The Influence of Anger on Implicit Biases

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by

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ABSTRACT

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Interpretation of ambiguous information is influenced by anxious (Richards, Reynolds, & French, 1992) and depressive (Wisco, & Nolen-Hoeksema, 2010) symptoms. Emotion regulation strategies, and in particular, cognitive reappraisal has shown to be effective at reducing feelings of distress (Denson, Grisham, & Moulds, 2011). The current study seeks to understand the extent that emotion regulation can influence interpretation bias, thoughts and behaviors. In the current study, participants underwent both Angry and Neutral mood inductions. For each mood condition, participants were instructed to cognitively reappraise and attend to their emotions. Participants rated the degree of negative affect they experienced, and completed 6 sentence completion items to assess interpretation bias. Results indicated that participants exhibited an increased negative interpretation bias in the Angry condition relative to baseline. Following reappraisal, participants rated less negative affect in the Angry condition. Though, reappraisal did not change interpretation bias. However, self-report data indicated that individuals who tend to struggle to engage in emotion regulation techniques and those who endorsed higher levels of state anger, both showed greater negative affect following cognitive reappraisal and an increased negativity bias. Participants who reported that they engaged in cognitive reappraisal during the mood induction, exhibited an increased positivity bias. Results from this study indicate that cognitive reappraisal is an effective strategy to reduce feelings of negativity in an angry mood state, however, participants are still at risk for displaying a negative interpretation bias to ambiguous information.

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I. INTRODUCTION

Individuals frequently encounter and manage ambiguous situations in everyday life. Whether it be hearing a noise in the middle of the night or deciding to report suspicious luggage at an airport, the way individuals interpret and respond to ambiguity is partly impacted by the emotions they experience (Andrade & Ariely, 2009), and partly by the way they manage their emotions (Barazzone & Davey, 2009). When individuals are prone to respond to ambiguity in a certain way (i.e. positive or negative), it is known as an interpretation bias (Huppert, Foa, Furr, Filip, & Mathews, 2003). Understanding the interaction between emotional state, interpretation bias, and emotion regulation is a highly relevant topic that can aid in understanding the ways individuals manage everyday life and perhaps help to understand the facets that lead to both adaptive and maladaptive behavior in individuals.

There are several different forms of interpretation biases, including threat bias, negative bias, and more. These different biases are indicative of cognitive processes that maintain certain psychopathologies, such as general anxiety (Richards, Reynolds, & French, 1992; Wilson, MacLeod, Mathews, & Rutherford, 2006) social anxiety (Franklin, Huppert, Langner, Leiberg, & Foa, 2005; Huppert et al., 2007), and depression (Everaert, 2012). Those who display such biases are more likely to interpret ambiguous information as negative or threatening, thus increasing the likelihood that they misinterpret a situation and behave in maladaptive ways. Further, these biases are likely to be indicative of other cognitive processes that reinforce maladaptive cognitions. For example, Wisco et al. (2010) provided a set of situations to their participants (e.g. You called a friend and left a message asking to get together. Several days pass and you have not heard from this

friend). They then instructed depressed and non-depressed participants to think of several explanations for each situation and select the one that most likely fit. Results from this study revealed that depressed participants were more likely to generate and select negative interpretations for each scenario. The authors posit that generating and selecting negative responses reinforced maladaptive thinking that aids in the maintenance of depressive symptoms.

To examine interpretation bias in laboratory settings, researchers often utilize homograph tasks (Hertel & El-Messidi, 2006; Richards, Reynolds, & French, 1992), or sentence completion paradigms (Barton, Morley, Bloxham, Kitson, & Platts, 2005; Huppert, Pasupuleti, Foa, & Mathews, 2007; White, Suway, Pine, Bar-Haim, & Fox, 2011). Homograph tasks are usually introduced as spelling tasks. They begin by orally presenting a list of words that have multiple meanings of different valences (e.g. die/dye). The participant is then instructed to spell the word, which allows investigators to see the lexical interpretation of the word and thus the participant's interpretation bias. The advantage to this model is that this task is a straightforward and automatic assessment of interpretation bias, however, it does not allow researchers to account for the participant's common lexical usage. For example, in the previous example, if the participant is someone who has an interest in hair styling, results could be confounded by her/his lexical usage and does not provide accurate information regarding the presence or absence of an interpretation bias.

Sentence completion paradigms are also used to assess interpretation bias. For example, Huppert et al. (2007), measured threat interpretations in socially anxious individuals by presenting participants with ambiguous sentences that have the last word

missing. Participants were asked to generate responses to disambiguate the sentence. Across similar studies, participants who were high in social anxiety were more likely to respond with negative or anxious answers than participants who were low in social anxiety, which is indicative of an interpretation bias (Franklin, Huppert, Langner, Leiberg, & Foa, 2005; Wisco, & Nolen-Hoeksema, 2010). Thus, sentence completion tasks were effective in identifying interpretation biases in this population. The advantage of this type of task is that it allows for investigators to control the context of a situation. For example, using homographs can be susceptible to a participant's lexical bias as in the previous example (a hairdresser spelling dye/die). But, an item from a sentence completion task might read, "Jenna found a stray kitten that was sick, she nursed the animal overnight and thinks it will likely _____". In the latter example, the participant will not be confused about the lexical usage of the words and results will be more indicative of a true interpretation bias.

Several studies have found that transient emotional states also influence interpretation bias (Barazzone & Davey, 2009; Berna, Lang, Goodwin, & Holmes, 2011; Gorn, Pham, & Sin, 2001). Barazzone and Davey (2009) induced angry, anxious, happy, or neutral mood states using guided imagery vignettes and music. Researchers gave participants a homophone spelling task and found that individuals who were in angry or anxious mood states were more likely to endorse the threatening version of the homophone as compared to participants who were induced to be in happy or neutral mood states. These results remained significant after controlling for trait anxiety and anger, suggesting that transient emotions play a large role in assessing ambiguous stimuli, even after accounting for emotional traits.

Transient moods and interpretation bias are also found to play a role in real-world applicable situations. For example, Gorn et al. (2001) asked participants to rate advertisements that had an ambiguous tone following pleasant or unpleasant mood inductions. Results showed that individuals who were induced in a pleasant mood rated the ambiguous advertisements as more positive when in a pleasant mood. As such, the literature shows that transient emotions influence the resolution of ambiguity both in terms of lexical disambiguation and object evaluation.

In general, emotions give us information regarding a situation to aid in the decision-making process (Gross & Thompson, 2007). However, relying on dysregulated emotions to aid in the decision making process can result in poor choices (Fenton-O'Creevy, Soane, Nicholson, & Willman, 2010). For instance, affect and decision making have been examined in risky behaviors (excessive gambling, reckless driving, etc.) and in efficacy of decision making (i.e. money earned in a gambling task) (Blanchette & Richards, 2010). Researchers found that feelings of anxiety guide us to avoid risk (Blanchette & Richards, 2010), while anger makes us perceive risk as less likely and we thus make risky decisions (Lerner & Keltner, 2001). Research has shown that anger is a particularly complex emotion in terms of decision making. Specifically, Anger guides individuals to feel negative about their past, optimistic about the future, and pessimistic in the intentions of others. Such individuals experience more confidence and thus are unlikely to generate alternative decisions, and lack the ability to approach a situation with rationality and objectivity (Lerner & Tiedens, 2006), thus putting these individuals at higher risk for making maladaptive decisions.

Emotion regulation is an important process that allows us to manage our emotions to a wide variety of stimuli (Gross, 2002). Emotion regulation may involve increasing, decreasing or maintaining an emotional response and is usually consistent with an individual's goals and expectations for a given situation (Gyurak, Gross, & Etkin, 2011; (Gross & Thompson, 2007). There are several benefits to successful emotion regulation. For example, emotion regulation permits individuals to convey desired information to others regarding internal states and to behave within social norms (Gross & Thompson, 2007). Consequently, individuals who successfully regulate their emotions tend to experience a higher quality of social relationships than those who do not (Lopes et al., 2011). In addition to social functioning, Gross and John (2003) found that individuals who engage in successful emotion regulation techniques tend to be more optimistic, experience greater satisfaction in life, and have higher self-esteem than those who do not engage in effective emotion regulation techniques.

There are several different strategies that can be implemented to regulate emotions; however, not all strategies are equally successful in changing the impact of the emotional experience. The following is a discussion of these emotion regulation strategies, beginning with the least effective. 'Situation selection' occurs at the beginning of the emotion generative process, and is the process by which individuals choose to avoid settings that are likely to produce unwanted emotions (Gross & Thompson, 2007). Implementation of this strategy requires the ability to predict the timing and specific unwanted emotions that a situation might evoke. This strategy is healthy and protective in the short-term, however, when using this strategy regularly, situations that should be

eventually confronted are ignored, thus making this a maladaptive long-term emotion regulation strategy (Gross & Thompson, 2007).

Situation selection is an antecedent-focused emotion regulation strategy, but other strategies attempt to manage affect once an emotional event has been experienced. 'Behavioral Suppression' is a strategy that occurs at the end of the emotion generative process, after the emotion is experienced. This strategy works to inhibit behavioral and physiological responses to the emotion (Sheppes & Gross, 2011). This strategy is often adaptive in social situations (Haga, Kraft, & Corby, 2009) in which it is important to inhibit the communication of certain emotions and reactions that are counterproductive to one's goals. For example, when sitting in a professional meeting and an unfavorable decision has been made, it is important to manage emotions in a way that maintains professional demeanor in this setting. The use of response modulation would conceal initial feelings of anger that may arise by sitting still with a calm facial expression, instead of shouting in frustration. Unlike situation selection, with response modulation, the individual experiences the emotion. However similar to situation selection, several negative outcomes related to suppression have been recorded. In particular, this strategy is thought to be highly taxing, as it requires a great deal of cognitive resources (Sheppes & Gross, 2011). Suppression is associated with poor memory and high physiological arousal. Further, the negative emotion is still experienced, just the expression has changed (Sheppes & Gross, 2011). Moreover, it has been shown that individuals who habitually engage in Suppression have negative well-being outcomes, such as depressed mood, negative affect and less satisfaction with life (Haga et al., 2009).

Where situation selection occurs prior to the elicited emotion, and response modulation occurs at the end of the emotion experience, cognitive reappraisal is a technique that takes place during the emotional experience. The aforementioned strategies are useful in controlling exposure to emotions and communication of emotional states; however neither effectively manages the internal experience of emotion. On the other hand, cognitive reappraisal is a method used to change the perception of an emotional stimulus to alter its impact on an individual (Gross & Thompson, 2007).

While this strategy is understood to mean that the individual changes their perception of a situation, it has been interpreted in several ways. In one study, participants engaged in cognitive reappraisal while watching a distressing film. Instructions encouraged participants to take a detached and unemotional approach to the film that would remove the emotional context in order to decrease the degree of negative emotion they felt (Gross, 1998). However, another study examining cognitive reappraisal worded the instructions differently. Specifically, participants were shown negative pictures and instructed to reinterpret it to be *less negative* (Ochsner, Bunge, Gross, & Gabrieli, 2002). While these studies may have inadvertently encouraged participants to utilize different strategies, both studies found that participants who reappraised their emotions reported a decrease in negative affect compared to trials where they did not implement cognitive reappraisal.

Despite the efficacy of decreasing negative affect with both instruction types, differences in experimental procedures within the literature complicate the definition of cognitive reappraisal, such that different instructions may lead researchers to study different emotion regulation processes with the same name. For example, in the study by

Ochsner et al. (2002) where participants reappraised negative images using explanations, any positive association they generate may encourage them to reinterpret negative stimuli as more positive as opposed to less negative. Both processes technically fall under the premise of cognitive reappraisal, such that the interpretation of the event is changed, but the studies use different processes. McRae, Ciesielski, and Gross (2012) highlight the issues of using instructions that encourage participants to increase positive emotions and decrease negative emotions under the same construct. In this study, participants were asked to reappraise their emotions toward negative pictures by either increasing their positive emotions or decreasing their negative emotions. Results showed that participants reported less negative affect and showed less of a decrease in skin conductance in the increase positive emotion condition compared to participants in the decrease negative emotions group. Results indicated that 'increase positive' was associated with greater reduction of subjective ratings of negative affect, but fewer physiological changes, which indicates that this strategy was not effective at reducing physiological arousal associated with negative emotions. In contrast, 'decrease negative' was associated with both subjective decrease in negative affect, and a decrease in physiological arousal. This study shows that different instruction types have different affective and physiological consequences.

