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UNIVERSITY OF CALGARY

The Effects of a Sad Mood Induction on Attention Disengagement from Emotional Images in Remitted and Never Depressed Women

by

Stephanie Laurie Marie Korol

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Abstract

Research suggests that depressed individuals experience more difficulty disengaging attention from negative information (e.g., Everaert et al., 2012; Joormann & D'Avanzato, 2010; Koster, et al., 2011), although not all studies have reached this conclusion (e.g., Karparova et al., 2005; Wisco et al., 2012). In the present study, differences in attention disengagement were examined in currently, remitted, and never depressed women. Eighty participants completed an attention disengagement task while viewing emotional images. The time taken to shift their gaze away from the image was used as the measure of attention disengagement. For remitted and never depressed women, the disengagement task was completed before and after a sad mood induction (MI). Currently depressed participants were not found to disengage more slowly from negative images than never depressed participants. There was evidence that the sad MI affected disengagement for the remitted depressed participants who were most affected by the sad MI. The implications of these findings are discussed.

Keywords: Depression, Attention disengagement, Eye-tracking, Mood induction

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The Effects of a Sad Mood Induction on Attention Disengagement from Emotional Images in Remitted and Never Depressed Women

In recent decades research investigating the risk factors that contribute to an individual developing major depressive disorder (MDD) has begun to focus on the cognitive processes that underlie depression. Attention and inhibition in particular are thought to be key factors involved in negative cognition in depression (Gotlib & Joormann, 2010; Joormann & D'Avanzato, 2010). Researchers have found that depressed individuals attend to emotional information differently than never depressed individuals, such that depressed individuals attend less to positive information and more to negative information (e.g. Caseras, Garner, Bradley, & Mogg, 2007; Eizenman et al., 2003; Leyman, DeRaedt, Vaeyens, & Phillippaerts, 2011). These attentional biases have been observed in many studies (see Gotlib & Joormann, 2010, for a review). Cognitive models of depression propose that these attention biases are not merely symptoms of depression, but are a vulnerability trait in those at risk for depression (e.g., De Raedt & Koster, 2010; Koster, De Lissnyder, Derakshan, & De Raedt, 2011). Remitted depressed individuals who are not currently experiencing a depressive episode are therefore predicted to have latent attentional biases, which, under the stressor of a dysphoric mood, can become active (e.g. Ingram, Bernet, & McLaughlin, 1994; Just, Abramson, & Alloy, 2000; Miranda & Gross, 1997; Scher, Ingram, & Segal, 2005; Teasdale & Dent, 1987). For these reasons, in the present study a sad mood induction (MI) procedure was used to create a dysphoric mood, in order to examine latent attentional biases in remitted depressed individuals.

In addition to these attentional biases, research suggests that depressed individuals experience more difficulty disengaging attention from negative information (e.g. Bradley, Mogg, & Lee, 1997; Caseras et al., 2007; Eizenman et al., 2003; Ellenbogen & Schwartzman, 2009;

Ellenbogen, Schwartzman, Stewart, & Walker, 2002; Everaert, Koster, & Derakshan, 2012; Joormann & D'Avanzato, 2010; Koster, et al., 2011; Koster, De Raedt, Goeleven, Frank, & Crombez, 2005; Leyman, De Raedt, Schacht, & Koster, 2007; Sanchez, Vazquez, Marker, LeMoult, & Joormann, 2013; Sears, Thomas, LeHuquet, & Johnson, 2010). The attentional biases for negative material, and the difficulty with disengaging from such material, are hypothesized to be interrelated (Everaert et al., 2012). More specifically, difficulty in the ability to disengage from negative stimuli is thought to be due to the impaired inhibition of processing such information, which results in an overall attentional bias for negative stimuli (Everaert et al., 2012). In addition, impaired disengagement is thought to be one of the underlying cognitive processes related to depressive rumination (De Raedt & Koster, 2010; Joormann & D'Avanzato, 2010). Slower disengagement from negative stimuli suggests that the ability to adaptively shift one's attention from one stimulus to another may be impaired, which may contribute to difficulties in rumination (Ellenbogen & Schwartzman, 2009). It is hypothesized that a reduced ability to inhibit the processing of negative information can lead to difficulty disengaging attention from negative thoughts, as proposed by the *impaired disengagement hypothesis* (Koster et al., 2011). This view is supported by correlational findings between rumination and reduced inhibition of negative information (Gotlib & Joormann, 2010). This hypothesis requires more empirical investigation and support, however, and this will require a better understanding of the differences between depressed and never depressed individuals in their ability to disengage from negative stimuli.

Research investigating the impact of emotional information on attention is rapidly developing (Riggs, McQuiggan, Farb, Anderson, & Ryan, 2011; Yiend, 2010), yet the study of attention disengagement from emotional information, particularly in depression, is fairly new.

Many hypotheses, such as the impaired disengagement hypothesis (Koster et al., 2011), require further empirical testing, and would benefit from the use of direct measures of attention, such as eye-tracking technology (Gotlib & Joormann, 2010; Peckham, McHugh, & Otto, 2010). In most previous studies, the use of manual response latency-based tasks to measure disengagement has resulted in researchers making inferences about disengagement, rather than directly observing shifts of attention. The present study focuses and builds on our understanding of attention disengagement in depression, using eye gaze tracking to directly measure the disengagement of attention.

Research on Attention Disengagement and Depression

Few studies have examined the disengagement of attention in depression, and most of these studies have used response latency-based tasks rather than directly measuring attention. For example, Koster, De Raedt, Goeleven, Frank, and Crombez (2005) used a spatial cueing task to measure attention disengagement from positive and negative words in dysphoric and non-dysphoric individuals. On each trial, participants were first shown either a positive, negative, or neutral word for 1500 ms on the left or right side of the display. Participants were then shown a black rectangular target on either the left or right side of a central fixation marker, and on 50% of the trials, the target appeared in the location opposite the positive, negative, or neutral word. Participants were asked to indicate the location of the black rectangular target (with a key press), which required them to disengage from the positive, negative, or neutral word when the target appeared in the location opposite to the word (disengagement trials). The speed with which participants were able to respond to the target when it was presented in the location opposite to the word indexed the time required to disengage from the word. Koster et al. found that on disengagement trials, dysphoric participants were slower to disengage attention from negative

word cues than from neutral word cues, whereas non-dysphoric participants did not exhibit this difference. Koster et al. also observed the opposite outcome with positive words. They concluded that attention disengagement from negative words was impaired in participants with dysphoria.

Van Duerzen et al. (2011) sought to extend the findings of Koster et al. (2005), and explore other aspects of attention. Like Koster et al., Van Duerzen et al. used a spatial cueing task, in which they presented a positive word (e.g., *happy*), neutral word (e.g., *green*), or negative word (e.g., *lonely*) cue for 1000 ms, followed by a black square target. Participants were asked to respond as quickly as possible to the location of the black square (left or right) with a keypress. The black square remained on the screen until participants made a response. The word cue that appeared before the black square was either in the same location as the square or in the opposite location. Similar to Koster et al.'s (2005) study, on trials where the black square appeared opposite to the word cue, participants were required to shift their attention toward the target. The time taken to shift attention away from the different word cues was used as the measure of attention disengagement. Van Duerzen et al. used a female sample that exhibited a full spectrum of depressive symptoms instead of dichotomized groups (dysphoric vs. non-dysphoric). Interestingly, Van Duerzen et al.'s findings contradicted Koster et al.'s (2005) results. They found that females with higher depression scores (assessed using the BDI-II) were faster to disengage from negative stimuli. Van Duerzen et al. speculated that the discrepancy with Koster et al.'s (2005) findings may have been due to different stimulus presentations times of the word cues (1000 ms versus 1500 ms).

In a similar, more recent study conducted by Pereira and Khan (2016), disengagement from emotional words to neutral words was tested for clinically depressed individuals and non-depressed individuals. Pereira and Khan also investigated whether there was an advantage or

disadvantage in reaction time (with faster reaction time representing faster disengagement), depending on the visual field participants were asked to disengage from, which tested for hemispheric differences in disengagement. Participants were first shown an emotionally valenced word (positive or negative) on the left or right side of the display. A central fixation marker was then shown, followed by the central presentation of both an emotionally valenced word (positive or negative) and a new neutral word. Participants were asked to identify the new word, which would be the neutral word each time, requiring them to disengage from the familiar emotionally valenced word they just observed. They found that the depressed participants' disengagement times were slower than those of the control group. They also found that there was no hemispheric difference for the depressed participants in their disengagement times. The control group, on the other hand, had shorter disengagement times for words presented to the left visual field, suggesting facilitated disengagement of attention from words presented to the right hemisphere. Because depressed participants did not show this advantage, Pereira and Khan concluded that the right hemispheric advantage for disengagement is impaired in depression. Pereira and Khan also noted that there was no significant effect of word valence (positive or negative), which contradicts previous studies showing impaired disengagement from negative stimuli in depressed participants. They suggest that this may be due to the valence of their stimuli failing to have an impact. To avoid any hemispheric advantages or disadvantages in disengagement abilities, in the present study, stimuli (emotional images) were presented in the centre of the display, and the disengagement task required participants to shift their gaze to a disengagement marker above or below the central image.

Other studies measuring attention disengagement in depression have also reported mixed results using different types of stimuli. Karparova, Kersting, and Suslow (2005) investigated

depressed patients' ability to disengage attention from emotional faces. They used a face-in-the-crowd task, consisting of schematic drawings of neutral and emotional (positive and negative) faces. Depressed patients and control participants were shown two types of displays: all four faces had the same facial expression, or one of the four faces had a different facial expression. Participants were asked to detect whether all the faces had the same expression or if one had a different expression than the others. They used response latencies and the number of errors made when detecting the different facial expression as the measure of disengagement. For example, for a display consisting of three negative faces and one positive face, the participant would have to disengage from the negative faces to respond accurately. They hypothesized that depressed patients would be slower and make more errors when disengaging from negative faces.

Karparova et al. (2005) found that, overall, depressed patients made more errors and were slower to respond than control participants; however, their results did not support the prediction that depressed patients would take longer than control participants to disengage from negative faces compared to neutral faces. Both participant groups were slower to detect a positive or neutral face when the other faces were all negative, compared to displays where the majority of the faces were positive or neutral, suggesting that the negative facial expression captured visual attention. Karparova et al. pointed out that one limitation of their study was that negative faces could have been interpreted as either angry or sad, and that using schematics such as line drawings, instead of real emotional expressions, may not be generalizable. Weierich, Treat, and Hollingworth (2008) also noted that using emotional pictures instead of words or line drawings of faces is preferable for tasks that assess top-down influences on attention to emotion, because emotional pictures or images are more similar to real-world stimuli, and they do not require

semantic processing. The present study, therefore, uses emotional pictures for the disengagement task.

Wisco, Treat, and Hollingworth (2012) addressed the limitations of Karparova et al.'s (2005) study by using images of real faces, and by using both angry and sad faces. They presented participants with an image of an emotional face (happy, neutral, angry, or sad) for 250 ms, which was followed with the presentation of a symbol on either the left or right side of the emotional face (a & or % symbol), while the emotional face remained on the screen. Participants were asked to press a button identifying the type of symbol presented, as quickly and as accurately as possible. This task required them to disengage from the emotional face and attend to the symbol, in order to identify as quickly as possible which symbol was being presented. Wisco et al. did not find any depression-related delay in disengagement of attention from the sad faces, or facilitated disengagement from the happy faces. They postulated that the presentation time of the faces was too short (250 ms) and that they had reduced statistical power with a small sample size. Wisco et al. also pointed out that they did not assess for the presence of anxiety disorders in their participants, and that it is possible that participants with comorbidity of depression and anxiety may have shown different results. It has been found in previous research, that anxious individuals' attention is captured more by threat-relevant information, and therefore leads to delayed disengagement from threatening stimuli; however the same difficulty in disengagement from sad, happy, or neutral stimuli does not appear for anxious individuals (see Weierich et al., 2008, for a review).

