

UNIVERSITY OF CALGARY

Cognitive Vulnerability in Previously Depressed Individuals: The Impact of a Negative
Mood Induction on Attentional Biases

by

Kristin Newman

A THESIS

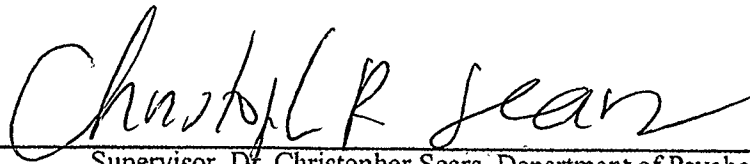
SUBMITTED TO THE FACULTY OF GRADUATE STUDIES IN PARTIAL
FULFILLMENT OF THE REQUIREMENTS FOR THE
DEGREE OF MASTER OF SCIENCE

DEPARTMENT OF CLINICAL PSYCHOLOGY
CALGARY, ALBERTA

SEPTEMBER, 2011

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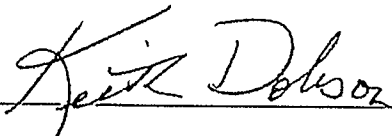
The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled "Cognitive Vulnerability in Previously Depressed Individuals: The Impact of a Negative Mood Induction on Attentional Biases" submitted by Kristin Newman in partial fulfillment of the requirements for the degree of Master of Science.



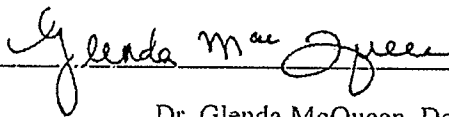
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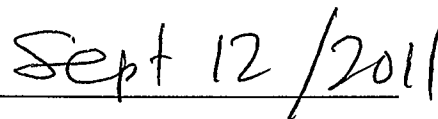
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Abstract

Cognitive models of depression postulate that information processing biases are an important cognitive vulnerability in those at risk for depression (Gotlib & Joormann, 2010). To test this assumption, attentional biases were examined in never, previously, and currently depressed individuals using a mood induction paradigm. A neutral or negative mood was induced, after which attention to emotional and neutral images was measured using eye-tracking methodology. For previously depressed individuals, the negative mood induction did not impact attentional biases differently than the neutral mood induction—both groups evidenced a attentional bias for depression-related images—but it did impact the attention of never depressed individuals, with those in the negative mood induction condition attending more to positive images and less to anxiety-related images relative to those in the neutral mood induction condition. The implications for the existence of a cognitive vulnerability to depression are discussed.

Acknowledgements

I would first like to express my gratitude to my supervisor, Dr. Christopher Sears for his guidance and generous support throughout the course of my Master's degree, and especially for all of his input and mentorship towards the completion of my research project. I would also like to thank Dr. Keith Dobson and Dr. Glen Bodner for their participation as members of my committee, and for all of their helpful suggestions at both the initial and final stages of my project. Thank you also to Dr. Glenda McQueen for participating in my thesis defense as an external examiner. I would especially like to thank my colleagues in the Cognitive Sciences Lab for their contributions to this project. Lastly, thank you to Lee for assuming most of what should be our joint household roles, and my patient children, Jessica, Alex, and Adam who always ask when I will be done with school and have to live with a mother who spends most of her time in front of her computer doing school work.

This research project was financially supported by the University of Calgary, a CIHR CGS Scholarship held by Kristin Newman, and an operating grant from NSERC awarded to Christopher Sears.

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Cognitive Vulnerability in Previously Depressed Individuals: The Impact of a Negative Mood Induction on Attentional Biases

Depression is a debilitating and persistent mood disorder with a recurrence rate estimated to be 75% within two years of recovery (Gotlib & Hammen, 2002). Each episode of depression is thought to impact the mental health outcome and overall functioning of individuals. In order to identify, treat, and ultimately prevent depression, it is important to understand the vulnerabilities and risk factors associated with experiencing subsequent episodes of depression. The purpose of the present study was to explore how one cognitive vulnerability—attentional biases—are implicated in the onset and recurrence of depressive episodes.

Information Processing Biases and Depression

A great deal of research supports the idea that depression is associated with information processing biases, consistent with one of the key assumptions of cognitive models of depression (e.g., Beck, Rush, Shaw, & Emery, 1979; Beck & Clark, 1988; Ingram, Miranda, & Segal, 1998). These models propose that depressive schemas develop over time in response to early negative life events and lead to attentional biases which influence the selection, encoding, evaluation, and memory of emotional information (Gotlib & Joorman, 2010; Yiend, 2010). For depressed individuals one consequence is an increased tendency to attend to stimuli with themes of loss, failure, and sadness. An attentional bias for negative stimuli is postulated to play an important role in the development and maintenance of depression and has therefore been a focus of much research over the past three decades.

Cognitive models of depression maintain that attentional biases are not merely symptoms of depression but are instead an important cognitive vulnerability of those at risk

for depression. According to some researchers, an attentional bias for negative stimuli is both an etiological and maintaining factor of depression (DeRaedt and Koster, 2010).

DeRaedt and Koster propose that a lack of control over attentional processes is a key factor in the vulnerability to subsequent depressive episodes: “Although many other cognitive processes may also be relevant to depression vulnerability...we propose a new conceptual framework with mood congruent attentional biases as the central process” (p. 50).

The Study of Attentional Biases in Dysphoric and Depressed Individuals

To understand if attentional biases confer a vulnerability to depression, it is important to first understand how they manifest during a depressive episode. Attentional biases in dysphoric and depressed individuals have most often been studied using the modified emotional Stroop task (Nunn, Mathews, & Trower, 1997; Gilboa & Gotlib, 1997) and the dot probe task (Joorman & Gotlib, 2007; Mogg, Millar, & Bradley, 2000; Bradley, Mogg, & Millar, 2000). The results of these studies are not entirely consistent, with many findings not indicative of attentional biases in depression (see Mogg & Bradley, 2005 for a review). Some have found evidence of attentional biases, but mainly with longer durations of stimuli presentation (e.g. Bradley, Mogg, & Lee, 1997; Gotlib, Krasnoperova, Yue, & Joorman, 2004). A recent meta-analysis of 22 dot-probe and emotional Stroop task studies concluded that depressed individuals do evidence greater biased attention to negative stimuli relative to non-depressed individuals, with the dot-probe task found to be a more robust measure of attentional biases relative to the Emotional Stroop task (Peckham, McHugh, & Otto, 2010).

Recently, researchers have begun to study attentional biases using eye-tracking techniques (discussed in Ingram, Steidtmann, and Bistricky, 2008). One advantage of eye-tracking paradigms is the ability to continuously track and record the allocation of attention

over extended intervals of time. Recent eye gaze tracking studies have used similar methods to study the shifts of attention over time when multiple emotional images compete for attention (Caseras, Garner, Bradley, & Mogg, 2007; Eizenman et al., 2003; Kellough, Beevers, Ellis, & Wells, 2008; Leyman, DeRaedt, Vaeyens, & Philippaerts, 2011; Sears, Thomas, LeHuquet, & Johnson, 2010). For example, Eizenman et al. presented depressed and non-depressed individuals with four types of images (positive, dysphoric, threat-related, and neutral) and examined participants' attention to the images over a 10.5 second viewing time. Their results showed that the depressed participants attended to dysphoric images longer than non-depressed participants, which is evidence for a negative attentional bias in depression. Similarly, Kellough et al. showed participants sets of four images (positive, dysphoric, threat-related, and neutral) and monitored attention to these images over a 30 second viewing time. Like Eizenman et al., Kellough et al. found that depressed participants spent more time attending to depression-related images (e.g., images depicting themes of sadness and loneliness) than non-depressed participants. Unlike Eizenman et al., Kellough et al. also found that depressed participants attended to positive images significantly less than non-depressed participants. The results of these studies lend strong support to the idea that depressed individuals exhibit attentional biases that likely contribute to the maintenance of a depressive episode. The present study examined whether those with a *history* of depression exhibited biases in attention and what the nature of those biases are.

Attentional Biases in Previously Depressed Individuals

It is estimated that approximately one-half to three quarters of those who have been depressed in the past will experience another episode of depression (Gotlib & Hammen, 2002). After one episode of depression, the likelihood of recurrence is 50%, increasing to

90% after three episodes (Munoz, Le, Clarke, & Jaycox, 2002). This high rate of recurrence has been postulated to reflect the existence of stable vulnerability factors, which lead to an increased risk of experiencing additional depressive episodes (Gotlib & Joorman, 2010).

A cognitive vulnerability is defined as a persistent, stable, internal characteristic that predisposes an individual to the development and emergence of depressive symptomatology (Ingram et al., 1998). This vulnerability is not readily observable and is presumed to be present even when no overt symptoms of depression are apparent—it is a stable, yet latent characteristic (Beck et al., 1979). As proposed by cognitive models of depression, activation of this underlying vulnerability is hypothesized to be due to a diathesis-stress interaction. Depression onset is thought to occur as a result of the interaction of a psychological tendency towards maladaptive cognitions and information processing combined with a negative life event, both of which work together to ultimately elicit the latent vulnerability (Joorman & Gotlib, 2010).

Depression researchers have suggested that cognitive vulnerabilities in those with a history of depression manifest in the form of biased information processing, especially attention (Beck et al., 1979; Gotlib & Joorman, 2010), and are in part related to the activation of dysfunctional cognitive schemas. As described by Ingram et al. (1994), “How an individual’s finite pool of attentional resources is distributed is thought to be a schema driven process that functions to structure the information that is processed by the individual.” (p. 319). Cognitive vulnerabilities can manifest as negative attentional biases—attending more to negative stimuli in the environment—and researchers have also hypothesized that those vulnerable to depression will give less attention to positive stimuli (see Teasdale, 1988 for a review; McCabe, Gotlib, & Martin, 2000). Surprisingly, very

little research has looked for attentional biases in individuals with a history of depression. The question of whether attentional biases impact those recovered from depression has important implications for determining if this pattern of information processing is a trait or state characteristic of depressed individuals. Understanding the specific manifestation and contribution of attentional biases to vulnerability in those previously depressed could inform their unique role in the onset and recurrence of subsequent depressive episodes.

There is some evidence that previously depressed individuals exhibit attentional biases, although the evidence is perhaps not as strong as cognitive models would lead one to expect. For theoretical reasons, it is presumed that a stressor is required to elicit cognitive vulnerabilities in those with a history of depression (due to their latent nature), and methodologically the use of mood priming techniques is often thought to be the best way to elicit those vulnerabilities (Just, Abramson, & Alloy, 2000; Scher et al., 2005). A few studies have examined information processing in previously depressed individuals without the use of mood priming, but with conflicting findings. In one study, previously depressed and non-depressed individuals completed a word finding task (a visual search task), and both groups found more positive words than negative words (Wenzlaff, Rude, Taylor, Stultz, & Sweatt, 2001). When an additional task increased their cognitive load, however, the previously depressed individuals performed more like depressed individuals in that they identified more negative words than positive words. Wenzlaff et al. concluded that previously depressed individuals were less able to suppress negative thoughts when under a cognitive load due to a disruption in mental control efforts. Thus, in this study, a cognitive load was required to elicit the cognitive vulnerability to depression in previously depressed individuals.

Hedlund and Rude (1995) reported findings different from Wenzlaff et al. with groups of never depressed, previously depressed, and currently depressed individuals. They predicted that previously depressed individuals would show a negative bias on two information processing tasks: the emotional Stroop task and the scrambled sentences task. For the emotional Stroop task they found that the currently depressed group was slower to name the colours of negative words than never depressed participants (reflecting increased interference), whereas the differences between the previously and never depressed groups were not significant. For the Scrambled Sentences task, participants unscrambled a random string of words into a positive or negative sentence (e.g., “winner born I am loser a”). They found that both previously depressed and currently depressed participants created more negative sentences than the never depressed participants. Hedlund and Rude concluded that the more salient stimuli in the Scrambled Sentences task likely provided a more ecologically valid method of testing for latent schemas relative to the Stroop task. However, the mixed findings of this study highlight the difficulty involved in demonstrating the existence of a cognitive vulnerability in those with a history of depression.

Joormann and Gotlib (2007) examined attentional biases in the processing of emotional faces in previously depressed and depressed individuals using a dot probe task. A neutral face was paired with either a happy or sad face and presented for 1000 ms. Joormann and Gotlib found that previously depressed and depressed individuals selectively attended to sad faces, whereas never depressed individuals avoided sad faces and oriented toward happy faces. Their study indicated that previously and currently depressed individuals exhibited a similar attentional bias to negative stimuli. If so, this would constitute strong evidence in support of the notion that attentional biases are trait-like

characteristics of individuals susceptible to depression, lending support to the presence of a cognitive vulnerability in those previously depressed.

Mood Inductions in Previously Depressed Individuals

As noted, because the cognitive vulnerability for depression is presumed to be latent, it has been suggested that a stressor is required to activate the dormant maladaptive schemas—known as cognitive reactivity—in order to observe information processing biases (Beck, Rush, Shaw, & Emory, 1979; Beck, 1987; Ingram et al., 1994; Scher et al., 2005). Similarly, the mood-state dependent hypothesis proposed that cognitive vulnerability factors are present, but dormant until activated by a negative or sad mood (Miranda & Persons, 1988; Miranda & Gross, 1997). Given that Beck's theory implied that stress plays an activating role and is required to elicit cognitive vulnerability, Just et al. (2000) and Scher et al. (2005) have argued that a significant issue with many remitted depression studies that seek to establish the presence of a cognitive vulnerability is that they have attempted to test the theory when the vulnerability was not actually activated. A negative mood induction (MI) procedure, analogous to a stressful life event, is intended to create a situation where the cognitive vulnerability emerges, manifested in the form of negative attentional biases.

The use of the negative MI procedure has provided support for evidence of attentional biases in individuals with a history of depression, and also an understanding of how a negative mood state impacts never depressed individuals. For example, Hunt and Forand (2005) found that a sad mood prime created a sad mood in never depressed individuals, but this sad mood did not increase their levels of dysfunctional attitudes (as measured by the Dysfunctional Attitudes Scale- DAS)—their attitudes became no more negatively biased after experiencing the sad mood prime.

Ingram et al. (1994) employed a negative MI in combination with a dichotic listening task to examine attentional processes in both never and previously depressed individuals. In the dichotic listening task, participants are instructed to listen to a target message in one ear and to ignore distractor stimuli presented in the other ear. Errors in tracking the target message occur when the participant momentarily attends to the distractor stimuli. In the neutral MI condition, no differences were found between the previously depressed and never depressed individuals in the number of tracking errors made. In the negative MI condition, however, previously depressed individuals made more tracking errors than never depressed individuals when the distractor stimuli were both positive and negative words. Ingram et al. concluded that the sad MI impacted attentional tracking to emotional stimuli, but only for the previously depressed individuals, and argued that these results provided evidence of a latent depressive schema in previously depressed individuals and a “protective bias” in never depressed individuals.