Given the aforementioned findings, the current study defines cognitive reappraisal as reinterpreting the content of negative stimuli to be less negative. An example of this strategy is when an individual, who is nervous about receiving an injection due to a fear of needles, reinterprets the situation as a short, standardized procedure with minimal risks. Ray, Ochsner, McCrae, and Gross (2010) demonstrated the benefit of this strategy.

In this study, participants viewed pictures that were negative in valence and high in arousal. Participants were instructed to reframe their thoughts to either increase or decrease their negative feelings, or just attend to the content of the picture. The authors found that the cognitive reappraisal technique used to minimize negative feelings successfully decreased negative emotions compared to trials where participants were asked to increase their emotional responses.

The current study focused on cognitive reappraisal and interpretation bias in angry mood states. Anger has been found to be associated with several psychopathologies including depression (Pasquini, Picardi, Biondi, Gaetano, & Morosini, 2004), social anxiety (Erwin, Heimberg, Schneier, & Liebowitz, 2003), and eating disorders (Waller et al., 2003). Anger is also implicated in negative health outcomes. Specifically, Denollet, Gidron, Vrints, and Conraads (2010) found that suppressed anger was associated with more serious cardiac events than the presence of anger alone. Other research has shown that anger influences biological mechanisms on a more cellular level. For example, Gouin, Kiecolt-Glaser, Malarkey, and Glaser (2008), found that individuals who had high levels of anger control, were likely to experience a shorter duration of blister healing, than those who were low in anger control. Further, the majority of these studies have discussed that greater than the presence of anger alone, anger dysregulation is associated with poorer outcomes (Erwin et al., 2003; Waller et al., 2003; Denollet et al., 2010; Gouin et al., 2008).

Previous literature has found that emotion regulation, and in particular, cognitive reappraisal is effective in regulating explicit ratings of anger (Ray, Wilhelm, & Gross, 2008; Scasz, Szentagotai, & Hofmann, 2011) and results in better cardiovascular

responses (Mauss, Cook, Cheng, & Gross, 2007). While these studies are encouraging, there are no known studies that examine anger regulation and interpretation bias together. What has been established is the ability to manipulate interpretation bias (Wilson et al., 2006). . In an experimental paradigm, the researchers trained healthy participants to use a threatening or nonthreatening interpretation of stimuli. Participants then watched an anxiety-inducing video clip. Results indicated that participants who were induced to have a threatening interpretation bias rated significantly more anxiety and depression from before and after the film clip, compared to participants with a nonthreatening interpretation bias. This study indicates that interpretation bias can play a causal role in distressing symptoms. Further, that it can be induced indicates that perhaps we can also systematically change the interpretation bias, using emotion regulation strategies, to decrease the distressing emotion. Another example that interpretation bias is can be manipulated comes from a study demonstrating that social phobics displayed greater negative interpretation bias than treated social phobics who had greater bias than controls. (Franklin et al., 2010) This finding demonstrates that interpretation bias is correlated with changes in cognitions and behaviors.

Through examining interpretation bias in conjunction with cognitive reappraisal, we can examine the extent that emotion regulation influences the interpretation of ambiguity. Specifically, if results indicate that angry participants display a negative interpretation bias, however, following cognitive reappraisal, the interpretation bias becomes more neutral or positive, we can then conclude that individuals who regulate their emotions subjectively feel less negative, and further, respond to ambiguity similar to individuals in more neutral mood states.

As such, if we can better understand the regulation of anger, it would help guide treatment in a variety of psychopathologies and inform health outcomes. An advantage to the current study design, is that mood manipulations will take the form of autobiographical recall, which allows us to directly examine the efficacy of emotion regulation techniques on managing emotions from life events, similar to what is experienced in a therapeutic setting.

A. Specific Aims

The present study aims to address four specific facets of emotion regulation and the interpretation of ambiguous information.

1. To determine whether mood impacts interpretation bias, we will evaluate the effect of angry and neutral mood on a sentence completion task. Mood-based interpretation bias will be established if the valence of the responses on the sentence completion task between angry and neutral states is significantly different. We hypothesize that participants will choose more negative answers following the angry mood induction than following the neutral mood induction.

2. To assess the efficacy of the cognitive reappraisal strategy on an angry mood state, we will compare subjective ratings of negative affect after angry mood inductions, in which participants reappraise their emotions (Angry Reappraise), compared to ratings of angry mood inductions when participants do not attempt to alter the emotional reactions (Angry Attend). We hypothesize that the Angry Reappraise condition will result in less negative affect than the Angry attend trial.

3. To evaluate whether cognitive reappraisal has an impact on mood-based interpretation bias, we will compare the endorsed choice of ambiguous sentences

following 'Anger Attend' and 'Anger Reappraise' trials. We hypothesize that individuals will choose the negatively valenced answer more often following the 'Anger Attend' trial than the 'Anger Reappraise' trial.

4. To understand whether state and trait mood features such as anxiety and anger, as well as effective use of emotion regulation impacts the efficacy of laboratory emotion regulation techniques, we will evaluate scores from self-report measures to determine if participants differ in subjective ratings of emotion regulation success and interpretation bias following laboratory procedures designed to reduce negative emotionality following reappraisal of angry mood states.

II. METHOD

A. Participants

Participants included 103 Marquette undergraduate students who were recruited through the Marquette University's Research Participant pool and received course credit for their participation. The mean age of the sample was 19 years and ranged from 18 to 23 years. Sixty-three percent of the sample was white and 56% were female. All participants met inclusion criteria for this study and denied being under the care of a psychiatrist or a psychologist or used medication for the treatment of any Axis I mood disorder. Experimental procedures were approved by Marquette's Internal Review Board and written informed consent was obtained from each participant prior to beginning the experiment.

B. Materials

Mood Induction Each participant underwent an angry and a neutral mood induction procedure (MIP). In the Anger MIP, participants were instructed to recall a time in which they felt extremely angry, and when recalling the event they still feel strong frustration, irritation, and / or anger. In the Neutral MIP, participants were instructed to think about their morning daily routine (e.g. getting ready for school or work). In each MIP, participants were instructed to write about this memory in the form of a narrative and recall details about the event. Participants were given 5 minutes to write about the event, but were able advance if they finished before the allotted time. After writing each narrative, participants were asked to reflect and re-experience the memory they recalled for 30 seconds. Several studies have found that the use of

autobiographical recall is an effective technique to induce targeted emotions (Jallais & Gilet, 2010; Lench, Flores, & Bench, 2011)

C. Emotion Regulation Task

Training. To acquaint participants with the emotion regulation task, they were first given an explanation of the difference between 'Attend' and 'Reappraise' trials. Specifically, when the words 'Attend' appeared, participants were instructed to view the photo and allow themselves to experience any emotions that surfaced without trying to alter them. For the reappraise instruction, participants were told to re-interpret the content of the picture to be less negative. When participants were instructed to Reappraise a Neutral photograph, they were told that despite the neutral content of the stimulus, that it was still possible to reinterpret the content to be less negative. Standardized pictures from the International Affective Picture System (IAPS; Lang, Bradley, & Cuthbert, 2005) were used during this phase so that stimuli and instructions were the same across participants. Participants viewed 2 different sets of standardized pictures (1 Neutral/Attend, 1 Neutral/Reappraise, 1 Negative/Attend, and 1 Negative/Reappraise). The first set was viewed with the experimenter (and instruction) and the other set was viewed alone, in order to practice the strategies.

Experimental. In the experimental procedures, participants underwent the MIP prior to emotion regulation instructions. Just as in training, when participants were shown the 'Attend' prompt, they paid attention to the emotions that surfaced as a result of the MIP. When participants were shown the 'Reappraise' prompt, they were asked to reappraise their view of the story to decrease negative emotions. For example, if a participant were to write about her/his mother being late to her/his high school

graduation, s/he could reinterpret the feeling as gratitude that the mother took the time to check on the final details of the graduation party to make it successful. In 'Reappraisal' trials, participants were instructed to write their reinterpretation of the Angry MIP. As in the training phase, prior to and following both 'Attend' and 'Reappraise' prompts, participants were asked to rate the degree of negative affect they were currently experiencing on a Visual Analogue Scale.

Mood Booster Because of the counterbalanced nature of this design, we instituted a mood booster to ensure that participants remained in a given mood state. In a questionnaire that participants completed prior to the experimental tasks, participants were asked to select and label two extremely anger-inducing events. For the Angry condition, participants were instructed to think and write about the second pre-chosen angry event. In the Neutral condition, participants were instructed to think about their evening routing (e.g. brushing teeth, washing face, etc). Format of mood booster was identical to the first MIP. Participants wrote about each event for a maximum of 5 minutes and then were instructed to think about each event for 30 seconds. The use of multiple memories in the same targeted state has been proven effective in other studies (Kross, Davidson, Weber, Ochsner, 2009).

Sentence Completion Task The experimental paradigm consisted of 30 sentences modified from existing sentence completion paradigms (Barton et al., 2005; Beard & Amir, 2009; Bloom & Fischler, 1980; Eysenck, Mogg, May, Richards & Mathews, 1991; Huppert et al., 2007; Loevinger, 1985; Rotter, Rafferty, & Schachtitz, 1949). Additional sentences were created by lab members. Sentences were designed or modified to illustrate ambiguous situations pertaining to threat, social settings, and

optimism. All sentences in the existing paradigm were created or modified grammatically to be in the first person. Sentences were presented with the last word missing, which is the disambiguating part. Participants were asked to complete the last word using a forced-choice response style, in which, they completed the sentence with the best word from a set of 3 answer choices that were positive, negative, and neutral in valence.

  Self-report measures Mood and Anxiety Symptom Questionnaire- Short Form (MASQ; Clark & Watson, 1991). The MASQ is a 62-item questionnaire that assesses mood and anxiety symptoms. We included this measure in place of the BAI and the BDI to measure sub-clinical levels of anxiety and depression in order to understand how common levels of anxiety and depression influence MIP and the resolution of ambiguity. Participants were instructed to read through a list of feelings, sensations, and problems, and asked to indicate the degree to which they experienced this in the last week on a 5-point likert scale, 1 indicating 'not at all' and 5 indicating 'extremely'. The MASQ score is presented in 4 scales: General Distress: Anxiety, General Distress: Depression, Anxious Arousal, and Anhedonic Depression). General Distress scales measure nonspecific symptoms of anxiety and depression. Anxious Arousal measures physiological symptoms of anxiety, while Anhedonic Depression examines general negativity and activity level. The MASQ has shown good convergent validity across all subscales ($r>.71$ for all scales) (Watson, 2005).

  State-Trait Anger Expression Inventory-2 (STAXI-2; Spielberger, 1999) was used to assess feelings of anger. The STAXI-2 is a 57-item measure that examines current feelings of anger, as well as trait displays of anger involving temperament and mood expression. Participants read statements and indicated the amount to which they currently

or typically identify with each statement. The STAXI-2 examines inward vs. outward expression (anger-in vs. anger-out) as well as verbal and physical expressions of anger. Higher scores indicate a greater degree of feelings or expression of anger. This measure has displayed high internal consistency (Spielberger, 1999).

Difficulties in Emotion Regulation Scale (DERS; Gratz & Romer, 2004). The DERS is a 36-item measure that assesses dysfunction in emotion regulation. Participants read a sentence and based on a likert scale and noted how much the statement applied to them. High scores indicate a greater level of emotion dysregulation. In addition to a total score of emotion dysregulation, the DERS has several subscales that target specific aspects of emotion dysregulation (e.g. impulse control, lack of emotional awareness, etc). The DERS has been shown to have high internal consistency (α=.93) and construct validity as measured by statistically significant correlations between the DERS and another measure of emotion regulation (Generalized Expectancy for Negative Mood Regulation Scale) (Gratz & Romer, 2004). Measuring emotion dysregulation allowed us to better assess participant's ability to engage in assigned emotion regulation strategies.

The Emotion Regulation Questionnaire- Short Form (ERQ-SF); Egloff, Schmuckle, Burns, & Schwerdtfeger, 2006) is a 6-item questionnaire used to assess the utilization of Reappraisal and Suppression during a mood induction. The questionnaire is comprised of a 3-item Reappraisal scale and a 3-item Suppression scale. The degree to which participants engage in either emotion regulation strategy habitually is likely to influence interpretation bias and explicit emotion regulation.

