination (depressive symptoms, aggression, anxiety symptoms).

If individuals high in trait rumination are more physically and emotionally affected by the act of rumination and thus, more likely to experience negative consequences of rumination (aggression, depression, anxiety), differences in responses to angry rumination should be observed between IPV and nonviolent men. Severely violent IPV perpetrators are known to show a greater increase in self-reported anger following an anger induction compared to low-level IPV perpetrators and nonviolent men (Babcock, Green, Webb, Yerington 2005). In our study, we hypothesize that self-reported anger and physiologically arousal in response to rumination will remain higher in IPV perpetrators compared to nonviolent men.

Anger expression

Anger as a state is a basic human emotion that does not necessarily result in aggressive outcomes. Anger as a trait can be expressed in two different ways. The first,

anger-in, is the tendency to inhibit expressions of anger, such as aggressive acts, but does not eliminate the emotional experience of anger. Anger-out, on the other hand, is the outward expression of anger (Smits & Kuppens, 2005). Although researchers hypothesized that anger-in would dampen the relation between trait rumination and IPV frequency, both high anger-in and anger-out strengthened the relationship between IPV frequency and trait rumination (Sotelo & Babcock, 2013). These findings suggest that both the expression and lack of expression of anger increase the frequency of IPV as trait rumination increases.

We hypothesize that trait rumination underlies both high anger-in and high anger-out responses. In terms of the general model of aggression (Anderson & Bushman, 2002), rumination occurs prior to a decision being made about whether or not to outwardly express anger. We predict that anger-in and anger-out will moderate the physiological changes associated with rumination, such that IPV perpetrators who are highly likely to express anger outwardly and IPV perpetrators who are highly likely to hold anger in, will both experience greater physiological changes in response to the rumination condition.

Using the rumination vs. distraction paradigm following an anger induction, the current study tested the following hypotheses in a community sample of intimate partner violent men (IPV) compared to nonviolent men (NV).

1. IPV and NV men will show an increase in physiological arousal following an anger induction task, as measured by heart rate, skin conductance and respiratory sinus arrhythmia (RSA).
2. IPV and NV men will show an increase in self-reported anger following an anger induction task.

3. IPV and NV men randomly assigned to ruminate will show an increase in physiological arousal during rumination, as measured by heart rate, skin conductance and RSA compared to their physiological arousal following the anger induction task.
4. IPV and NV men randomly assigned to ruminate will show an increase in self-reported anger during rumination compared to their self-reported anger following the anger induction.
5. IPV and NV men randomly assigned to distract will show a decrease in physiological arousal during distraction compared to their physiological arousal, as measured by heart rate, skin conductance, and RSA, following the anger induction task.
6. IPV and NV men randomly assigned to distract will show a decrease in self-reported anger during distraction compared to their self-reported anger following the anger induction task.
7. IPV men will show greater increases in self-reported anger and physiological arousal during the anger induction task and rumination or distraction conditions compared to NV men.
8. Self-reported anger will mediate the effects of rumination and distraction on physiological arousal for IPV and NV men. In the rumination condition, as self-reported anger increases, physiological arousal will increase. In the distraction condition, as self-reported anger decreases, physiological arousal will decrease.
9. Trait rumination will be positively correlated with depressive symptoms, anxiety symptoms, and the frequency of IPV acts across IPV and NV men.

10. The effect of rumination on physiological responding will be moderated by trait rumination, anger-in and anger-out response styles. All three of these variables are expected to strengthen the effect of rumination.

Method

Sample

Participants were recruited as part of a larger study exploring psychophysiological responding in IPV perpetrators. Couples were recruited through newspaper advertisements and flyers. The advertisement read "Couples experiencing conflict needed to participate in a research study." The advertisement also listed a number of requirements for participating. Participants had to be married or living together as if married for at least 6 months, at least 18 years of age, and native English speakers. There must have been at least two male-to-female acts of IPV during the past year in order to be included in the intimate partner violent (IPV) sample.

Procedure

Interested couples were contacted by phone by trained undergraduate students. Female partners completed the violence subscale of the Conflicts Tactics Scale-2 (CTS2; Straus, Hamby, Boney-McCoy, & Sugarman, 1996). In order to be classified as IPV, the female partner had to report at least two instances of male-to-female violence in the past year and not anticipate increased aggression in her partner as a result of participation in the study. In order to be included in the NV group, the female partner had to report no male-to-female violence in the past five years and no serious violence during the entire course of their relationship.

Male participants completed two assessment periods, lasting a total of approximately 6 hours. The first assessment period included a number of self-report measures and a standardized anger induction task. Following the anger induction task, participants were randomly assigned to either ruminate or distract for 8 minutes. Psychophysiological measures were continuously collected starting before the anger induction task and ending after the rumination/distraction task. Psychophysiological measures included heart rate, skin conductance, respirations, skin temperature, finger pulse amplitude, and movement. Male participants were paid $30 for participation in the first session. Both partners participated in the second session and engaged in a Play-by-Play interview (Hooven, Rushe, & Gottman, 1996) and a structured conflict discussion. Each partner was paid $35 for their participation in the second session.

Anger induction task. The standardized anger induction task used was the Articulated Thoughts in Simulated Situations paradigm (ATSS; Davison, Robins, & Johnson, 1983). This task includes two audiotaped vignettes. Previous research has demonstrated that these vignettes induce anger (Eckhardt, Barbour, & Davison, 1998) and physiological arousal among IPV male perpetrators (Babcock et al., 2005). For the first vignette, participants were asked to imagine as if they were overhearing a conversation between their wife and someone else. In this scenario, the wife is recorded describing her husband as “a loser” and a poor financial provider. In the second vignette, the participants hear a woman, who they are asked to imagine is their wife, preparing dinner for and flirting with another male. In the original ATSS task (Eckhardt et al., 1998), participants listened to the scenarios, interrupted every 30-seconds by a 30-second articulation period where they expressed their thoughts and feelings about the scenarios aloud. In this study, baseline physiological data was collected for 4

minutes, and then the two scenarios, each 4 minutes in duration, were played without interruption so as to keep the physiological responding more consistent. As participants listened to the scenarios, they were instructed to use a rating dial to continuously indicate their level of anger (ranging from “neutral” to “violently angry”). Following each scenario, men articulated aloud for one minute about their thoughts and feelings regarding the scenarios.