McCabe, Gotlib, and Martin (2000) used a deployment of attention task to examine the effect of a negative MI on attention to emotional words in previously depressed and never depressed individuals. In this task, participants are presented with pairs of neutral and negative words and told to select the one word that is presented first, although both words are actually presented simultaneously. The word reported by the participant to be presented first is taken to indicate the word that was attended first and for the most time. McCabe et al. found that with a neutral MI, both previously depressed and never depressed individuals directed attention away from negative words, which was interpreted as evidence of a protective bias in the allocation of attention (similar to the bias observed in never depressed individuals in other deployment of attention tasks, e.g., Ellis, Beevers, & Wells, 2010; Joorman & Gotlib, 2007). In contrast, with a negative MI, those previously depressed

attended equally to negative and neutral words in an unbiased fashion, no longer diverting attention away from the negative words, whereas those never depressed maintained their protective bias and directed attention away from negative words. McCabe et al. concluded that an absence of this protective bias in those previously depressed “may be one pathway that contributes to their vulnerability to developing depression.” (p. 441).

The Present Study

The purpose of this study was to determine how a neutral or negative MI would impact attentional biases to emotional images in previously depressed individuals relative to never depressed and currently depressed individuals. This is the first study to use eye-tracking methodology in combination with a negative MI to examine attentional biases in individuals recovered from depression. Through determination of the impact and necessity of a negative MI for elicitation of attentional biases in previously depressed individuals, the aim of the study was to advance knowledge of cognitive vulnerabilities to depression. In this study, a film-based negative MI procedure was employed to induce a negative mood state in individuals never depressed, previously depressed, and currently depressed (a neutral MI condition was also used and served as the control condition). After the negative MI procedure, selective attention to four image types (depression-related, anxiety-related, positive and neutral) was examined using eye-tracking methodology to look for evidence of attentional biases.

Research Questions

The principle research hypotheses were as follows. Based on the idea that the cognitive vulnerability in individuals with a history of depression requires a negative mood to elicit (e.g., Just et al., 2000; Scher et al., 2005), it was hypothesized that previously depressed individuals in the negative MI condition would attend to emotional stimuli

similar to currently depressed individuals and differently than never depressed individuals; more specifically, they would attend more to depression-related images and attend less to positive images, exhibiting a pattern of attention similar to that of currently depressed individuals. Second, based on the results with previously depressed individuals in previous studies (e.g., Ingram et al., 1994; McCabe et al., 2000), it was hypothesized that previously depressed individuals in the negative MI condition would attend to depression-related images more (when the latent bias is presumed to be activated) relative to previously depressed participants in the neutral MI condition. Third, given previous research findings that individuals with no history of depression have a protective and/or positive bias when processing negative stimuli (e.g., Ellis et al., 2010; Joorman & Gotlib, 2007; Mathews & Antes, 1992; McCabe et al., 2000), it was hypothesized that never depressed individuals in both the negative and neutral MI conditions would attend more to positive images and less to negative images and that their attention would be relatively unaffected by the negative MI.

Method

Measures

The Patient Health Questionnaire-9 (PHQ-9; Spitzer, Kroenke, Williams, 1999) is a 9-item depression scale used to assess symptoms, functional impairment, and depression severity. This measure allows one to make a tentative depression diagnosis. The PHQ-9 is based on the diagnostic criteria for major depressive disorder as described in the Diagnostic and Statistical Manual 4th Edition (DSM-IV) and asks how often over the past two weeks the person has been bothered by each of the criteria for depression: depressed mood, anhedonia, appetite change, sleep disturbance, psychomotor agitation or retardation, loss of energy, feelings of worthlessness or guilt, diminished concentration and suicide attempts. It

is rated on a 4-point scale (“*Not at all*”, “*Several days*”, “*More than half the days*”, and “*Nearly every day*”). Categorical scoring can be used to establish a diagnosis of current or past depression, based on meeting one of the first two cardinal criteria (depressed mood, anhedonia), as well as endorsing at least four of the other criteria. Severity scores between 5-9 indicate minimal symptoms of depression, 10-14 indicate minor/mild major depression, 15-19 indicate moderately severe major depression, and scores greater than 20 indicate severe major depression. The PHQ-9 can be modified to assess a lifetime history of depression (PHQ-9 Lifetime), and scores on this measure have been shown to correspond with diagnoses of past Major Depressive Episodes as assessed by the Structured Clinical Interview for DSM-IV (SCID) (Cannon et al., 2007). In the current study, the original instructions were changed from: “*Over the last 2 weeks, how often have you been bothered by any of the following problems?*” to “*For the 2 weeks in your life (or longer) that you were the most blue, sad, or depressed, how often were you bothered by any of the following problems*”. The PHQ-9 Lifetime was used in the present study to establish a past history of depression. Participants had to meet criteria for past depression through endorsement of at least 5 criteria (At least one of the first two cardinal criteria plus at least four other criteria).

The BDI-II (Beck, Steer, & Brown, 1996) is a 21-item self-report inventory that measures participants’ depressive symptoms over the past two weeks. Each item is rated from zero to three, with a total score of 63, higher scores indicating more symptoms of depression. The BDI-II has excellent internal consistency in student ($\alpha = .93$) and outpatient samples ($\alpha = .92$) and excellent test-retest reliability ($r = .93$) (Beck et al., 1996).

A demographics inventory included questions about age, ethnicity, previous episodes of depression and anxiety, experiences with psychotherapy, and recent changes in

mood. A number of questions inquired about previous episodes of depression and anxiety (e.g., “*If you have experienced depression, how long ago was your last depressive episode?*”; “*Have you ever been diagnosed with anxiety by a mental health professional?*”), as well as medication and psychotherapy history (e.g., “*Have you had therapy or counseling for depression in the past?*”; “*Are you taking medication for anxiety right now?*”). (Appendix B)

The State Trait Anxiety Inventory (STAI; Spielberger et al., 1983) is a 40-item self-report measure used to assess transient and enduring levels of anxiety. It consists of both state and trait measures, each containing 20 statements that describe how one feels either at this moment or generally. State anxiety refers to the participant’s present feelings of anxiety, whereas trait anxiety measures the participant’s stable proneness to anxiety and how this anxiety tends to influence the perception of threats in the environment. Participants read each statement and rate them from 1 (*not at all*) to 4 (*very much so*), with scores ranging from 20 to 80.

Paulhus’ (1991) Balanced Inventory of Desirable Responding was used to assess socially desirable responding tendencies. This assessment was hypothesized to be important because the instructions for the negative mood induction had the potential to create a situation where participants may have felt compelled to report that they had experienced a shift in mood (i.e., the demand characteristics of the mood induction procedure may be more powerful for some individuals). The BIDR is a 40-item self-report measure of self-deceptive enhancement (SDE- the tendency toward a positively biased understanding of the self and impression management (IM- deliberate positively biased presentation of the self to others). For the purposes of the present study only scores on the IM scale were of interest. The 20-item SDE scale (items 1-20) and the 20-item IM scale (items 21-40) were

answered on 7-point Likert scales ranging from *not true* to *very true*. The scale has good internal consistency and convergent-discriminant validity. Cronbach alpha coefficients are 0.80 for the total BIDR and in the range of 0.80 to 0.86 for IM (Paulhus, 1991).

The Visual Analogue Mood Scale (VAMS; Luria, 1975) is a self-report instrument used to measure change in current mood state. It is a 100 mm horizontal line on which participants mark their current mood between “very sad” on the left and “very happy” on the right. Scores range from zero to 100 and are determined by measuring in mm the distance from the left side of the scale to the participants’ rating. The VAMS has been shown to have acceptable to very good reliability, with test-retest reliabilities ranging from $r = .59$ to $r = .80$ (Luria, 1975). In addition to the VAMS, mood ratings were collected using an 11-point scale ranging from -5 (*very sad*) to +5 (*very happy*), with a midpoint of 0 (*neutral*).

The Dysfunctional Attitudes Scale-Short Form (DAS-SF; Beevers et al., 2007) is a self-report scale that measures a variety of dysfunctional attitudes (e.g., rigid, negative, and perfectionist) that may contribute to the development of depressive symptoms. (See Appendix F for more information)

The Cognitive Style Questionnaire (CSQ; Alloy et al., 2000; Haeffel et al., 2008) is a measure of cognitive vulnerability. (See Appendix F for more information)

Participants and Group Assignment

The majority of the participants were University of Calgary undergraduate students recruited through an online research participation system. In an initial pre-screen process, participants completed the PhQ-9 Lifetime and the BDI-II online in exchange for course credit. Those who met group criteria in the pre-screen were invited to participate in the study. Participants were also recruited using posters placed throughout campus and these

individuals were compensated with \$20 gift cards for their time. To control for gender, all participants were women. Participants had normal or corrected-to-normal vision and could not wear eyeglasses because of the potential for reflections to reduce the accuracy of the eye-tracking system. The mean age of the participants was 22.7 (range of 18 to 60). All participants provided informed consent prior to their participation.

To determine which of the five groups a participant was assigned to, the participant first completed the PHQ-9 and the BDI-II to assess depression status (never depressed, previously depressed, or currently depressed). Participants classified as “never depressed” had scores indicative of not presently or ever meeting criteria for a diagnosis of depression on the PHQ-9 and PHQ-9 Lifetime, and a score of 6 or less on the BDI-II. These participants were randomly assigned to receive either the neutral or negative MI. Participants classified as “previously depressed” had scores indicative of not presently meeting criteria for depression on the PHQ-9, but they did meet criteria for a diagnosis of depression in the past on the PHQ-9 Lifetime, and had scores of 6 or less on the BDI-II to ensure they currently had very minimal depression symptoms. These participants were randomly assigned to receive either the neutral or negative MI. Participants classified as “currently depressed” had scores indicative of presently meeting criteria for a diagnosis of depression on the PHQ-9 and scores of greater than 20 on the BDI-II, the cut-off score recommended by Dozois, Dobson, and Ahnberg (1998) for a dysphoric or depressed classification (classified as depressed if also meeting criteria) when using undergraduate samples. All of the currently depressed participants were assigned to the neutral MI condition. After completing the PHQ-9 (both current and lifetime), the BDI-II, and the DAS-SF-I, each participant’s questionnaires were collected and quickly scored while the participant completed the demographics questionnaire, the 11-point mood rating scale (-5

to +5) and the VAMS mood rating. In this way no participant classified as currently depressed was assigned to a negative MI (in order to meet institutional ethics requirements).

A total of 281 participants were recruited for the study; 128 were assigned to one of the five groups based on meeting requirements for group membership. The final sample consisted of 28 participants in the never depressed neutral MI group, 30 participants in the never depressed negative MI group, 19 participants in the previously depressed neutral MI group, 23 participants in the previously depressed negative MI group, and 28 participants in the currently depressed neutral MI group. Of the 281 participants, those not placed into one of the five groups ($n = 153$): 1) did not fit into a group based on scores on the BDI, PHQ-9, and/or PHQ-9 Lifetime ($n = 130$), 2) were not successfully mood induced ($n = 11$), 3) had unusable eye-tracking data ($n = 4$), or 4) had unusual eye tracking data with many outliers (greater than 3 SDs from a group mean; $n = 8$).

Mood Induction Procedure

After completion of the questionnaires, the MI procedure began. Participants in the negative MI were told that the purpose of this procedure was to get them into a sad mood, as previous research has suggested that explicit instruction helps participants get into the intended mood state (Westermann et al., 1996). The negative MI condition consisted of a short film clip from the movie *The Champ* (Lovell & Zeffirelli, 1979), of approximately 9 minutes in duration. The clip depicts a scene about a young boy's reaction to his last moments with his father who was dying after he had just been fatally injured in a boxing match. This clip has been successfully used to induce negative mood in previously depressed women (Miranda et al., 1998) and has been validated in at least three separate studies as the most effective at eliciting sadness (Gross & Levenson, 1995; Hewig et al.,

2005; Rottenberg, Ray, & Gross, 2007). While viewing the clip, participants were instructed to imagine how they would feel if a similar event was happening to them, and to focus on a specific individual who was important in their life (their father, mother, husband, etc.). After viewing the clip, to help personalize the experience of the MI, participants were asked to imagine delivering a eulogy at that person's funeral (what they would think and say about that person). They wrote a short paragraph describing the eulogy (See Appendix D for paragraph instructions). Previous research has found that self-focused attention helps to increase negative mood, particularly in those with a history of depression (Miranda & Gross, 1997). While thinking and writing about their experience, the music *Russia Under the Mongolian Yoke*, composed by Prokofiev, was played at half speed in the background. This piece of music has been found to elicit a transient sad mood and to intensify the MI when used in combination with thinking about sad situations (e.g., Kelvin, Goodyer, Teasdale, & Brechin, 1999; Lethbridge & Allen, 2008). After writing their paragraph, they again rated their mood state on the VAMS and the 11-point mood scale before the eye-tracking portion of the study began. A decrease of 20 mm in self-reported mood on the VAMS was required to consider the negative MI successful. Participants who were not successfully mood induced still completed the eye-tracking portion of the study but their data was not included in any analyses.

Participants in the neutral MI procedure watched a short clip called 'EZ Hang Door Installation- How to Hang a Door', chosen based on its factual, non-emotional content (EZHangDoor, 2009). After viewing the clip, they wrote a paragraph on how they would explain to another person how to hang a door (see Appendix E for paragraph instructions). They then rated their mood on the VAMS and 11-point mood rating scale. After completing

the negative and neutral MI procedure, participants were fitted with the headband camera and the eye tracking system was then calibrated.

Stimuli for the Eye Tracking Portion of the Study

The stimuli were 160 colour images, divided equally among four categories: depression-related, anxiety-related, positive, and neutral. The distinction between depression-related and anxiety-related images was intended to differentiate between themes of sadness and threat. The majority of images were collected from the Internet and the remainder from the International Affective Picture System database (Centre for the Study of Emotion and Attention, 1999). The depression-related images included scenes of people appearing sad and unhappy, neglected animals (e.g., a puppy in a small cage), scenes of poverty, and gloomy landscapes. The anxiety-related images included themes of threat and injury, such as people being threatened with weapons, people with physical injuries (e.g., a burn on an arm), dangerous situations (a person walking along a cliff), vehicle accidents, and threatening animals. The positive images showed people smiling and laughing, children playing, rabbits and kittens, and vacation activities and destinations (e.g., a beach at a tropical resort). The neutral images were selected to include people in various activities and to have no obvious positive or negative theme (e.g., a woman talking on the telephone; a group of people having a meeting). They also included pictures of objects (e.g., a bicycle, a computer) and a variety of landscapes (e.g., office buildings). These images were categorized by a separate group of female undergraduate students (N = 152). They were presented with a total of 221 images, presented on a computer display one at a time, and for each image they were asked to choose one of the four categories that best described each image: 1) positive/happy, 2) sad/depressing/gloomy, 3) anxiety-provoking/dangerous/fearful, or 4) neutral/no emotion. They rated each image for valence

on a scale from -5 (*very negative*) to +5 (*very positive*), with a midpoint of zero (*neutral*). An image was chosen for use only if at least 85% of the raters agreed to its category.