In addition to these points, I speculate that leaving the emotional face on the screen while having participants disengage to the target symbol may have affected their results, due to some preliminary pilot testing of my own method. In my disengagement task (described more fully

below), pilot test participants stated that they could still see the emotional image in their peripheral vision even after they had shifted their gaze away from the image to a peripheral fixation marker above or below the image. Thus, when the image is still visible there is an opportunity for the participant to continue to process the image, so they do not have to completely disengage their attention from the image. Although Wisco et al. (2012) point out that they wanted the emotional face to remain on the screen so that participants had to disengage from an image that was still present, the participants may have been able to view the image in their peripheral vision once they looked at the target symbol, and may not have felt that disengagement was very difficult because of this.

Wisco et al. (2012) suggested that in future research, comparing the role of anxiety and depression in disengagement would be useful, as well as using multiple presentation times for the disengagement task (rather than only 250 ms). My study addresses these concerns by assessing for comorbid anxiety disorders, and by using three different presentation times during the disengagement task. Wisco et al. also suggested that eye-tracking methodologies should be used, and that having trials where the target is present and trials where it is absent would be beneficial, because their study used only target-present trials. Lastly, they noted that the use of threatening faces could have complicated their findings. The present study addresses all of these issues.

Eye-tracking Research on Disengagement and Depression

Sears, Thomas, LeHuquent, and Johnson's (2010), and Sanchez, Vazquez, Marker, LeMoult, and Joormann's (2013) recent studies, are the only two studies, to my knowledge, that have specifically examined attention disengagement in depression using eye-tracking methodologies. Sears et al. examined attention disengagement in dysphoric individuals (their

participants were not assessed for MDD using a clinical interview, but scored above 20 on the BDI). Sears et al. presented dysphoric and non-dysphoric individuals with four types of images (sad/depressing, angry/threatening, happy/positive, or neutral), with each image presented for four seconds. For 25% of the images a probe appeared either 1500, 2000, 2500, or 3000 ms after the image appeared; the probe was a semitransparent arrow presented in the center of the image that pointed to one of the four corners of the computer display (each corner contained a + sign). Participants were told to immediately shift their gaze off of the image in the direction indicated by the arrow to the location of the + sign. Disengagement was measured by the speed with which participants were able to move their gaze off the probed images.

Sears et al. (2010) found that dysphoric participants were slower than non-dysphoric participants to disengage their attention from depression-related images. When looking at the difference between depression-related images and neutral images, they also found that dysphoric participants were slower to disengage from the depression-related images than neutral images, whereas non-dysphoric individuals showed no difference in their disengagement times for depression-related and neutral images. Sears et al. concluded that dysphoric individuals had greater difficulty disengaging from depression-related images once they had focused on them. Sears et al. also found that both dysphoric and non-dysphoric participants were able to disengage faster from positive images than neutral images, but for dysphoric participants the difference in disengagement times between positive and neutral images was larger, suggesting faster disengagement from positive information. They speculated that if dysphoria causes faster disengagement from positive stimuli, then it may be consistent with the view that dysphoric individuals show disturbances in positive emotional responding, because positive information may have a reduced ability to engage their attention. Sears et al. pointed out that their results

would need to be extended to clinically depressed individuals, which was one of the goals of the present study.

Sanchez et al. (2013) extended Sears et al.'s (2010) research by using a clinically depressed sample, although their disengagement task was quite different. Participants were presented with both an emotional (happy, angry, or sad) face and a neutral face simultaneously for 3000 ms of free-viewing. In one condition, once participants fixated on the neutral face for 100 ms, a frame (square or circle) appeared around the emotional face, and participants were asked to move their gaze as quickly as possible toward the framed face, and to press a key to indicate what frame type it was (square or circle). In the second condition, participants had to fixate on the emotional face and then disengage to the framed neutral face, again indicating what frame type was shown. The final condition was a control condition where no cue was presented. The time taken (in milliseconds) to disengage attention from either the emotional face to the neutral face, or vice versa, was the measure of disengagement. Sanchez et al.'s results support previous findings that depression is associated with difficulties disengaging attention from depression-related stimuli. Participants with MDD, compared to control participants, took significantly longer to disengage from sad faces when cued to attend to a neutral face. Difficulties in disengagement for MDD participants were specific to depression-related stimuli (sad faces), and their disengagement from the other stimuli (angry and happy faces) did not differ from control participants. Sanchez et al. speculated that, for those with MDD, the difficulties disengaging attention may support Koster et al.'s (2011) hypothesis that the processing of negative information (such as rumination) may lead to prolonged negative affect (De Raedt & Koster, 2010).

The Present Study

The purpose of the present study was to examine attention disengagement and to test the impaired disengagement hypothesis (Koster et al., 2011). My study used eye gaze tracking to provide a direct measure of attention disengagement, which may shed light on the conflicting results reported in the literature. The present study also sought to extend the eye-tracking research of Sears et al. (2010) and Sanchez et al. (2013) by using MI procedures and by including a remitted depressed participant group.

More specifically, the present study differs from previous studies in the following respects: 1) emotional images were used instead of words or schematics, 2) images were shown one at a time in the center of the display, and a mask was used to cover the image once attention had shifted or disengaged, 3) an auditory cue was used rather than a visual cue, and the cue was endogenous rather than exogenous (described in more detail below), 4) three groups of participants were included in the study (a currently depressed, remitted depressed, and never depressed non-clinical control group), and 5) a sad MI was used to determine if disengagement times would be affected by a sad mood. The following brief description of the present study's methodology will explain how and why these differences were employed.

For the present study, participants viewed emotional images (negative and positive) as well as neutral images. Threatening images were not used, as Wisco et al. (2012) noted that the use of such images may have complicated their results, and the focus of the present study was solely on depression-related images compared to positive images. Emotional images were used instead of words or schematic faces, as Weirech et al. (2008) recommended.

Unlike previous studies, participants were presented with one image at a time, and half of the images were probed with an auditory cue that required participants to look away from the

image as quickly as possible (given Wisco et al.'s, 2012, recommendation to use trials where disengagement is not required). By presenting one image on the screen at a time, participants were required to disengage to a marker, rather than to another image, creating a pure and simple measure of attention disengagement. The image was also covered with a pattern mask after the participant disengaged their attention away from the image, which prevented the participant from continuing to attend to the image in their peripheral vision. After several practice trials participants understood that once they shifted their attention away from the image, they would no longer be able to process it. Before beginning the actual trials, this understanding should influence participants' disengagement behavior (i.e., participants understood that they would have to interrupt their processing of the image to disengage their attention, and their awareness of this fact likely delayed their disengagement from some images that they found difficult to stop attending to). In addition, by placing the image in the center of the display and requiring participants to disengage to the top or bottom of the display, the present study avoided any hemispheric advantages or disadvantages noted in Pereira and Khan's (2016) study.

An endogenous auditory cue was used in my study, instead of an exogenous visual cue, which has been used in most of the disengagement studies discussed previously (e.g., Koster et al., 2005; Van Duerzen et al., 2011). An exogenous cue is a stimulus that elicits an automatic or reflexive shift of attention to the cue, and does not require voluntary control. In contrast, an endogenous cue requires a voluntary shift of attention (Posner, 1980). For this reason, Sears et al. (2010) argued that the use of an endogenous cue is superior for testing biases in attention disengagement because participants need to deliberately decide to shift their attention. Sears et al. and Sanchez et al. (2013) used an endogenous visual cue, whereas in my study, I chose to use an endogenous auditory cue. I reasoned that an auditory cue would be superior because it is less

visually distracting, and because it requires more cognitive control to interpret the cue and execute the shift of attention away from the image.

Three groups of participants were recruited (currently depressed, remitted depressed, and never depressed) for the present study. A remitted depressed group was used to investigate whether impaired disengagement is a vulnerability trait that may be a risk factor for depression, or if it is a state-like characteristic that only emerges when one is currently depressed. Comorbid anxiety disorders were also assessed amongst the participants.

Finally, a sad MI was used to determine if the attention disengagement from negative and positive stimuli can be affected by a sad mood. For remitted depressed individuals an induced sad mood may cause them to behave similarly to currently depressed individuals (Ingram et al., 1994; Just et al., 2000; Miranda & Gross, 1997; Scher et al., 2005; Teasdale & Dent, 1987). The never depressed participants also experienced the sad MI to explore whether this affects their attention disengagement. Never depressed participants may have difficulty disengaging from negative stimuli due to their sad mood, or they may have difficulty disengaging from positive stimuli because they are attempting to repair their mood, as found in previous research (Newman & Sears, 2015). The latter finding would further support the idea that never depressed individuals possess a resilience factor that reduces their vulnerability of developing depression, by using emotion regulation strategies, such as attending to positive stimuli more when in a sad mood (DeRaedt & Koster, 2010; Joormann & D'Avanzato, 2010).

Predictions

It was predicted that currently depressed participants would disengage the slowest from negative images, followed by remitted depressed participants, with the never depressed control participants showing the fastest disengagement from negative images. It was also predicted that

following the sad MI, remitted depressed participants would behave more similarly to currently depressed participants, and show slower disengagement from negative images, whereas never depressed participants were predicted to show slower disengagement from positive images.

Method

Participants

Three groups of participants were recruited from the community using advertisements seeking women diagnosed with current depression, those with a history of depression, and those with no history of depression (using posters in public locations, online classified ads, and media releases). In addition, undergraduate students from the University of Calgary were recruited using an online research participation recruitment system. The never depressed control group consisted of women with no history of depression or current psychiatric diagnosis (n = 20). The remitted depressed group consisted of women who were previously diagnosed with clinical depression, but did not meet the diagnostic criteria for current MDD (n = 27). The currently depressed group consisted of women diagnosed with current MDD (n = 33).

Participants were excluded if they screened positive for current substance or alcohol abuse, psychosis, bipolar disorder, or anxiety disorder (unless the anxiety disorder was comorbid with current or previous episodes of depression). To control for gender and to eliminate any confounds due to gender differences, only women were recruited. To be eligible for participation, participants were required to have normal or corrected-to-normal vision. Prospective participants from the community completed a survey screening initially to assess for inclusion and exclusion criteria. The emailed survey screening consisted of questions adapted from the measures listed in the next section (ie: SCID, BDI-II, BAI, and PHQ-9). The screening was not used as the primary method to categorize participants into each group, but rather to get a

sense of the participants' experiences, or lack thereof, with depression or anxiety, before the lab session took place, and to screen-out participants with any exclusionary criteria listed previously. Once participants were deemed eligible following the survey screening, they were scheduled for the laboratory session, where they completed the measures listed in the next section. Participants were assigned to the appropriate group based on their responses to the measures completed in the lab session. Participants were compensated with a payment of $25 (CAN) for the 120 minute study session, or for those participants recruited via the research participation system, the compensation was bonus credits in a psychology course.

Measures

All participant diagnoses were determined using the Structured Clinical Interview for DSM-IV diagnoses (SCID; First, Spitzer, Gibbon & Williams, 1996). Both myself and the research coordinators involved in the study were trained to use the SCID, and deemed proficient at using this tool by a clinical psychologist. Participants also completed the Beck Depression Inventory II (BDI-II; Beck, Steer, & Brown, 1996), the Ruminative Response Scale (RRS; Nolen-Hoeksema & Morrow, 1993), the Automatic Thoughts Questionnaire (ATQ; Hollon & Kendall, 1980), and the Patient Health Questionnaire-9 (PHQ-9; Spitzer, Kroenke, & Williams, 1999), to assess for current and previous depression, as well as symptoms and severity of depression. The Beck Anxiety Inventory (Beck, Epstein, Brown, & Steer 1988) was used to assess for current comorbid anxiety disorders. Before and after the sad MI participants completed the Visual Analogue Mood Scale (VAMS; Luria, 1975), and an 11-point self-report mood scale (described below), to measure the effect of the sad MI.

The SCID (First et al., 1996) was used for the standardized assessments of MDD and anxiety disorders. Emphasis was placed on Modules A (*Mood Episodes*), D (*Mood Disorders*),

and F (*Anxiety and Other Disorders*). The diagnostic summary from the SCID allowed for classification of whether the disorder was "current" (full criteria have been met at any time during the current month), and/or "lifetime" (if the full criteria have ever been met during the participants' life). For the remitted depressed participant group the episode was not current.