Liebowitz Social Anxiety Scale (LSAS-SR; Liebowitz, 1987). The LSAS-SR is a 24-item self-report measure that assesses fear and avoidance of several social situations.

We measured social anxiety in addition to generalized anxiety in order to better understand the influence of specific types of anxiety on the experimental paradigm. Similar to generalized anxiety, individuals with social anxiety often possess a negativity bias when resolving ambiguous information (Huppert et al., 2007). Participants were asked to read statements and indicate the degree of fear or anxiety they experienced as well as the degree of avoidant behavior they engaged in within the last week. Scores on the fear scale and avoidant scale are summed together. Higher scores indicate a greater level of social phobia. This measure has displayed good test-retest reliability (r=.083) with a time interval of 12 weeks and a high level of internal consistency (α=.95) (Baker, Heinrichs, Kim, & Hofmann, 2002).

Personality Inventory-Revised: (NEO PI-R; Costa & McCrae, 1992) was used to assess personality characteristics. In particular, the assessment contains 60 items that comprise 5 different domains: Neuroticism, Extroversion, Openness to Experience, Agreeableness and Conscientiousness. Participants read statements and indicated the degree to which they agree or disagree with each item. This survey has reported high internal consistencies, ranging from .82 to .92 (Costa & McCrae, 1992). It is important to assess personality characteristics in participants as it has been shown that personality interacts with response modulation and interpretation of ambiguity (Stemmler & Wacker, 2010).

The Life Orientation Test Revised (LOT-R; Scheier, Carver, & Bridges, 1994) is a 10-item questionnaire used to measure trait optimism. Participants read each statement and indicated using a likert scale, the degree to which they agree or disagree with each item. Three items are phrased in a positive way and 3 in a negative manner, while the

remaining 4 items are used as fillers. Higher scores indicate greater levels of optimism. Similar to depression, optimism and pessimism have been found to influence decision-making (Hey, Lotito, Maffioletti, 2010).

D. Procedure

Participants were asked to attend 1, 60-minute, experimental session at the Inquiries in Affective Science Lab at Marquette University. All participants first read and signed a consent form. The experimental procedures took place on a 22-inch computer in the lab, using E-Prime (Version 2) software (Psychology Software Tools, Inc.). Participants who agreed to participate then completed a demographics survey, DERS, MASQ, and STAXI, and LOT-R (See appendix for LOT-R results).

Participants then completed baseline emotion ratings, in which they were asked to rate the extent that they were experiencing several emotions at the time of testing, using an automated 10 cm Visual Analogue Scale (VAS: 0-10), from 'not at all' (0) to 'extremely' (10). Emotion descriptors were presented and rated separately, and included: Aggressive, Angry, Annoyed, Anxious, Aroused, Cheerful, Excited, Happy, Nostalgic, and Sad. Participants then completed a block of 6 items from the sentence completion paradigm to assess the presence of any baseline interpretation biases.

Following baseline measures, the training phase took place and the experimenter explained the emotion regulation instructions. Participants were taught to Attend and Reappraise for both negative and neutral pictures. The experimenter left the room and the participant viewed a second set of standardized photos in order to practice instructed emotion regulation without the experimenter present. Before and after the negative and neutral training trials, participants rated the degree of negative affect they were currently

experiencing on a Visual Analogue Scale to ensure the efficacy of emotion regulation procedures.

Following training, participants completed experimental procedures for both the Angry and Neutral mood conditions, counterbalanced across participants. In both conditions, participants completed MIPs, followed by a rating of emotion descriptors to ensure that the MIP was effective. The emotion regulation task then began and consisted of 2 phases: 'Attend' and 'Reappraise'. Phase order was counterbalanced across participants. To begin, participants first saw one emotion regulation instruction for 4 seconds (e.g. 'Attend' or 'Reappraise'). Following this period, participants rated the degree of negative affect they were experiencing on a scale of 1-10 (1= weak; 10= strong) using the visual analogue scale. Participants then completed a block of 6 items from the sentence completion paradigm.

Between emotion regulation instructions, participants completed the mood booster in which they underwent a second MIP in the targeted state. Participants then saw the second emotion regulation instruction. After writing and reflecting on this emotion, participants rated the degree of negative affect they were experiencing. Following the second emotion regulation (Attend or reappraise), participants then completed another block of 6 items from the sentence completion paradigm. At the end of each trial, participants viewed the word 'RELAX' for 5 seconds. At the end of each mood condition, participants rated several emotion descriptors.

Each item of the sentence completion task began with a 2 second fixation point, followed by a screen presenting the sentence for 6 seconds. The next screen showed all 3 answer choices: one with a positive valence, one with a neutral valence, and one with a

negative valence. Participants were instructed to choose the response that best completed the sentence. There were no time constraints on selecting a response. Once experimental procedures were complete, participants completed another set of questionnaires that included the two forms of the ERQ-SF to assess both Angry and Neutral MIPs, LSAS, NEO (see appendix for LSAS and NEO results).

III. RESULTS

A. Manipulation Check

To confirm the efficacy of each MIP, a series of repeated measures analysis of variances (rmANOVAs) were performed to ensure that participants' subjective ratings of emotion descriptors were in the intended direction after each MIP. The emotion descriptors were first divided into 3 groups: Positive (Amused, Excited, Happy, Joyful, Peaceful), Negative (Angry, Annoyed, Anxious, Negative Affect, Sad), and Engagement (Aroused, Interested). Three, Time x Emotion Descriptor rmANOVAs were conducted for each mood induction. In addition, average time to complete the MIP was noted. All statistical analyses were analyzed at an alpha level of .05 in SPSS 21.0 (SPSS, 2012).

In the Angry MIP, participants wrote for an average of 3.5 minutes. Results from the Angry MIP, revealed significant main effects of time and emotion, qualified by a significant interaction (Table 1: rmANOVA results). Specifically, ratings of Negative emotions increased from pre- to post-Angry MIP, while Positive emotions decreased. The interaction effect in both analyses is explained by specific descriptors changing at different rates (see Figures 1 and 2). Finally, we examined Arousal separately using a paired t-test and found that this rating did not significantly change, $t(102)=-1.44$, $p=.15$. In essence, the Angry MIP was effective at increasing ratings of negative emotions, and decreasing positive emotions and did not change arousal. Ratings of 'Negative Affect' were considered especially important, as participants rated this descriptor multiple times throughout the experiment to track efficacy of mood boosters and emotion regulation in place of the full set of emotion descriptors to reduce participant fatigue. As such, this

descriptor was analyzed separately using a paired t-test and found that ratings of Negative Affect significantly increased from pre- to post- Angry MIP, $t(102)=-11.49$, $p<.001$.

In the Neutral MIP, participants wrote for an average of 2.5 minutes. Identical analyses were conducted to examine emotion descriptor changes from pre- to post- Neutral MIP (Table 2: Results of rmANOVA analyzing change). Results from the Negative emotion descriptors analysis found significant main effects of time and emotion that was qualified by a significant interaction. Specifically, all negative descriptors, except 'Anxious' decreased slightly, while Anxious ratings increased (See Figure 3). In a separate analysis, ratings of Negative Affect significantly decreased from pre- to post-MIP, $t(101)=2.70$, $p<.01$. In the positive emotion descriptor analysis, only a main effect of emotion was observed, indicating that participants rated emotions differently, though they did not significantly change (Figure 4). Finally, a paired t-test indicated that ratings of Arousal did not significantly change, $t(101)=-.70$, $p=.49$. Results from these analyses indicate that the Neutral MIP did not change positive emotions, however, negative emotions mostly decreased, with the exception of anxiety. Comparing effect sizes, emotion ratings in the Angry condition (partial $\eta^2=0.69$), were much larger than in the Neutral condition (partial $\eta^2=0.04$), which is considered a small effect.

To examine efficacy of mood induction boosters that were utilized between emotion regulation instructions, paired t-tests were conducted to examine ratings of negative affect following mood induction and mood booster. In the Angry condition, there was no significant difference between these ratings of Negative Affect, indicating that the Angry mood booster was effective at producing similar levels of negative affect as the initial mood induction: $t(102)$, $p=0.24$. A second paired t-test was performed to

compare ratings of Negative Affect for the Neutral mood induction and the Neutral mood booster. The results indicate that participants rated significantly less negative affect in the Neutral mood booster compared to the Neutral mood induction: $t(101)$, $p<0.001$.

B. Mood Induction and Interpretation Bias (Aim 1)

The first aim was to determine whether mood had an effect on interpretation bias. We conducted a 3x3 rmANOVA of mood (baseline, neutral, negative) and response valence (Positive, Negative, and Neutral). (Table 5: Means and standard deviations of the number of Positive, Negative and Neutral endorsements Table 3: rmANOVA analysis). In these analyses, the statistic of interest was the interaction as it illustrates the proportion of endorsed response valences by condition. Any main effect of mood would be uninterruptible as each mood had the same number of sentences. Results revealed a significant main effect of Response Valence, $F(2,94)=69.64$, partial $\eta^2=0.60$, $p<.001$, with a moderate effect size. This main effect was qualified by a statistically significant interaction effect for Mood and Response Valence, $F(4,92)=7.59$, partial $\eta^2=0.25$, $p<0.001$, which is indicative of a medium effect size (Figure 5). To better understand this interaction effect, 3 1(Mood) x 3 (Response Valence) rmANOVAs were conducted. Specifically, a 1(Baseline) x 3(positive, negative, neutral responses) was conducted. Results indicated a significantly different number of responses endorsed at Baseline, $F(2,94)=70.34$, partial $\eta^2=0.60$, $p<0.001$. Post hoc Pairwise comparisons with Bonferroni correction revealed that participants endorsed significantly fewer Negative responses than Positive (Mean Difference=-1.69, $p<0.001$, Negative mean=0.90, Positive mean=2.58) or Neutral responses (Mean Difference=-1.65, $p<0.001$, Negative mean=0.90 Neutral mean=2.54). There was no significant difference between the numbers of Positive or

Neutral endorsed responses. These results indicate that at Baseline, participants exhibit a tendency to interpret ambiguous stimuli as positive or neutral.

To examine interpretation bias in the Neutral condition a 1(Neutral) x 3(Response Valence) rmANOVA was conducted. Results indicated that participants endorsed significantly different number of response valences in the Neutral condition, $F(2,100)=34.41$, partial $\eta^2=0.41$, $p<0.001$, with a medium effect size. Post hoc Pairwise comparisons using Bonferroni correction revealed that participants endorsed fewer Negative responses than Positive responses (Mean Difference=-0.76, $p<0.01$, Negative mean=1.20, Positive mean=1.95) or Neutral responses (Mean Difference=-1.66 $p<0.001$, Negative mean=1.20, Neutral mean=2.85). Additionally, participants endorsed more Neutral responses than Positive responses (Mean Difference=0.90, $p<0.01$, Positive mean=1.95, Neutral mean=2.85). As such, in the Neutral condition, participants were more likely to exhibit a Neutral bias.

Finally, to examine interpretation bias in the Angry condition a 1(Angry) x 3(Response Valence) rmANOVA was conducted. Results indicated that participants in the Angry condition endorsed significantly different number of valenced responses, $F(2,101)=13.40$, partial $\eta^2=0.21$, $p<0.001$. Post hoc Pairwise comparisons using Bonferroni correction revealed that participants endorsed significantly fewer Negative responses compared to Positive responses (Mean Difference=-0.80, $p<0.01$, Negative mean=1.40, Positive mean=2.19) or Neutral responses (Mean Difference=-1.01, $p<0.001$, Negative mean=1.40, Neutral mean=2.41). There was no significant difference between the number of Positive and Neutral endorsements in the Angry condition.

Results from the Angry condition indicate that participants are likely to exhibit a positive or neutral bias in interpreting ambiguous stimuli. However, looking at the means, it is evident that there were more negative responses endorsed in the Angry condition compared to Neutral and Baseline. To explore this statistically, a 1 (Negative responses) x 3 (Mood) rmANOVA was conducted and revealed that significantly different number of negative responses were endorsed in each condition $F(2,94)=6.07$, partial $\eta^2=0.11$, $p<0.01$. Post hoc pairwise comparisons using Bonferroni correction revealed that participants in the Angry condition endorsed more Negative responses compared to Baseline (Mean Difference=.47, $p<.01$, Baseline mean=.90, Angry mean=1.37), but not Neutral (Mean Difference=-.17, p=n.s. Neutral mean=1.2). In essence, while participants in the Angry condition are more likely to endorse positive or neutral responses to ambiguity, rates of negative endorsements also significantly increase, compared to Baseline.