Rumination/distraction task. The rumination and distraction manipulation was a computerized version of Lyubomirsky and Nolen-Hoeksema's (1995) task. Each condition involves the participant reading at his own pace and thinking about a series of phrases on a computer monitor for 8 minutes. In the rumination condition, participants were given items about their current physical and emotional state and their personal characteristics. Some examples include "Think about: the physical sensations you feel in your body" or "why you react the way you do." In the distraction condition, participants were given items not focusing on their current physical and emotional state or their personal characteristics. For example, participants were asked to think about "children playing at a beach" or "the fuzz on the shell of a coconut.” The items were repeated if participants clicked finished before 8 minutes.

Safety check. At the end of the second session, male partners were debriefed about the purpose of the study and asked to rate their current level of anger. Participants who indicated moderate to high levels of anger were asked to wait in the laboratory until they “cooled down.” Referrals for counseling were offered. Female partners were also debriefed and asked to rate their current level of fear and a safety check was conducted. Referrals for counseling and a list of resources for victims of IPV were provided to all interested

participants. A follow-up telephone call to each female partner was conducted one week following participation to assess for adverse events resulting from participation in the study. All participants denied adverse events.

Self-Report Measures

The Revised Conflict Tactics Scale (CTS2). The CTS2 (Straus et al., 1996) is a 78-item measure used to assess the rates of both physical and psychological aggression by self and by partner. With each item in the measure, the participant rates his or her own behavior and his or her partner's behavior. The measure contains five subscales: psychological aggression, physical assault, sexual coercion, injury, and negotiation. The present study only used the frequency of male-to-female acts of physical violence. Internal consistency ranges from 0.79 to 0.95. Cronbach's alpha for this subscale was 0.85 in the current dataset.

Personality Assessment Inventory (PAI). The PAI (Morey, 1991) is self-report personality measure used to assess psychopathology and psychological functioning. The PAI contains 344 items and 22 non-overlapping scales. The scales include 4 validity scales, 11 clinical scales, 5 treatment scales, and 2 interpersonal scales. The Depression subscale of the PAI (DEP) focuses on the symptoms and behaviors related to depressive disorders. This scale contains three subscales which assess cognitive (DEP-C), affective (DEP-A), and physiological (DEP-P) symptoms of depressive disorders. The Anxiety subscale of the PAI (ANX) assesses three dimensions of anxiety: cognition (ANX-C), affect, (ANX-A), and physiological symptoms (ANX-P). Validity of the PAI has a median stability coefficient of 0.73 (Boyle & Lennon, 1994) to 0.81 (Morey, 1991).

State-Trait Anger Expression Inventory (STAXI). The STAXI (Spielberger, 1988) is a self-report measure that assesses the intensity of anger at a certain time point. The

STAXI includes four subscales: Anger-Out, Anger-In, Anger Control-Out, and Anger Control-In. In the present study, only the Anger-Out and Anger-In subscales were used. The STAXI has demonstrated high reliability and validity. Measures of internal consistency range from 0.65 to 0.80 (Bishop & Quah, 1998; Spielberger, 1988). Cronbach's alpha was 0.76 for both the Anger-In and Anger-Out scales in the current dataset.

The STAXI was administered three times: before, during, and after the experimental task (rumination/distraction). In order to mask the purpose of these repeated assessments, non-angry words were interspersed (e.g., peaceful, happy). The order of items presented on the STAXI was varied each time it was administered. See Table 1 for the complete list of items on the STAXI and the order in which they were given at each presentation. See Table 2 for the time points at which the STAXI was administered.

Table 1
STAXI Items and Order at Time 1, Time 2, and Time 3

STAXI Item	Time 1 Order	Time 2 Order	Time 3 Order
1. Furious*	1	7	15
2. Happy	2	1	2
3. Calm	3	10	17
4. Irritated*	4	5	3
5. Angry*	5	3	12
6. Content	6	12	13
7. Yelling*	7	4	4
8. Peaceful	8	6	9
9. Breaking Things*	9	11	5
10. Mad*	10	17	1
11. Relaxed	11	14	6
12. Banging on Table*	12	3	11
13. Bored	13	13	16
14. Hitting Someone*	14	2	8
15. Burned Up*	15	8	10
16. Swearing*	16	16	7
17. Joyful	17	15	14

Note. Items on the STAXI (Spielberger, 1988) are denoted with an asterisk.

Table 2
Descriptions of epochs

Epoch	Total Time (in seconds)	Description of Epoch	STAXI Administration
Epoch 1	30	Baseline measurement	Time Order 1
Epoch 2	532	Anger induction and articulation	
Epoch 3	30	Baseline following anger induction and articulation	Time Order 2
Epoch 4	480	Rumination/Distraction	
Epoch 5	30	Baseline following rumination/distraction	Time Order 3

Dissipation-Rumination Scale. The Dissipation-Rumination Scale (Caprara, 1986) contains 20 items on a 6-point Likert scale. This scale measures ruminative tendencies from the onset of anger to the opportunity for aggression. Previous research has found that this scale is associated with anger, expressions of anger, and negative affectivity (Sukhodolsky et al., 2001). Studies using this scale have found a positive correlation between rumination and aggression (Bushman & Green, 1990; Collins & Bell, 1997). Cronbach's alpha was 0.90 in the current study.

Physiological Measures

Heart rate, skin conductance, and RSA were continuously collected at baseline, during the standardized anger induction, and throughout either the rumination condition or distraction condition. Physiological measures were collected using an integrated software and hardware package by James Long Company (Long, 1998). Physiological measures were compiled into epochs. The epochs of interest for the current study include physiological data collected at baseline (30 seconds), during the anger induction (532 seconds), after the anger

induction (30 seconds), during rumination or distraction (480 seconds), and after rumination or distraction (30 seconds).

Heart rate was measured using three, pre-gelled, 30-mm square Unitrace, alligator-clip-type electrodes on the participant's chest. Two of the electrodes were placed in a bipolar configuration on opposites sides of the chest. The third electrode was placed on the sternum and acted as a ground. The interbeat interval (IBI) data analysis program (Long, 1998a) recorded R-waves on a second-by-second basis upon which beats per minute were determined. An average heart rate for each epoch was used for data analysis. To control for the baseline heart rate differences between groups as well as individual differences in range of reactivity, range-corrected heart rate scores were used in analyses (Lykken, Rose, Luther, & Maley, 1966). The formula for calculated range-corrected heart rate (HR) scores is (mean HR during task - minimum HR)/(maximum HR - minimum HR).