The BDI-II (Beck et al., 1996) is a 21-item self-report measure which assessed the severity of participants' depressive symptoms. Items measure various symptoms of depression, such as "sadness", "loss of interest", "crying", and "suicidal thoughts". Each item was rated on a 0-3 scale with total scores ranging between 0-63. Scores of 0-13 represent minimal depression; 14-19 represent mild depression; 20–28 represent moderate depression; and 29-63 represent severe depression. Higher total scores indicate more severe depressive symptoms.

The RRS (Nolen-Hoeksema & Morrow, 1993) is a 22-item questionnaire developed to measure the degree of rumination in an individual. Participants were asked to rate how often they experience certain ruminative thoughts, such as, "think about how alone you feel". Each item was rated on a scale from 1 ("*almost never*") to 4 ("*almost always*"), with total scores ranging from 22-88 points. Although there are no cut-off scores for an individual to be considered a "ruminator" or not, higher scores indicate higher levels of rumination, with lower scores indicating lower levels of rumination.

The ATQ (Hollon & Kendall, 1980) is a 30-item questionnaire developed to identify and assess the frequency of automatic negative self-statements, which are linked to depression. Each item consists of a negative thought, such as, "I feel like I'm up against the world". Participants were asked to rate how often the thought had surfaced in the past week on a scale from 1 ("*not at all*") to 5 ("*all the time*"). Internal consistency of the ATQ is high, with a Spearman-Brown

coefficient = .94 (Kazdin, 1990). Subjects with higher ATQ scores tend to display lower self-esteem, greater hopelessness, and a more external attribution of control.

The PHQ-9 (Spitzer et al., 1999) is a 9-item depression scale that assessed participants' depression severity, symptoms, and functional impairment. The PHQ-9 measures participants' experience of DSM-IV criteria for depression (depressed mood, anhedonia, appetite change, loss of energy, sleep disturbance, feelings of worthlessness or guilt, psychomotor agitation/retardation, suicidal ideation, and diminished concentration) over the past two weeks. Questions are scored on a 4-point scale ("*Not at all*", "*Several days*", "*More than half the days*", and "*Nearly every day*") to assess how many days over the past two weeks participants had experienced each of the nine criteria. PHQ-9 scores of 5, 10, 15, and 20 represent mild, moderate, moderately severe, and severe depression, respectively (Kroenke, Spitzer, & Williams, 2001).

The BAI (Beck et al., 1988) is a 21-item self-report measure of anxiety severity which was used along with the SCID to assess for participants experiencing comorbid anxiety disorders. Fourteen of the 21 items measure somatic symptoms, while the remaining seven items measure cognitions associated with anxiety and panic. Each item was rated for severity on a 4-point scale ranging from 0 ("*Not at all*") to 3 ("*Severely – I could barely stand it*"). Scores on each item were added together to obtain a total score, which can range from 0-63. A total score ranging between 0-21 indicates very low anxiety; 22-35 indicates moderate anxiety; and scores over 36 indicate more severe anxiety.

The visual analog mood scale (VAMS; Luria, 1975) is a 100 mm horizontal line with labels on each endpoint, with "*very sad*" on the left, and "*very happy*" on the right. Participants indicated their current mood by placing a mark on the horizontal line, and their responses were

scored from 0 to 100 by measuring the distance in mm from the left side of the scale to the participants' rating. The VAMS has strong reliability, with test-retest reliabilities ranging from $r = .59$ to $r = .80$ (Luria, 1975). The VAMS is a commonly used measure in MI literature (e.g. Ahearn, 1997; Scherrer & Dobson, 2015; Segal et al., 2006), with good psychometric properties with respect to validity and reliability (e.g., Blackburn, Cameron, & Deary, 1990; Brosse, Craighead, & Craighead, 1999; Segal, Gemar, & Williams, 1999; Segal et al., 2006).

The 11-point self-report mood scale is a horizontal scale that ranges from −5 ("*very negative*") to +5 ("*very positive*"), with a midpoint of 0 ("*neutral*"). This measure was used by Newman & Sears (2015) in their MI study. Participants were asked to choose one of the 11 points on the scale that corresponds to their current mood. Both the VAMS (Luria, 1975) and the 11-point self-report mood scale were used to measure mood, to ensure increased sensitivity of the mood change measurement (before to after the sad MI). The VAMS and 11-point mood scale are highly correlated with one another (Newman & Sears, 2015). With the VAMS measuring mood in terms of *"very sad"* to *very happy"*, and the 11-point mood scale in terms of *"very negative"* to *"very positive"*, the present study was able to ensure that participants' different descriptions of a sad mood were captured by either, or both of the two mood scales.

Stimuli

Images. A total of 120 images were used and divided equally between three categories: negative (40 images), positive (40 images), and neutral (40 images). These images were divided into two different blocks (per participant session), with 20 negative, 20 positive, and 20 neutral images in each block (for a total of 60 images per block). Two image blocks were used so that one block could be shown before the sad MI, and one block afterwards, for those participants experiencing the sad MI. This ensured that participants were not viewing the same images before

and after the sad MI. The presentation order of the two blocks was counterbalanced across participants, with some participants receiving Order 1 (Block 1 before the sad MI, Block 2 after the sad MI), and others receiving Order 2 (Block 2 before the sad MI, Block 1 after the sad MI). Within each block, half of the images were probed and required participants to disengage from them, and half were not probed (10 negative, 10 positive, and 10 neutral probed images).

Images were collected from the internet, and rated by female undergraduate psychology students as either "positive/happy", "sad/depressing/gloomy", or "neutral/no emotion". Images had to be placed in one of these three categories by 80% or more of the participants to be included in an image set. Negative and positive images were also rated for their pleasantness or unpleasantness (emotional valence) on a scale from 1 ("*very unpleasant*") to 7 ("*very pleasant*"), and their level of arousal on a scale from 1 ("*very low arousal*") to 7 ("*very high arousal*"), using a 7 x 7 matrix (similar to procedure used by Jefferies, Smilek, Eich, & Enns, 2008). Amongst emotion theorists, there is a general agreement that mood states can be organized using these two dimensions (valence and arousal; Jefferies Smilek, Eich, & Enns, 2008). Emotions of sadness are argued to have low pleasantness and low arousal; calmness, to have high pleasantness and low arousal; anxiety, to have low pleasantness and high arousal; and happiness, to have high pleasantness and high arousal (Jefferies et al., 2008).

Images were confirmed to be negative with a mean rating less than 4.0 on the unpleasantness-pleasantness scale, and a mean rating less than 5.0 on the arousal scale. Images were confirmed to be positive if they had a mean rating of 5.0 or higher on the unpleasantness-pleasantness scale, and a mean rating of 4.0 or higher on the arousal scale. The mean ratings for the positive and negative images' pleasantness/unpleasantness and arousal from the survey results can be seen in Table 1.

Table 1

Mean Pleasantness and Arousal Ratings for Positive and Negative Images

	Positive Images				Negative Images			
	Block 1		Block 2		Block 1		Block 2	
	Probed	Non-Probed	Probed	Non-Probed	Probed	Non-Probed	Probed	Non-Probed
Pleasantness	6.03	5.90	5.75	5.76	1.79	2.31	1.89	1.94
Arousal	4.78	4.55	4.59	4.43	4.19	3.53	3.90	4.12

Note. Arousal ratings range from 1 ("*Very Low Arousal*") to 7 ("*Very High Arousal*"), and Pleasantness ratings range from 1 ("*Very Unpleasant*") to 7 ("*Very Unpleasant*"). Ratings based upon a total of N = 176 students ratings.

The negative images included images of sad or crying individuals, scenes of poverty or wastelands, and neglected or injured animals. Any images with threatening or violent themes were avoided, as the focus was on depression-related themes. The positive images included images of people laughing or having fun, happy families and animals, and pleasant scenery or vacation destinations. The neutral images included scenes of individuals working at an office, simple household objects, or plain landscapes or buildings (see Appendix A for each image type, in each image block).

Block 1's mean arousal rating (M = 4.26, SD = 0.65) did not significantly differ from Block 2's mean arousal rating (M = 4.26, SD = 0.54; $t(86) = 0.03$, $p = .977$). For mean pleasantness ratings there was no significant difference between the images in Block 1 (M = 4.01, SD = 2.02) and Block 2 (M = 3.84, SD = 1.97), $t(86) = 0.40$, $p = .688$). There were no significant differences between the probed (M = 4.37, SD = 0.59) and non-probed (M = 4.15, SD = 0.60) images' mean arousal ratings, $t(86) = 1.67$, $p = .098$, or mean pleasantness ratings (probed, M = 3.86, SD = 2.08; non-probed, M = 3.98, SD = 1.90), $t(86) = 0.27$, $p = .788$. These comparisons ensured that the images that were shown in the two blocks did not differ along these dimensions, nor did the probed and non-probed images

The mean arousal rating of the negative images (M = 3.93, SD = 0.53) was significantly lower than that of the positive images (M = 4.59, SD = 0.47), $t(86) = 6.12$, $p < .001$. Not surprisingly, the mean pleasantness of the negative images (M = 1.98, SD = 0.42) was significantly lower than the mean pleasantness of the positive images (M = 5.86, SD = 0.31), $t(86) = 48.75$, $p < .001$. These comparisons ensured that the negative images were considered to be less pleasant and less arousing than the positive images.

Mood Induction. A video clip was used for the sad MI, as a previous meta-analysis concluded that the presentation of a film clip is most effective in inducing both negative and positive moods (Westermann, Spies, Stahl, & Hesse, 1996). The sad MI used was a video called "Otto's story" (Lisl Haldenwang, 2012; approximately 8 minutes in length). This video shows the story of a young boy named Otto who died of brain cancer when he was four years old. It contains very emotional content that is not anxiety provoking. The video uses home videos, pictures, and writing to show the progression of Otto's illness. This video was pilot tested for effectiveness, and found to be over 90% successful in inducing a sad mood. Participants deemed to be remitted depressed or never depressed were shown the sad MI; participants who were found to be currently depressed did not experience the sad MI, as they were already in a negative mood, and further distressing a currently depressed individual was considered to be unethical.

All participants received a positive MI at the end of the session to help repair their mood, and to test for differences in mood repair between participant groups. Participants were given a choice between two positive MI videos, depending on their personal preference. The first choice was a video called "Members of the military return home to reunite with their families" (Jcs Jamalovic, 2013; approximately 6 minutes in length). This video shows members of the military surprising their family members and being reunited with their families. The second choice was a video called "America's Funniest Home Videos' Animal Clips" (Associated Press, 2009; approximately 4 minutes in length). This video shows various recordings of different animals and pets acting silly and cute.

Eye-tracking Apparatus

Eye movements were recorded using an EyeLink 1000 eye-tracking system (SR Research Ltd., Ottawa, Ontario), which uses infrared video-based tracking technology. The system has a

1000 Hz sampling rate, a temporal resolution of 2 ms, and an average gaze error of less than 0.5 degrees of visual angle. Stimuli were shown on a 24-inch LCD monitor positioned approximately 60 cm away from the participant. Participants used a chin rest to minimize head movements while they viewed the images.

Procedure

Participants began each session with the calibration and preparation of the eye-tracker. Following calibration, participants completed 12 practice trials of the disengagement task, which will be described next. After the practice trials, participants were instructed that they would be presented with a 60 image slideshow. Before and after the presentation of each image, a white fixation marker on a dark background was presented. Participants were also told that while viewing some of the images, they would hear either a high auditory tone, or a low auditory tone. They were instructed to shift their gaze to the fixation marker located at the top centre of the display immediately after they heard the high auditory tone, and to shift their gaze to the fixation marker located at the bottom centre of the display immediately after they heard the low auditory tone (the auditory endogenous cue).