Apparatus for Eye Tracking

Eye movements were recorded by an Eyelink I eye tracking system (SR Research Ltd., Mississauga, Ontario, Canada), which uses infrared video-based tracking technology. The system has a visual resolution of 20 sec. of arc and a sampling rate of 250 Hz (allowing for a temporal resolution of 4 ms). Participants wore a small lightweight headband equipped with a camera positioned below the right eye to track the position of the right eye's pupil as it moved. The eye-tracker was connected to a Dell Dimension 8300 computer and a ViewSonic G225fb 21-inch flat screen monitor with a vertical retrace rate of 160 Hz. The computer controlled the visual display and recorded the horizontal and vertical coordinates corresponding to the position of the right eye every 4 ms. Eye movements of the participant's right eye were tracked and recorded continuously throughout each trial.

Procedure for Eye Tracking

Participants received verbal instructions at the beginning of the session. They were told that their pupil dilation would be measured as they viewed the images to determine how pupil dilation varied as a function of image emotionality. On each trial, participants were shown four images: an anxiety-related image, a depression-related image, a positive image, and a neutral image (see Figure 1). One image was placed in each of the four corners of the display (top left, top right, bottom left, bottom right). Images were randomly assigned to the four corners of the display and across all of the trials each image type was equally likely to appear in each corner.

At the start of each trial the participant fixated on a black dot in the center of the display. The four images were then presented for 8 seconds and the participant was told to

look at the images in any fashion they wished. There were 45 trials in total, the first five being practice trials and the remaining 40 being data trials. Two versions of the 40 trial sequence were created to counterbalance the presentation lists, alternating each version with every other participant.

After viewing the images, participants completed the BIDR, the STAI, the DAS-SF-2, the CSQ, and the final VAMS and mood rating scale. Participants who received the negative MI were administered a positive MI, which consisted of watching a film clip from the movie *When Harry Met Sally* (Reiner, 1989), previously validated as successful in inducing a positive mood state (Schaefer et al., 2010). Participants were then debriefed and any questions were addressed.

Results

Participant Characteristics

Participant characteristics are listed in Table 1. The never depressed and previously depressed groups did not differ in terms of their age, BDI scores, PHQ-9 scores, or STAI scores. As expected, the never depressed group did differ from the previously and currently depressed groups on PHQ-9 Lifetime scores, which confirmed that never depressed participants had no history of depression, unlike the previously depressed and currently depressed participants. The ethnicity of the groups varied somewhat, with 69%, 74% and 39% of the participants in the never depressed, previously depressed, and currently depressed groups self-identifying as “Caucasian” on the demographics questionnaire, and most of the remaining participants in these groups self-identifying as “Asian”. The three groups did not differ significantly on their BIDR IM scores, $F(4, 112) = 1.59, p > .10, MSE = 12.45$, which indicated there was no reason for concern about group differences in

socially desirable responding, which could have influenced the self-reported effectiveness of the negative MI.

Effect of the Negative Mood Induction

The VAMS and 11-point mood rating scale data are listed in Table 2. A successful negative MI was defined as a decrease on the VAMS of at least 20 mm in the post-MI rating relative to the pre-MI rating. For never depressed participants who experienced the negative MI ($N = 38$), 31 were successfully mood induced (81.6%), with a mean VAMS decrease of 43.3 mm (79.7 vs. 36.4). The mean 11-point mood rating scale (+5 to -5) decrease was 4.8 (3.2 vs. -1.6). T-tests confirmed that participants' VAMS ratings were significantly lower following the negative MI, $t(29) = 10.19, p < .001$. The same was true for the mood ratings, with significantly lower ratings post-MI, $t(29) = 12.76, p < .001$. For the never depressed participants assigned to the neutral MI, VAMS scores were no different pre- and post-MI: 73.7 vs. 77.3, $t(27) = 0.64, p > .10$. There was a significant difference in the pre- versus post-neutral MI mood ratings, (2.5 vs. 2.1), $t(27) = 2.29, p < .05$, but this small reduction likely reflected participants' boredom with the neutral MI video (and perhaps the higher sensitivity of the mood rating measure relative to the VAMS). In any event, the difference (0.4 units on the mood rating scale) was very minor relative to the difference observed on the same scale in the negative MI condition (a decrease of 3.7 units).

Several other comparisons confirmed that the negative and neutral MIs had very different effects on the never depressed participants' self-reported mood. First, whereas never depressed participants in the neutral MI and negative MI did not differ on their pre-MI VAMS scores (73.7 vs. 79.7, respectively), $t(56) = 1.53, p > .10$, or their mood ratings (2.6 vs. 3.2, respectively), $t(56) = 1.51, p > .10$, they did differ on their post-MI VAMS

scores (77.3 vs. 36.4, respectively), $t(56) = 6.52, p < .001$, and their post MI mood ratings (2.1 vs. -1.6, respectively), $t(56) = 1.51, p < .001$.

For the previously depressed participants who experienced the negative MI ($N = 27$), 23 (85.2%) of the negative MIs were successful, with a mean VAMS decrease of 36.9 mm (72.7 vs. 35.8). The mean 11-point mood rating scale (+5 to -5) decrease was 3.7 (2.48 vs. -1.22). Pre- and post-MI VAMS and mood rating data were again compared using t -tests. These confirmed that participants' VAMS ratings were significantly lower following the negative MI, $t(22) = 9.92, p < .001$. The same was true for the mood ratings, with significantly lower ratings post-MI, $t(22) = 8.36, p < .001, SE = .442$. These analyses confirm that the negative MI was effective and produced the intended shift in participants' mood. For previously depressed participants assigned to the neutral MI, VAMS and mood ratings were no different pre- and post-MI: VAMS (71.6 versus 71.1), $t(18) = .32, p > .05, SE = 1.80$; mood ratings (2.5 vs. 2.2), $t(18) = 1.37, p > .05, SE = .26$. These data confirm that participants' moods did not change after experiencing the neutral MI, as intended. Additional comparisons confirmed that the negative and neutral MI had the intended effects on the previously depressed participants' self-reported mood. The participants in the negative MI did not differ from the participants in the neutral MI on their pre-MI VAMS scores (71.6 vs. 72.7), $t(40) = 0.22, p > .10$, or their pre-MI mood ratings (2.5 vs. 2.4), $t(40) = 0.19, p > .10$, whereas the two groups did differ on the post-MI VAMS scores (71.1 vs. 35.8), $t(40) = 6.75, p < .001$, and their post-MI mood ratings (2.2 vs. -1.2), $t(40) = 6.95, p < .001$.

Analysis of Eye Tracking Data

The fixation data were processed using the EyeLink Data Viewer analysis software (SR Research) to filter for blinks, missing data, and other recording artifacts (using the

default settings). To be included in the analyses, a fixation had to be at least 100 ms in duration. The dependent variables were the total fixation time for each image type (in milliseconds) and the number of fixations to each image type. These measures were computed for each image for each trial and then averaged over the 40 trials. The fixation data is listed in Table 3.

There were three separate sets of analyses: the first to determine if there were differences between the never depressed neutral MI group, the previously depressed neutral MI group, and the currently depressed neutral MI group in their attention to emotional images, the second to determine the effect of the negative MI on the never depressed groups' attention to emotional images, and the third to determine the effect of the negative MI on the previously depressed groups' attention to emotional images. For all analyses, the critical statistical test was the interaction between Group and Image Type (depression-related, anxiety-related, positive, and neutral); to control the Type I error rate follow-up tests were carried out only if this interaction was statistically significant ($p < .05$). Statistically significant interactions were followed up with between-group t-tests and an alpha of 5% to maximize statistical power.

Never Depressed vs. Previously Depressed vs. Currently Depressed: Neutral MI condition.

These analyses were carried out to look for differences between the never depressed, previously depressed, and currently depressed groups in their attention to emotional images. All of the participants included in these analyses experienced a neutral MI.

Number of fixations and total fixation time. These analyses were conducted to look for differences between the groups in the number of fixations and the total fixation

times to the four different image types (depression-related, anxiety-related, positive, and neutral). The number of fixations and the total fixation times to each image type were first analyzed together using multivariate analysis of variance (MANOVA) because these two measures were correlated and MANOVA is designed to handle correlated dependent variables (i.e., as the number of fixations to an image increase, the total fixation time also increases, with a mean correlation of .86 for the four image types). The data were analyzed with a 3 (Group: never depressed, previously depressed, currently depressed) x 4 (Image Type: depression-related, anxiety-related, positive, neutral) MANOVA.

There was a significant main effect of image type, Wilk's $\Lambda = .43$, $F(6, 430) = 37.64$, $p < .001$, partial $\eta^2 = .34$, with the most fixations and the longest total fixation times to the anxiety-related images and the fewest fixations and shortest total fixation times to the neutral images (see Table 3). The main effect of Group was not significant, Wilk's $\Lambda = .96$, $F < 1$. Most important was the significant interaction between Group and Image Type, Wilk's $\Lambda = .89$, $F(12, 430) = 2.05$, $p < .05$, partial $\eta^2 = .05$. The interaction indicated that the number of fixations and the total fixation times for the different image types were not the same for the three groups. Follow-up ANOVAs revealed that the critical Group x Image Type interaction was significant for both number of fixations, $F(6, 216) = 2.28$, $p < .05$, $MSE = 3.11$, partial $\eta^2 = .06$, and total fixation time, $F(6, 216) = 2.49$, $p < .05$, $MSE = 265585.05$, partial $\eta^2 = .07$. As seen in Table 3, group differences in the number of fixations and total fixation times were very similar, and therefore to reduce the complexity of the discussion only the total fixation time results are discussed further.

The Group x Image Type interaction in the total fixation data was followed-up with one-factor ANOVAs to look for group differences for each image type. The three groups differed in their total fixation times for depression-related images, $F(2, 72) = 7.25$, $p < .01$,

$MSE = 127953.52$, partial $\eta^2 = .17$. T-tests revealed a significant difference between the never depressed group and the currently depressed group, $t(54) = 3.99$, $p < .001$, with currently depressed participants having longer total fixation times for depression-related images than never depressed participants (1920 ms vs. 1560 ms). There was a similar difference between the never depressed group and the previously depressed group, with previously depressed participants' total fixation times for the depression-related images being significantly longer than those of the never depressed participants (1792 ms vs. 1560 ms), $t(45) = 2.29$, $p < .05$. The currently depressed group and the previously depressed group did not differ (1920 ms vs. 1792 ms), $t(45) = 1.08$, $p > .10$. These results indicate that both previously depressed and currently depressed individuals attended to depression-related images more than never depressed individuals. As can be seen in Table 3, the same pattern of group differences was evident in the number of fixations data.

The simple main effects analysis also revealed a marginally significant difference between the groups for positive images, $F(2, 72) = 2.51$, $p = .08$, $MSE = 371679.12$, partial $\eta^2 = .07$. T-tests indicated that previously depressed participants' total fixation times to positive images were longer than those of currently depressed participants (1934 ms vs. 1575 ms), $t(45) = 2.13$, $p < .05$. There was also a significant difference between the never depressed and currently depressed groups in their total fixation times to positive images, $t(54) = 1.95$, $p = .05$, with the never depressed participants total fixation times for positive images being longer than the currently depressed (1872 ms vs. 1575 ms). The never depressed and previously depressed participants did not differ (1872 ms vs. 1934 ms), $t(45) = .30$, $p > .10$. These results indicate that both the never and previously depressed participants attended to positive images more than the currently depressed participants (a pattern of differences mirrored in the number of fixations data; see Table 3).

In contrast to the group differences in the total fixation times for depression-related images and positive images, there were no significant group differences in the fixation times for anxiety-related images or neutral images (both F s < 1). Thus, considered together, these analyses show that the previously depressed participants were similar to the currently depressed participants in their greater attention to depression-related images relative to the never depressed participants, consistent with Joorman and Gotlib's (2007) findings that previously and currently depressed individuals selectively attended more to sad faces relative to never depressed participants. In addition, the previously depressed participants were similar to the never depressed participants in their greater attention to positive images relative to the currently depressed individuals.

Effect of Negative MI for Never Depressed Participants.

The purpose of these analyses was to determine the effect of the negative MI on never depressed individuals in their attention to emotional images. The dependent variables were the number of fixations and total fixation times.

Number of fixations and total fixation time. To be consistent with the previous analyses, the number of fixations and total fixation times were first analyzed together using MANOVA. There was an effect of image type, Wilk's $\Lambda = .44$, $F(6, 334) = 27.52$, $p < .001$, partial $\eta^2 = .33$, with the most fixations and the longest total fixation times to the positive images and the fewest fixations and shortest total fixation times to the neutral images (see Table 3). The effect of Type of Mood Induction was not significant, Wilk's $\Lambda = .99$, $F < 1$. Most important was the significant interaction between Type of Mood Induction and Image type, Wilk's $\Lambda = .90$, $F(6, 334) = 2.84$, $p < .01$, partial $\eta^2 = .05$. Follow-up ANOVAs revealed the same interaction for the number of fixations, $F(3, 168) = 4.58$, $p < .01$, $MSE = 4.01$, partial $\eta^2 = .08$, and for total fixation times, $F(3, 168) = 5.32$, $p < .01$, MSE

=335193.68, partial $\eta^2 = .09$. For brevity only the total fixation time analyses are described further, although the pattern in the number of fixations was identical (see Table 3). T-tests revealed a significant difference between the two never depressed groups for their total fixation times to anxiety-related images, $t(56) = 2.95, p < .01$; the never depressed participants in the negative MI condition had shorter total fixation times to anxiety-related images (1481 ms vs. 1883 ms) than the never depressed participants in the neutral MI condition. There was also a significant difference between the two groups for their total fixation times to positive images, $t(56) = 2.12, p < .05$; the never depressed participants in the negative MI condition had longer total fixation times to positive images than the never depressed participants in the neutral MI group (2256 ms vs. 1872 ms). There were no significant differences for depression-related images or neutral images (both $ps > .10$). Thus, for never depressed participants, the negative MI decreased their attention to anxiety-related images and increased their attention to positive images (relative to participants in the neutral MI condition), a pattern suggestive of a mood regulation strategy that will be discussed in more detail in the General Discussion.