In order to measure skin conductance, two James Long Company Ag/AgCl (1-cm diameter) electrodes containing isotonic solution were placed on the first and third phalanges of each participant's non-dominant hand. Sweat gland secretion was recorded in microsiemens. Similar to heart rate reactivity, skin conductance reactivity was operationalized as the average skin conductance reactivity for each epoch.

Respiratory sinus arrhythmia (RSA) measures decreases in heart rate controlled by the vagus nerve. The ability to downregulate one's heart rate is believed to be voluntary (Pribram & McGuinness, 1975) and thought of as a strategy for emotion self-regulation (Porges, Doussand-Roosevelt, & Maiti, 1994). RSA was measured using a bellows fitted around the chest. The bellows measure the interbeat interval during each inspiration/expiration. The difference between the minimum interbeat interval during

inspiration and the maximum interbeat interval during expiration were used for RSA. An average RSA was computed for each epoch.

Data Analysis

Hypotheses were tested using the Statistical Package for the Social Sciences (SPSS) and Analysis of Moment Structures (AMOS), a module within SPSS. Hypotheses 1-7 were tested using a 2 (condition) X 2 (violence status) X 3 (time) repeated-measures mixed MANOVA. The between-subjects factors were condition (rumination or distraction) and violence status (IPV or NV) and the within-subjects factor was time. The dependent variables included self-reported anger, heart rate reactivity, skin conductance reactivity, and RSA reactivity. Three time points were used: baseline, during the anger induction, and during rumination/distraction. Contrasts were used to test each hypothesis individually.

Hypothesis 8, testing self-reported anger as a mediator of the physiological effects of rumination and distraction, was tested using the procedure recommended by MacKinnon, Lockwood, Hoffman, West, and Sheets (2002). First, a significant relation must be demonstrated between physiological measures before rumination/distraction (predictor variable) and after rumination/distraction (outcome variable). Next, the mediator (self-reported anger) must show a significant relation to the predictor and outcome variables. Finally, a model is used to test if the relation between the predictor and outcome variables is fully or partially explained by the mediator.

Hypothesis 9 consisted of Pearson's r correlations to determine the association between trait rumination and depressive symptoms, anxiety symptoms, and frequency of IPV.

Multiple regression was used to test Hypothesis 10. Physiological arousal (heart rate, skin conductance, RSA) after rumination was entered as the criterion variable. Physiological arousal after the anger induction was entered as the predictor variable. Next, the proposed moderator (trait rumination, anger-in, or anger-out) was entered into each model. Each variable was standardized and interaction variables were created in order to test for moderation.

Results

Demographics

The final sample consisted of 114 male participants. The participants' average age was 31.7 (*SD* = 9.4). Of those participants that reported income, median gross family income was approximately 31,149 (*SD* = 17,909). Approximately 54.7% of the sample identified as African American, 14.0% as Hispanic, 26.2% as Caucasian, 0.8% as Asian, 0.8% as Native American, and 2.8% were classified as other. All participants were in a heterosexual, committed relationship for an average of 4.6 years (*SD* = 4.3). The average number of children was 1.4 (*SD* = 1.5).

Thirty participants were classified as nonviolent (NV) and 84 participants were classified as intimate partner violent (IPV). Fifty-six participants were randomly assigned to the rumination condition and 58 participants to the distraction condition.

Overall Model

An overall 2 (condition) X 2 (violence status) X 3 (time) repeated-measures mixed MANOVA was run to test Hypotheses 1-7. The between-subjects factors were condition (rumination or distraction) and violence status (IPV or NV) and the within-subjects factor

was time. The dependent variables included self-reported anger, heart rate reactivity, skin conductance reactivity, and RSA reactivity. See Tables 3-6 for results.

Table 3
Test of Overall Model for Heart Rate

Heart Rate	*F*
Time[a]	26.796***
Condition[b]	0.061
Violence Status[c]	0.098
Time * Condition[d]	1.356
Time * Violence Status[e]	0.463
Time * Condition * Violence Status[f]	0.587

[a]Pillai's trace, $V = 0.351$, $F(2, 99) = 26.796$, $p < 0.001$, partial $\eta^2 = 0.351$
[b]$F(2, 99) = 0.061$, $p = 0.805$, partial $\eta^2 = 0.001$
[c]$F(2, 99) = 0.098$, $p = 0.754$, partial $\eta^2 = 0.001$
[d]Pillai's trace, $V = 0.027$, $F(2, 99) = 1.356$, $p = 0.262$, partial $\eta^2 = 0.027$
[e]Pillai's trace, $V = 0.009$, $F(2, 99) = 0.463$, $p = 0.631$, partial $\eta^2 = 0.009$
[f]Pillai's trace, $V = 0.011$, $F(2, 99) = 0.526$, $p = 0.592$, partial $\eta^2 = 0.011$

Table 4
Test of Overall Model for RSA

RSA	*F*
Time[a]	0.373
Condition[b]	0.391
Violence Status[c]	0.200
Time * Condition[d]	3.031
Time * Violence Status[e]	1.186
Time * Condition * Violence Status[f]	0.429

[a]Pillai's trace, $V = 0.007$, $F(2, 99) = 0.373$, $p = 0.690$, partial $\eta^2 = 0.007$
[b]$F(2, 99) = 0.391$, $p = 0.533$, partial $\eta^2 = 0.004$
[c]$F(2, 99) = 0.200$, $p = 0.655$, partial $\eta^2 = 0.002$
[d]Pillai's trace, $V = 0.058$, $F(2, 99) = 3.031$, $p = 0.053$, partial $\eta^2 = 0.058$
[e]Pillai's trace, $V = 0.023$, $F(2, 99) = 1.186$, $p = 0.310$, partial $\eta^2 = 0.023$
[f]Pillai's trace, $V = 0.009$, $F(2, 99) = 0.429$, $p = 0.652$, partial $\eta^2 = 0.009$

Table 5
Test of Overall Model for Skin Conductance

Skin Conductance	
Time[a]	83.385***
Condition[b]	0.164
Violence Status[c]	4.768*
Time * Condition[d]	0.496
Time * Violence Status[e]	3.334*
Time * Condition * Violence Status[f]	0.588