Participants then viewed the first block of 60 images (20 negative, 20 positive, and 20 neutral images). Half of these images (10 negative, 10 positive, and 10 neutral images) were probed with either the high or low auditory cue (at random), requiring participants to disengage from the image by shifting their gaze from the image to the top or bottom fixation marker as quickly as possible. The tone cue was presented after 1500, 2000, or 2500 ms (randomly determined) after the start of the image presentation, so the participants were not able to predict when or if the cue would occur. The eye-tracking system measured the amount of time (in milliseconds) between the onset of the auditory cue and the detection of a fixation at the top or

bottom of the display (with 2 millisecond accuracy), as well as whether the participant looked at the correct fixation marker. Once participants fixated on the appropriate fixation marker, the image was masked with a checkerboard image so that participants could not continue to view the image in their peripheral vision. Of the 60 images presented, 50% were probed and the remainder were not probed and were presented for 4000 ms. The presentation of non-probed images created a situation where the probed images were unpredictable amongst the non-probed images. The eye-tracker system randomly determined the order in which the probed and non-probed images were presented within each block of images (see Appendix B for an example of the disengagement task).

Following the first block of image viewing, participants completed a survey questionnaire containing the BDI-II, BAI, PHQ, ATQ, and RRS, as well as demographic questions (age, ethnicity, marital status, height, weight, number of previous depressive episodes, whether they had currently or previously accessed counselling, and whether they currently or previously used antidepressant medication). After completing this questionnaire, participants completed the SCID with the researcher, in order to determine whether they were currently depressed, remitted depressed, or never depressed, and to assess for any comorbid anxiety disorders. Following the SCID, all participants completed their first ratings of mood using the VAMS and 11-point mood scale. If participants were found to be currently depressed, they then viewed the positive MI video. Following the positive MI video, the currently depressed participants completed the same two mood scales in order to obtain a pre- and post-measure of mood. For the participants assessed to be remitted or never depressed, they viewed the sad MI video next. Following this video, remitted and never depressed participants completed the VAMS and 11-point mood scale again, in order to obtain a pre- and post-measure of the effect of the sad MI on participants'

mood. Immediately after completing the mood scales (post sad MI), remitted and never depressed participants proceeded to completing the next eye-tracking block.

The eye-tracking system was calibrated again, and remitted and never depressed participants were given the same instructions on the disengagement task, with the option of skipping the 12 practice trials if they felt confident about the task requirements. Participants then viewed the second block of 60 images, with 50% of the images being probed with the auditory cue. In each of the two blocks of 60 images (one block before the sad MI, one following the sad MI), the same 30 images were always cued with the auditory tone, so that disengagement was being measured for the same images across participants. As noted previously, the order of presentation of the two blocks (one before the sad MI and one after the sad MI) of 60 images was counterbalanced across remitted and never depressed participants.

Following the presentation of the second block of images, remitted and never depressed participants completed the VAMS and the 11-point mood scale before viewing their choice of positive MI. The positive MI was intended to repair the participants' mood following the sad MI. The VAMS and the 11-point mood scale were completed following the positive MI to measure changes in participants' mood, and to compare how well mood was repaired among the currently depressed, remitted depressed, and never depressed participants. Participants were then debriefed on the purpose of the study, and given the opportunity to ask any questions that they may have had.

Statistical Analyses

Disengagement times (in milliseconds) were averaged across the 10 probed images for each image type (30 images total) in each block, for each participant. Disengagement time was defined as the number of milliseconds that elapsed between the presentation of the auditory

probe and the registration of the participant's gaze to the fixation marker below or above the image. Disengagement time therefore measures the amount of time it took a participant to shift their attention away from an image. Averaging over the 10 images in each category provided a mean disengagement time for the positive, neutral, and negative images for both the block before the sad MI (for all three participant groups) and after the sad MI (for remitted and never depressed participants only).

Before averaging the disengagement times, any disengagement times that were over 2000 ms or under 200 ms were excluded, as they were found to be outliers. That is, a distributional analysis revealed that disengagement times over 2000 ms were in the top 1% of all disengagement times (i.e, 99% of all disengagement times were slower than 2000 ms) , and disengagement times under 200 ms were in the bottom 3.7% of all times. Two hundred milliseconds was chosen as the minimum possible saccade (eye movement) time, as previous research has suggested that saccades less than 100 ms are "anticipations" (Buchtel & Butter, 1988) or potentially errors due to an eye blink. Other research has shown that it normally takes around 100-150 ms or longer to initiate a correct antisaccade (non-reflexive eye-movement), than to initiate a reflexive prosaccade (Munoz & Everling, 2004), so a minimum disengagement time of 200 ms seemed appropriate for my dataset. After excluding any disengagement times outside of the 200-2000 ms range, each participants' disengagement times were examined using a distributional analysis, and additional outliers within their respective image blocks (looking at disengagement times before the sad MI and after the sad MI) were removed. Finally, once average disengagement times were obtained for each image type, for each participant, any participants who had more than 50% incorrect saccades (incorrect gaze fixations) averaged

across the negative, positive, and neutral images, were excluded for all analyses due to their poor performance. This was only the case for one participant across the entire sample.

Of the 160 participants tested, 92 were found to have useable data. The 68 (42.5%) participants excluded from the analyses included participants whose eyes could not be calibrated, or whose data files were missing data from technical errors with the eye-tracking equipment, as well as participants who screened positive for current or lifetime substance/alcohol abuse, psychosis, bipolar disorder, or anxiety disorder (unless the anxiety disorder was comorbid with current or previous episodes of depression).

Of the 92 participants with useable data, 59 were diagnosed as remitted or never depressed participants, who therefore experienced the sad MI. Forty-seven of the 59 participants experiencing the sad MI were successfully mood induced, which was a 79.7% success rate. Remitted and never depressed participants were required to be successfully mood induced from the sad MI in order to be included in the data analyses. For the VAMS, this was defined as at least a 20 mm decrease on the VAMS pre- versus post-MI, and for the 11-point mood scale this was defined as at least a 2-point decrease on the 11-point mood scale pre- versus post MI (similar to procedures in previous research; Newman & Sears, 2015). Participants were only required to be successfully mood induced according to the aforementioned requirements on one of these two scales. Since the purpose of the study was to determine the impact of a sad mood on attention disengagement for the remitted and never depressed participants, only participants who were successfully mood-induced were included in the analyses, in order to ensure that any differences in attention disengagement following the sad MI could be attributed to a decrease in mood. The following results are based only on those participants who were successfully mood

induced, as well as the participants diagnosed as being currently depressed, for a total of $N = 80$ participants ($n = 33$ currently depressed; $n = 27$ remitted depressed; $n = 20$ never depressed).

Results

The demographic statistics will be discussed first, followed by the MI data, then the eye-tracking data.

Demographic Statistics

Participant Demographics. Tables 2 and 3 show the demographic information collected during participant testing. With respect to age, the currently depressed participants were older ($M = 32.36$, $SD = 12.21$) than the remitted depressed ($M = 31.19$, $SD = 10.32$) and never depressed participants ($M = 25.00$, $SD = 9.03$; see Table 2). Age was not significantly correlated ($p > .05$) with the mean disengagement times for the negative, positive, or neutral images before or after the sad MI, and therefore should not affect the interpretation of any differences found between the groups of participants.

For the currently depressed participants, 54.5% identified their ethnicity as White, with the remaining participants identifying with one of the following ethnicities: Aboriginal, Arab/West Asian, Black, Chinese, Japanese, Latin American, South Asian, and South East Asian (for details of the exact percentages of participants in each ethnic group, please see Appendix C). For the remitted depressed participants, 66.7% identified as White, and of the never depressed participants, 65.0% identified as White.

Table 2

Means and Standard Deviations of Participant Demographic Information

	Age	SCID # of Depress. Episodes	SR # of Depress. Episodes	BMI	Hrs of Physical Activity (week)	BDI-II Score	RRS Score	ATQ Score	PHQ Score	BAI Score
CD (*n* = 33)	32.36 (12.21)	12.46 (20.54)	3.24 (0.66)	25.61 (4.79)	3.98 (2.76)	20.12 (10.34)	53.12 (12.63)	66.79 (28.28)	12.39 (6.18)	12.79 (9.61)
RD (*n* = 27)	31.19 (10.32)	2.52 (2.71)	2.96 (0.90)	24.94 (5.89)	4.69 (3.36)	9.56 (6.89)	46.63 (9.98)	48.56 (17.37)	6.30 (5.31)	9.22 (8.05)
ND (*n* = 20)	25.00 (9.03)	0.00 (0.00)	1.90 (0.85)	20.59 (6.08)	5.33 (4.03)	5.20 (4.03)	33.35 (9.25)	37.80 (6.27)	3.45 (2.19)	5.95 (5.10)
Total (*N* = 80)	30.13 (11.14)	5.56 (13.65)	2.81 (0.96)	24.45 (5.14)	4.56 (3.32)	12.83 (10.17)	45.99 (13.41)	52.68 (23.57)	8.10 (6.34)	9.88 (8.52)

Note. CD = currently depressed participants, RD = remitted depressed participants, ND = never depressed participants. SR = Self-Reported.

Table 3

Frequencies and Percentages of Demographic Variables

	Bereavement	In Relationship	Marital Status			
			Married/ Living with Someone	Widowed	Divorced	Never Married
CD (n = 33)	3 (9.1%)	21 (63.6%)	16 (48.5%)	2 (6.1%)	3 (9.1%)	12 (36.4%)
RD (n = 27)	3 (11.1%)	21 (77.8%)	13 (48.1%)	0 (0.0%)	0 (0.0%)	14 (51.9%)
ND (n = 20)	0 (0.0%)	8 (40.0%)	5 (25.0%)	0 (0.0%)	1 (5.0%)	14 (70.0%)
Total (N = 80)	6 (7.5%)	50 (62.5%)	34 (42.5%)	2 (2.5%)	4 (5.0%)	40 (50.0%)

Note. CD = currently depressed participants, RD = remitted depressed participants, ND = never depressed participants.

As expected, currently depressed participants had the highest mean BDI-II score (*M* = 20.12, *SD* = 10.34) followed by remitted depressed (*M* = 9.56, *SD* = 6.89) and never depressed (*M* = 5.20, *SD* = 4.03) participants. Currently depressed participants also had the highest scores on the RRS and ATQ, followed again by the remitted depressed and never depressed participants. Currently depressed participants' mean PHQ-9 scores were highest (*M* = 12.39, *SD* = 6.18) followed by remitted depressed (*M* = 6.30, *SD* = 5.31) and never depressed (*M* = 3.45, *SD* = 2.19) participants. Finally, all three participant groups had BAI scores in the "very low anxiety" range, with the currently depressed participants having the highest mean score in this range.

As can be seen in Table 2, based on the SCID assessment conducted during the lab session, currently depressed participants had the highest mean number of previous depressive episodes (*M* = 12.46, *SD* = 20.54), followed by the remitted depressed participants (*M* = 2.52, *SD* = 2.71), with the never depressed participants reporting no clinically significant previous episodes of depression. Participants also self-reported their estimate of previous depressive episodes during the demographic questionnaire, which was completed before the SCID (Table 2).

Never depressed participants had the lowest percentage of individuals currently in a relationship (40.0%), followed by the currently depressed (63.6%), and remitted depressed participants (77.8%). Finally, three of the currently and remitted depressed participants reported at least one previous depressive episode due to bereavement.

Depression and Anxiety Treatment Questions. Participants were asked questions regarding their current or past experiences with depression and anxiety. Tables 4, 5, 6, 7, and 8 list their responses. Note that some of the never depressed participants indicated having

experienced previous depression, however, based on the SCID assessment; these previous episodes were not determined to be clinically significant.

It was found that approximately 20% of currently and remitted depressed participants were in counselling for depression at the time of the study. A larger percentage of the currently and remitted depressed participants (approximately 50%) had accessed counselling in the past. Almost 50% of the currently depressed participants reported that they had received a diagnosis of depression from a mental health professional, and approximately 40% of remitted depressed participants had received a diagnosis.

The majority (36.4%) of the currently depressed participants reported that the length since their most recent depressive episode had ended, was less than one month ago, or that it was still currently ongoing (27.3%). The majority (33.3%) of the remitted depressed participants reported that over 24 months had elapsed since their last depressive episode. Finally, the majority of never depressed participants (25.0%) that self-reported feeling previously depressed reported that this had occurred less than 24 months ago.

Approximately 25% of the currently depressed and 30% of the remitted depressed participants reported that they were currently taking antidepressant medication at the time of the study, and approximately 35% had previously used antidepressant medication.