Effect of Negative MI for Previously Depressed Participants.

The final analysis examined the effect of the negative MI on attention to emotional images for the previously depressed participants. Like the analysis for the never depressed participants, the dependent variables were the number of fixations to each image type and the total fixation times to each image type, analyzed in the same manner as in the previous analyses.

Number of fixations and total fixation time. In the MANOVA there was an effect of image type, Wilk's $\Lambda = .439, F(6, 238) = 20.21, p < .001$, partial $\eta^2 = .34$, with the most fixations and the longest total fixation times to the positive images and the fewest fixations

and shortest total fixation times to the neutral images. As can be seen in Table 3, both groups attended to positive images the most and to neutral images the least. The effect of Type of MI was not significant, Wilk's $\Lambda = .938$, $F(2, 39) = 1.28$, $p > .10$, and, unlike the situation with the never depressed participants, there was no interaction between Type of Mood Induction and Image Type, Wilk's $\Lambda = .936$, $F(6, 238) = 1.33$, $p > .10$. This interaction was also not present in separate analyses of the total fixation time or the number of fixations (both F s < 1).

The absence of a Type of Mood Induction x Type of Image Type interaction revealed that the previously depressed individuals' attention to emotional images was not affected by the negative MI. Unlike the never depressed participants, the previously depressed participants who experienced a negative MI did not attend to emotional images differently than those who received a neutral MI. This outcome was unexpected and points to important differences in the way that previously depressed individuals respond to a negative MI.

General Discussion

The purpose of this study was to look for evidence of cognitive vulnerability, in the form of attentional biases, in individuals with a history of depression. According to cognitive models of depression, attentional biases are trait-like characteristics of depressed individuals and therefore should be present in previously depressed individuals, although they may be latent until activated. To examine attentional biases, attention to emotional images in never depressed, previously depressed, and currently depressed individuals was measured using an eye-gaze tracking paradigm after administration of either a neutral or negative MI. The major findings of this study and their linkage to previous and current theory are detailed below.

Comparison of Never, Previously, and Currently Depressed Individuals

In the neutral MI condition, previously depressed individuals attended to depression-related images like currently depressed participants, with both groups attending to depression-related images more than never depressed participants. Although previously depressed individuals were similar to currently depressed individuals in their attention to depression-related images, they were unlike currently depressed individuals in their attention to positive images; that is, previously depressed individuals and never depressed individuals attended to positive images more than currently depressed individuals. As these three groups had experienced a neutral MI, it was assumed that they would be similar in mood state to groups in previous studies that did not use MI procedures, and the results of the present study did in fact replicate previous findings. For one, the currently depressed participants attended to depression-related images more than never depressed participants, replicating the findings of both Eizenman et al. (2003) and Kellough et al. (2008). In addition, the currently depressed participants attended to positive images less than the never depressed participants, replicating the findings of Kellough et al. (2008).

With respect to the previously depressed group, participants attended to depression-related images more than never depressed participants, which is consistent with the findings of Joorman and Gotlib (2007), who found that previously and currently depressed individuals selectively attended more to sad faces relative to never depressed participants. Neither the currently or previously depressed participants in Joorman and Gotlib's study evidenced a bias towards positive faces, however, which is different from the findings of the present study, where the previously depressed participants were similar to the never depressed participants in their allocation of more attention to positive images relative to the

currently depressed. At this time, there is no parallel in the literature for these particular results, and so additional research will be necessary to confirm these findings.

Effect of the Negative Mood Induction for Never Depressed Individuals

The VAMS and mood rating data indicated that the negative MI was effective in inducing a sad mood in never depressed participants. It was also clear that the negative MI had a substantial effect on never depressed participants' attention to emotional images. More specifically, never depressed individuals who experienced the negative MI attended significantly more to the positive images than never depressed participants who experienced a neutral MI. In addition, never depressed individuals who experienced a negative MI attended to anxiety-related images significantly less than never depressed participants who experienced the neutral MI. Thus, taken together, the negative MI had the effect of increasing attention to positive images and decreasing attention to anxiety-related images in those never depressed.

Recall that previous research with never depressed individuals in attentional tasks (e.g., the deployment of attention task) has determined that they demonstrate a positive bias—directing attention towards positive stimuli, or a protective bias—directing attention away from negative stimuli. The results of the present study are consistent with these findings, as the never depressed participants attended more to positive and less to anxiety related images, a pattern of attention that was further pronounced in the negative MI condition. Eye tracking studies have also demonstrated that never depressed individuals allocate more attention to positive stimuli relative to depression-related stimuli (Kellough et al., 2008, Sears et al., 2010). In contrast, depressed individuals do not display these types of biases (as discussed in McCabe et al., 2000).

Although no studies to date have combined the use of a MI with eye tracking to emotional images, previous studies that have employed negative MIs with never depressed individuals have typically found minimal differences in attention to emotional stimuli between groups who receive the induction and those who do not—these studies have shown that never depressed individuals either divert attention away from negative stimuli and/or maintain greater or equal attention to positive stimuli relative to negative stimuli (Ingram et al., 1994; McCabe et al., 2000). The current study found that when exposed to a negative stressor in the form of a negative MI, those never depressed exhibited a more pronounced protective/positive bias, with attention towards positive images increasing and attention to anxiety-related images decreasing (the anxiety-related images being a particularly strong form of negative stimuli).

These findings imply that never depressed individuals are less vulnerable to developing depression due to an emotional regulation strategy of enhanced attention to positive stimuli under conditions of stress or sadness. Koster et al. (2011) pointed out that an ability to regulate negative affect when impacted by stressful events results in less risk of prolonged negative affect. As discussed by Bebko, Franconeri, Ochsner, and Chiao (2011), selective attention can be used to regulate emotions through allocation towards or away from emotionally evocative stimuli. In the present study, the never depressed individuals who experienced the negative MI were likely regulating negative affectivity through both increased attention to positive images and decreased attention to anxiety-related images. Attending to and processing positive stimuli as a way to recover from a negative mood state is thought to be an important resilience factor in the attenuation of cognitive vulnerability (DeRaedt & Koster, 2010).

Recent research on the effect of a negative MI on dysfunctional attitudes in never depressed individuals is also relevant to the present results. Dysfunctional attitudes have been implicated as a latent cognitive vulnerability factor in depression (Alloy et al., 2006; Lewinsohn, Joiner, & Rohde, 2001; Otto et al., 2007). Hunt and Forand (2005) found that a negative MI procedure did not elicit dysfunctional attitudes in never depressed individuals, and actually had an attenuating effect on the ability of dysfunctional attitudes to predict future episodes of depression. That is, the presence of dysfunctional cognitions at Time 1, as measured by the DAS, were more likely to predict future episodes of depression at Time 2 (one month later) in never depressed individuals who did not experience a sad mood prime, relative to those who did experience a sad mood prime. Hunt and Forand concluded that the use of a negative MI was not an effective means of activating dysfunctional attitudes in those never depressed, and that it may cause never depressed individuals to “suppress or resist dysfunctional thoughts in an effort to repair their mood”, referred to as the ‘resilience hypothesis’. Similarly, in the present study, the changes in the never depressed participants’ attention to emotional images in response to the negative MI—increased attention to positive images and decreased attention to negative images—may have been a strategy to suppress attention to negative stimuli, intended to repair and regulate their mood.

Effect of the Mood Induction for Previously Depressed Individuals

In contrast to the never depressed participants, the negative MI had no impact on previously depressed participants’ attention to emotional images. Contrary to expectations, the negative MI did not elicit any further change in attentional biases above and beyond that observed in the neutral MI. The most straightforward interpretation of this outcome is that a transient negative mood state was not required to detect a cognitive vulnerability to

depression using the methods employed in this study—the vulnerability in the form of increased attention to depression-related images was present with or without the induced temporary negative mood state.

Although the negative MI did not produce a change in the pattern of attention, both previously depressed groups did exhibit an attentional bias towards depression-related images, similar to the currently depressed group. As both the neutral and negative MI groups displayed this bias, this finding is inconsistent with the idea that the cognitive vulnerability presumed to characterize those with a history of depression requires a stressor to elicit. The negative MI was clearly successful in eliciting a sad mood, and therefore this lack of difference was not due to an inability to impact the participants' mood state. While these findings are unexpected, note that Joorman and Gotlib (2007) did not employ a MI manipulation, yet they also found that previously depressed participants exhibited an attentional bias for sad faces using a dot probe task. However, most other studies examining attentional biases either after a neutral MI procedure or without the use of any MI at all, have generally found no evidence for attentional biases to depression-related stimuli in those previously depressed (e.g., Gilboa & Gotlib, 1997; McCabe & Gotlib, 1993; McCabe et al., 2000). Joorman and Gotlib speculated that their use of interpersonal stimuli (faces) instead of words (often used in other studies) was likely an important factor in their ability to detect attentional biases in the previously depressed, as they may have more readily elicited attentional biases. The same could have been true for the present study, which used a diversity of images that included faces and people in various situations.

In general, although the negative MI did not change the pattern of attention for previously depressed participants, a question to consider is if there were any additional biases that could have been elicited. Given that those in the neutral MI condition already

exhibited attentional biases toward depression-related images, it seems that all the negative MI could have done is to enhance this tendency. On the other hand, it is reasonable to ask why previously depressed individuals in the negative MI condition did not exhibit a pattern of attentional biases similar to the never depressed individuals in response to the negative MI—increasing their attention to positive images and decreasing the attention to anxiety-related images.

Theories of emotion context insensitivity (ECI) can provide some insight into this discrepancy. Theories of ECI propose that depressed individuals display a blunted affect—whereby they are less emotionally reactive to negative stimuli, as opposed to displaying a mood congruent response (Rottenberg, 2005). Lethbridge and Allen (2008) also found evidence for this phenomenon in individuals with a history of depression. After experiencing a negative MI, some of the previously depressed did not display reduced positive affect—the negative mood did not make them less happy, indicating a lack of emotional reaction to the negative mood MI. Further, those who exhibited this lowered emotional reactivity were found more likely to experience a subsequent episode—at a greater risk of depression relapse. Lethbridge and Allen suggested that insensitivity to emotional context—in this case the lack of reduction in positive affect after the negative MI—may actually be a characteristic of individuals at risk for future episodes of depression. Given the present study's findings, where the negative MI did not induce a change in the previously depressed individuals' attention to positive images relative to the neutral MI, it could be that an absence of emotional reactivity (similar to that described by Lethbridge and Allen) to the negative MI could explain the lack of a difference between the two groups in their attention to positive images. Thus, while the previously depressed participants in the neutral MI condition attended to positive images no differently than the

never depressed participants in the neutral MI condition, their lack of further response in the negative MI condition relative to the never depressed individuals in the negative MI condition could be reflective of blunted emotional reactivity. This reduced response to positive stimuli relative to those never depressed could, in turn, be reflective of maladaptive emotional regulation, an idea discussed by Rottenberg, Kasch, Gross, and Gotlib (2002). Ehring et al. (2008) also found evidence of deficits in emotional regulation in those with a history of depression—they reported more difficulty in the regulation of negative emotions, as well as a decrease in the use of positive regulatory strategies relative to never depressed individuals.

Implications of the mood induction across groups

When considering the results of these five groups overall and the impact of the negative MI on attention to emotional stimuli, it appears that the never depressed individuals employed a mood regulation strategy when under an analogue condition of stress (the MI) that the previously depressed individuals did not employ. The previously depressed individuals did not further increase their attention to positive images after the negative MI, as the never depressed individuals did in an attempt to regulate their emotional state, nor did they decrease their attention to depression-related images—they maintained attention to both positive and depression-related images, as did the previously depressed who experienced the neutral MI condition.

The present findings are not entirely consistent with a previous study that employed a negative MI with both never and previously depressed individuals. As described previously, Ingram et al. (1994) found no differences between never and previously depressed participants in negative cognitive processing in those who experienced a neutral MI, but they did find differences between never and previously depressed individuals who

experienced a negative MI— the previously depressed participants had more tracking errors for both negative and positive stimuli than the never depressed participants. They concluded that the previously depressed who experienced a negative MI were impacted by a schema activation process to emotional material in general, and that it may not be worthwhile to examine cognitive processes in previously depressed individuals without a negative MI. However, the results of the present study create uncertainty as to the requirement of a negative MI to examine cognitive processes in previously depressed individuals. The negative MI did not create differences between the two previously depressed groups in the present study, yet these two groups still evidenced a cognitive vulnerability as observed in their greater attention to depression-related stimuli relative to those never depressed.

McCabe et al. (2000) examined never and previously depressed women, under conditions of a negative or a neutral MI, and their findings also differed from those of the present study. As described previously, using a deployment of attention task, previously depressed individuals in the neutral MI condition along with both groups of never depressed individuals allocated attention away from depression related adjectives (a 'protective bias'). However, the previously depressed individuals in the sad MI condition did not evidence this protective bias, but instead attended equally to positive, negative, and neutral stimuli in an 'unbiased fashion'. They concluded that previously depressed individuals in the sad MI condition did not have the protective bias, and that the lack of this protective bias may confer vulnerability to future episodes of depression. However, the results of the present study indicate that some type of positive bias was still active in those previously depressed, as evidenced by their similar level of attention to positive images relative to those with no history of depression.

These mixed findings—differential attention to both depression-related and positive images relative to never depressed individuals—may suggest that previously depressed individuals, after remission from depression, re-establish a certain level of a positive bias similar to that seen in those who have not experienced depression. DeRaedt and Koster (2010) pointed out that the way in which positive stimuli is processed could be an important vulnerability factor, in that attention to positive stimuli could provide resilience against maintaining a negative mood state. However, the continued attention to depression-related stimuli in those previously depressed may still impart a certain amount of vulnerability to future episodes of depression. These findings may imply that those who do experience a subsequent episode of depression lose their positive bias, at least temporarily until the depression remits, as the currently depressed group evidenced significantly less attention to the positive images relative to both the never and previously depressed groups. If previously depressed individuals regain their positive bias after a depressive episode, the implications would be that they either lose it again, which increases vulnerability or leads to another episode of depression, or they lose it when the episode occurs. Future research could prospectively follow previously depressed individuals to determine precisely when the loss of a positive bias occurs in relation to a new depressive episode. The present findings also speak to the importance of attentional retraining of negative biases, a relatively new area of research (Browning, Holmes, & Harmer, 2010; Wells and Beevers, 2010). If negative attentional biases can be retrained in those previously depressed, then the vulnerability to future episodes may decrease.