C. Negative Affect and Emotion Regulation (Aim 2)

To examine ratings of negative affect and emotion regulation strategy, a 2 (Mood Induction) x 2 (Emotion Regulation Strategy) was conducted (Table 7: Means and standard deviations of each variable Table 4: rmANOVA analysis). The Mood Induction variable had 2 levels: Angry and Neutral; and the Emotion Regulation variable had 2 levels: Attend and Reappraise. Results revealed significant main effects of Mood Induction and Emotion Regulation Strategies, which were qualified by a significant interaction between these variables. The significant interaction effect of Mood Induction and Emotion Regulation revealed that negative affect for Reappraise was significantly lower than Attend, for the Angry condition only, $F(1, 101)=8.98$, $p<0.01$, partial $\eta^2=0.08$

(Figure 2), with a small effect size. Follow-up paired t-tests confirmed this difference in negative affect ratings between Attend and Reappraise in the Angry condition, $t(102)=5.76$, $p<0.001$. The significant main effect of Mood Induction showed that participants rated higher levels of Negative Affect in the Angry condition, compared to the Neutral condition: $F(1, 101)= 122.09$, $p<0.001$, partial $\eta^2=0.55$. The significant main effect of Emotion Regulation showed that participants rated less negative affect after the 'Reappraise' instruction, compared to 'Attend': $F(1, 101)=31.57$, $p<0.001$, partial $\eta^2=0.24$. Overall, results from these analyses revealed that Reappraise was effective at reducing Negative Affect ratings in the Angry condition, but not the Neutral condition.

D. Interpretation Bias and Emotion Regulation (Aim 3)

To assess whether interpretation bias can be modified by emotion regulation strategies, separate 2(Emotion Regulation) x 3(Response Valence) rmANOVA were conducted. Emotion Regulation had 2 levels: Attend and Reappraise, and Response Valence had 3 levels: positive, negative, and neutral endorsed valences. As before, the main focus is on the interaction effect. In the Angry condition, results revealed a significant main effect of Response Valence, $F(2,101)=29.09$, partial $\eta^2=0.37$, $p<.001$, with a medium effect size (see Table 9: Means and standard deviations of each variable Table 5: rmANOVA analysis). Pairwise comparison post hoc tests with Bonferroni correction revealed that participants endorsed significantly fewer Negative responses than Positive (Mean Difference=-.78, p<.001, Negative mean=1.37, Positive mean=2.16) or Neutral (Mean Difference=-1.11, p<.001, Neutral mean=2.49) responses. There was no significant difference between the numbers of Positive and Neutral endorsed responses (Mean Difference=-.33, p=n.s.) (See Figure 7). A follow-up paired samples t-test was

conducted to examine possible changes in the amount of Negative endorsements. Results revealed that Emotion Regulation did not significantly impact the amount of Negative endorsements, $t(102)=.34$, p=n.s. There was no significant main effect of Emotion Regulation or a significant interaction effect. Results indicate that Angry participants revealed a Positive/Neutral bias and that Emotion Regulation does not significantly impact this.

Results from the rmANOVA conducted for the Neutral condition revealed a significant main effect of response valence, $F(2,100)=58.68$, partial $\eta^2=.54$, $p<.001$ with a medium effect size (see Table 11: Means and standard deviations of each variable Table 6: rmANOVA analysis). Post-hoc pairwise comparisons with Bonferroni correction revealed that the number of endorsements of each valence were significantly different from each other (see Figure 8), such that there were more Neutral responses than Positive (Mean Difference=.84, p<.001, Neutral mean=2.84, Positive mean=2.00) or Negative responses (Mean Difference=1.67, p<.001, Neutral mean=2.84, Negative mean=1.17). Additionally, there were fewer Negative responses than Positive (Mean Difference=-.83, $p<.01$). A follow-up paired t-test was conducted to examine Negative responses after Emotion Regulation strategies. Results revealed that there was no significant difference in Negative endorsements between Attend and Reappraise, $t(101)=.43$, p=n.s.. No significant main effect of Emotion Regulation or interaction effect was observed. Thus, results from this study indicate that participants in the Neutral condition exhibited a Neutrality bias and emotion regulation strategies did not significantly influence this.

Taken together, results from the Angry and Neutral analyses indicated that Emotion Regulation does not significantly impact valenced response endorsement in

either the Angry or Neutral condition. Further, results restate Aim 1 findings that Angry participants exhibit a Positive/Neutral bias, where as Neutral participants show a Neutrality bias.

E. Self-report measures and Reappraising Angry Events: Predicting Negative Affect and Interpretation Bias (Aim 4)

To understand how information gathered from self-report measures, such as trait anxiety, depression, anger, and trait emotion regulation, impact the utilization and success of cognitive reappraisal, a series of regression analyses were conducted using scores from self report measures to predict Negative Affect and number of endorsed response valences following Reappraise trials from the Angry condition. (Note: To look at regression analyses examining the LOT-R, NEO, and LSAS, see the Appendix.)

<u>DERS</u>

The first set of analyses examined the total score from the DERS which measures difficulties in emotion regulation. Separate bivariate regression analyses were conducted using the DERS total score as the independent variable to predict Negative Affect, Positive responses, Negative responses, and Neutral responses following Reappraisal of an angry autobiographical event. Results from the regression analysis predicting Negative Affect indicated that the DERS score significantly predicted negative affect following Reappraisal of an Angry event R^2=0.08, $F(1,100)$=8.49, $p<.001$ with a modest effect size (R=.28) and that the DERS predicts 8% of the variance in negative affect ratings following Angry Reappraisal (See Table 7a for details). Additionally, the Constant (B=2.28) revealed that if the DERS score was 0, participants would rate negative affect after reappraisal as 2.28. Finally, the standardized beta (β=.28, $p<.001$) indicated that

with one standard deviation increase in DERS scores, negative affect following Angry Reappraise would increase by almost one third of a standard deviation, indicating that with greater difficulties in emotion regulation, negative affect also increases.

Using the same independent variable of DERS scores to predict the number of Negative responses following Angry Reappraise revealed that the total DERS score significantly predicted the dependent variable, $F(1,100)=9.15$, $p<.01$, with a small effect size (R=.29). The DERS score predicted 8.4% of the variance in Negative responses following Angry Reappraise (See Table 7c for details). The standardized beta (ß=.29, $p<.001$) revealed that in the case that the DERS score increased by one standard deviation, negative responses would also increase by almost one third of a standard deviation, such that with greater difficulties in emotion regulation, the number of negative responses following Angry Reappraise also increases.

Using the same independent variable of DERS scores to predict the number of positive responses following Angry reappraise indicated that the DERS score significantly predicted Positive responses $F(1, 100)=7.64$, $p<.01$), though the effect size was small (R=.27), with the DERS scale predicting 7% of the variance in Positive responses following Angry Reappraise (See Table 7b for details). The standardized beta (ß=-.27, $p<.001$) indicated that with one standard deviation increase in DERS scores, the number of positive responses would decrease by over one fourth of a standard deviation, thus with more difficulties endorsed on the DERS, the number of positive responses decreases.

Finally, the regression analysis to predict the number of Neutral responses following Angry Reappraise indicated that the DERS scale did not significantly predict the dependent variable, $F(1,100)=0.00$, p=n.s. (See Table 7d for details).

STAXI

The second set of analyses utilized multiple regression to predict Negative Affect and the number of Negative, Positive, and Neutral endorsed responses following Angry Reappraise from the STAXI-II, which is used to measure state and trait anger. The first multiple regression model predicted Negative Affect ratings following Angry Reappraise from the independent variables of state and trait anger. This analysis revealed that state and trait anger did not significantly predict negative affect following Angry Reappraise, $F(2,99)=2.11$, p=n.s. (See Table 8a for details of the analysis). Despite the non-significant model, the independent variable of state anger significantly predicted negative affect (ß=.21, p<.05), indicating more state anger predicts greater levels of Negative Affect following Angry Reappraise.

The second multiple regression analysis used the same independent variables to predict the number of positive responses. Results indicated that state and trait anger did not significantly predict the number of positive responses $F(2,99)=1.88$, p=n.s. (See Table 8b for details). The third multiple regression analysis predicted negative responses from state and trait anger. Results revealed that state and trait anger significantly predict the number of Negative responses $F(2,99)=5.09$, p<.01 with a medium effect size (R=.31), where state and trait anger ratings predicted 9.3% of the variance in Negative responses (See Table 8c). Examining individual predictors revealed that state anger alone significantly predicted the number of negative responses endorsed following Angry

Reappraise (ß=.23, *p*<.05), such that one standard deviation increase in State Anger ratings, would increase the number of negative responses by almost one quarter of a standard deviation.

The final multiple regression analysis predicted the number of Neutral endorsed responses following Angry Reappraise. Results revealed that state and trait scores from the STAXI-II did not significantly predict the number of Neutral responses following Angry Reappraise, *F*(2,99)=0.02, *p*=n.s. (See Table 8d for details).

MASQ

A third set of multiple regression analyses were conducted to predict Negative Affect and the number of Negative, Positive, and Neutral response valences following Angry Reappraise, using anxiety and depression scales from the MASQ. The first regression analysis predicted Negative Affect Following Angry Reappraise from the MASQ subscales. Results indicated that reported General Anxiety, General Depression, Anxious Arousal, and Anhedonic Depression did not significantly predict the dependent variable *F*(4,97)=1.48, *p*=n.s. (See Table 9a).

A second regression analysis used the same 4 independent variables to predict the number of positive responses following Angry Reappraise. Results revealed that General Anxiety, General Depression, Anxious Arousal, and Anhedonic Depression significantly predicted the number of positive responses following Angry Reappraise, *F*(4,97)=3.67, *p*<.01 with a medium effect size (R=3.6), where the MASQ subscales predicted 13% of the variance in the number of positive responses following Angry Reappraise (See Table 9b for details). Examining individual predictors revealed that reports of Anhedonic Depression significantly predicted the number of positive responses following Angry

Reappraise (ß=-.33, *p*<.01), such that with a one standard deviation increase in Anhedonic Depression, the number of positive responses following Angry Reappraise decreased by one third of a standard deviation.

A separate multiple regression analysis was conducted to predict the number of Negative responses following Angry Reappraise from the same 4 subscales. Results revealed that General Anxiety, General Depression, Anxious Arousal, and Anhedonia scales significantly predicted the number of Negative responses endorsed following Angry Reappraise, *F*(4,97)=4.78, *p*=.001 with a medium effect (R=.41), such that MASQ scales predicted 17% of the variance in the number of Negative responses endorsed following Angry Reappraise (See Table 9c for details). Examination of individual predictors revealed that Anxious Arousal significantly predicted the number of Negative responses following Angry Reappraise (ß=-.29, *p*<.05), where one standard deviation increase in Anxious Arousal will result in almost one third of a standard deviation decrease in Negative endorsements following Angry Reappraise.

Multiple regression was also used to predict the number of endorsed Neutral responses following Angry Reappraise, using the MASQ scales as independent variables. Results indicated that these scales did not significantly predict the number of Neutral endorsed responses following Angry Reappraise, *F*(4,97)=1.15, *p*=n.s. (See Table 9d for details).

ERQ-SF

A final set of multiple regression analyses were conducted to predict Negative Affect and the number of valenced responses following Angry Reappraise as the dependent variables, and the degree to which participants engaged in Reappraise and

Suppression during the Angry mood induction, measured by the ERQ-SF, as the independent variables. The first multiple regression analysis predicted Negative Affect following Angry Reappraise from Reappraise and Suppression scales from the ERQ-SF. Results revealed that engagement in Reappraise and Suppression did not significantly predict Negative Affect following Angry Reappraise, $F(2,98)=2.08$, p=n.s. (See Table 10a for details of the analysis).