When asked how participants had overcome previous episode(s) of depression, the majority of currently depressed participants (36.4%) answered that they did nothing, and the depression went away eventually. Approximately 20% of currently depressed participants overcame depression through professional counselling, followed by 12.1% using antidepressants and counselling, and 9% using only antidepressants. Approximately 20% of currently depressed participants used ‘other’ methods to overcome depression. The majority of remitted depressed

participants were split in their methods for overcoming previous episodes of depression, with 29.6% reporting that they did nothing, and the depression went away eventually, and 29.6% reporting that they used a combination of antidepressants and counselling. Of the never depressed participants who reported feeling depressed in the past, 25% reported that they did nothing, and the depression went away eventually, while 5% of participants reported using professional counselling, and 35% of participants reported that they used ‘other’ methods to overcome their depression.

Table 4

Frequencies and Percentages of Depression Counselling Information

	Depression Diagnosis	Present Counselling	Past Counselling	Length of Counselling Therapy (months)					
				< 1	1-6	7-12	13-18	> 24	N/A
CD (*n* = 33)	16 (48.5%)	7 (21.2%)	17 (51.5%)	1 (3.0%)	7 (21.2%)	4 (12.1%)	1 (3.0%)	2 (6.1%)	4 (12.1%)
RD (*n* = 27)	11 (40.7%)	6 (22.2%)	13 (48.1%)	0 (0.0%)	6 (22.2%)	2 (7.4%)	0 (0.0%)	3 (11.1%)	4 (14.8%)
ND (*n* = 20)	0 (0.0%)	0 (0.0%)	1 (5.0%)	2 (10.0%)	1 (5.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	7 (35.0%)
Total (*N* = 80)	27 (33.8%)	13 (16.3%)	31 (38.8%)	3 (3.8%)	14 (17.5%)	6 (7.5%)	1 (1.3%)	5 (6.3%)	15 (18.8%)

Note. CD = currently depressed participants, RD = remitted depressed participants, ND = never depressed participants.

Table 5

Frequencies and Percentages of Previous Depressive Episodes

	Length since Previous Depressive Episode (months)					
	Current	< 1	< 6	< 12	< 24	> 24
CD (*n* = 33)	9 (27.3%)	12 (36.4%)	5 (15.2%)	0 (0.0%)	2 (6.1%)	5 (15.2%)
RD (*n* = 27)	2 (7.4%)	1 (3.7%)	6 (22.2%)	6 (22.2%)	1 (3.7%)	9 (33.3%)
ND (*n* = 20)	0 (0.0%)	2 (10.0%)	1 (5.0%)	2 (10.0%)	5 (25.0%)	3 (15.0%)
Total (*N* = 80)	11 (13.8%)	15 (18.8%)	12 (15.0%)	8 (10.0%)	8 (10.0%)	17 (21.3%)

Note. CD = currently depressed participants, RD = remitted depressed participants, ND = never depressed participants.

Table 6

Frequencies and Percentages of Antidepressant Treatment

	Current Antidepressants	Previous Antidepressants	Length of Antidepressant Treatment (months)					
			1-6	7-12	13-18	19-24	> 24	N/A
CD (*n* = 33)	8 (24.2%)	13 (39.4%)	1 (3.0%)	0 (0.0%)	1 (3.0%)	1 (3.0%)	6 (18.2%)	5 (15.2%)
RD (*n* = 27)	9 (33.3%)	8 (29.6%)	2 (7.4%)	3 (11.1%)	0 (0.0%)	1 (3.7%)	3 (11.1%)	4 (14.8%)
ND (*n* = 20)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	20 (100.0%)
Total (*N* = 80)	17 (21.3%)	21 (26.3%)	3 (3.8%)	3 (3.8%)	1 (1.3%)	2 (2.5%)	9 (11.3%)	16 (20.0%)

Note. CD = currently depressed participants, RD = remitted depressed participants, ND = never depressed participants.

Table 7

Frequencies and Percentages of Participants' Methods for Overcoming Previous Depressive Episodes

	"How did you overcome depression?"					
	Nothing, Went Away	Antidepressants	Professional Counselling	Antidepressants & Counselling	Other	N/A
CD (*n* = 33)	12 (36.4%)	3 (9.1%)	7 (21.2%)	4 (12.1%)	7 (21.2%)	0 (0.0%)
RD (*n* = 27)	8 (29.6%)	1 (3.7%)	3 (11.1%)	8 (29.6%)	4 (14.8%)	3 (11.1%)
ND (*n* = 20)	5 (25.0%)	0 (0.0%)	1 (5.0%)	0 (0.0%)	7 (35.0%)	7 (35.0%)
Total (*N* = 80)	25 (31.3%)	4 (5.0%)	11 (13.8%)	12 (15.0%)	18 (22.5%)	10 (12.5%)

Note. CD = currently depressed participants, RD = remitted depressed participants, ND = never depressed participants.

Table 8

Frequencies and Percentages of Anxiety Disorder Information

	Anxiety Diagnosis	Current Therapy for Anxiety	Previous Anxiety Therapy	Currently Anxiety Medication	Previously Anxiety Medication	Currently Feeling Anxious	Comorbid Anxiety (SCID)
CD (n = 33)	10 (30.3%)	5 (15.2%)	12 (36.4%)	4 (12.1%)	5 (15.2%)	19 (57.6%)	20 (60.6%)
RD (n = 27)	8 (29.6%)	3 (11.1%)	7 (25.9%)	4 (14.8%)	5 (18.5%)	11 (40.7%)	5 (18.5%)
ND (n = 20)	1 (5.0%)	0 (0.0%)	3 (15.0%)	0 (0.0%)	0 (0.0%)	4 (20.0%)	0 (0.0%)
Total (N = 80)	19 (23.8%)	8 (10.0%)	22 (27.5%)	8 (10.0%)	10 (12.5%)	34 (42.5%)	25 (31.3%)

Note. CD = currently depressed participants, RD = remitted depressed participants, ND = never depressed participants.

Lastly, participants were asked about any comorbid anxiety disorders and methods of treatment for them. Approximately 30% of currently and remitted depressed participants had received an anxiety disorder diagnosis, and one never depressed participant noted having received a diagnosis in the past. Approximately 13% of currently and remitted depressed participants were currently in therapy for an anxiety disorder, and a higher percentage of approximately 30% had previously been in therapy for an anxiety disorder. Approximately 13% of currently and remitted depressed participants were currently using medication for an anxiety disorder, at the time of the study, and approximately 16% had used medication for an anxiety disorder in the past. Of the currently depressed participants, 57.6% reported currently feeling very anxious, followed by 40.7% of the remitted depressed participants, and 20.0% of the never depressed participants. According to the SCID, 60.6% of currently depressed participants had a comorbid anxiety disorder, followed by 18.5% of remitted depressed participants, and 0.0% of never depressed participants.

Main Analyses

Mood Induction Data. Table 9, and Figures 1 and 2, display the mean ratings on the mood rating scales before and after the sad MI, as well as before and after the positive MI. One currently depressed participant did not complete the positive MI. The mean 11-point mood scale ratings were analyzed using a 3 (Group: currently depressed, remitted depressed, and never depressed) x 2 (MI Time Point: before positive MI, after positive MI) mixed-model ANOVA, to test the effects of the positive MI for each of the three groups on the 11-point mood scale. The main effect of Group was not significant, $F(2, 76) = 0.19$, $p = .826$. The main effect of MI Time Point was significant, $F(1, 76) = 60.55$, $p < .001$, with the 11-point mood rating before the positive MI ($M = 0.52$, $SD = 1.63$) significantly lower than the rating after the positive MI ($M =$

2.00, *SD* = 1.63), suggesting that the positive MI significantly improved all three participant groups' mood. The interaction of Group by MI Time Point was not significant, $F(2, 76) = 0.14$, $p = .870$, suggesting no group differences in mood repair.

The same analysis was conducted for the VAMS mood scale ratings, to test the effects of the positive MI for each of the three groups on the VAMS. The main effect of Group was not significant, $F(2, 76) = 1.75$, $p = .180$. The main effect of MI Time Point was significant, $F(1, 76) = 62.81$, $p < .001$, with the VAMS ratings before the positive MI ($M = 51.84$, $SD = 15.56$) significantly lower than the ratings after the positive MI ($M = 66.39$, $SD = 17.21$), suggesting a significant improvement in mood due to the positive MI, for all three participant groups. The Group by MI Time Point interaction was not significant, $F(2, 76) = 2.06$, $p = .135$, suggesting no group differences in mood repair.

The mean 11-point mood scale MI ratings were then analyzed using a 2 (Group: remitted depressed and never depressed) x 4 (MI Time Point: before sad MI, after sad MI, before positive MI, and after positive MI) mixed-model analysis of variance (ANOVA), to test the effects of the MIs for the remitted and never depressed participants on the 11-point mood scale. Mauchly's test showed that the data was non-spherical (Mauchly's $W(5) = .64$, $p < .01$) for MI Time Point; therefore the Huynh-Feldt adjustment was applied to the ANOVA result's df ($\varepsilon = .854$). The main effect of Group was not significant for the 11-point mood scale, $F(1, 45) = 0.00$, $p = .953$. With the adjusted df, the main effect of MI Time Point was significant for the 11-point mood scale, $F(2.56, 115.35) = 91.91$, $p < .001$, but the Group by MI Time Point interaction was not significant, $F(2.56, 115.35) = 1.26$, $p = .290$.

Because the Group by MI Time Point interaction was not significant, the main effect of MI Time Point for the 11-point mood scale (collapsed across the remitted and never depressed

participant groups) was followed up using paired t-tests, comparing the four different mood ratings to one another (before sad MI, after sad MI, before positive MI, after positive MI). The difference between the mean 11-point rating before the sad MI (M = 2.45, SD = 1.41) to after the sad MI (M = −0.83, SD = 1.72) was significant, $t(46) = 13.00$, $p < .001$, suggesting a significant decrease in mood due to the sad MI for both groups. The difference between the 11-point rating before the sad MI and before the positive MI (M = 0.57, SD = 1.49) was significant, $t(46) = 9.54$, $p < .001$, showing that both groups' mood was still significantly lower before the positive MI, than their baseline mood rating (before sad MI). The difference between the 11-point rating before the sad MI to after the positive MI (M = 2.11, SD = 1.27) was not significant, $t(46) = 1.63$, $p = .110$, showing that the positive MI repaired their mood to their baseline mood rating (before sad MI). The difference between the 11-point rating after the sad MI to before the positive MI was significant, $t(46) = 8.78$, $p < .001$, which suggests a mood repair that occurred from the time the sad MI was completed, to the time before the positive MI was completed. The difference between the 11-point rating after the sad MI to after the positive MI was also significant, $t(46) = 11.27$, $p < .001$. Lastly, the difference between the 11-point rating before the positive MI to after the positive MI was significant, $t(46) = 7.21$, $p < .001$, showing a significant improvement in mood due to the positive MI, for both groups.

Table 9

Means and Standard Deviations of the 11-point mood scale and the VAMS

	Before Sad MI 11pt	Before Sad MI VAMS	After Sad MI 11pt	After Sad MI VAMS	Change Sad MI 11pt	Change Sad MI VAMS	Before Pos. MI 11pt	Before Pos. MI VAMS	After Pos. MI 11pt	After Pos. MI VAMS	Change Pos. MI 11pt	Change Pos. MI VAMS
CD (n = 33)	----	----	----	----	----	----	0.44 (1.85)	50.59 (18.60)	1.84 (2.05)	60.56 (21.21)	1.47 (1.83)	10.28 (20.03)
RD (n = 27)	2.63 (1.39)	71.37 (13.45)	−1.00 (1.84)	30.85 (16.24)	−3.63 (1.93)	−40.52 (17.11)	0.63 (1.47)	53.26 (14.47)	2.07 (1.41)	70.48 (15.09)	1.41 (1.58)	17.22 (15.34)
ND (n = 20)	2.20 (1.44)	69.60 (11.97)	−0.60 (1.57)	35.30 (15.20)	−2.80 (1.32)	−31.80 (19.21)	0.50 (1.54)	51.90 (11.71)	2.15 (1.09)	70.20 (8.64)	1.65 (1.31)	18.30 (9.93)
Total (N = 80)	2.45 (1.41)	70.62 (12.74)	−0.83 (1.72)	32.74 (15.80)	−3.28 (1.73)	−36.81 (18.35)	0.52 (1.63)	51.84 (15.56)	2.00 (1.63)	66.39 (17.21)	1.49 (1.61)	14.69 (16.60)

Note. CD = currently depressed participants, RD = remitted depressed participants, ND = never depressed participants. The 11-point mood scale ratings range from −5 (*very negative*) to +5 (*very positive*). The VAMS ratings range from 0 (*very sad*) to 100 (*very happy*). A successful MI on the 11-point mood scale requires at least a 2-point change in mood. A successful MI on the VAMS requires at least a 20 point change in mood.