The present results also speak to differences between never depressed and previously depressed individuals that may play a role in the vulnerability to future episodes in those with a history of depression. The never depressed individuals appeared to evidence

a positive bias that gets stronger during times of stress (based on their increased attention to positive images when in the negative MI condition), and although the previously depressed did attend to positive images similarly to those never depressed in the neutral MI condition, they did not further increase their attention to positive images in response to the negative MI, nor did they reduce their attention to depression-related stimuli. This lack of mobilization of increased attentional resources towards positive stimuli, in combination with their attention to depression-related stimuli, could leave them more vulnerable to future episodes of depression relative to those never depressed.

Strengths of Study

It is important to point out that a major strength of the present study was the multifaceted MI procedure. One potential concern of the use of MI procedures intended to induce a sad mood in research is whether they will provide a rich enough context in which an individual actually experiences a more negative mood state. In the present study, the use of a well-validated sad film clip in combination with the subsequent personalized writing exercise while also listening to sad music did provide a strong enough context, as evidenced by the significant drop in reported mood state in those who experienced the negative MI. In addition, the assessment of social desirability in the participants indicated that the reported decreases in mood following the MI procedure were not simply due to the participants' wishes to please the experimenter, another concern when employing MI procedures in research. Another notable strength of the present study is the use of the eye-tracking paradigm to assess attention to emotional images. This methodology allows for the continuous monitoring of attention to stimuli. Further, the viewing of images vs. words may be a more salient form of stimuli when attempting to examine attentional biases in

those with a history of depression, as also suggested by Joorman and Gotlib's (2007) findings with previously depressed individuals when using emotional faces as stimuli.

Limitations and Considerations for Future Research

Some limitations of the present study should be noted. Although the negative MI in the present study did appear to elicit the desired negative mood state in participants, Gross and Levenson (1995) noted that it is possible that a discrete emotion such as sadness is not the only emotion elicited through a negative MI. Components of other emotions could be present, and may impact the nature of the evoked mood state and amount of attention given to each image type. The efficacy of *The Champ* is supported in eliciting sad mood states (Miranda et al., 1998; Gross & Levenson, 1995; Hewig et al., 2005; Rottenberg et al., 2007), but Gross and Levenson cautioned that it may not be possible to elicit high levels of a single emotion without traces of other emotions.

Another limitation is inherent in the selection of the never depressed group, based on never having met criteria for a depressive episode. It is possible that an individual categorized as never depressed may have experienced symptoms at some point at a level that did not meet criteria for major depression, but they may actually be vulnerable to depression (Ingram et al., 1998). It is also unclear if this type of study examines a vulnerability to, or a consequence of depression. The use of groups with a history of depression to determine vulnerabilities disregards those who have not yet experienced an initial episode, and there may be differences between these two groups (as discussed by Just et al., 2001). Originally proposed by Lewinsohn, Steinmetz, Larson, Franklin, (1981), the scar hypothesis suggests that cognitive vulnerabilities may be a consequence of previous depressive episodes, as opposed to an initial vulnerability factor or a cause. Ingram et al. (1998) pointed out that studies that use previously depressed individuals look

at vulnerability from a perpetuation of depression standpoint, even though it is difficult to directly pinpoint if that vulnerability existed before the first depressive episode.

For these reasons researchers should consider prospectively examining attentional biases in vulnerable individuals before, during, and after an initial depressive episode to determine how attention to negative stimuli is manifested throughout and after the course of an episode. Ideally, individuals could be followed after remission through to a subsequent episode. Given the findings of the present study, it would also be important to determine the nature and course of the positive bias as well. This type of research would help to more definitively establish when attentional biases that confer a cognitive vulnerability emerge, eliminating some of the inherent difficulties in forming conclusions when examining cross-sectional samples of previously depressed individuals.

Conclusions

This study examined attentional biases in those previously depressed using a combination of eye-tracking and mood induction paradigms. The key findings indicated that the negative MI did not further elicit biases in those with a history of depression relative to the neutral MI, evidently because an induced negative mood state was not required to detect the cognitive vulnerability. The previously depressed participants evidenced a negative attentional bias towards depression-related images after experiencing either the neutral or negative MI. Another key finding was that never depressed participants appeared to employ a mood regulation strategy after experiencing a negative MI in the form of both a protective bias and an enhanced positive bias. The findings from this study have implications regarding the stability of cognitive vulnerabilities in those susceptible to depression, and how these individuals differ from those who have never experienced a depressive episode.

Table 1.

Participant Characteristics

	ND Neutral	ND Negative	PD Neutral	PD Negative	CD Neutral
BDI	3.1 (1.9) _a	2.8 (2.1) _a	3.4 (2.0) _a	3.0 (2.1) _a	29.2 (7.8) _b
PHQ-9	1.9 (2.3) _a	2.1 (1.7) _a	3.1 (2.0) _a	2.3 (1.8) _a	16.1 (4.3) _b
PHQ-9 LT	5.0 (3.8) _a	4.2 (3.3) _a	17.9 (5.1) _b	17.5 (4.3) _b	18.5 (5.5) _b
STAI State	32.6 (1.1) _a	36.3 (10.9) _{ab}	31.1 (7.8) _a	39.4 (11.0) _b	55.6 (9.9) _c
STAI Trait	34.5 (6.4) _a	33.9 (6.4) _a	35.8 (9.6) _{ab}	37.8 (7.0) _b	59.6 (8.0) _c
BIDR IM	6.3 (3.2) _a	6.8 (3.9) _a	6.2 (3.1) _a	5.2 (3.5) _a	4.6 (3.5) _a
Age	22.3 (6.1) _a	21.7 (6.2) _a	23.0 (6.1) _a	25.0 (10.8) _a	21.8 (3.5) _a

Note: Standard errors in parenthesis. Means in the same row having the same subscript are not significantly different at $p < .05$. ND = never depressed. PD = previously depressed. CD = currently depressed. Neutral = neutral mood induction. Negative = negative mood induction.

Table 2.

Mood Induction Efficacy

		ND Neutral	ND Negative	PD Neutral	PD Negative
VAMS	<i>Pre-Induction</i>	73.7 (16.0)	79.7 (13.5)	71.6 (16.2)	72.7 (13.3)
	<i>Post-Induction</i>	77.3 (28.2)	36.4 (18.9)	71.1 (15.9)	35.8 (17.5)
Mood Rating	<i>Pre-Induction</i>	2.5 (1.8)	3.2 (1.3)	2.5 (1.6)	2.4 (1.6)
	<i>Post-Induction</i>	2.1 (1.9)	-1.6 (1.7)	2.2 (1.5)	-1.2 (1.6)

Note: ND = never depressed. PD = previously depressed. CD = currently depressed.
 Neutral = neutral mood induction. Negative = negative mood induction.

Table 3.

Mean number of fixations and total fixation time (in milliseconds) for the depression-related, anxiety-related, positive, and neutral images

Image Type	ND Neutral (N = 28)	ND Negative (N = 30)	PD Neutral (N = 19)	PD Negative (N = 23)	CD Neutral (N = 28)
<i>Number of fixations</i>					
Depression-related	6.7 (1.4)	6.5 (1.7)	7.6 (1.6)	7.0 (1.4)	7.7 (1.5)
Anxiety-related	7.7 (2.3)	6.4 (2.3)	7.2 (1.7)	6.8 (1.6)	7.2 (1.6)
Positive	7.7 (2.2)	9.1 (2.5)	7.7 (2.4)	7.6 (2.3)	6.5 (1.6)
Neutral	3.9 (0.8)	4.3 (1.0)	4.0 (1.2)	4.0 (0.9)	3.9 (1.0)
<i>Total fixation time</i>					
Depression-related	1560 (281)	1453 (418)	1792 (412)	1727 (337)	1920 (385)
Anxiety-related	1883 (556)	1465 (522)	1716 (463)	1706 (459)	1827 (452)
Positive	1872 (674)	2298 (836)	1934 (718)	1888 (574)	1575 (439)
Neutral	938 (287)	992 (265)	1012 (551)	983 (241)	958 (298)

Note: ND = never depressed. PD = previously depressed. CD = currently depressed.
Neutral = neutral mood induction. Negative = negative mood induction.

Figure Captions

Figure 1: Example of a Trial including a positive, neutral, depression-related, and anxiety-related image.



Figure 2. Never Depressed vs. Previously Depressed vs. Currently Depressed: Neutral Mood Induction Condition

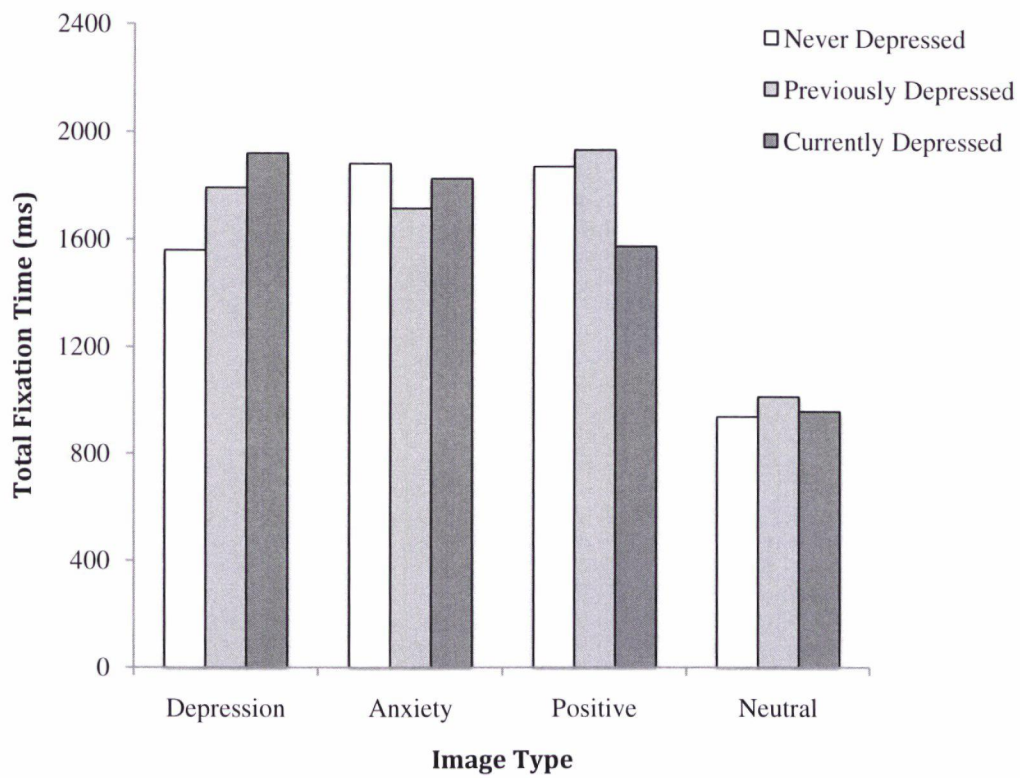


FIGURE 3. Never Depressed Neutral MI vs. Never Depressed Negative MI

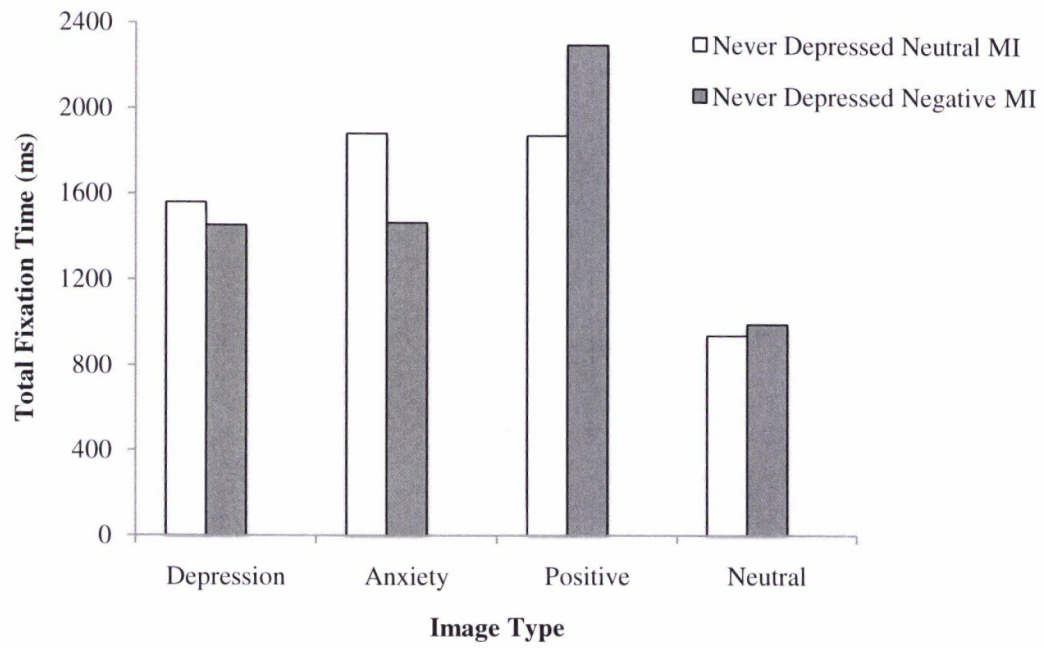
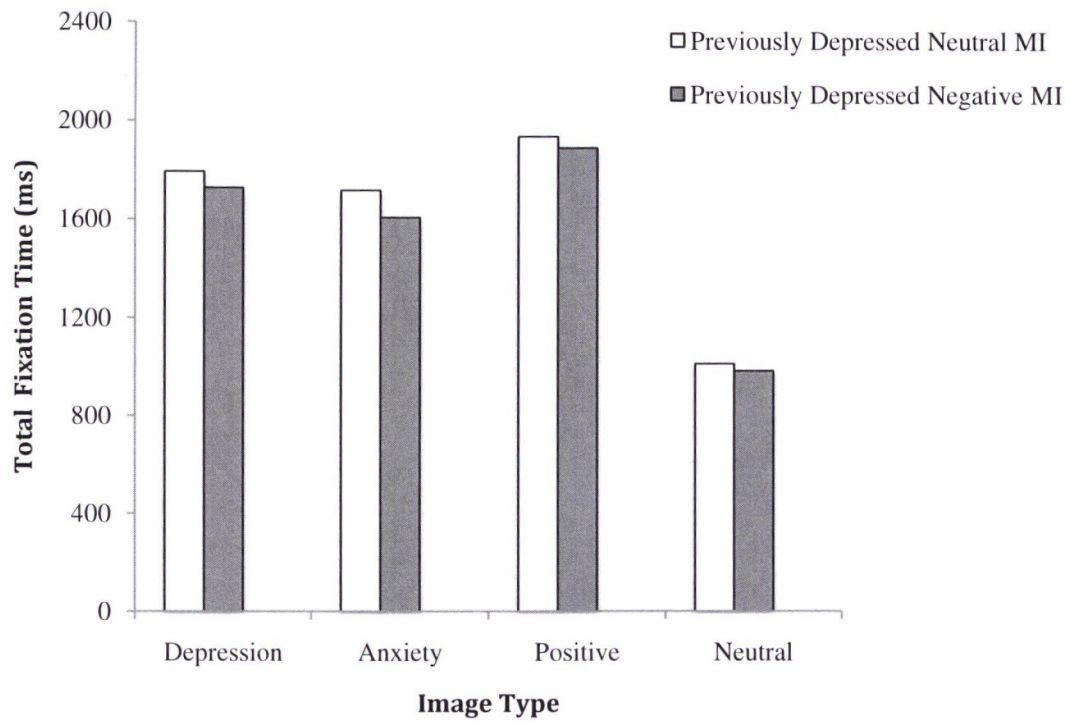