Engagement of Reappraisal and Suppression during the Angry mood induction was also used to predict the number of Positive responses endorsed following Angry Reappraise. Results revealed that the independent variables significantly predicted the number of positive endorsements following Angry Reappraise, $F(2,98)=4.68$, $p<.05$, with a medium effect size (R=.30), such that Reappraisal and Suppression explained 8.7% of the variance in the number of positive responses (See Table 10b for details). Examining individual predictors, revealed that using Reappraisal during the Angry mood induction significantly predicted the number of positive responses ($ß=.30$, $p<.01$), such that one standard deviation increase in Reappraisal raises the number of positive endorsements by almost one third of a standard deviation.

Multiple regression analysis, predicting the number of Negative endorsements from Reappraise and Suppression scales from the ERQ-SF, revealed that the independent variables significantly predicted the dependent variable, $F(2,98)=8.43$, $p<.001$ with a medium effect size (R=.38), where these scales predicted 14.7% of the variance in Negative endorsements following Angry Reappraise (See Table 10c for details). Examining individual predictors revealed that engagement in Reappraisal during the Angry mood induction significantly predicted negative responses ($ß=-.38$, $p<.001$), such

that where Reappraisal increases by one standard deviation, the number of Negative endorsements following Angry Reappraise decreases by almost two fifths of a standard deviation.

Finally, engagement in Reappraisal and Suppression in the Angry mood induction was used to predict the number of Neutral responses following Angry Reappraise. Results revealed that the independent variables did not significantly predict the dependent variable, $F(2,98)=.25$, p=n.s. (See Table 10d for details of the analysis), indicating that engagement in suppression and reappraisal during the MIP does not predict Neutral responses after Angry reappraisal.

IV. DISCUSSION

The purpose of this study was to understand the role of cognitive reappraisal on explicit (self-report of negative affect) and implicit (interpretation bias) biases. Results showed that autobiographical recall was an effective technique to induce Angry and Neutral mood states. Cognitive reappraisal was effective at reducing explicit feelings of negative affect after autobiographical recall of an angry event. The implicit interpretation bias in the Angry and Neutral mood states showed that participants exhibited an equally positive and neutral bias to ambiguous information in both mood states, however, the Angry condition showed an increased negativity bias compared to baseline. Utilization of cognitive reappraisal did not significantly change interpretation bias in either the Angry or Neutral mood state. Finally, significant relationships were observed between state and trait dimensions of emotion and utilization of emotion regulation techniques, and interpretation bias. Specific findings and implications of each aim are discussed below.

A. Explicit Bias and Mood State

Examining explicit bias (i.e. negative affect ratings) showed that subjective ratings of negativity were higher in the Angry condition than the Neutral condition. Further, instructed Reappraisal, but not Attending to emotions, was effective at reducing subjective feelings of negativity in the Angry condition. Cognitive reappraisal has been shown to be effective at reducing general negative emotionality (Denson, Moulds, & Grisham, 2012; Mauss, Cook, Cheng, & Gross, 2007; Ray, Wilhelm, & Gross, 2008; Szasz, Szentagotai, & Hofmann, 2011). Specifically regarding Anger, cognitive reappraisal is effective at reducing negativity in a variety of Angry MIPs including

autobiographical recall (Denson, Moulds, & Grisham, 2012; Ray, Wilhelm, & Gross, 2008), guided imagery (Szasz, Szentagotai, & Hofmann, 2011) and anger provocations (Mauss, Cook, Cheng, & Gross, 2007).

Cognitive reappraisal was also implemented in the Neutral condition. Results indicated that while ratings of negative affect between Attend and Reappraise in the Neutral condition did not reach statistical significance, there was a trend for individuals to rate less negative affect following the Reappraise than Attend in the Neutral condition (p=0.07). Few studies have instructed participants to implement this strategy to Neutral stimuli. In fact, only two studies were found that included a similar condition (Golkar et al. 2012; Ray, McRae, Ochsner, & Gross, 2010. Ray et al. (2010) measured emotion regulation success using ratings of negative affect (as in the current study), while Golkar et al. (2012) measured subjective ratings of discomfort. Both studies found that reappraising both neutral and negative stimuli significantly decreased the dependent variable (Negative Affect or Discomfort) compared to Attend trials. Therefore, Neutral Reappraise results from the current study slightly differ from the current literature. One consideration that may account for this difference is that both aforementioned studies used picture stimuli to induce targeted moods, while the current study used autobiographical recall. It is plausible that when there is limited emotionality to the stimuli (i.e. Neutral), participants may find it easier to reappraise concrete stimuli, such as pictures, compared to more nebulous stimuli, such as autobiographical recall. Another confounding factor that precludes direct comparison with the current study is that when using standardized stimuli, researchers have normative measures of valence and arousal, which is absent in personalized stimuli. Thus the current stimuli may have differed on

either axis (valence or arousal) from the standardized stimuli that may explain the difference in subjective changes in negative affect to neutral stimuli.

B. Mood and Interpretation Bias

Results from interpretation bias analyses indicated that at Baseline, participants endorsed mainly positive and neutral responses, indicating a positive/neutrality bias and an absence of negativity bias. Compared to Baseline, participants in the Neutral condition endorsed more neutral responses and fewer positive responses, indicating a neutrality bias. Finally, participants in the Angry condition mainly endorsed positive and neutral responses, similar to the Baseline condition. However, they also endorsed a greater number of negative responses relative to Baseline, indicating an increased negativity bias in the Angry condition. Results from this study are consistent with previous research. For example, Wenzel and Lystad (2005) found that angry participants displayed a negative interpretation bias in estimating the likelihood that negative events would occur. This study also included anxious participants and found that both conditions displayed a negative interpretation bias, though it was more pronounced in the Angry condition. Participants in this study were recruited based on trait anxiety and anger, while the current study induced targeted mood states. Despite this difference in sample, both state angry participants from the current study and trait angry participants from Wenzel and Lystad (2005) displayed an increased negativity bias. Similarly, Barrazzone & Davey (2009) found that when participants in angry mood states were presented with homographs that had a neutral or threat resolution and found that angry participants were more likely to endorse the threat resolution. Results from the current study indicate that Anger primes participants to interpret ambiguity in an *increasingly* negative manner,

while the literature indicates that anger leads individuals to display an overtly negative interpretation bias. This difference between the literature and the current study may be a result of the experimental interpretation bias paradigm (see Limitations for details). Nevertheless, a conservative interpretation of the evidence is that Anger increases the likelihood that participants interpret ambiguity negatively.

Conversely, several studies from the risk literature found that angry participants were more likely to make optimistic judgments about risk (Lerner & Keltner, 2000; Lerner & Keltner, 2001). The idea that angry participants are likely to display optimism in risk perceptions seems contrary to findings in the current study. In fact, the appraisal tendency theory (Lerner & Kelnter, 2000) helps explain this difference. Specifically, this theory posits that emotions trigger changes in cognitions that influence judgments and decision-making that are based on levels of certainty. For example, the authors posit that anger is an emotion that is associated with assertiveness that in turn influences feelings of certainty in control. The appraisal-tendency theory then posits that angry individuals, who tend to be more assertive, will feel they have control over uncertain events, which then influences perceptions of risk to be less threatening. This theory was corroborated using a series of studies that employed both trait anger and induced anger (Lerner & Kelnter, 2001). Despite the confidence of angry decision makers, there is no evidence that these decisions are advantageous. Research has shown that angry individuals process information at a shallow level, employing shortcuts, such as stereotyping and reliance on superficial cues to make judgments that influence decision making. This was in contrast to sad participants who used more complex heuristics in making judgments (Bodenhausen, Sheppard, & Kramer, 1994). Reliance on superficial cues to make

decisions puts angry decision makers at risk for making uninformed and potentially less advantageous decisions, despite feeling confident in their optimistic perceptions of risk.

Taken together, angry individuals display a negative interpretation bias to stimuli that examine general optimism in future events (predicting the likelihood of a negative event occurring), threat (homographs) and decision-making in situations that pertain to general optimism, social settings, and threat (the current paradigm). However, anger is also associated with an optimistic view toward risk assessment, though this may be due to increased assertiveness and impulsivity. Therefore, optimistic risk assessments may not translate to optimism in other areas that imply positive affect. As such, we can conclude that Anger increases the likelihood that individuals will display a negative interpretation bias.

C. Emotion Regulation and Interpretation Bias

In the current study, interpretation bias did not change with instructed emotion regulation strategies. In the Angry condition, participants endorsed mainly positive and neutral responses with fewer negative responses in both Attend and Reappraise trials. In the Neutral condition, participants endorsed mostly neutral responses, followed by positive responses. Participants endorsed significantly less negative responses than positive or neutral. Similar to the Angry condition, this pattern held for both Attend and Reappraise trials in the Neutral condition. Contrary to the hypothesis, evidence from both mood conditions indicated that emotion regulation did not significantly change the interpretation of ambiguous information. Few studies have examined the relationship of changing interpretation biases through emotion regulation; however, other studies have experimentally modified the interpretation bias to understand the resulting behavioral

changes (Beard & Amir, 2008; Koster, Fox, & MacLeod, 2009; Wilson, MacLeod, Mathews, & Rutherford, 2006). For example, MacLeod et al. (2006) experimentally induced a threatening or nonthreatening interpretation bias. Threat bias was induced by continually encouraging participants to access threat meanings to homographs through numerous trials, and filling in missing letters to threat homographs. Feedback was given at each trial to encourage the generation of threat interpretations. Participants who underwent the threat interpretation training exhibited a significantly higher level of state anxiety following the video stressor than those who did not. Results indicate that experimentally modifying interpretation bias can increase emotional reaction in the targeted valence, suggesting a potentially causal role for interpretation bias and subsequent emotional reactions. Results from the current study found that interpretation bias was not informative in understanding the cognitive impact of emotion regulation as it was in MacLeod et al. (2006). However, given that the current results show that Angry participants exhibited an increased negativity bias, it may be that this bias maintained the generation of further negative resolutions. Thus, perhaps the increased negativity bias may have been less amenable to change.

Another study examined interpretation bias as a means to reduce distress. Specifically, Mathews, Ridgeway, Cook, and Yiend (2007), induced a positive interpretation bias in trait anxious individuals. Training was completed over 4 sessions in a graded fashion, such that the degree of positivity in the stimuli increased throughout the sessions. Interpretation bias was induced by presenting participants with a description of a situation and then presenting forced-choice questions where the positive resolution was the only response that semantically fit. At the end of training, participants were able to

access positive resolutions to ambiguous situations without assistance. Further, scores of trait anxiety decreased from pre to post training. Results suggest that inducing a positive interpretation bias may be helpful in treating emotional disorders, such as anxiety.

Together, these studies show that altering interpretation bias is effective at changing mood and behavior. The aim of the current study was to see if instructed cognitive reappraisal was a powerful enough tool to alter interpretation bias. Results showed that this strategy was effective in managing negative emotionality, but not in changing behavior. One explanation is that the aforementioned studies used more cognitive-based tasks (filling in the missing letters of words, etc) that directly focused on the interpretation bias. Further, participants in the described studies underwent intensive training procedures that likely resulted in an automatic response style to the desired effect. The current procedures utilized a training phase, though as it was more emotionally based, it was less structured and incorporated fewer trials. This may partially explain the different results in interpretation bias. However, it is unclear if altering interpretation bias has longer lasting cognitive results compared to cognitive reappraisal. As such, it appears that interpretation bias can help explain thoughts and behaviors, though the utility of this strategy clinically warrants further research.

D. State and Trait Emotion, Cognitive Reappraisal, and Interpretation Bias

Information from self-report data gave us more insight into how participants responded to both the emotion regulation task as well as interpretation bias. As the primary interests in this study were anger, cognitive reappraisal, and interpretation bias, we performed analyses that targeted this information. Namely, self-report data was used to predict negative affect and responses from the sentence completion task after Angry

Reappraisal. We found that individuals who endorsed greater emotion dysregulation on the DERS, rated higher levels of negative affect following Angry Reappraise. This indicates that individuals who endorsed greater emotion dysregulation in general, did not experience the same benefits from instructed emotion regulation (as evidenced by subjective ratings of negativity). This finding conceptually makes sense and fits with the research that states that individuals who generally experience emotion dysregulation also experience more negative emotions, including anger, and display greater physiological responses to anger provocations, compared to individuals who regularly engage in healthy emotion regulation (Mauss, Cook, Cheng, & Gross, 2007). Therefore, individuals who are emotionally dysregulated may require more extensive training to benefit from emotion regulation.