[a]Pillai's trace, $V = 0.627$, $F(2, 99) = 83.385$, $p < 0.001$, partial $\eta^2 = 0.627$
[b]$F(2, 99) = 0.164$, $p = 0.687$, partial $\eta^2 = 0.002$
[c]$F(2, 99) = 4.768$, $p = 0.031$, partial $\eta^2 = 0.046$
[d]Pillai's trace, $V = 0.010$, $F(2, 99) = 0.496$, $p = 0.610$, partial $\eta^2 = 0.010$
[e]Pillai's trace, $V = 0.142$, $F(2, 99) = 3.334$, $p = 0.038$, partial $\eta^2 = 0.142$
[f]Pillai's trace, $V = 0.012$, $F(2, 99) = 0.588$, $p = 0.557$, partial $\eta^2 = 0.012$

Table 6
Test of Overall Model for Self-Reported Anger

Self-Reported Anger	*F*
Time[a]	123.997***
Condition[b]	0.497
Violence Status[c]	0.189
Time * Condition[d]	1.047
Time * Violence Status[e]	0.598
Time * Condition * Violence Status[f]	0.854

[a]Pillai's trace, $V = 0.703$, $F(2, 99) = 123.997$, $p < 0.001$, partial $\eta^2 = 0.703$
[b]$F(2, 99) = 0.497$, $p = 0.482$, partial $\eta^2 = 0.005$
[c]$F(2, 99) = 0.189$, $p = 0.665$, partial $\eta^2 = 0.002$
[d]Pillai's trace, $V = 0.020$, $F(2, 99) = 1.047$, $p = 0.355$, partial $\eta^2 = 0.020$
[e]Pillai's trace, $V = 0.011$, $F(2, 99) = 0.589$, $p = 0.552$, partial $\eta^2 = 0.011$
[f]Pillai's trace, $V = 0.016$, $F(2, 99) = 0.854$, $p = 0.429$, partial $\eta^2 = 0.016$

Note. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Analyses showed no main effect of condition on heart rate ($F(2, 99) = 0.061$, $p = 0.805$), RSA ($F(2, 99) = 0.391$, $p = 0.533$), skin conductance ($F(2, 99) = 0.164$, $p = 0.687$), or self-reported anger ($F(2, 99) = 0.497$, $p = 0.482$). Similarly, no significant interactions were found between condition and time for heart rate ($F(2, 99) = 1.356$, $p = 0.262$), RSA ($F(2, 99) = 3.031$, $p = 0.053$), skin conductance ($F(2, 99) = 0.496$, $p = 0.610$), and self-reported anger ($F(2, 99) = 1.047$, $p = 0.355$). Planned comparisons were then used to test each hypothesis individually.

Hypothesis 1: Change in Physiological Arousal Following Anger Induction

Analyses revealed a significant main effect of time on heart rate, $F(2, 99) = 26.796$, $p < 0.001$. A planned comparison indicated that there was a significant increase in heart rate from baseline ($M = 0.29$, $SD = 0.18$) to post-anger induction ($M = 0.41$, $SD = 0.16$), $t(103) = -8.06$, $p < 0.001$. A similar pattern was found for skin conductance, such that there was a main effect of time, $F(2, 99) = 83.385$, $p < 0.001$. Skin conductance reactivity significantly increased from baseline ($M = 6.66$, $SD = 4.70$) to post-anger induction ($M = 9.98$, $SD = 6.46$), $t(103) = -13.60$, $p < 0.001$. Results indicated no significant effect of time on RSA, $F(2, 99) = 0.373$, $p = 0.690$. See Figures 1-3. These results support Hypothesis 1 and demonstrate that the anger induction increased heart rate and skin conductance in IPV and NV men. This also replicates and extends findings from Babcock et al. (2005).

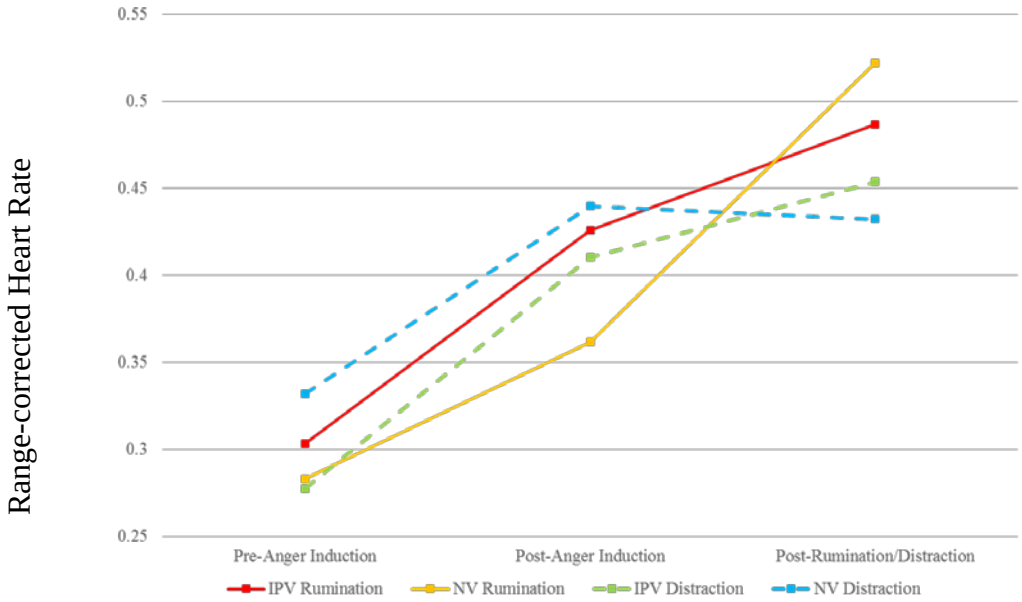

Figure 1. Range-corrected heart rate for IPV and NV men in the Rumination and Distraction conditions for three points, pre-anger induction (baseline), post-anger induction, and post-rumination/distraction.