FIGURE 4. Previously Depressed Neutral MI vs. Previously Depressed Negative MI



References

- Abramson, L., Metalsky, G., & Alloy, L. (1989). Hopelessness depression: A theory-based subtype of depression. *Psychological Review*, *96*, 358-372.
- Alloy, L., Abramson, L., Hogan, M., Whitehouse, W., Rose, D., Robinson, M. (2000). The Temple-Wisconsin Cognitive Vulnerability to Depression Project: lifetime history of Axis-I psychopathology in individuals at high and low cognitive vulnerability to depression. *Journal of Abnormal Psychology*, *109*, 403-418. doi: 10.1037/0021-843X.109.3.403.
- Alloy, L., Abramson, L., Whitehouse, W., Hogan, M., Panzarella, C., & Rose, D. (2006). Prospective incidence of first onsets and recurrences of depression in individuals at high and low cognitive risk for depression. *Journal of Abnormal Psychology*, *115*, 145. doi: 10.1037/0021-843X.115.I.145.
- American Psychiatric Association. (1994). *Diagnostic and Statistical manual of mental disorders* (4th ed.) Washington, DC: Author.
- Bebko, G., Franconeri, S., Ochsner, K., & Chiao, J. (2011). Look before you regulate: Differential perceptual strategies underlying expressive suppression and cognitive reappraisal. *Emotion*, doi: 10.1037/a0024009.
- Beck, A. T. (1967). *Depression: Clinical, experimental, and theoretical aspects*. New York: Harper and Row.
- Beck, A. T. (1976). *Cognitive therapy and the emotional disorders*. New York: International Universities Press.
- Beck, A., & Clark, D. (1988). Anxiety and depression: An information processing perspective. *Anxiety Research*, *1*, 23-36.

Beck, A., Steer, R., & Brown, G. (1996). *Manual for the Beck Depression Inventory-II*.

San Antonio, TX: Psychological Corporation.

Beck, A., Rush, A., Shaw, B., & Emory, G. (1979). *Cognitive therapy of depression*. New

York: Guilford Press.

Beevers, C., Strong, D., Meyer, B., Pilkonis, P., & Miller, I. (2007). Efficiently assessing negative cognition in depression: An item response theory analysis of the

Dysfunctional Attitude Scale. *Psychological Assessment, 19*(2), 199-209. doi:

10.1037/1040-3590.19.2.199

Bieling, P., & Grant, D. (2007). Toward bridging the science and practice of depression

prevention: What can we learn from cognitive vulnerability? *Canadian Psychology, 48*(4), 240-255. doi: 10.1037/cp2007021

48(4), 240-255. doi: 10.1037/cp2007021

Bradley, B., Mogg, K., & Lee, S. (1997). Attentional biases for negative information in

induced and naturally occurring dysphoria. *Behavior Research and Therapy, 35*(10),

911-927.

Bradley, B., Mogg, K., & Millar, N. (2000). Overt and covert orienting of attention to

emotional faces in anxiety. *Cognition and Emotion, 12*, 737-753. doi:

10.1080/02699930050156636

Browning, M., Holmes, E., & Harmer, C. (2010). The modification of attentional bias to emotional information: A review of the techniques, mechanisms, and relevance to

emotional disorders. *Cognitive, Affective, And Behavioral Neuroscience, 10*(1), 8-

20. doi: 10.3758/CABN.10.1.8.

Cannon, D., Tiffany, S., Coon, H., Scholand, M., McMahon, W., & Leppert, M. (2007).

The PHQ-9 as a brief assessment of lifetime major depression. *Psychological*

Assessment, 19(2), 247-251. doi: 10.1037/1040-3590.19.2.247

- Caseras, X., Garner, M., Bradley, B., & Mogg, K. (2007). Biases in visual orienting to negative and positive scenes in dysphoria: An eye-movement study. *Journal of Abnormal Psychology, 116*, 491-497. doi: 10.1037/0021-843X.116.3.491.
- Centre for the Study of Emotion and Attention. (1999). International Affective Picture System (IAPS). Available from the Centre for the Study of Emotion and Attention Web site, <http://csea.phhp.ufl.edu/Media.html#topmedia>.
- DeRaedt, R., & Koster, E. (2010). Understanding vulnerability for depression from a cognitive neuroscience perspective: A reappraisal of attentional factors and a new conceptual framework. *Cognitive, Affective, and Behavioral Neurosciences, 10*(1)50-70. doi: 10.3758/CABN.10.1.50.
- Dozois, D., Dobson, K., & Ahnberg, J. (1998). A psychometric evaluation of the Beck Depression Inventory-II. *Psychological Assessment, 10*, 83-89.
- Ehring, T., Fischer, S., Schnulle, J., Bosterling, A., & Tuschen-Caffier, B. (2008). Characteristics of emotion regulation in recovered depressed versus never depressed individuals. *Personality and Individual Differences, 44*, 1574-1584. doi: 10.1016/j.paid.2008.01.013.
- Eizenman, M., Yu, L., Grupp, L., Eizenman, E., Ellenbogen, M., Gemar, M., & Levitan, R. (2003). A naturalistic visual scanning approach to assess selective attention in major depressive disorder. *Psychiatry Research, 118*, 117-128. doi: 10.1016/S0165-1781(03)00068-4
- Ellis, A., Beevers, C., & Wells, T. (2010). Attention Allocation and incidental recognition of emotional information in dysphoria. *Cognitive Therapy and Research*. doi: 10.1007/s10608-101-9305-3.

EZHangDoor (2009/03/29). EZ Hang Door Installation-How to Hang a Door [Video File]. Retrieved from

<http://www.youtube.com/watch?v=ivynJo4n0gQ&feature=youtu.be>

Gilboa, E. & Gotlib, I. (1997). Cognitive biases and affect persistence in previously dysphoric and never-dysphoric individuals. *Cognition and Emotion, 11*, 517-538. doi: 10.1080/026999397379881a

Gotlib, I., & Hammen, C. (2002). Introduction. In I. Gotlib & C. Hammen (Eds.), *Handbook of depression* (pp. 1-20). New York: Guilford.

Gotlib, I., & Joorman, J. (2010). Cognition and depression: Current status and future directions. *Annual Review of Clinical Psychology, 6*, 285-312. doi: 10.1146/annurev/clinpsy.121208.131305

Gotlib, I., Krasnoperova, E., Yue, D., & Joorman, J. (2004). Attentional biases for negative interpersonal stimuli in clinical depression. *Journal of Abnormal Psychology, 113*(1), 127-135. doi: 10.1037/0021-843X.113.1.127.

Gross, J., & Levenson, R. (1995). Emotion elicitation using films. *Cognition and Emotion, 9*(1), 87-108. doi: 10.1080/02699939508408966

Haefffel, G., Abramson, L., Voelz, Z., Metalsky, G., Halberstadt, L., Dykman, B., Donovan, P., Hogan, M., Hankin, B., & Alloy, L. (2005). Negative cognitive styles, dysfunctional attitudes, and the remitted depression paradigm: A search for the elusive cognitive vulnerability to depression factor among remitted depressives. *Emotion, 5*(3), 343-348. doi: 10.1037/1528-3542.5.3.343.

Haefffel, G., Abramson, L., Brazy, P., Shah, J., Teachman, B., Nosek, B. (2007). Explicit and implicit cognition: A preliminary test of a dual-process theory of cognitive

vulnerability to depression. *Behaviour Research and Therapy*, 45, 1155-1167.

doi: 10.1016/j.brat.2006.09.003

Haefffel, G., Gibb, B., Metalsky, G., Alloy, L., Abramson, L., Hankin, B., Joiner, T., Swendsen, J. (2008). Measuring cognitive vulnerability to depression: Development and validation of the cognitive style questionnaire. *Clinical Psychology Review*, 28, 824-836. doi:10.1016/j.cpr.2007.12.001.

Hedlund, S., & Rude, S. (1995). Evidence of latent depressive schemas in formerly depressed individuals. *Journal of Abnormal Psychology*, 104 (3), 517-525.

Hewig, J., Hagermann, D., Seifert, J., Gollwitzer, M., Naumann, E., Bartussek, D. (2005). A revised film set for the induction of basic emotions. *Cognition and Emotion*, 19, 1095-1109. doi: 10.1080/02699930541000084.

Hunt, M., & Forand, N. (2005). Cognitive vulnerability to depression in never depressed subjects. *Cognition and Emotion*, 19(5), 763-770. doi: 10.1080/02699930441000382

Ingram, R., Bernet, C., & McLaughlin, S. (1994). Attentional allocation processes in individuals at risk for depression. *Cognitive Therapy and Research*, 18, 317-332. doi: 10.1007/BF02357508.

Ingram, R., Miranda, J., & Segal, Z. (1998) *Cognitive vulnerability to depression*. New York: Guilford Press.

Ingram, R., Steidtmann, D., & Bistricky, S. (2008). Information processing: Attention and memory. In K. Dobson & D. Dozois (Eds.), *Risk factors in depression* (pp. 145-169). San Diego, CA: Elsevier.

- Joormann, J. & Gotlib, I. (2007). Selective attention to emotional faces following recovery from depression. *Journal of Abnormal Psychology, 116*(1), 80-85. doi: 10.1037/0021-843X.116.1.80.
- Just, N., Abramson, L., & Alloy, L. (2001). Remitted depression studies as tests of the cognitive vulnerability hypothesis of depression onset: A critique and conceptual analysis. *Clinical Psychology Review, 21*(1), 63-83.
- Kellough, J., Beevers, C., Ellis, A., & Wells, T. (2008). Time course of selective attention in clinically depressed young adults: An eye tracking study. *Behaviour Research and Therapy, 46*, 1238-1243. doi: 10.1016/j.brat.2008.07.004
- Kelvin, M., Goodyer, I., Teasdale, J., & Brechin, D. (1999). Latent self-schema and high emotionality in well adolescents at risk for psychopathology. *Journal of Child Psychology and Psychiatry, 40*, 959-968.
- Koster, E., DeLissnyder, E., Derakshan, N., & DeRaedt, R. (2011). Understanding depressive rumination from a cognitive science perspective: The impaired disengagement hypothesis. *Clinical Psychology Review, 31*, 138-145. doi: 10.1016/j.cpr.2010.08.005
- Lethbridge, R., & Allen, N. (2008). Mood induced cognitive and emotional reactivity, life stress, and the prediction of depressive relapse. *Behaviour Research and Therapy, 46*, 1142-1150. doi: 10.1016/j.brat.2008.06.011
- Lewinsohn, P., Joiner, T., & Rohde, P. (2001). Evaluation of cognitive diathesis-stress models in predicting major depressive disorder. *Journal of Abnormal Psychology, 110*, 203-215. doi: 10.1037/0021-843X110.2.203
- Lewinsohn, P., Steinmetz, J., Larson, D., Franklin, J. (1981). Depression related cognitions: Antecedent or consequences? *Journal of Abnormal Psychology, 90*, 213-219.

- Leyman, L., DeRaedt, R., Vaeyens, R., & Philippaerts, R. (2011). Attention for emotional facial expressions in dysphoria: An eye-movement registration study. *Cognition and Emotion, 25*(1), 111-120. doi:10.1080/02699931003593827.
- Lovell, D. (Producer), & Zeffirelli, f. (Director) (1979). *The Champ* [Motion Picture]. USA:MGM.
- Luria, R. (1975). The validity and reliability of the visual analogue mood scale. *Journal of Psychiatric Research, 12*, 51-57.
- Matthews, G. & Antes, J. (1992). Visual attention and depression: Cognitive biases in the eye fixations of the dysphoric and the nondepressed. *Cognitive Therapy and Research, 16*(3), 359-371.
- McCabe, S., & Gotlib, I. (1993). Attentional processing in clinical depression: A longitudinal investigation. *Cognitive Therapy and Research, 17*, 359-377.
- McCabe, S., Gotlib, I., & Martin, R. (2000). Cognitive vulnerability for depression: Deployment of attention as a function of history of depression and current mood state. *Cognitive Therapy and Research, 24*, 427-444.
- Miranda, J., & Gross, J. (1997). Cognitive vulnerability, depression, and the mood state dependent hypothesis: Is out of sight out of mind? *Cognition and Emotion, 11*, 585-605. doi: 10.1080/026999397379863a
- Miranda, J., Gross, J., Persons, J., Hahn, J. (1998). Mood matters: Negative mood induction activates dysfunctional attitudes in women vulnerable to depression. *Cognitive Therapy and Research, 22*(4), 363-376.
- Miranda, J., & Persons, J. (1988). Dysfunctional thoughts are mood-state dependent. *Journal of Abnormal Psychology, 97*, 76-79.

- Mogg, K., & Bradley, B. (2005). Attentional bias in generalized anxiety disorder versus depressive disorder. *Cognitive Therapy and Research, 29*(1), 29-45. doi: 10.1007/s10608-005-1646-y
- Mogg, K., Millar, N., & Bradley, B. (2000). Biases in eye movements to threatening facial expressions in generalized anxiety disorder and depressive disorder. *Journal of Abnormal Psychology, 109*, 695-704. doi: 10.1037//0021-843X/109.4.695
- Munoz, R., Le, H., Clarke, G., Jaycox., L. (2002). Preventing the onset of major depression. In I. Gotlib & C. Hammen (Eds.), *Handbook of depression* (pp. 343-359). New York: Guilford.
- Nunn, J., Mathews, A. & Trower, P. (1997). Selective processing of concern-related information in depression. *British Journal of Clinical Psychology, 36*, 489-503.
- Otto, M., Teachman, B., Cohen, L., Soares, C., Vitonis, A., & Harlow, B. (2007). Dysfunctional attitudes and episodes of major depression: Predictive validity and temporal stability in never depressed, depressed, and recovered women. *Journal of Abnormal Psychology, 116*(3), 475-483. doi: 10.1037/0021-843X.116.3.475.
- Paulhus, D. L. (1991). Measurement and control of response bias. In J. P. Robinson, P. R. Shaver & L. S. Wrightsman (Eds.), *Measures of Personality and Social Psychological Attitudes* (pp. 17-59). San Diego: Academic Press.
- Peckham, A., McHugh, K., Otto, M. (2010). A meta-analysis of the magnitude of biased attention in depression. *Depression and Anxiety, 27*, 1135-1142. doi: 10.1002/da.20755.
- Reiner, R. (Producer and Director). 1989. *When Harry Met Sally* [Motion Picture]. USA: MGM.