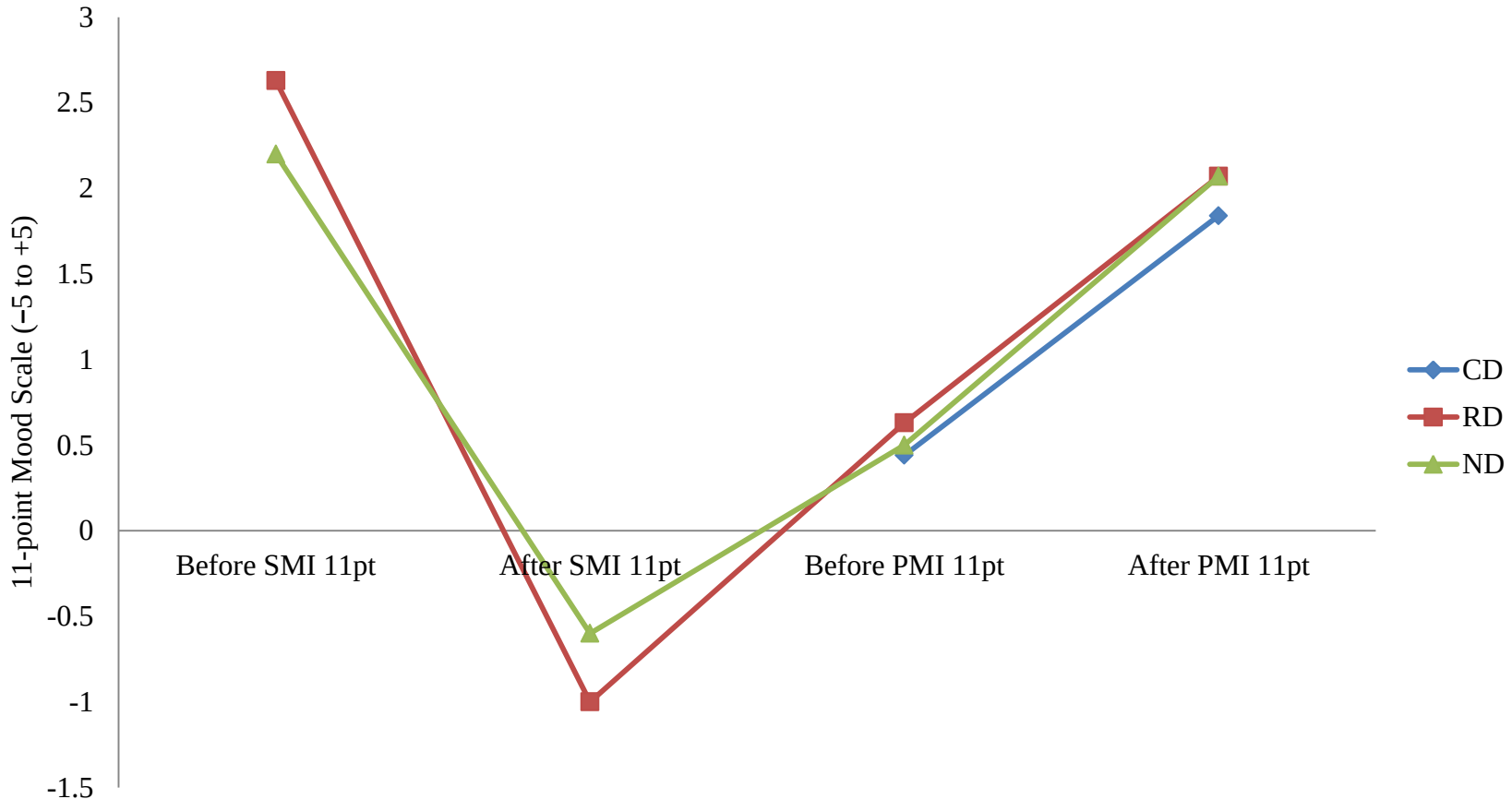

Figure 1. Mean 11-point mood scale ratings across the four time points for currently (n = 32), remitted (n = 27), and never depressed (n = 20) participants (N = 79). SMI = sad mood induction. PMI = positive mood induction.

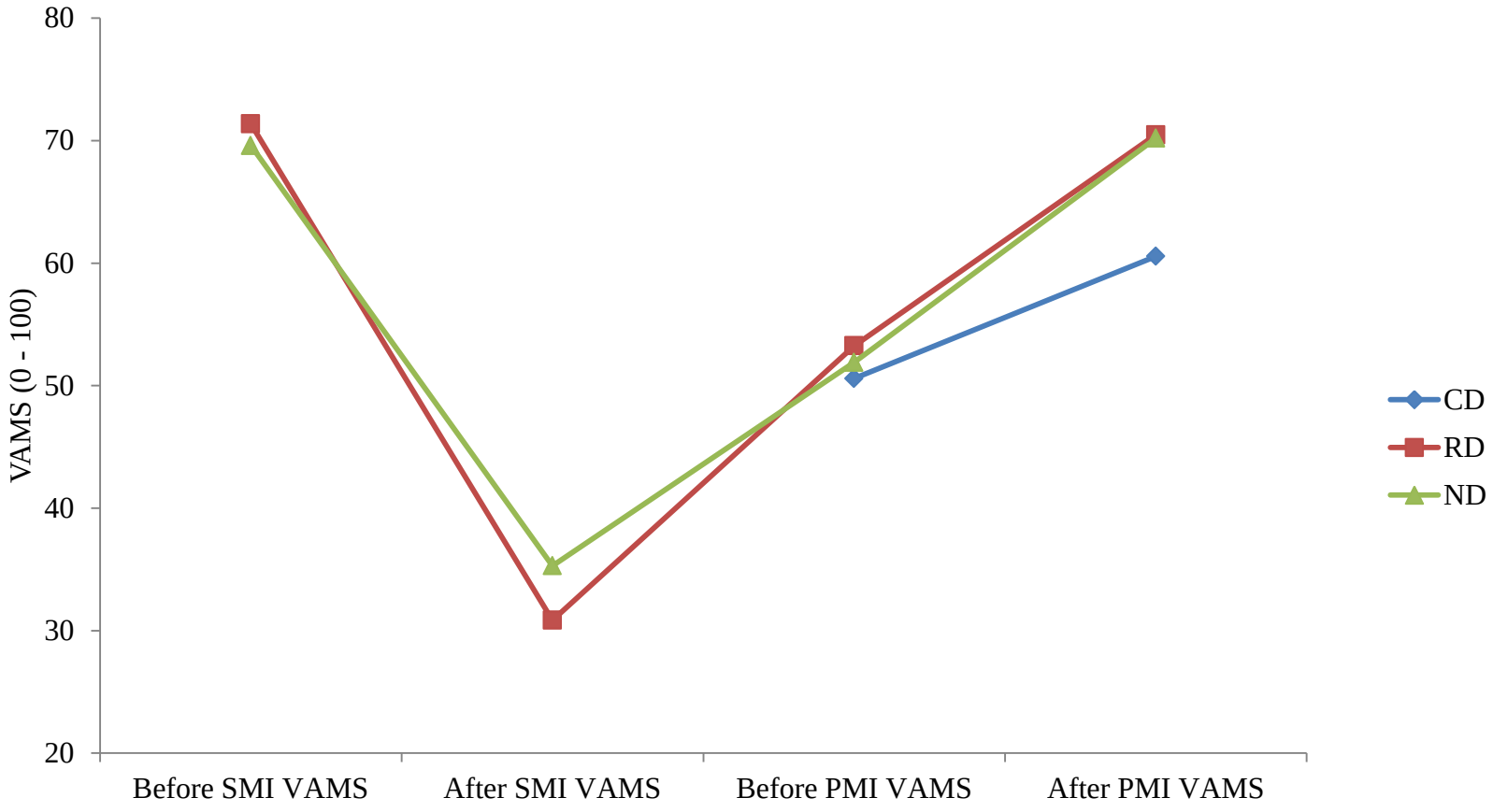

Figure 2. Mean VAMS ratings across the four time points for currently (n = 32), remitted (n = 27), and never depressed (n = 20) participants (N = 79). SMI = sad mood induction. PMI = positive mood induction.

The same mixed-model ANOVA conducted for the 11-point mood scale was conducted for the mean VAMS ratings, to test the effect of the MIs for the remitted and never depressed participants on the VAMS. Mauchly's test found that the data was non-spherical (Mauchly's W(5) = .63, $p < .01$) for the MI Time Point; therefore the Huynh-Feldt adjustment was applied to the ANOVA results' df ($\varepsilon = .859$). The main effect of Group was not significant for the VAMS, $F(1, 45) = 0.01$, $p = .933$. With the adjusted df, the main effect of MI Time Point was significant for the VAMS, $F(2.58, 115.99) = 133.47$, $p < .001$. The Group by MI Time Point interaction was not significant, $F(2.58, 115.99) = 0.86$, $p = .449$.

Because the interaction of Group by MI Time Point was not significant, the main effect of MI Time Point (collapsed across the remitted and never depressed participants groups) for the VAMS was followed up using paired t-tests, comparing the four different mood ratings to one another (before sad MI, after sad MI, before positive MI, after positive MI). The pattern of differences between the four mood rating time points was the same as it was for the 11-point mood scale. Specifically, the difference on the VAMS before the sad MI ($M = 70.62$, $SD = 12.74$) to after the sad MI ($M = 32.74$, $SD = 15.80$) was significant, $t(46) = 16.24$, $p < .001$, showing a significant decrease in mood due to the sad MI. The difference on the VAMS before the sad MI to before the positive MI ($M = 52.68$, $SD = 13.25$) was significant, $t(46) = 9.68$, $p < .001$, showing that mood ratings were significantly lower before the positive MI than participants' baseline mood rating (before sad MI). The difference on the VAMS before the sad MI to after the positive MI ($M = 70.36$, $SD = 12.63$) was not significant, $t(46) = 0.12$, $p = .906$, suggesting that both participant groups had their mood repaired back to their baseline rating. The difference on the VAMS after the sad MI to before the positive MI was significant, $t(46) = 11.44$, $p < .001$, showing a mood repair that occurred during the second eye-tracking task. The

difference on the VAMS after the sad MI to after the positive MI was significant, $t(46) = 13.73$, $p < .001$. Lastly, the difference on the VAMS before the positive MI to after the positive MI was also significant, $t(46) = 9.19$, $p < .001$, showing a significant improvement in mood from the positive MI for both groups.

The change in ratings on the 11-point mood scale for the sad MI (the difference in mood before the sad MI to after the sad MI) was correlated with the change in ratings on the VAMS for the sad MI, using Pearson's correlation, and the correlation was significant, $r = .60$, $p <.001$. In addition, the change in ratings on the 11-point mood scale for the positive MI (the difference in mood before the positive MI to after the positive MI) was correlated with the change in ratings on the VAMS for the positive MI, using Pearson's correlation, and the correlation was also significant, $r = .60$, $p <.001$. These correlational analyses show that the two mood scales are significantly related to one another.

Eye-tracking Data: Percentage of Correct Disengagements. Table 10 lists the percentage of correct disengagements (i.e., the participant correctly fixated on the top fixation marker when the high tone sounded and the bottom fixation marker when the low tone sounded). As noted previously, only disengagement times for correct disengagements were analyzed. Correct disengagements were analyzed as a way to test for any differences of accuracy of the disengagement task.