Further, in the current study, individuals who reported more emotion dysregulation were also found to have an increased negativity bias and a decreased positivity bias following Angry Reappraisal. This is consistent with a previous study that examined the way implicit evaluation of emotion regulation paralleled the emotional experience of anger (Mauss, Evers, Wilhelm, & Gross, 2006). This study used a derivation of the Implicit Association Task (IAT) to measure implicit evaluation of engagement in emotion regulation. Results indicated that those who valued emotion regulation experienced less anger and fewer negative thoughts following an anger provocation. The current results suggest that individuals who display emotion dysregulation will not experience the benefits of cognitive reappraisal, as corroborated by negative affect ratings. As such, it is unclear if instructed regulation was not as successful due to baseline dysregulation of emotion, or less value placed in emotion regulation.

Understanding anger was a central component to this study. Anger has been associated with a particularly pronounced negative interpretation bias, recurrent negative thinking, and other unique cognitions (Wenzel & Lystad, 2005; Wilkowski & Robinson, 2008). Therefore, understanding the influence of state and trait anger on the current paradigm was of central importance. Results showed that individuals who endorsed higher levels of anger, and especially state anger reported more negative affect following Angry Reappraisal. Research shows that individuals who report high levels of anger, tend to regularly engage in negative emotion regulation strategies such as rumination and catastrophizing (Martin & Dahlen, 2005), indicating that they have more practice and automatic cognitions related to these harmful strategies. Therefore, as cognitive reappraisal differs greatly from these strategies, instructed reappraisal may be more difficult and require more practice in order for the strategy to be used effectively.

Similarly, individuals who reported greater levels of anger, and once again particularly state anger, displayed greater negativity biases. As indicated by analyses of negative affect, it appears that such individuals did not benefit from cognitive reappraisal. Taken together, individuals who reported greater levels of state anger reported more negative affect and greater negativity biases following cognitive reappraisal of an angry event. It is plausible that these individuals did not fully engage in reappraisal, as these results are similar to what would be expected in unregulated anger. Interestingly, significant results from this analysis revealed that state anger as compared to trait anger, drove these results. Given the nature of this sample, it is plausible the majority of participants do not experience pathological levels of trait anger, and therefore state anger was more influential in this result.

The current paradigm assessed instructed utilization of cognitive reappraisal. However, it has been shown that some individuals automatically regulate their emotions in a plethora of situations (Mauss, Bunge, & Gross, 2007), which likely impacts mood induction techniques and instructed reappraisal. To understand the usage of emotion regulation techniques during the mood induction, the ERQ-SF was administered. Results indicated that individuals who endorsed engaging in reappraisal during the MIP, displayed an increased positivity bias and less of a negativity bias. Results indicate that when individuals reappraise while experiencing a negative emotion, interpretation biases change to be more positive. This finding is consistent with the hypothesis that the utilization of effective emotion regulation techniques during the emotional experience reduces feelings of negativity. This likely speaks to implicit and habitual use of emotion regulation. Several studies have indicated that implicit value and habitual use of emotion regulation show different emotion profiles compared to individuals who do not regularly engage in healthy emotion regulation strategies (Mauss, Evers, Wilhelm, & Gross, 2006; Memedovic, Grisham, Denson, & Moulds, 2010). Such evidence may speak to implicit emotion regulation facilitating effective explicit emotion regulation, which may then lead to the expression of interpretation bias. There is growing evidence that explicit emotion regulation is a cognitively demanding process that is demanding of executive control and working memory capacities (McRae, Jacobs, Ray, John, & Gross, 2012). As such, it is probable that individuals who greater benefitted from instructed cognitive reappraisal in the current study are individuals who do not find the process as taxing and perhaps are more likely to engage in automatic emotion regulation.

Clinical anxiety and depression have demonstrated threat interpretation bias (Richards, Reynolds, & French, 1992) and depressive interpretation biases (Dunn et al., 2009) respectively. Assessing levels of anxiety and depression are important in this study in order to understand the efficacy of instructed emotion regulation in such individuals as it is directly applicable to clinical experiences. Results from analyses investigating depression and anxiety symptoms indicated that individuals who rated higher levels of anxiety and depression, in particular anhedonic symptoms (as measured by the MASQ) reported a reduced positivity bias. There is some evidence in the literature suggesting that in place of looking at overt interpretation bias, examining the *reduction* of positivity bias aids in identifying depressive symptoms (Dunn, Stefanovitch, Buchan, Lawrence, & Dalgleish, 2009). In particular, Dunn et al. (2009) used a working memory task without feedback and examined self-judgments. Results indicated that a reduced positivity bias in this task was associated with anhedonic symptoms. These data can be extended to the current study in that anhedonic symptoms uniquely predicted a reduced positivity bias to an ambiguous stimulus.

Conversely, individuals who endorsed higher levels of anxiety and depression, and especially anxious arousal, reported a decreased negativity bias. This finding was surprising, as negative interpretation biases tend to be prominent in anxiety disorders (Franklin et al., 2005; Huppert et al., 2007; Wilson, et al., 2006). There were 2 measures of anxiety in this model: anxious arousal and general anxious distress. That general anxious distress did not contribute to this finding, it appears that the physiological arousal component explains this result. Nes, Segerstrom, and Sephton, (2005) found that some forms of positive emotions, such as optimism are associated with greater skin

conductance responses and increased Cortisol. Therefore, trait factors such as optimism that lead to a decreased negativity bias, may be physiologically taxing and mirroring symptoms of anxious arousal (e. g. sweaty palms, racing, heart, etc).

There are several strengths that should be noted in this study. First, we used a forced-choice paradigm, in which participants were instructed to select one of three differently valenced responses. Several studies utilize a free-choice paradigm (Huppert et al., 2007, Wisco & Nolen-Hoeksema, 2010). This has some intuitive appeal in assessing interpretation bias in that we can understand more precisely how responses are generated, however the process of generating responses requires cognitive effort and may be less susceptible to picking up interpretation biases. Also, participants may generate uncodable responses. Second, the use of the current paradigm included the option to resolve the ambiguity using positive, negative, and neutral valenced responses. Other studies include only 2 valenced responses, such as threat and benign resolutions (Beard & Amir, 2009) or negative and benign resolutions (Hindash & Amir, 2011). Using positive, negative, and neutral resolutions allow us to understand the full spectrum of interpretation bias in certain mood states.

Another strength of this study is that there is limited empirical data that speaks to interpretation bias and emotion regulation in a nonclinical population. It has been shown that interpretation bias plays a role in maintaining psychological distress in nonclinical (Wilson et al., 2006) and clinical population (Franklin et al., 2005). It is also know that cognitive reappraisal has been shown to be effective to decrease explicit distress (Denson, Moulds, & Grisham, 2012; Fabiansson, Denson, Moulds, Grisham, & Schira, 2012; Mauss, Cook, Cheng, & Gross, 2007), however the extent of cognitive reappraisal

is not fully understood until we understand it's role in interpretation bias. The current study did not find significant results in interpretation bias and emotion regulation, however, further research should be conducted in this area using different paradigms and emotions. This would help us better understand the pervasive effect of different emotions (e.g. anger, anxiety, etc) as well as the complete effectiveness of different emotion regulation strategies.

Results from this study show promising implications for cognitive reappraisal and subclinical anger on reducing explicit feelings of negativity. However, there are a few limitations that should be noted. First, it is difficult to separate implicit emotion regulation in this study. We used the ERQ-SF as a proxy measure for implicit emotion regulation. That is, it measured their use of cognitive reappraisal during the mood induction without being instructed to do so. Not surprisingly, individuals who engaged in cognitive reappraisal during Angry autobiographical recall showed differences in implicit, but not explicit interpretation biases. Engagement in Suppression did not have a significant impact on implicit or explicit biases. The current model showed that instructed cognitive reappraisal was effective in reducing negative affect following an Angry event, which may have had a stronger effect in individuals who engaged in automatic reappraisal during the MIP. However, the ERQ-SF only measured Cognitive Reappraisal, and Suppression, as such it is unclear if other forms of implicit emotion regulation, such as distraction or acceptance would influence the results.

Second, while the current interpretation bias paradigm had several strengths, it may have been susceptible to other processes, such as social desirability and that some items were not subtle in assessing the desired variables. For example, one item from the

task was, 'Today I had a good day, which means that tomorrow will probably be

_____.'. In this situation a participant may not want to be seen as overly negative, and thus change their responses accordingly. Using other paradigms, such as a word association task may help us understand interpretation bias without as much interference if social desirability is playing a role.

In conclusion, the current study demonstrated that cognitive reappraisal is an effective tool to reduce negative emotionality in angry mood states. Further, individuals in angry mood states displayed an increasingly negative interpretation bias from baseline, indicating that anger influences cognitions. Despite efficacy of regulating negative emotionality in anger, cognitive reappraisal was not effective in reducing negative interpretation bias, indicating that perhaps anger is a more difficult emotion to implicitly modulate. Finally, the current study found that individuals who engage in automatic cognitive reappraisal while experiencing an emotion, display less negative emotionality and a greater positivity bias following instructed reappraisal. Further, individuals who experience high state anger or typically struggle to engage in healthy emotion regulation experienced greater negative emotionality and an increased negativity bias following instructed reappraisal. Such results indicate that state and trait emotion influence implementation of cognitive reappraisal and the resulting interpretation biases.

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APPENDIX A: TABLES

Table 1

Repeated Measures ANOVAs Evaluating Emotion Descriptor Change in Angry Induction

	df	*F*	partial η^2
Negative Emotion Descriptors			
Time	1, 102	231.02**	0.69
Emotion	4, 99	23.75**	0.49
Time x Emotion	4, 99	38.78**	0.61
Positive Emotion Descriptors			
Time	1, 102	127.48**	0.56
Emotion	4, 99	4.59*	0.16
Time x Emotion	4, 99	12.33**	0.33
Engagement Descriptors			
Time	1, 102	1.47	0.01
Emotion	1, 102	22.48**	0.18
Time x Emotion	1, 102	20.21**	0.17

N=103
*p<.01, **p<.001

Table 2

Repeated Measures ANOVAs Evaluating Change in Emotion Descriptors in Neutral Induction

	df	F	partial η^2
Negative Emotion Descriptors			
Time	1, 101	4.13*	0.04
Emotion	4, 98	18.36**	0.43
Time x Emotion	4, 98	3.06*	0.11
Positive Emotion Descriptors			
Time	1, 101	0.27	0.00
Emotion	4, 98	24.08**	0.50
Time x Emotion	4, 98	1.19	0.05
Engagement Descriptors			
Time	1, 101	0.13	0.00
Emotion	1, 101	40.75**	0.29
Time x Emotion	1, 101	0.50	0.01

N=102

*p<.01, **p<.001

Table 3

Repeated Measures ANOVA Evaluating Different Interpretation Bias by MIP (Aim 1)

	df	*F*	partial η^2
MIP	1, 95	2.021	0.02
Response Valence	2, 94	69.64**	0.60
MIP x Response Valence	4, 92	7.59**	0.25

*p<.01, **p<.001

Table 4

Repeated Measures ANOVAs Evaluating Change in Negative Affect (Aim 2)

	df	F	partial η²
Mood Induction	1, 101	122.09**	0.55
Emotion Regulation	1, 101	31.57**	0.24
Mood Induction x Emotion Regulation	1, 101	8.98*	0.08

*p<.01, **p<.001

Table 5

Repeated Measures ANOVAs Evaluating Change in Interpretation Bias and per Emotion Regulation in the Angry condition (Aim 3)

	df	*F*	partial η^2
Emotion Regulation	1, 102	1	0.01
Response Valence	2, 101	29.09**	0.37
Emotion Regulation x Response Valence	2, 101	0.46	0.01

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

Table 6

Repeated Measures ANOVAs Evaluating Change in Negative Affect (Aim 3)

	df	F	partial η^2
Emotion Regulation	1, 101	1.00	0.01
Response Valence	2, 100	58.68**	0.54
Emotion Regulation x Response Valence	2, 100	0.20	0.00

*p<.01, **p<.001

Table 7

Results of regression analysis predicting Negative Affect and valenced responses after Angry Reappraise: DERS (Aim 4)