- Rottenberg, J. (2005). Mood and emotion in major depression. *Current Directions in Psychological Science, 14*(3), 167-170.
- Rottenberg, J., Kasch, K., Gross, J., & Gotlib, I. (2002). Sadness and amusement reactivity differentially predict concurrent and prospective functioning in Major Depressive Disorder. *Emotion, 2*(2), 135-146. doi: 10.1037//1528-3542.2.2.135.
- Rottenberg, J., Ray, R., & Gross, J. (2007). Emotion elicitation using films. In J. Coan & J. Allen (Eds.), *Handbook of Emotion Elicitation and Assessment* (pp. 9-28). London: Oxford University Press.
- Rude, S., Durham-Fowler, J., Baum, E., Rooney, S., & Maestas, K. (2010). Self-report and cognitive processing measures of depressive thinking predict subsequent major depressive disorder. *Cognitive Therapy and Research, 34*, 107-115. doi: 10.1007/s10608-009-9237-y.
- Schaefer, A., Nils, F., Sanchez, X., Philoppot, P. (2010). Assessing the effectiveness of a large database of emotion-eliciting films: A new tool for emotion researchers. *Cognition and Emotion, 24*(7), 1153-1172. doi: 10.1080/02699930903274322
- Scher, C., Ingram, R., Segal, Z. (2005). Cognitive reactivity and vulnerability: Empirical evaluation of construct activation and cognitive diatheses in unipolar depression. *Clinical Psychology Review, 25*, 487-510. doi: 10.1016/j.cpr.2005.01.005
- Sears, C., Thomas, C., LeHuquet, J., & Johnson, J. (2010). Attentional biases in dysphoria: An eye tracking study of the allocation and disengagement of attention. *Cognition and Emotion, 24*(8), 1349-1368. doi:10.1080/02699930903399319.
- Segal, Z., Gemar, M., & Williams, S. (1999). Differential cognitive response to a mood challenge following successful cognitive therapy or pharmacotherapy for unipolar

depression. *Journal of Abnormal Psychology*, 108(1), 3-10. doi: 10.1037/0021-843X.108.1.3.

Spielberger, C. D., Gorsuch, R. L., Lushene, R., Vagg, P. R., & Jacobs, G. A. (1983). *Manual for the State-Trait Anxiety Inventory*. Palo Alto, CA: Consulting Psychologist Press.

Spitzer, R., Kroenke, K., Williams, J., & The Patient Health Questionnaire Primary Care Study Group. (1999). Validation and utility of a self-report version of the PRIME-MD: The PHQ primary care study. *Journal of the American Medical Association*, 282, 1737-1744. doi: 10.1001/jama.282.18.1737

Teasdale, J.D. (1988). Cognitive vulnerability to persistent depression. *Cognition and Emotion*, 2, 247-274.

Weissman, A., & Beck, A. (1978). Development and validation of the Dysfunctional Attitudes Scale: A preliminary investigation. Paper presented at the annual convention of the Toronto: American Educational Research Association.

Wells, T., & Beevers, C. (2010). Biased attention and dysphoria: Manipulating selective attention reduces subsequent depressive symptoms. *Cognition and Emotion*, 24(4), 719-728. doi: 10.1080/02699930802652388

Wenzlaff, R., Rude, S., Taylor, C., Stultz, C., & Sweatt, R. (2001). Beneath the veil of thought suppression: Attentional bias and depression risk. *Cognition and Emotion*, 15(4), 435-452. doi: 10.1080/02699930125871

Westermann, R., Spies, K., Stahl, G., & Hesse, F. (1996). Relative effectiveness and validity of mood induction procedures: a meta-analysis. *European Journal of Social Psychology*, 26, 557-580.

Yiend, J. (2010). The effects of emotion on attention: A review of attentional processing of emotional information. *Cognition and Emotion*, 24(1), 3-47.

doi:10.1080/02699930903205698

APPENDIX A: Consent form



Cognitive Sciences Lab

Department of Psychology

Research Project:	Individual Differences in the Perception of Emotional Images
Principle Investigators:	Kristin Newman, Christopher Sears
Supervisor:	Christopher R. Sears, Ph.D.
Funding Agency:	Natural Sciences and Engineering Research Council (NSERC)

This consent form, a copy of which has been given to you, is only part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like more detail about something mentioned here, or information not included here, please ask. Please take the time to read this form carefully and to understand any accompanying information.

The University of Calgary Conjoint Faculties Research Ethics Board has approved this research study.

Purpose of the Study

The purpose of the study is to learn more about individual differences in the perception of emotional images.

What Will I Be Asked to Do?

You will first fill out some questionnaires in private. Then, you will experience a neutral mood induction or a negative mood induction. For the neutral mood induction condition you will watch a short film clip that does not elicit any particular emotion. For the negative mood induction condition you will watch a short film clip that has the potential to make you experience feelings of sadness. You will then be asked to imagine a hypothetical personal situation related to the film clip and write a short statement about that personal situation. It is important that you realize that you may or may not experience a sad mood following this procedure—people differ and for some the feelings of sadness will be

stronger or weaker than they are for others. Note that any negative emotions you do experience will be brief and temporary.

After the mood induction, you will be shown pictures on a computer screen. You will be shown 40 sets of four pictures, one set at a time. While you are looking at the pictures your eye movements will be monitored by an eye tracking device that will record where you are looking and for how long. The eye tracker is mounted on a lightweight headband that is comfortable to wear during testing. It does not touch your eyes or interfere with your vision in any way. You will have the opportunity to practice this task and to ask questions and the researcher will demonstrate and explain everything to you before you begin.

After you have finished viewing the pictures you will be asked to fill out a few questionnaires in private. These include questionnaires about attitudes and styles of thinking. You will not put your name on any of these questionnaires. Once you have finished the questionnaires you will seal them in the envelope and place the sealed envelope into a box.

Lastly, you will experience a positive mood induction procedure before leaving the laboratory, which consists of watching an amusing film clip. Positive mood inductions have been shown to be effective in counteracting any lingering negative feelings brought about by negative mood inductions.

Your participation today will require no more than 60 minutes of your time. After you have finished the researcher will be happy to answer any questions you might have about the study. You will also be given an Information Sheet that includes supplementary information on this area of research.

You will receive 1 bonus credits for your participation.

What Type of Personal Information Will Be Collected?

You will be asked to complete a demographic questionnaire that asks about your age, gender, relationship status, medication history, psychotherapy experiences, etc. You are free to choose which questions to answer. You will also be asked to complete a number of measures of mood and anxiety; these measures ask you to check off options (“not at all”, “sometimes”) that describe moods and thoughts you may have experienced lately (e.g., “hands trembling”, “fear of dying”, “difficulty sleeping”, “dizzy or lightheaded”, “lack of interest in food”, “feeling sad and lonely”). You will also fill out some questionnaires that assess your attitudes and styles of thinking. You are free to choose which questions to answer. You will complete these questionnaires in a private room and will seal them inside an envelope for privacy. You will not put your name on any questionnaires. Your

questionnaires will be identified by number only and will be kept in complete confidentiality.

Are There Any Risks or Benefits If I Participate?

Participation in this study includes a mood induction procedure, the aim of which is to produce feelings of sadness. As noted above, not everyone experiences sadness as a result of this procedure, and individuals will vary regarding the extent to which they experience a shift in their mood. Past research has shown that any effects are relatively brief.

There will be no physical injury or physical discomfort involved in this study. Please note that a few of the pictures you will be shown might be disturbing to some people (e.g., depictions of blood, bodily injuries, insects, weapons, death, etc.). None of the images will be outside of the range typically seen on television or in movies. It is not necessary to look at a picture if you find it too disturbing. If at any time you feel too uncomfortable with the pictures you are being shown you may withdraw from the study with no penalty.

As a result of your participating in this study, will be given the option of being provided with the study's findings upon its completion.

Collection and Storage of Personal Information:

Your participation is completely confidential and voluntary. You are not asked to put your name on the questionnaires you fill out. The data you contribute to this study will be identified by number only and will be kept in complete confidentiality. No one except the researchers will be allowed to see the data you contribute to this study. Each participant will be assigned a number code, and all data for each participant will be filed by this code to ensure confidentiality. The master coding sheet with each participant's number codes will be stored in a locked cabinet separate from the data files, and only the investigators and supervisor of this project will have access to these files. The questionnaires are kept in a locked cabinet accessible only by the researchers. Only group information will be summarized for any presentation or publication of results. Once the data are anonymized and summarized, the data set will be archived for permanent storage by the researchers on a password protected computer. The data from this study will be used for a clinical psychology M.Sc. thesis written by Kristin Newman, for conference presentations, and for publications in academic journals.

Should you decide to withdraw from the study, any information you provide will be destroyed.

From time to time, similar research may be carried out in the Cognitive Sciences Laboratory and you may also be interested in this research. If you would like us to contact you about other research participation possibilities, please check the box below:

Please contact me about other research participation opportunities:

Signatures

Your signature on this form indicates that you 1) understand to your satisfaction the information provided to you about your participation in this research project, and 2) agree to participate in this study.

Your signature in no way waives your legal rights nor releases the investigators, sponsors, or involved institutions from their legal and professional responsibilities. You are always free to withdraw from this study at any time, for any reason. You should feel free to ask for clarification or new information throughout your participation.

Participant's Name: (please print) _____

Participant's Signature _____ Date: _____

Researcher's Name: (please print) _____

Researcher's Signature: _____ Date: _____

Questions/Concerns

If you have any questions or concerns after you have participated in the study you can contact the researchers for more information (Kristin Newman at kristinnewman@shaw.ca or Christopher Sears at sears@ucalgary.ca).

You have participated in this study as part of your educational experience in the Psychology Department. In exchange for your time you can expect to gain some understanding of research and some of the ideas currently being explored in psychology. If, after the study, you have concerns regarding your experience, you may register your concerns with Dr. Tavis Campbell, Chair, Psychology Department Ethics Committee (220-7490, t.s.campbell@ucalgary.ca).

If you have any concerns about the way you have been treated as a participant, please contact Russell Burrows, Senior Ethics Resource Officer, Research Services, University of Calgary at (403) 220-3782 (rburrows@ucalgary.ca).

There are many services available throughout the university and community should you wish to talk with someone further about any negative experiences you may had in your life which continue to cause you discomfort. Some of these include:

University of Calgary Counselling Services: 210-9355, #2 for counselling

University of Calgary Multifaith Chaplain Centre: 220-5451

Calgary Counselling Centre: 265-4980

East Side Family Services: 299-9696

The Distress Centre: 266-1605

A copy of this consent form has been given to you to keep for your records and reference.
The researchers have also kept a copy of the consent form for their records.

APPENDIX B: Demographics Questionnaire

Your responses to the following questions are completely confidential. Please do not put your name anywhere on this form.

Your age: _____

Your gender: Male Female

Ethnicity:

Caucasian

First Nations (Indigenous Peoples)

African American

Hispanic

Asian

East Indian

Middle Eastern

Multi-Racial (please specify) _____

If none of the options above are applicable to you, please provide your own:

Is English your first (native) language?

Yes

No

If English is **NOT** your first (native) language, how fluent are you with the English language?

1

2

3

4

5

Not fluent

Very fluent

Are you presently in a romantic relationship?

Yes

No

Yes No

Have you taken medication for depression in the past?

Yes No

Do you think you have been depressed lately?

Yes No

If you have previously experienced depression and depressive episodes, what did you do to overcome it?

Not applicable

I did nothing, it went away on its own

I used antidepressant medication

I received professional counseling

I used antidepressant medication and received counseling from a therapist

If you used antidepressant medications, for how long did you use them?

1-6 months

7-12 months

13-18 months

19-24 months

More than 24 months

If you received counseling from a therapist, for how long did you go?

1-6 months

7-12 months

13-18 months

19-24 months

More than 24 months

Have you ever been diagnosed with anxiety by a mental health professional?

Yes No

Are you presently undergoing therapy or counseling for anxiety?

Yes No

Have you had therapy or counseling for anxiety in the past?

Yes No

Are you taking medication for anxiety right now?

Yes No

Have you taken medication for anxiety in the past?

Yes No

Do you think you have been feeling especially anxious lately?

Yes No

Thank you for answering these questions! Your responses will be kept completely confidential.

Once you have finished completing the questionnaires please seal them in the envelope and put the sealed envelope in the box on the table.

APPENDIX C: Select Demographics Characteristics

Table 4.

Demographic Characteristics

	Previously Depressed Neutral MI N = 19		Previously Depressed Negative MI N = 23	
	NO	YES	NO	YES
Therapy current	19 (100%)	0 (0%)	20 (87%)	3 (13%)
Therapy in past	10 (53%)	9 (47%)	12 (52%)	11 (48%)
Meds depression current	17 (89%)	2 (11%)	20 (87%)	3 (13%)
Meds depression past	12 (63%)	7 (37%)	16 (70%)	7 (30%)
Mean number past episodes	1.53		2.17	

APPENDIX D: Paragraph Instructions: Negative Mood Induction

You have just viewed a film clip about a young boy who has just lost his father. Imagine that you have just lost someone close to you—your father or mother, or a very important person in your life. You have been asked to deliver a speech at their funeral. Write a short paragraph describing what you would say about the person, what they meant to you, how they impacted your life, or whatever else you feel would be important to say.

APPENDIX E: Paragraph Instructions: Neutral Mood Induction

You have just viewed a film clip about how to install a door. Imagine that you have just been asked by a friend if you know how to install a door. Do your best to remember in general what steps you would take to install a door. Write a short paragraph describing these steps or whatever else you feel would be important to explain to your friend. You can use point form if you would like.