To calculate the percentage of correct disengagements, the number of correct disengagements were divided by the total number of disengagements, for each image type, for each participant. This resulted in each participant having a mean "percentage of correct disengagements" for each image type, before and after the sad MI. The percentages of correct disengagements were then analyzed using a 3 (Group: currently depressed, remitted depressed,

and never depressed) x 3 (Image Type: negative, positive, and neutral) mixed-model ANOVA, to test for differences in participants' disengagement accuracy, for each image type, before the sad MI only. The main effect of Group was not significant, $F(2, 77) = 0.92$, $p = .404$. The main effect of Image Type was marginally significant, $F(2, 154) = 2.91$, $p = .057$, with negative images showing the lowest mean correct disengagements ($M = 80\%$, $SE = .02$), followed by the neutral images ($M = 83\%$, $SE = .02$) and the positive images ($M = 85\%$, $SE = 0.02$). The Group by Image Type interaction was not significant, $F(4, 154) = 1.55$, $p = .191$. Together these findings indicate that before the sad MI, the three participant groups were similar in their accuracy of the task, and that overall participants were most accurate with positive images, followed by neutral, then negative images

Next, the percentages of correct disengagements were analyzed using a 2 (Group: remitted and never depressed) x 2 (Sad MI: Before and After) x 3 (Image Type: negative, positive, and neutral) mixed-model ANOVA, to test for differences in the participants' disengagement accuracy, for each image type, before and after the sad MI. The main effect of Group was not significant, $F(1, 45) = 0.78$, $p = .381$, with correct disengagements being similar for remitted depressed participants ($M = 86\%$, $SE = 0.02$) and never depressed participants ($M = 84\%$, $SE = 0.02$). The main effect of Image Type was marginally significant, $F(2, 90) = 2.78$, $p = .067$, with correct disengagements highest for positive images ($M = 86\%$, $SE = 0.02$), and neutral images ($M = 86\%$, $SE = 0.02$), followed by negative images ($M = 83\%$, $SE = 0.02$). The main effect of Sad MI was significant, $F(1, 45) = 4.31$, $p = .044$, with correct disengagements higher after the sad MI ($M = 86\%$, $SE = 0.02$), compared to before the sad MI ($M = 84\%$, $SE = 0.02$), which was likely due to a practice effect. None of the interactions were statistically significant (all p-values > .10).

Table 10

Means and Standard Deviations of Disengagement Times and Percentage of Correct Disengagement

	Before Sad MI						After Sad MI					
	Neg Images DT (ms)	Neutral Images DT (ms)	Pos Images DT (ms)	Neg Images % Correct	Neutral Images % Correct	Pos Images % Correct	Neg Images DT (ms)	Neutral Images DT (ms)	Pos Images DT (ms)	Neg Images % Correct	Neutral Images % Correct	Pos Images % Correct
CD (n = 33)	549 (129)	556 (145)	559 (161)	81.0 (13.6)	79.4 (13.9)	81.5 (16.0)	----	----	----	----	----	----
RD (n = 27)	583 (149)	566 (104)	573 (126)	82.4 (17.7)	83.1 (16.8)	88.1 (10.5)	580 (129)	588 (141)	592 (139)	86.1 (12.8)	90.3 (15.1)	87.8 (13.1)
ND (n = 20)	489 (90)	481 (79)	499 (102)	77.3 (18.3)	86.0 (11.7)	84.7 (11.9)	513 (92)	502 (73)	518 (91)	84.3 (15.3)	85.1 (14.9)	84.9 (16.6)
Total (N = 80)	545 (125)	541 (115)	548 (122)	81.5 (16.2)	82.3 (14.5)	84.5 (13.5)	552 (120)	551 (113)	560 (107)	85.4 (13.8)	88.1 (15.1)	86.6 (14.6)

Note. CD = currently depressed, RD = remitted depressed, ND = never depressed.

Eye-tracking Data: Disengagement Times. The mean disengagement times for each group, for each image type, before and after the sad MI, are listed in Table 10 (recall that for the currently depressed participants disengagement times were only collected before the sad MI). The effects of the image blocks were included in the analysis of mean disengagement times to account for some of the variability in the ANOVA. As described previously, participants would view either Block 1 or Block 2 before the sad MI, and then the other block after the sad MI. Therefore each remitted depressed and never depressed participant was presented with one of two orders of image blocks: Block 1 before the sad MI then Block 2 after the sad MI (Order 1), or Block 2 before the sad MI then Block 1 after the sad MI(Order 2)). Currently depressed participants were presented with only one of the two image blocks before the sad MI: Block 1 (Order 1), or Block 2 (Order 2).

The mean disengagement times were analyzed using a 3 (Group: currently depressed, remitted depressed, and never depressed) x 2 (Block Order: Order 1 and Order 2) x 3 (Image Type: negative, positive, and neutral) mixed-model ANOVA. This analysis was conducted to compare disengagement times from each image type, between the three participant groups, and between the two different block orders, before the sad MI only (since currently depressed participants did not experience the sad MI). In this analysis, there was a marginally significant main effect of Group, $F(2, 74) = 3.03$, $p = .054$, with remitted depressed participants having the slowest mean disengagement time (M = 573 ms, SE = 23 ms), followed by currently depressed participants (M = 554 ms, SE = 21 ms), then never depressed participants (M = 489 ms, SE = 27ms). The main effect of Block Order was not significant, $F(1, 74) = 0.12$, $p = .732$, showing that participants with Order 1 (M = 543 ms, SE = 20 ms) had similar disengagement times to those with Order 2 (M = 534 ms, SE = 19 ms). In addition, the main effect of Image Type was

not significant, $F(2, 148) = 0.48$, $p = .618$, with similar disengagement times for negative (M = 539 ms, SE = 15 ms), neutral (M = 534 ms, SE = 14 ms), and positive images (M = 543 ms, SE = 16 ms), before the sad MI.

The Group by Block Order interaction was not significant, $F(2, 74) = 0.71$, $p = .493$, nor was the Group by Image Type interaction, $F(4, 148) = 0.48$, $p = .754$, nor was the Image Type by Block Order interaction, $F(2, 148) = 1.06$, $p = .348$. Finally, the three-way interaction between Group, Image Type, and Block Order was not significant, $F(4, 148) = 1.17$, $p = .326$.

Next, the data for the remitted and never depressed participants, before and after the sad MI was analyzed. The mean disengagement times were analyzed using a 2 (Group: remitted depressed and never depressed) x 2 (Sad MI: Before and After) x 2 (Block Order: Order 1 and Order 2) x 3 (Image Type: negative, positive, and neutral) mixed-model ANOVA. The main effect of Group was significant, $F(1, 43) = 7.35$, $p = .010$, with the remitted depressed participants having significantly slower disengagement times (M = 579 ms, SE = 19 ms) compared to the never depressed participants (M = 499 ms, SE = 22 ms). The main effect of Block Order was not significant, $F(1, 43) = 1.00$, $p = .324$, suggesting that the disengagement times for participants with Order 1 (M = 554 ms, SE = 21 ms) were similar to those with Order 2 (M = 525 ms, SE = 20 ms). In addition, the main effect of Sad MI was not significant, $F(1, 43) = 2.45$, $p = .125$, suggesting that disengagement times before the sad MI (M = 531 ms, SE = 15 ms) were similar to those after the sad MI (M = 548 ms, SE = 16 ms). The main effect of Image Type was not significant, $F(2, 86) = 0.91$, $p = .406$, suggesting that disengagement times were similar for negative (M = 540 ms, SE = 16 ms), neutral (M = 533 ms, SE = 15 ms), and positive images (M = 544 ms, SE = 15 ms).

The Block Order by Group interaction was not significant, $F(1, 43) = 2.18$, $p = .147$, nor was the Sad MI by Block Order interaction, $F(1, 43) = 1.01$, $p = .320$. The Group by Image Type interaction was not significant, $F(2, 86) = 0.26$, $p = .776$, nor was the Sad MI by Image Type interaction, $F(2, 86) = 0.23$, $p = .797$. The three-way interaction between Group, Sad MI, and Block Order was also not significant, $F(1, 43) = 0.38$, $p = .539$. The three-way interaction between Group, Image Type, and Sad MI was not significant, $F(2, 86) = 0.62$, $p = .542$, nor was the three-way interaction between Image Type, Sad MI, and Block Order, $F(2, 86) = 0.69$, $p = .503$. Interestingly, the four-way interaction between Group, Image Type, Sad MI, and Block Order was marginally significant, $F(2, 86) = 2.86$, $p = .063$. Figures 3, 4, 5, and 6 below show these differences.

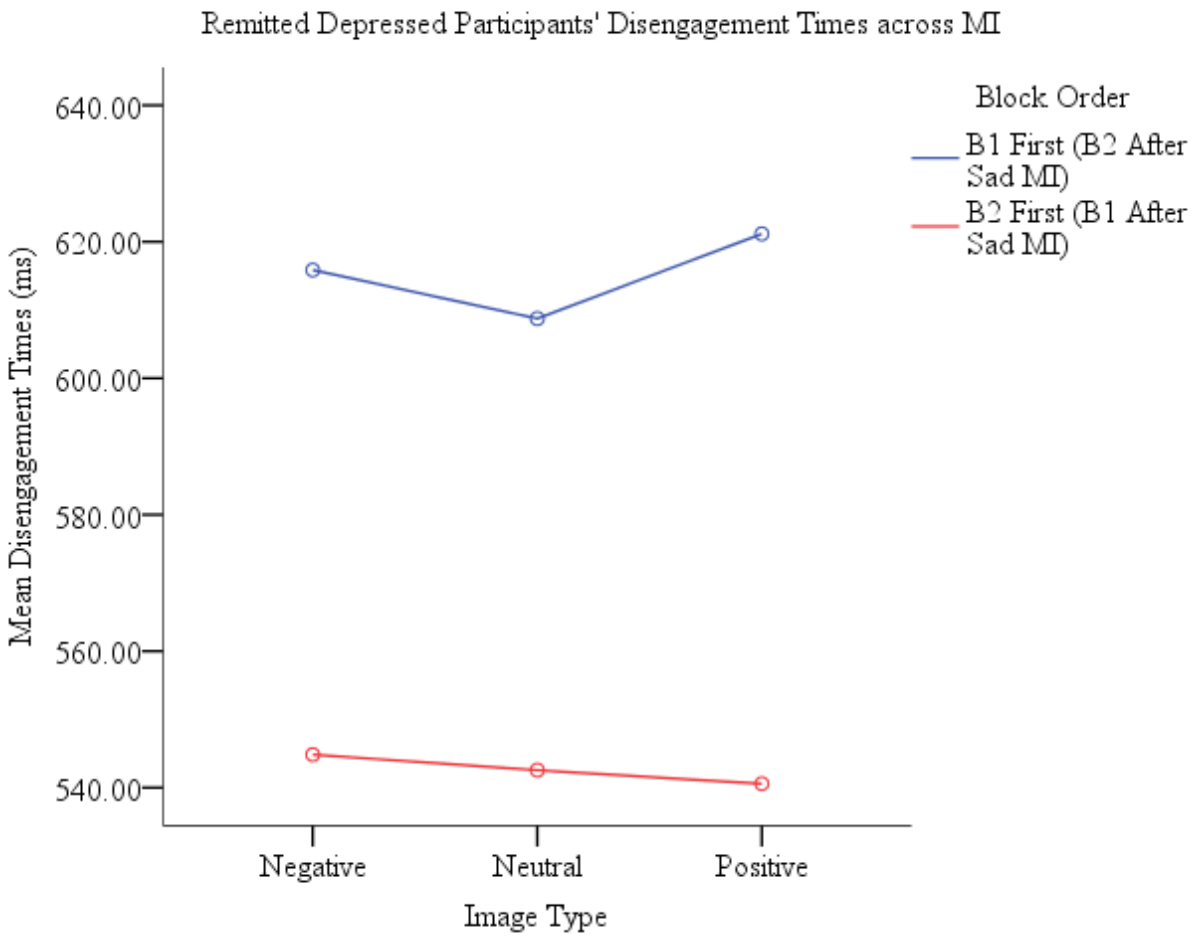

Figure 3. Remitted depressed participants' mean disengagement times for each image type for those with the Order 1 (n = 14) and those with Order 2 (n = 13).