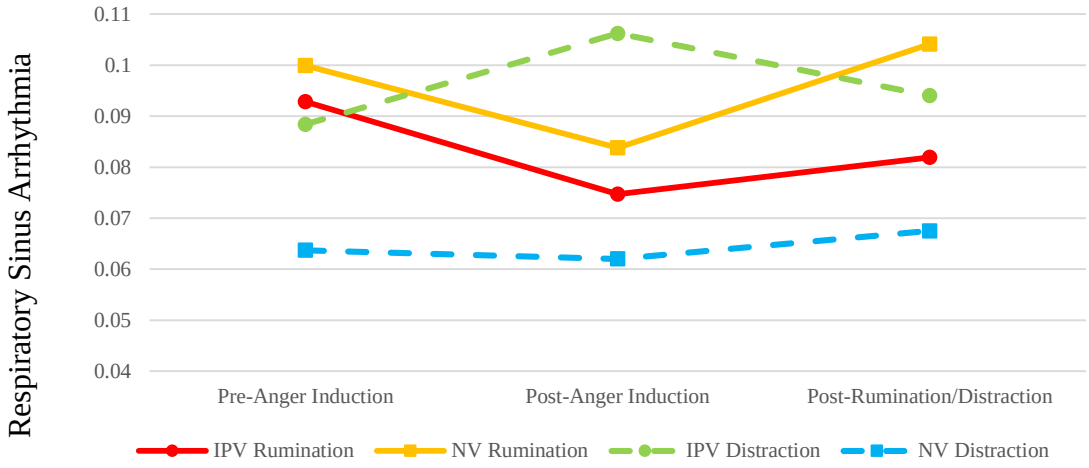

Figure 2. RSA reactivity for IPV and NV men in the Rumination and Distraction conditions for three points, pre-anger induction (baseline), post-anger induction, and post-rumination/distraction.

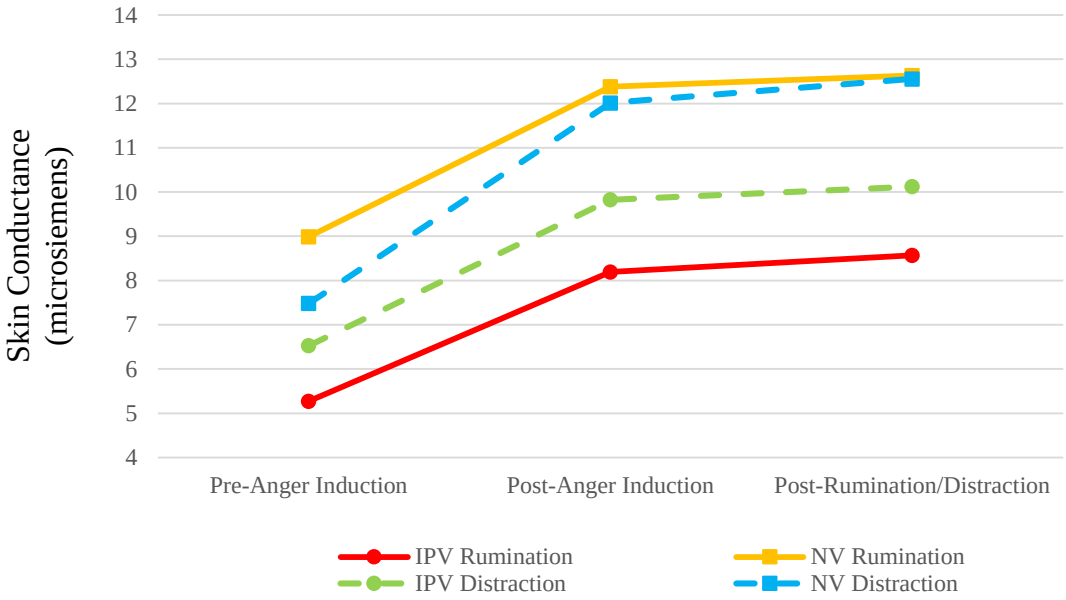

Figure 3. Skin conductance (SCL) for IPV and NV men in the Rumination and Distraction conditions for three points, pre-anger induction (baseline), post-anger induction, and post-rumination/distraction.

Hypothesis 2: Change in Self-Reported Anger Following Anger Induction

Results indicated a significant main effect of time on self-reported anger, $F(2, 108) = 123.997$, $p < 0.001$. Specifically, there was a significant increase in anger from baseline ($M = 11.47$, $SD = 3.51$) to post-anger induction ($M = 15.45$, $SD = 4.02$), $t(109) = -18.31$, $p < 0.001$. Thus, Hypothesis 2 was supported. Both Hypotheses 1 and 2 served as a manipulation checks for the anger induction. See Figure 4.

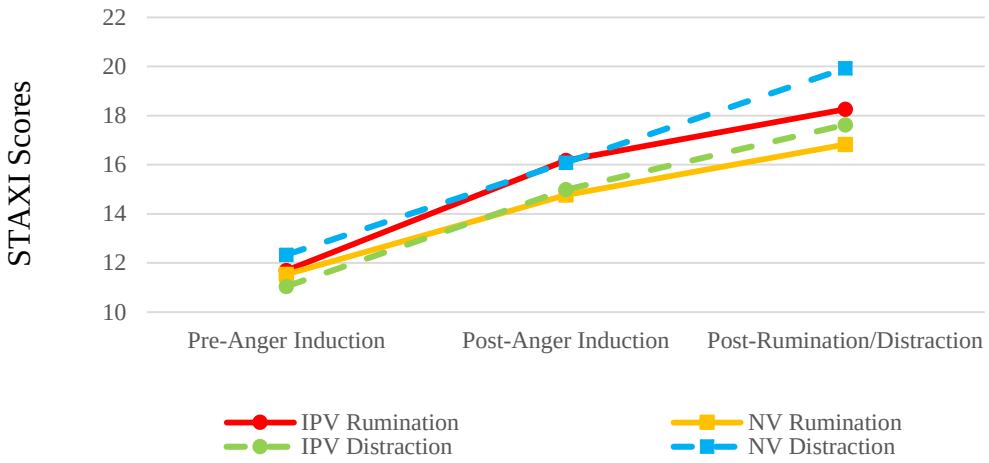

Figure 4. Self-reported anger for IPV and NV men in the Rumination and Distraction conditions for three points, pre-anger induction (baseline), post-anger induction, and post-rumination/distraction.