Variable	Negative Affect (a)			Positive Bias (b)			Negative Bias (c)			Neutral Bias (d)		
	B	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
DERS	0.03	0.01	0.28**	-0.02	0.01	-0.27**	0.02	0.01	0.29**	0.00	0.01	0.01
R^2		0.08			.07			.08			0.00	
F for change in R^2		8.49**			7.64**			9.15**			0.00	

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

Table 8

Results of regression analysis predicting Negative Affect and valenced responses after Angry Reappraise: STAXI (Aim 4)

Variable	Negative Affect (a)			Positive Bias (b)			Negative Bias (c)			Neutral Bias (d)		
	B	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
State Anger	0.10	0.05	0.21*	-0.03	0.03	-0.13	0.06	0.03	0.23*	-0.02	0.02	-0.11
Trait Anger	-0.01	0.05	-0.03	-0.03	0.03	-0.10	0.03	0.03	0.13	-0.01	0.02	-0.05
R²		0.04			0.04			0.09			0.02	
F for change in R²		2.11			1.88			5.09**			0.94	

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

Table 9

Results of regression analysis predicting Negative Affect and valenced responses after Angry Reappraise: MASQ (Aim 4)

Variable	Negative Affect (a)			Positive Bias (b)			Negative Bias (c)			Neutral Bias (d)		
	B	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
General Anxiety	0.30	1.12	0.08	-0.03	0.03	-0.16	0.04	0.03	0.26	-0.02	0.02	-0.12
General Depression	0.06	0.03	2.46	0.01	0.02	0.05	0.02	0.02	0.13	-0.02	0.02	-0.19
Anxious Arousal	-0.04	0.04	-0.16	0.03	0.02	0.19	-0.04	0.02	-0.29*	0.02	0.02	0.13
Anhedonia	-0.01	0.02	-0.04	-0.04	0.01	-0.33**	0.02	0.01	0.2	0.02	0.01	0.22
R^2		0.06			0.13			0.17			0.05	
F for change in R^2		1.48			3.67**			4.78**			1.15	

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

Table 10

Results of regression analysis predicting Negative Affect and valenced responses after
Angry Reappraise: ERQ-SF (Aim 4)

	Negative Affect (a)			Positive Bias (b)			Negative Bias (c)			Neutral Bias (d)		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
Reappraise	-0.15	0.08	-0.19	0.14	0.58	0.30**	-0.17	0.04	-0.38***	0.01	0.04	0.03
Suppress	-0.07	0.06	0.12	-0.03	0.34	-0.08	0.00	0.03	0.00	0.02	0.03	0.06
R^2		0.04			0.09			0.15			0.01	
F for change in R^2		2.08			4.68*			8.43***			0.25	

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

APPENDIX B: FIGURES
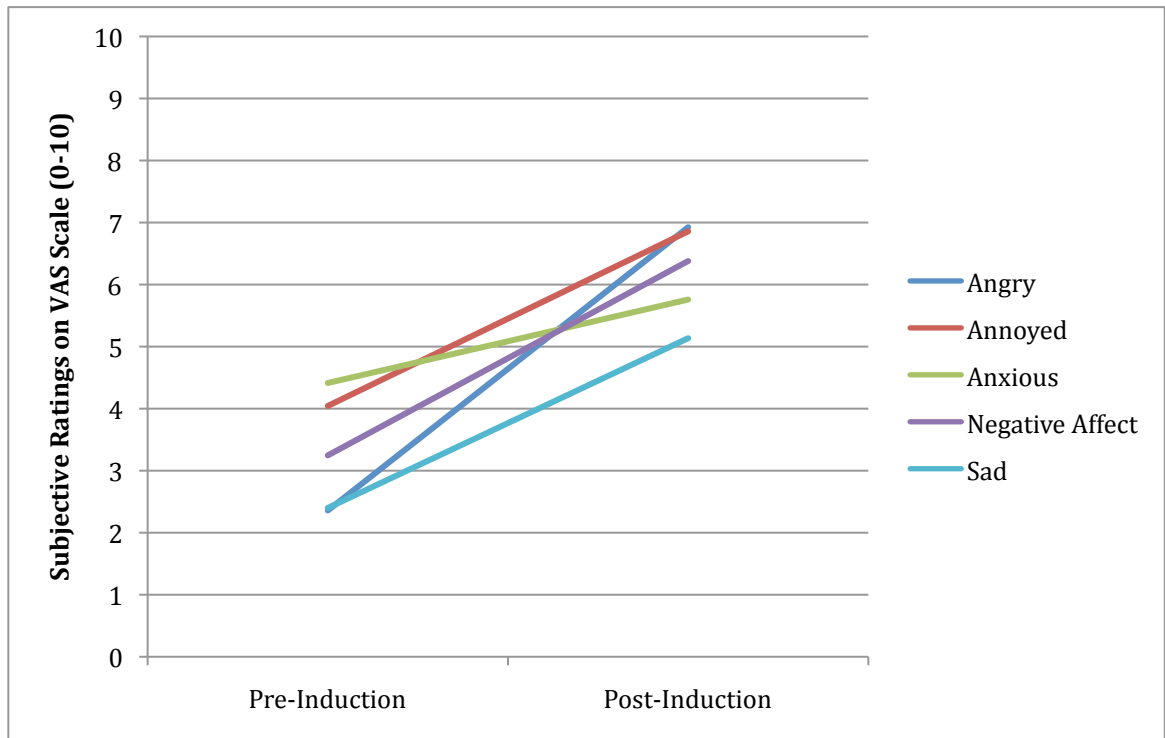
Figure 1. Mean Ratings of Negative Emotion Descriptors before and after Angry MIP
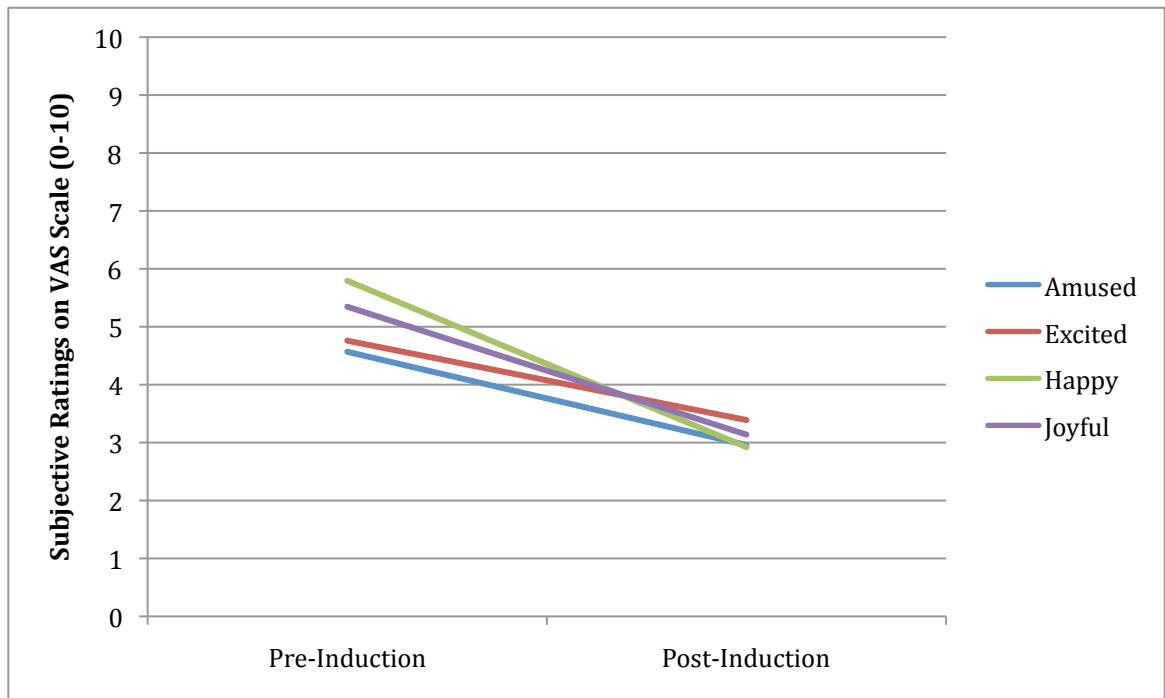
Figure 2. Mean Ratings of Positive Emotion Descriptors before and after Angry MIP
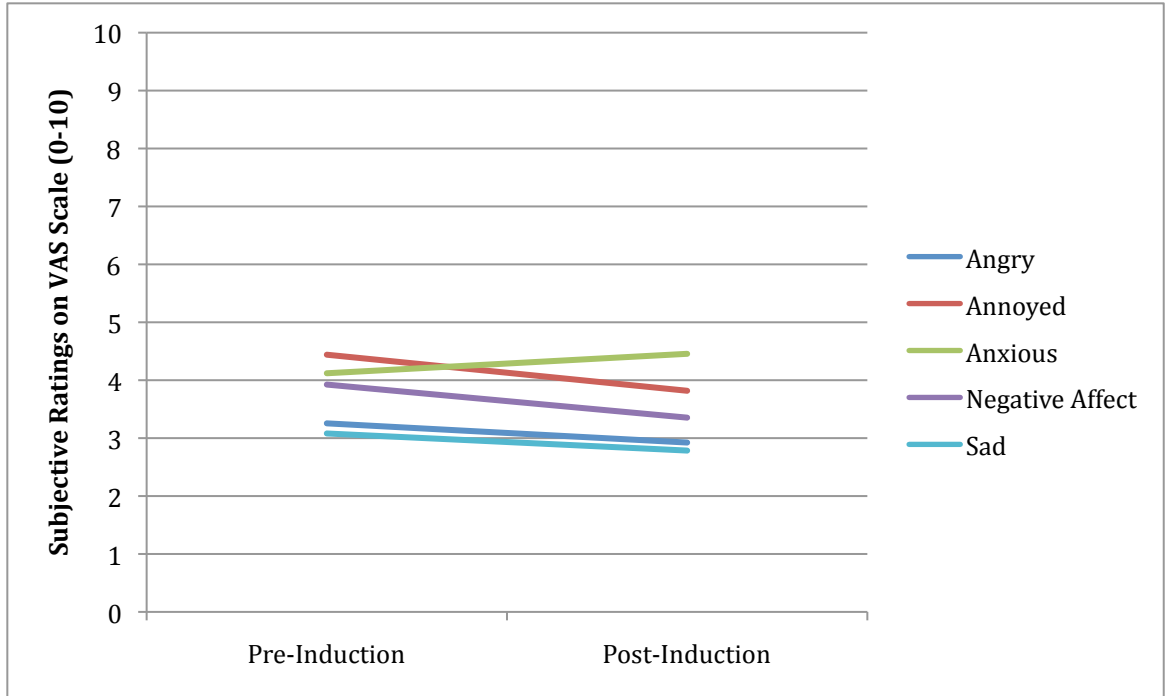
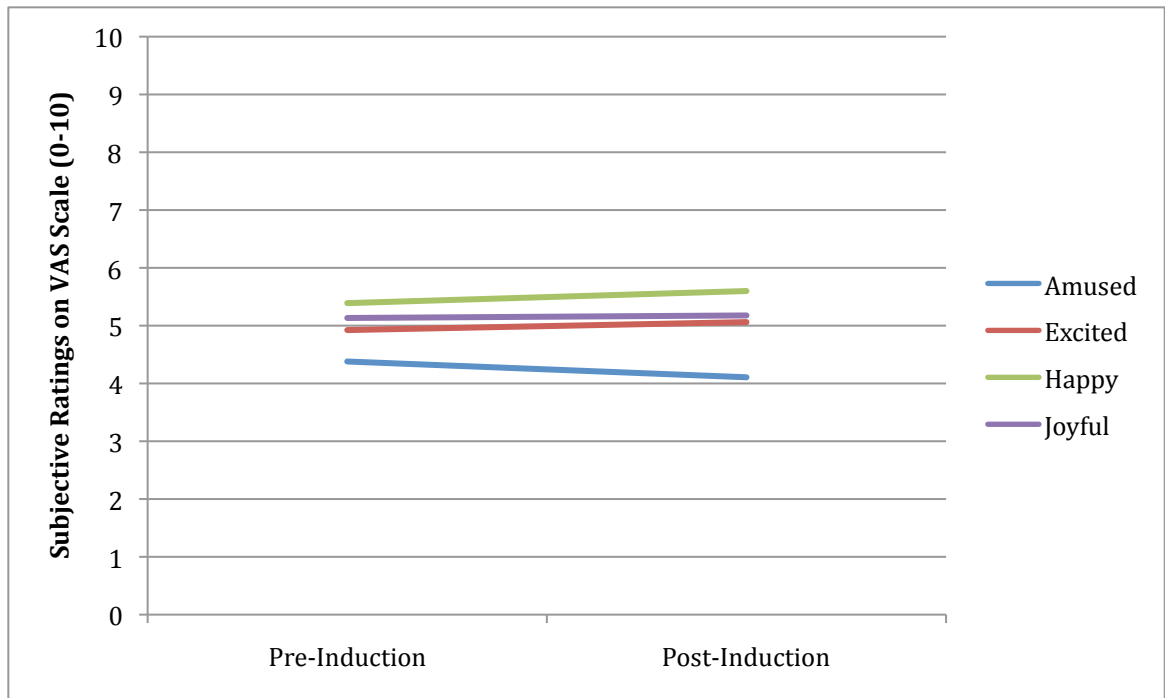*Figure 3.* Mean Ratings of Negative Emotion Descriptors before and after Neutral MIP