APPENDIX F: Exploratory Analyses

In exploratory analyses, this study also examined the association between attitudes, cognitive style and attentional biases. Maladaptive cognitive styles are based in hopelessness theories of depression (Abramson, Metalsky, & Alloy, 1989) and dysfunctional attitudes are based in Beck's theories of depression (Beck, 1967). Together, these have been termed 'maladaptive cognitive patterns' (Haefffel et al., 2005), and are thought to increase the risk of depressive onset in those vulnerable to depression (e.g. Alloy et al., 2006). Beck et al. (1979) and others (e.g., Ingram et al., 1998; Scher et al., 2005) have suggested that dysfunctional cognitions exist and may be a trait-like feature in those with a history of depression—a cognitive vulnerability that increases susceptibility to future episodes of depression. This cognitive vulnerability is often assessed through the use of the Dysfunctional Attitudes Scale (DAS). Abramson et al. (1989), in their hopelessness theory of depression, proposed that those with a cognitive vulnerability to depression tend to make specific inferences regarding the causes (stable and global), consequences (likely to lead to further negative consequences), and self worth implications (being unworthy or deficient) of negative life events. This vulnerability is thought to interact with a negative life event to lead to a depressive episode. The Cognitive Style Questionnaire was developed to assess this cognitive vulnerability (Haefffel et al., 2008).

When testing Beck's theory as related to dysfunctional attitudes (Beck et al., 1979), some studies have found individuals with a history of depression no more likely to display dysfunctional attitudes relative to those without a history of depression (e.g. Hedlund & Rude, 1995; Haefffel et al., 2005), which creates uncertainty regarding the existence of cognitive vulnerability to depression. However, other studies have found evidence to the contrary, where those with a history of depression have been found to exhibit dysfunctional

attitudes or styles of thinking (Miranda, Gross, Persons, and Hahn, 1998; Alloy et al., 2006; Otto et al., 2007).

When testing the hopelessness theory as related to maladaptive cognitive styles, one study (Haefffel et al., 2005) that did not employ a MI procedure found that individuals with a history of depression had more negative cognitive styles (as assessed by the CSQ) than those with no history of depression. Haefffel et al. deemed their findings important in terms of supporting hopelessness theories of cognitive vulnerabilities to depression, and also because many past studies had not found differences between remitted and never depressed groups. The CSQ has a built-in priming component that was thought to contribute to these results. Interestingly, however, whereas more negative cognitive styles in previously depressed individuals were found, Haefffel et al. (2005) did not find that previously depressed individuals differed in their negative attitudes (as assessed by the DAS) relative to those never depressed. The authors speculated this result was due to a lack of mood priming (Haefffel et al., 2005). Other studies have found a relation between DAS scores and subsequent episodes of depression, providing evidence that dysfunctional thinking is a vulnerability factor (Segal et al., 1999; Alloy et al., 2006; Otto et al., 2007).

Rude, Durham-Fowler, Baum, Rooney, and Maestas (2010) administered the DAS along with a more implicit measure, a cognitive processing task (the Scrambled Sentences Task), to predict future episodes of depression amongst a sample of non-depressed females. The Scrambled Sentences Task requires participants to unscramble phrases into a coherent sentence, which can be either positive or negative (e.g., “winner born I am loser a”). Not only were both the DAS and Scrambled Sentences Task found to be predictive of future episodes of depression, each measure made unique contributions to that prediction. The researchers stated that the “use of different types of measures was important in terms of

finding converging evidence for cognitive biases in emotional disorders” (p. 112), and also that it was important for future research to examine these differing types of cognitive vulnerabilities (Rude et al., 2010). In other research, Beevers, Strong, Meyer, Pilkonis, and Miller (2007) pointed out the necessity for future studies to examine if cognitive vulnerabilities such as self-reported dysfunctional attitudes were associated with other types of cognitive vulnerabilities not measured by questionnaire, such as biased information processing. With this in mind, the present study examined how both explicit self-reported cognitive biases (as assessed by the DAS and CSQ) and implicit forms of cognitive biases (attentional biases) correlated.

Research Question and Hypothesis

Do differing types of cognitive vulnerabilities (maladaptive cognitive patterns versus attentional biases) occur simultaneously? I hypothesized that these cognitive vulnerabilities do occur together and that the presence of dysfunctional attitudes and patterns of thinking will predict the presence of attentional biases.

Measures used to assess maladaptive cognitive patterns

The Dysfunctional Attitudes Scale Short Form (DAS-SF; Beevers et al., 2007) was adapted from the original 80-question Dysfunctional Attitudes Scale (forms A and B, 40 questions per form; Weissman & Beck, 1978). For the short form version, the number of questions was reduced to 18, with 9 items each on Form A and Form B. This shorter form has been found to be highly correlated ($r =$ from .91 to .93) with the 80-item version and to have good concurrent, convergent, and predictive validity (Beevers et al., 2007). This self-report scale measures a variety of dysfunctional attitudes (for example, rigid, negative, and perfectionist attitudes) that are hypothesized to contribute to the development of depressive symptoms.

The Cognitive Style Questionnaire (CSQ; Alloy et al., 2000; Haeffel et al., 2008) is an expanded, modified version of the Attributional Style Questionnaire (ASQ; Peterson et al., 1982). It assesses attributions for 12 hypothetical negative events on dimensions of internality, stability, and globality and includes ratings (on 7-point scales) of the potential consequences and implications of each event as related to self-concept. It assesses participants' inferences regarding the cause, consequence, and self-worth implications of each hypothetical negative event. Scores are calculated by taking an average rating across three vulnerability components (stable global causal attributions, consequences, and self-worth characteristics) for the 12 hypothetical negative life events. Scores can range from 1-7, where higher scores indicate more negative cognitive styles and greater levels of cognitive vulnerability to depression. The CSQ has been shown to be a reliable measure of cognitive vulnerability, with a high degree of construct validity and good internal consistency (Haeffel et al., 2008).

Results

Scores for both the CSQ and DAS-SF1 are listed in Table 4. A one-factor ANOVA was used to determine if there were differences between the five groups (never depressed neutral MI, never depressed negative MI, previously depressed neutral MI, previously depressed negative MI, and currently depressed neutral MI) on the CSQ and DAS-SF-1 scores. There was a significant group difference for the CSQ scores, $F(4, 125) = 23.78, p < .001, MSE = 0.70$, and the DAS-SF-1 scores, $F(4, 127) = 20.04, p < .001, MSE = 15.99$. Follow up t-tests indicated that the currently depressed group had significantly higher scores on the CSQ ($M = 4.8$) than the never depressed neutral MI group ($M = 3.1$), $t(53) = 7.69, p < .001$, the never depressed negative MI group ($M = 2.9$), $t(56) = 8.80, p < .001$,

the previously depressed neutral MI group ($M = 3.7$), $t(45) = 4.32$, $p < .001$, and the previously depressed negative MI group ($M = 3.3$), $t(48) = 6.41$, $p < .001$.

For the DAS-SF-1 scores, follow up t-tests indicated that the currently depressed group had significantly higher scores ($M = 23.4$) than the never depressed neutral MI group ($M = 15.3$), $t(53) = 7.55$, $p < .001$, the never depressed negative MI group ($M = 15.3$), $t(56) = 7.73$, $p < .001$, the previously depressed neutral MI group ($M = 18.4$), $t(45) = 4.16$, $p < .001$, and the previously depressed negative MI group ($M = 16.6$), $t(48) = 6.05$, $p < .001$.

Correlational analyses were used to test the hypothesis that dysfunctional attitudes (as assessed by the DAS-SF-1) and maladaptive attributional styles (as assessed by the CSQ) were correlated with attentional biases. Table 5 shows the zero-order correlations between the bias scores and the CSQ and DAS-SF-1. Depression-related bias (calculated as the percentage of total fixation time for depression-related images minus 25%) was positively correlated with scores on the CSQ, $r(124) = .24$, $p < .01$. As scores on the CSQ increased, the bias towards depression-related images also increased. Positive bias (calculated as the percentage of total fixation time for positive images minus 25%) was negatively correlated with scores on the CSQ, $r(124) = -.25$, $p < .01$, such that as scores on the CSQ increased, attentional biases towards the positive images decreased. Similarly, the DAS-SF-1 scores were positively correlated with depression-related bias, $r(124) = .27$, $p < .01$, and negatively correlated with positive bias, $r(124) = -.23$, $p < .01$. What should be noted, however, is that the BDI scores were also correlated with the CSQ, $r(124) = .61$, $p < .001$, and the DAS-SF-1, $r(124) = .63$, $p < .001$. As a consequence, it is not clear if the correlation between the attentional biases and CSQ and DAS-SF-1 scores was due to the correlation between these measures and the BDI. To determine if the CSQ was correlated with the bias scores after taking into account the correlation between the CSQ and BDI,

partial correlations between CSQ and each bias score were computed. When the scores on the BDI were controlled for, the partial correlation between CSQ and depression bias was not significant $r(123) = .10, p > .10$, nor was the correlation between CSQ and positive bias $r(124) = -.14, p > .10$. The same was true for the partial correlations between DAS-1 and depression bias, $r(123) = .13, p > .10$, and DAS-SF-1 and positive bias, $r(123) = -.11, p > .10$. These correlations indicated that the CSQ and DAS did not contribute incremental variance in the bias scores above and beyond that accounted for by the BDI scores—when BDI scores were controlled for, there was no remaining association between CSQ and DAS-SF-1 scores and depression and positive bias.

Table 4

Scores on the CSQ and DAS-SF-1

	ND Neutral	ND Negative	PD Neutral	PD Negative	CD Neutral
CSQ	3.1 (.78) _{ab}	2.9 (.83) _a	3.7 (.90) _b	3.3 (.84) _{ab}	4.8 (.84) _c
DAS-SF-1	15.3 (3.8) _a	15.3 (3.5) _a	18.4 (3.6) _a	16.6 (3.6) _a	23.4 (5.0) _b

Note: Standard error in parentheses. Means in the same row having the same subscript are not significantly different at $p < .05$. ND = never depressed. PD = previously depressed. CD = currently depressed. Neutral = neutral mood induction. Negative = negative mood induction.

Table 5

Correlations between bias scores and scores on the CSQ and DAS-SF-1

	CSQ	CSQ- control for BDI score	DAS-SF-1	DAS-SF1 control for BDI score
Bias Depression	$r = .24, p < .01$	$r = .10, p = .25$	$r = .27, p < .01$	$r = .13, p = .12$
Bias Positive	$r = -.25, p < .01$	$r = -.14, p = .10$	$r = -.23, p < .01$	$r = -.11, p = .21$

Correlation with BDI: CSQ/BDI score, $r = .67, p < .001$ DAS-SF-1/BDI score, $r = .630, p <$

.001

Discussion

This exploratory analysis examined the scores on a measure of cognitive vulnerability (the CSQ), as well as dysfunctional attitudes (The DAS-SF-1) to determine if there were differences in scores between groups, as well as determining if these maladaptive cognitive patterns were correlated with attentional biases across all groups. The currently depressed group displayed higher scores on both the CSQ and the DAS-SF-1. The two previously depressed groups did not differ on CSQ and DAS-SF-1 scores as a function of MI condition. As the CSQ is predicated on the hopelessness theory of depression whereby a cognitive vulnerability should interact with a negative life event to create risk for depression (Haefel et al., 2008), it was thought that scores on the CSQ should increase in those who had experienced the negative MI condition relative to the neutral MI condition. This was not the case. The use of the negative MI relative to the neutral MI did not appear to impact the level of cognitive vulnerability as measured by the CSQ and reported by those with a history of depression. In other comparisons, the previously depressed group in the neutral MI condition evidenced higher scores on the CSQ relative to the never depressed group in the negative MI condition. Other research has found that those with a history of depression evidence more negative cognitive styles, as measured by the CSQ relative to those never depressed (Haefel et al., 2005). The results could be reflective of the impact of the negative MI on the never depressed group, as also seen in their lowered attention to anxiety-related images and increased attention to positive images. The CSQ asks people to consider 12 negative situations and how they would respond—perhaps those never depressed individuals who had already experienced the negative MI were still regulating their mood towards more positive themes in general, explaining the lower score. However,

their score was not different from the never depressed who had experienced the neutral MI, so this may not be a plausible explanation. Perhaps a negative MI, which induces only a temporary negative mood state relative to an actual negative life event, does not provide the requisite amount of stress required to elicit the negative cognitive style that the CSQ taps into.

The presence of attentional biases did correlate with scores on both the CSQ and DAS-SF-1 across groups, but when scores on the BDI, which were highly correlated with scores on the CSQ and DAS-SF-1, were controlled for, these correlations disappeared. Therefore, neither negative cognitive style nor dysfunctional attitudes accounted for variance in attentional biases above and beyond scores on the BDI. A complicating issue here may be in trying to compare implicit (i.e. attentional biases) and explicit (i.e., maladaptive cognitive patterns) measures of cognitive vulnerability. Haeffel et al. (2007) compared an implicit (Implicit Association Test) and explicit (CSQ) measure of cognitive vulnerability and found there were weak correlations between these two types of vulnerabilities. They concluded that a dual process theory of cognitive vulnerability was operating, whereby implicit processing of information determines an individual's immediate emotional response to a stressful situation, and explicit processing is more important in the prediction of subsequent depressive episodes. It is plausible that the lack of correlation in the present study is related to the distinction between implicit and explicit cognitive processing. As described by Haeffel et al. (2007), there tends to be two 'camps' of cognitive vulnerability researchers—one that studies explicit cognitions, which refers to deliberate processing and effortful cognitive controls (such as cognitive products tapped by measures such as the CSQ). The other camp studies implicit cognitions that are more focused on automatic activation of cognitive processes and information processing (e.g.,

attentional biases). It is thought that how an individual interprets events is dependent on which type of processing they are engaged in—automatic or effortful, and whether or not they employ explicit processes to change their more automatic responses. If an individual can use explicit cognitive processes, they can override the more automatic schema-driven, implicit cognitions that contribute to negative interpretations of information, which lead to and maintain depressive symptoms. The CSQ appears to be more likely to predict subsequent depressive symptoms and/or episodes (as described by Haeffel et al.) as opposed to predicting how one will react to a negative mood state (e.g., in the form of attentional biases to emotional images).

Clinical Implications of Cognitive Maladaptive Cognitive Patterns in Depression:

Understanding how dysfunctional thinking patterns interact with attentional biases and contribute to cognitive risk for depression is important. An understanding of these vulnerability factors is key to effective treatment and ultimately prevention of depression (Bieling & Grant, 2007). If attentional biases and maladaptive cognitions exist together creating a cognitive vulnerability to depression, further research may be useful to examine whether treatment for one type also helps to eradicate the other, or if separate treatment modalities are required. A recent review (DeRaedt & Koster, 2010) discussed findings suggestive of differing pathways that result in maladaptive cognitive patterns versus attentional biases. It is possible that effective treatment would benefit from targeting cognitive vulnerabilities in its varying manifestations for optimal effectiveness. However, a more comprehensive understanding of how these two types of cognitive vulnerabilities co-exist and interact will need to await further research.