Hypothesis 3: Change in Physiological Arousal Following Rumination

Analyses testing for changes in physiological arousal over time, following rumination, revealed a significant main effect of time on range-corrected heart rate, $F(2, 47) = 16.85$, $p < 0.001$. A planned comparison indicated a significant increase in heart rate from post-anger induction ($M = 0.40$, $SD = 0.17$) to post-rumination ($M = 0.50$, $SD = 0.25$), $t(48) = -3.25$, $p = 0.002$. See Figure 1. No significant main effect of time was found for RSA reactivity, $F(2, 45) = 2.47$, $p = 0.096$. See Figure 2. A significant main effect of time was found for skin conductance, $F(2, 47) = 38.89$, $p < 0.001$. Skin conductance reactivity increased from post-anger induction ($M = 9.62$, $SD = 6.19$) to post-rumination ($M = 9.98$, $SD = 6.33$), but this change was not statistically significant, $t(46) = -1.69$, $p = 0.10$. See Figure 3. These results demonstrate that rumination served to increase heart rate in IPV and NV

men, supporting Hypothesis 3. However, contrary to our predictions, no statistically significant change in skin conductance or RSA was observed following rumination.

Hypothesis 4: Change in Self-Reported Anger Following Rumination

Results showed a significant main effect of time on self-reported anger for participants in the rumination condition, $F(2, 51) = 83.75$, $p < 0.001$. Specifically, there was a significant increase in anger from post-anger induction ($M = 15.72$, $SD = 4.29$) to post-rumination ($M = 17.79$, $SD = 3.50$), $t(52) = -3.88$, $p < 0.001$. See Figure 4. Thus, Hypothesis 4 was supported; self-reported anger increased over time in the rumination condition.

Hypothesis 5: Change in Physiological Arousal Following Distraction

Analyses used to examine changes in physiological arousal following distraction revealed a significant main effect of time on heart rate, $F(2, 53) = 17.04$, $p < 0.001$. However, a planned comparison indicated no significant change in heart rate from post-anger induction ($M = 0.42$, $SD = 0.15$) to post-distraction ($M = 0.46$, $SD = 0.20$), $t(54) = -1.67$, $p = 0.10$. A significant main effect of time was found for RSA reactivity, $F(2, 53) = 4.46$, $p = 0.016$. However, a planned comparison indicated no significant change in RSA from post-anger induction ($M = 0.10$, $SD = 0.09$) to post-distraction ($M = 0.09$, $SD = 0.07$), $t(54) = 1.19$, $p = 0.24$. A significant main effect of time was also found for skin conductance, $F(2, 53) = 51.78$, $p < 0.001$. However, skin conductance reactivity did not differ statistically from post-anger induction ($M = 10.29$, $SD = 6.74$) to post-distraction ($M = 10.65$, $SD = 6.75$), $t(52) = -1.29$, $p = 0.203$. These results demonstrate that distraction maintained physiological arousal in IPV and NV men.

Hypothesis 6: Change in Self-Reported Anger Following Distraction

Results showed a significant main effect of time on self-reported anger for participants in the distraction condition, $F(2, 55) = 82.76$, $p < 0.001$. Specifically, there was a significant increase in anger from post-anger induction ($M = 15.21$, $SD = 3.78$) to post-rumination ($M = 18.11$, $SD = 3.37$), $t(56) = -5.63$, $p < 0.001$. As we had hypothesized that self-reported anger would decrease during distraction, Hypothesis 6 was not supported.

Hypothesis 7: Comparing Physiological and Self-Reported Anger between IPV and NV Men

We hypothesized that both IPV and NV men would experience an increase in physiological arousal and self-reported anger, but that IPV men would experience a greater elevation in physiological arousal and self-reported anger compared to NV men. Analyses revealed no main effect of violence status on heart rate reactivity ($F(2, 99) = 0.098$, $p = 0.754$) or RSA reactivity, $F(2, 99) = 0.200$, $p = 0.655$. Similarly, no interaction between violence status and time was found for heart rate reactivity ($F(2, 99) = 0.463$, $p = 0.631$) or RSA reactivity, $F(2, 99) = 1.186$, $p = 0.310$. See Figures 1 and 2. A significant main effect of violence status ($F(2, 99) = 4.768$, $p = 0.031$) and an interaction between time and violence status ($F(2, 99) = 3.334$, $p = 0.038$) on skin conductance was found. Follow-up analyses examining the simple main effects revealed significant differences in skin conductance between IPV and NV men at all three times points: baseline ($t(102) = 2.42$, $p = 0.017$), after the anger induction ($t(102) = 2.244$, $p = 0.027$), and after rumination or distraction ($t(102) = 2.243$, $p = 0.027$). Although NV men have greater skin conductance reactivity at all three time points, the difference in skin conductance reactivity between IPV and NV men increased over time, with the greatest difference being observed after rumination or distraction.

Analyses showed no main effect of violence status ($F(2, 99) = 0.189$, $p = 0.665$) or interaction between violence status and time on self-reported anger ($F(2, 99) = 0.598$, $p = 0.552$). Hypothesis 7 was not supported as violence status did not moderate changes in physiological arousal or self-reported anger over time as predicted.

Hypothesis 8: Self-Reported Anger Mediating the Change in Physiological Arousal

We hypothesized that self-reported anger would mediate the change in physiological arousal in both the rumination and distraction conditions. Specifically, in the rumination condition, as self-reported anger increased, physiological arousal was expected to increase. In the distraction condition, as self-reported anger decreased, physiological arousal was expected to decrease. In order to establish mediation, the procedure recommended by MacKinnon, Lockwood, Hoffman, West, and Sheets (2002) was followed. First, a significant relation must be demonstrated between physiological measures before rumination/distraction (predictor variable) and after rumination/distraction (outcome variable). Next, the mediator (self-reported anger) must show a significant relation to the predictor and outcome variables. Finally, if significant relations are present, a model is used to test if the relation between the predictor and outcome variables is fully or partially explained by the mediator. As seen in Table 7, significant relations between the predictor and outcome variables were present. However, the proposed mediator was not significantly correlated to any of the predictor or outcome variables. As evidence for mediation was not established, the proposed mediator was not further tested using a regression analysis.