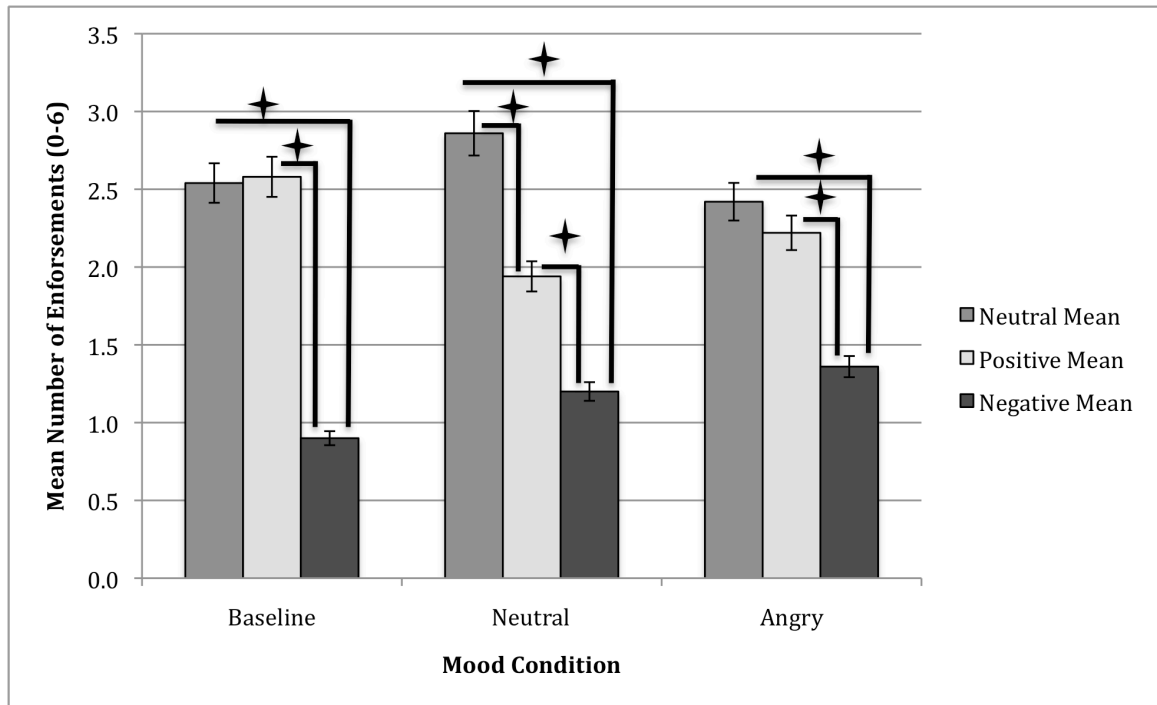*Figure 4.* Mean Ratings of Positive Emotion Descriptors before and after Neutral MIP

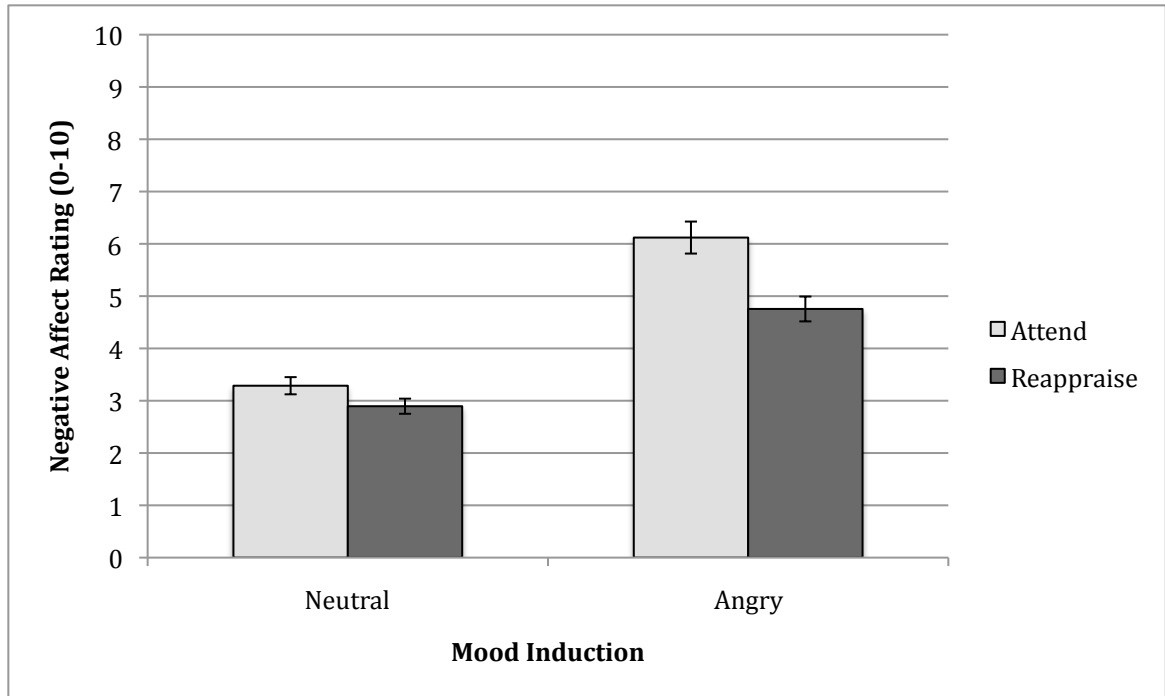*Figure 5*. Mean (95% CI) Interpretation Bias per Mood Condition (Aim 1)

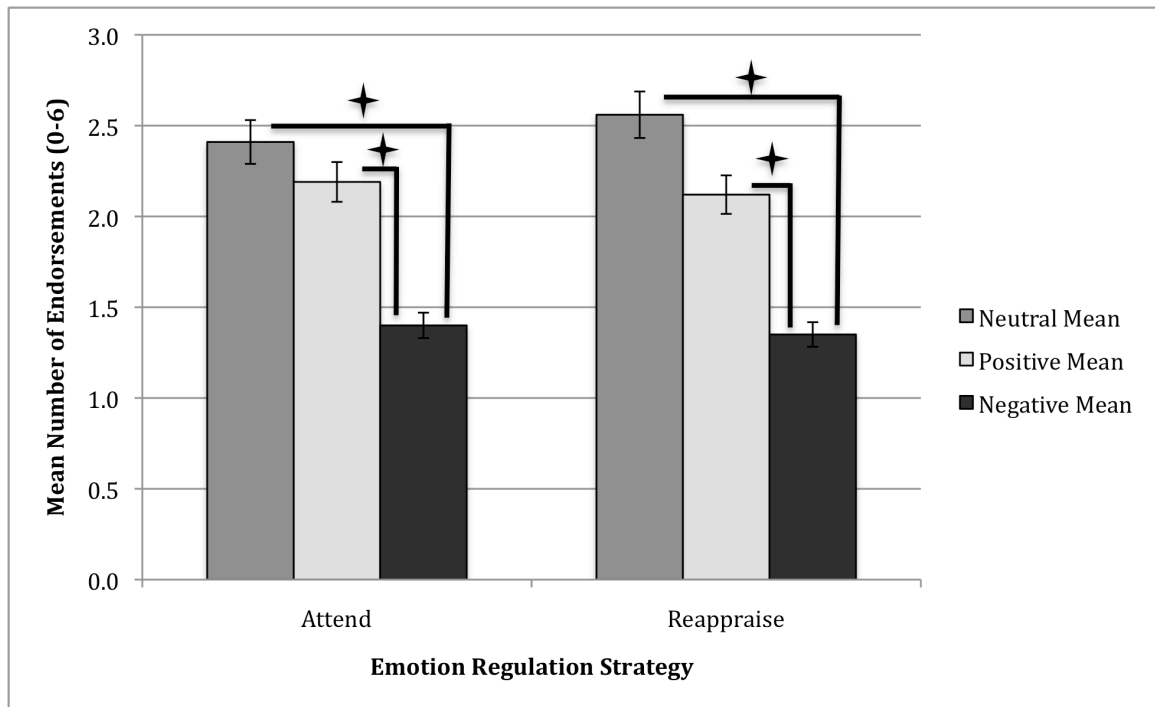*Figure 6.* Mean Negative Affect Ratings per Mood Condition and Emotion Regulation Strategy (Aim 2)

Figure 7. Mean (95% CI) Interpretation bias in Angry Condition and Emotion Regulation (Aim 3)

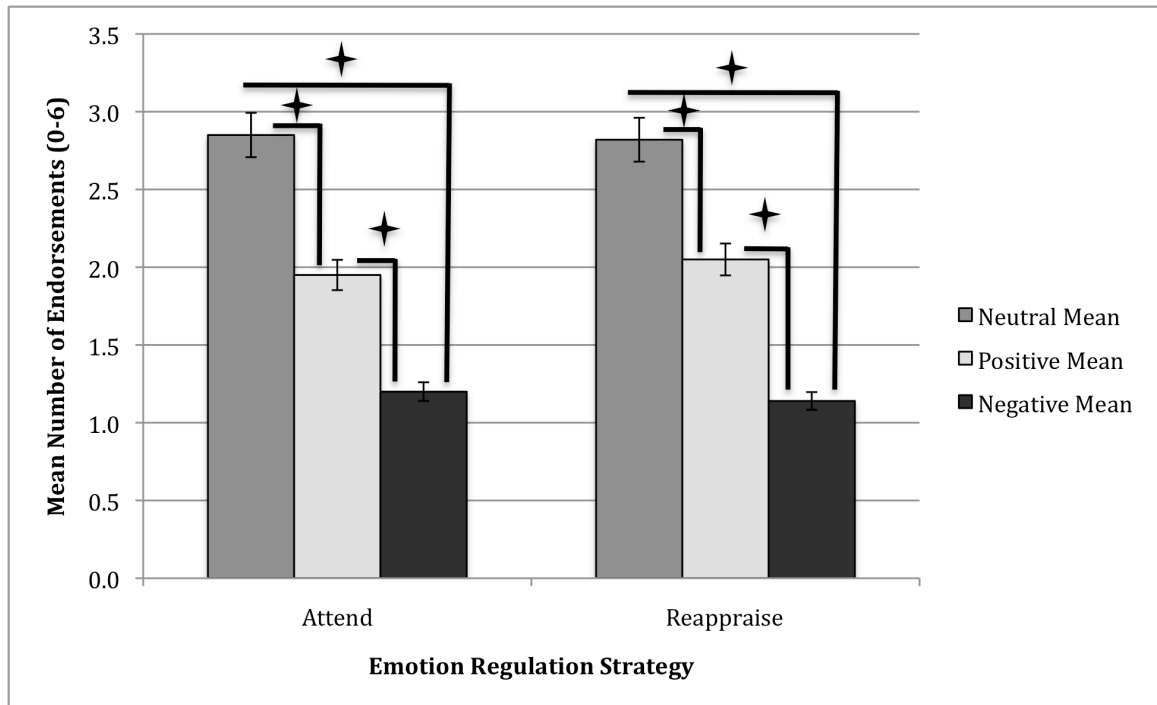*Figure 8.* Mean (95% CI) Interpretation Bias in Neutral Condition and Emotion
Regulation (Aim 3)