Table 7
Correlations among Measures of Physiological Arousal and Self-Reported Anger at Time 2 and Time 3

	Time 2 Heart Rate	Time 3 Heart Rate	Time 2 RSA	Time 3 RSA	Time 2 Skin Conductance	Time 3 Skin Conductance	Time 2 Self-Reported Anger	Time 3 Self-Reported Anger
Time 2 Heart Rate	--	.450***	-0.126	-0.060	-0.208*	-0.202*	-0.049	-0.067
Time 3 Heart Rate	.450***	--	-0.131	-0.129	-0.029	-0.028	0.033	0.180
Time 2 RSA	-0.126	-0.131	--	0.746**	0.034	0.023	-0.117	-0.105
Time 3 RSA	-0.060	-0.129	0.746**	--	-0.106	-0.117	0.094	-0.088
Time 2 Skin Conductance	-0.208*	-0.029	0.034	-0.106	--	0.989**	-0.070	0.081
Time 3 Skin Conductance	-0.202*	-0.028	0.023	-0.117	0.989**	--	-0.095	0.061
Time 2 Self-Reported Anger	-0.049	0.033	-0.117	0.094	-0.070	-0.095	--	0.463**
Time 3 Self-Reported Anger	-0.067	0.180	-0.105	-0.088	0.081	0.061	0.463**	--

Note. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Hypothesis 9: Correlations between Trait Rumination and Depressive Symptoms, Anxious Symptoms, and Frequency of IPV

Pearson's r correlations were used to determine the association between trait rumination and depressive symptoms, anxiety symptoms, and frequency of IPV. Results are presented in Table 8.

Table 8
Correlations among Trait Rumination, Frequency of IPV, Depressive Symptoms, and Anxious Symptoms

Variable	Frequency of IPV	Depressive Symptoms	Anxious Symptoms
Trait Rumination	0.47***	0.482***	0.369***
Frequency of IPV	---	0.212**	0.165
Depressive Symptoms		---	0.77***
Anxious Symptoms			---

Note. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Trait rumination and frequency of IPV had a moderate positive correlation, $r = 0.47$, $p < 0.001$. Trait rumination was also positively correlated to depressive symptoms ($r = 0.369$, $p < 0.001$) and anxious symptoms, $r = 0.482$, $p < 0.001$. Thus, Hypothesis 8 was supported and extended previous findings by demonstrating a correlation between trait rumination and depressive and anxious symptoms in IPV perpetrators.

Hypothesis 10: Trait Rumination, Anger-In, and Anger-Out as Moderators of Physiological Responding

Multiple regression was used to test several variables as moderators of physiological responding in the rumination condition. Physiological arousal (heart rate, skin conductance,

RSA) after rumination was entered as the criterion variable. Physiological arousal after the anger induction was entered as the predictor variable. Next, the proposed moderator (trait rumination, anger-in, or anger-out) was entered into each model. Multiple regression analyses revealed no evidence for trait rumination, anger-in, or anger-out as moderators of physiological responding. See Tables 9-11.

Table 9
Multiple Regressions Examining Moderators of the Relation between Heart Rate at Time 2 and Time 3 in the Rumination Condition

	Unstandardized B	SE *B*	Standardized Beta
Post-Anger Induction Heart Rate	0.133	0.038	0.501*
Trait Rumination	-0.074	0.035	-0.311
Post-Anger Induction Heart Rate X Trait Rumination	-0.030	0.054	-0.079
Post-Anger Induction Heart Rate	0.135	0.034	0.515***
Anger-In	-0.061	0.032	-0.247
Post-Anger Induction Heart Rate X Anger-In	-0.039	0.045	-0.112
Post-Anger Induction Heart Rate	0.119	0.034	0.475**
Anger-Out	-0.055	0.031	-0.230
Post-Anger Induction Heart Rate X Anger-Out	-0.019	0.044	-0.057

Note. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Table 10

Multiple Regressions Examining Moderators of the Relation between RSA at Time 2 and Time 3 in the Rumination Condition

	Unstandardized B	SE *B*	Standardized Beta
Post-Anger Induction RSA	0.061	0.017	0.682*
Trait Rumination	-0.002	0.012	-0.019
Post-Anger Induction RSA X Trait Rumination	-0.001	0.013	-0.019
Post-Anger Induction RSA	0.059	0.014	0.665***
Anger-In	0.001	0.010	0.016
Post-Anger Induction RSA X Anger-In	-0.006	0.015	-0.058
Post-Anger Induction RSA	0.064	0.010	0.709***
Anger-Out	-0.009	0.012	-0.102
Post-Anger Induction RSA X Anger-Out	0.002	0.020	0.016

Note. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Table 11

Multiple Regressions Examining Moderators of the Relation between Skin Conductance at Time 2 and Time 3 in the Rumination Condition

	Unstandardized B	SE *B*	Standardized Beta
Post-Anger Induction Skin Conductance	6.292	0.167	0.986***
Trait Rumination	-0.104	0.173	-0.017
Post-Anger Induction Skin Conductance X Trait Rumination	-0.084	0.180	-0.013
Post-Anger Induction Skin Conductance	6.257	0.150	0.989***
Anger-In	-0.116	0.167	-0.018
Post-Anger Induction Skin Conductance X Anger-In	-0.112	0.197	-0.015
Post-Anger Induction Skin Conductance	6.242	0.155	0.983***
Anger-Out	0.060	0.153	0.010
Post-Anger Induction Skin Conductance X Anger-Out	0.142	0.147	0.024

Note. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Discussion

Understanding the emotional nature of IPV is the first step in gaining insight into the motivations and cognitive state of IPV perpetrators. No study to date has applied an experimental rumination vs. distraction paradigm to perpetrators of IPV. We hypothesized

that IPV perpetrators will show an increase in physiological arousal and self-reported anger following rumination and this effect would be mediated by self-reported anger. Similarly, IPV perpetrators asked to distract following anger induction were expected to show a decrease in physiological arousal and self-reported anger. In support of our main hypothesis, heart rate and self-reported anger did increase as a result of rumination. This provides clear evidence of the activating effect angry rumination has on physiological arousal and one's perception of his or her anger. These results suggest a possible mechanism by which angry rumination increases the risk of a violent act against one's partner, lending support for the role of anger in IPV.

However, self-reported anger also increased in the distraction condition, contrary to our predictions. No statistically significant change in physiological arousal was observed in the distraction condition, such that physiological arousal was maintained across time. These results suggest that the effects of rumination and distraction on physiological arousal and self-reported anger may differ. These results highlight the importance of distinguishing between physiological and affective states in the study of anger and rumination in general. Further, self-reported anger was suspected to mediate the change in physiological arousal as a result of rumination or distraction. Results indicated that self-reported anger did not act a mediator and the connection between physiological arousal and self-reported anger remains unclear. However, this is the first study to demonstrate the effect of rumination and distraction on physiological arousal and self-reported anger in IPV perpetrators and provides a platform for future research to explore this area in more detail.

We also hypothesized that the IPV group would show a greater increase in physiological arousal and self-reported anger compared to the NV control group. Although

we found an interaction between violence status and time on skin conductance, a main effect or interaction between violence status and time was not found for heart rate, RSA reactivity, or self-reported anger. Furthermore, the effect of violence status on skin conductance was contrary to our predictions, with NV men showing greater skin conductance reactivity at all three time points. As research on the physiological differences between IPV and NV men is limited, more research is needed in order to accurately interpret this finding. Research on depressive rumination suggests that the physiological effects of rumination may not be affected by one's mood state prior to a mood induction (Vickers & Vogeltanz-Holm, 2003), and thus, it could be hypothesized that IPV and NV men will show the same pattern of physiological arousal in response to rumination.

In addition to exploring the effect of rumination and distraction on IPV perpetrators, the present study also sought to test the perseverative cognition hypothesis. Previous research demonstrated a positive correlation between trait rumination and the frequency of IPV. The current study extended previous findings by showing a positive correlation between trait rumination and anxiety and depression. Frequency of violent acts, anxiety, and depression are all thought to be amplified by different types of rumination. Demonstrating a relation between these outcomes and trait rumination suggest an underlying tendency for all three types of rumination (angry rumination, depressive rumination, and worry). In other words, perpetrators that are likely to engage in angry rumination, are also more likely to experience outcomes related to others types of rumination (depressive rumination and worry), supporting the perseverative cognition hypothesis. Results of this type suggest that IPV perpetrators suffer the consequences of all types of rumination, not just angry rumination. Interventions aimed at reducing the frequency of IPV may try to focus on

combating all types of rumination. Additionally, IPV perpetrators likely to benefit from this type of intervention could be easily identified by elevated depressive or anxiety symptoms and a general focus on reducing rumination may increase motivation for change within treatment.

We predicted that IPV perpetrators with high trait rumination will be more physiologically affected by the act of rumination, making them more vulnerable to its consequences (e.g., depressive symptoms, violence). Contrary to our predictions, trait rumination did not moderate the change in physiological arousal as a result of rumination. Recent research has shown that anger-in and anger-out moderate the association between trait rumination and IPV (Sotelo & Babcock, 2013), meaning that in IPV perpetrators with high trait rumination, the outward expression or lack of expression of anger both result in an increase in IPV. We hypothesized that anger-in and anger-out would act as moderators, such that IPV perpetrators high in either response style would be more physiologically affected by rumination. No evidence of moderation was found. Our results suggest that anger response style does not alter the physiological response to anger.

Clinical Implications

The basis of cognitive therapy for depression emphasizes decreasing depressive rumination in order to minimize depressive symptoms. Similarly, a treatment for IPV perpetrators targeting those with high trait rumination could incorporate cognitive techniques to decrease all types of rumination and to promote distraction or others means of avoiding rumination. Our findings suggest that the use of distraction indeed helps avoid the increase in physiological arousal associated with rumination. However, as we found no difference in self-reported anger between the rumination and distraction conditions, it does not appear that

distraction will reduce perpetrators' perceptions of their anger. This could be due to the boredom or frustration induced by the laboratory task. While they were physiologically soothed in the distraction task, they may have still felt frustrated by the experiment itself.

As the relation between cognitive processes (rumination/distraction), emotions, and physiological changes becomes clearer in this population, interventions that target this cycle can be employed. Our study highlights the use of distraction, but other cognitive approaches (e.g., mindfulness) or physiological self-soothing techniques (e.g., diaphragmatic breathing) could also be explored as useful strategies for IPV prevention.

In addition, our study makes a strong case that treatment for perpetrators of IPV focus on all types of rumination and move beyond a model focused solely on angry rumination. Furthermore, treatment must include strategies that address both the physiological experience of anger and one's self-perception of his or her anger, as our study suggests that these two components of anger may be affected in different ways.

Limitations

There are several limitations to the present study. This study used a diverse sample of male perpetrators recruited within a large urban area. Although this strengthens the ability to generalize results to several different groups, results may not generalize to rural or female perpetrators. Additionally, in order to explore the effects of rumination and distraction, a laboratory paradigm was used. Use of this previously established paradigm increases the current study's internal validity. However, the artificiality of the experimental manipulation limits the generalizability of the findings to real world situations.

Our study explored the effects on rumination and distraction on physiological arousal and self-reported anger, but did not attempt to measure if rumination and distraction actually

changes the frequency of IPV. Based on previous findings (Anestis et al., 2009; Sotelo & Babcock, 2013), we extrapolate the increased physiological arousal and self-reported anger would lead to greater acts of aggression, including IPV, but this causal link was not directly assessed in the current study due to ethical constraints. In order to ethically address this questions, the effect of interventions that promote alternatives to rumination on IPV frequency would need to be explored. Alternatives to rumination could include coaching men on ways to distract from rumination (e.g., mindfulness, cognitive restructuring of ruminative thoughts) after a real argument with their partner, as opposed to audiotaped vignettes.

In order to test the perseverative cognitive hypothesis, correlations between trait rumination and outcomes of different types of rumination were examined (IPV frequency, depressive symptoms, anxious symptoms). We did not test the frequency with which participants engage in depressive rumination or anxious rumination directly. It is possible that our sample experiences depressive and anxious symptoms as a result of third variable, and not due to high levels of depressive and anxious rumination. Future studies would benefit from using measures of the frequency of different types of rumination and their respective outcomes.

Future Directions

In all, the current study is the next step in determining the effect of angry rumination in IPV perpetrators while also exploring the relation between trait rumination and different outcomes of rumination. There is little understanding regarding the sequence of events leading up to an act of IPV, especially in regards to IPV perpetrators' cognitive, affective, and physiological changes. The present study explored these changes and provides possible

answers as to the dampening and amplifying effect of cognitive processes on physiological arousal and self-reported anger among partner violent men. Future studies are tasked with finding alternatives to rumination that help decrease instances of IPV and predicting which perpetrators are likely benefit from such interventions.

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