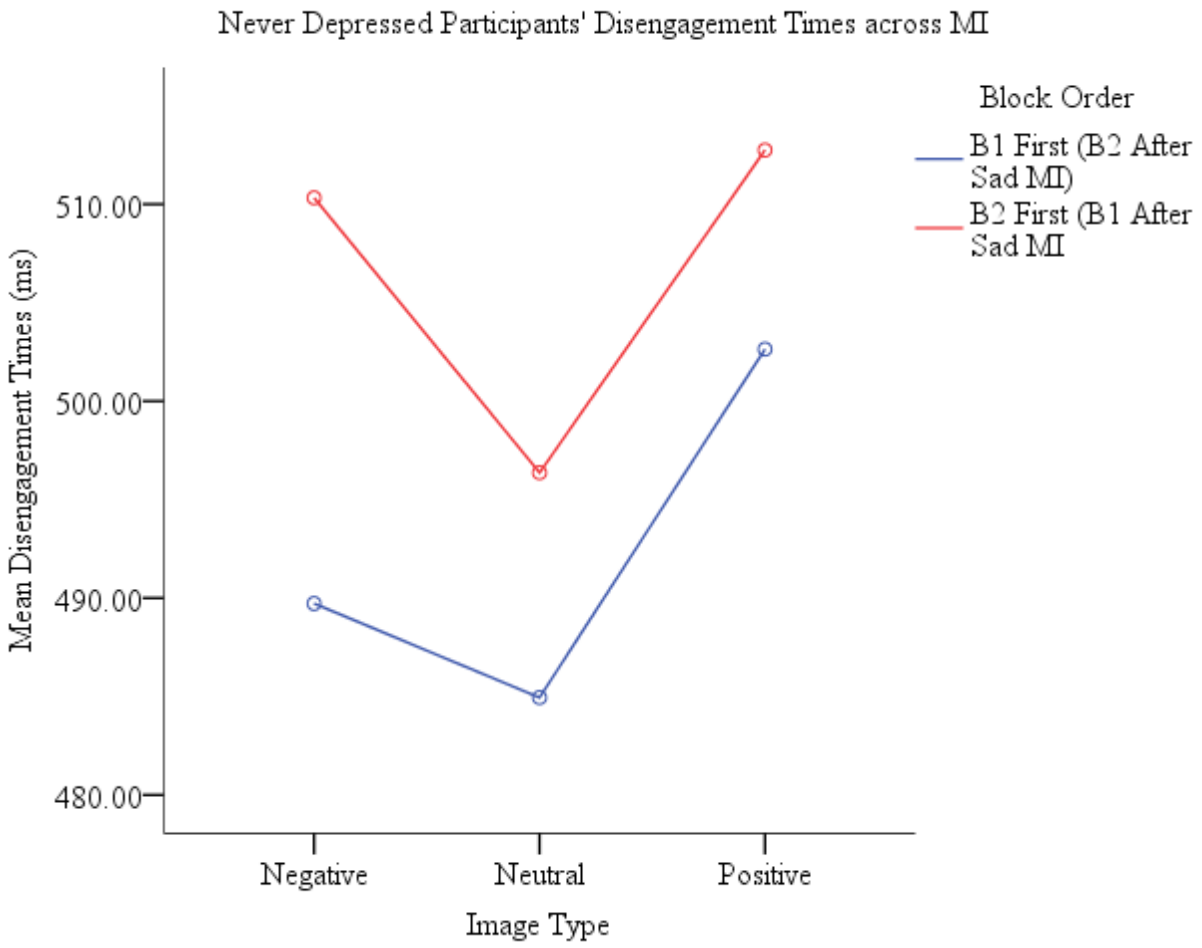

Figure 4. Never depressed participants' mean disengagement times for each image type for those with the Order 1 (n = 9) and those with the Order 2 (n = 11).

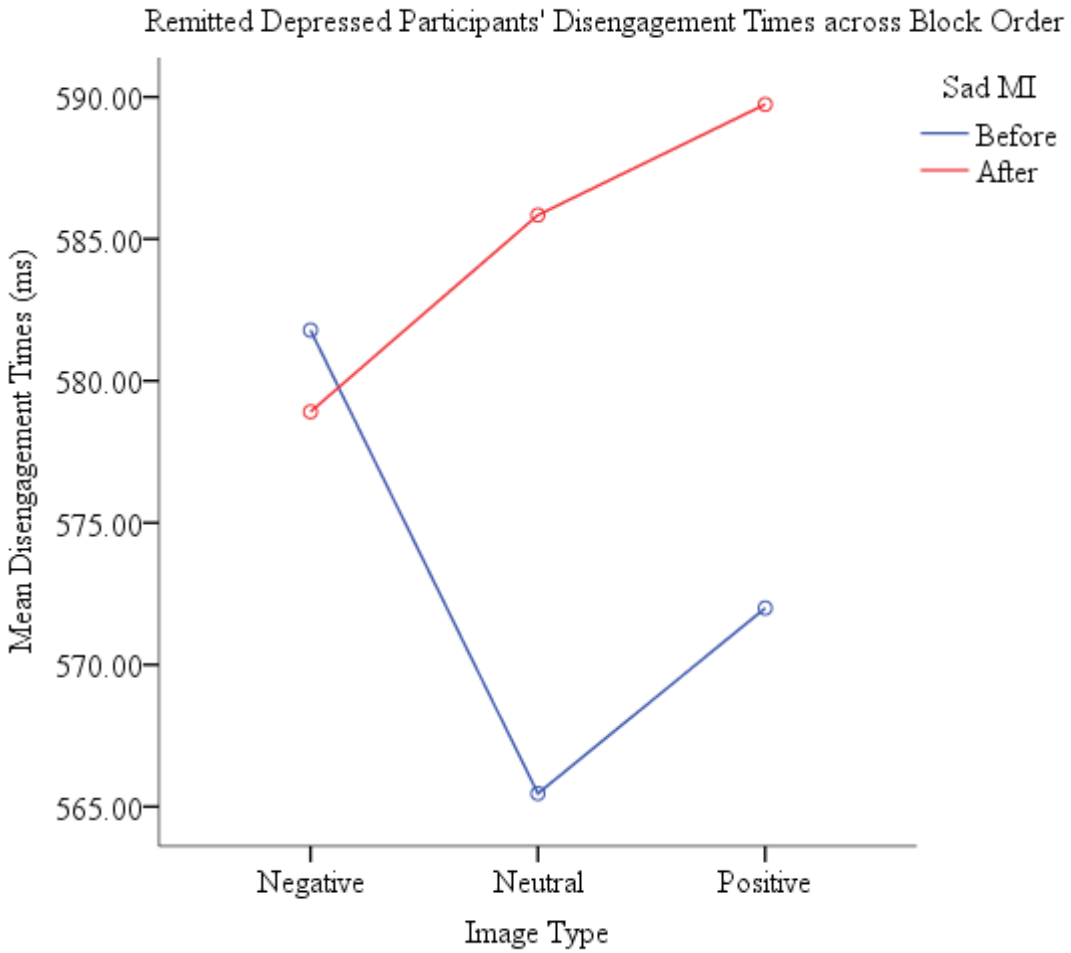

Figure 5. Remitted depressed participants' mean disengagement times for each image type before and after the sad MI, across the two block orders (n = 27).

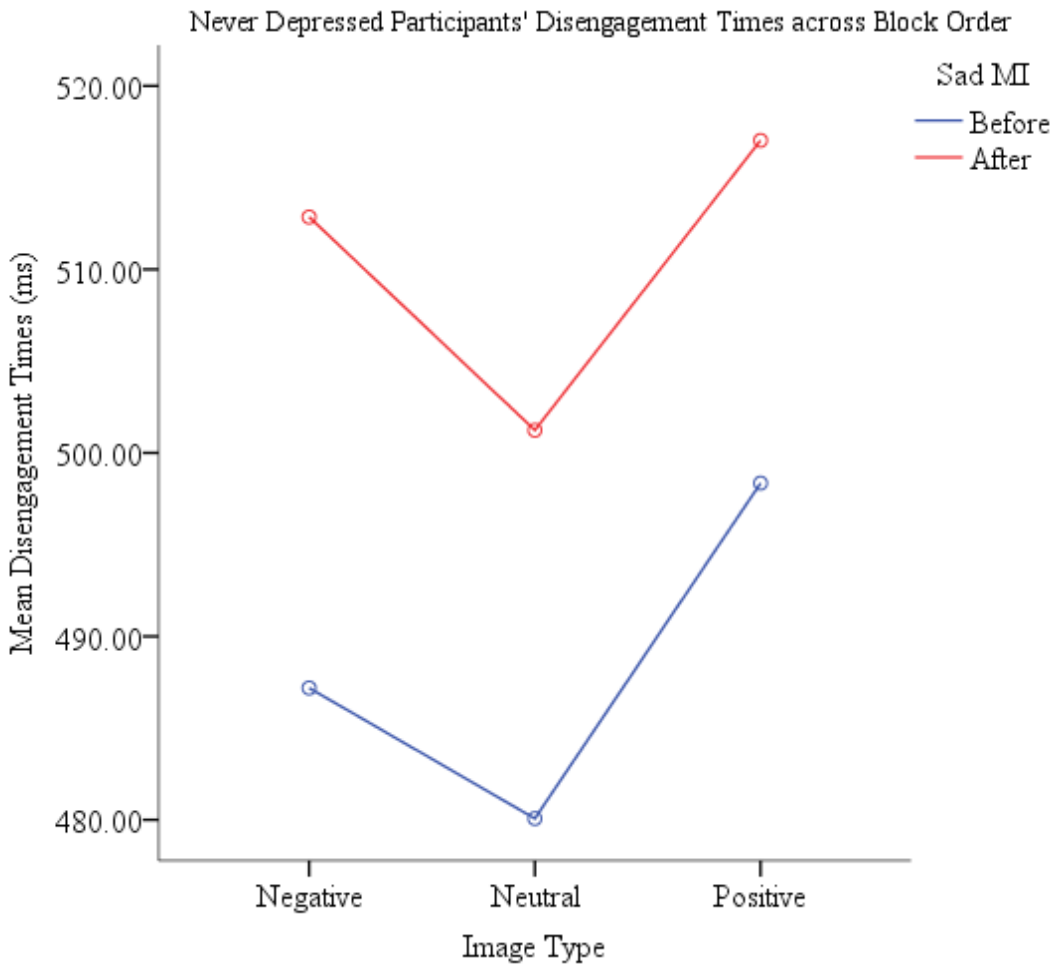

Figure 6. Never depressed participants' mean disengagement times for each image type before and after the sad MI, across the two block orders (n = 20).

The four-way interaction was followed up by analyzing the data for the remitted depressed and never depressed participants separately. First, the never depressed participants' mean disengagement times were analyzed using a 2 (Block Order: Order 1 and Order 1) x 2 (Sad MI: Before and After) x 3 (Image Type: negative, positive, and neutral) mixed-model ANOVA. The main effect of Block Order was not significant, $F(1, 18) = 0.20$, $p = .660$, nor was the main effect of Image Type, $F(2, 36) = 1.05$, $p = .362$), or Sad MI, $F(1, 18) = 1.49$, $p = .238$. No interactions were statistically significant (all p-values > .10). This suggests that the four-way interaction was due to a three-way interaction for the remitted depressed participants only.

The data for the remitted depressed participants was analyzed using the same ANOVA. Mauchly's test found that the data was non-spherical (Mauchly's W(2) = .70, $p < .05$) for the Image Type by Sad MI interaction; therefore the Huynh-Feldt adjustment was applied to the ANOVA results' df ($\varepsilon = .845$). The main effect of Block Order was not significant, $F(1, 25) = 2.66$, $p = .116$, nor was the main effect of Image Type, $F(2, 50) = 0.13$, $p = .880$, nor the main effect of Sad MI, $F(1, 25) = 0.83$, $p = .371$. None of the two-way interactions were significant (all p-values > .10), but the three-way interaction between Image Type, Sad MI, and Block Order was significant, $F(2, 50) = 3.63$, $p = .034$.

This three-way interaction for the remitted depressed participants was followed up by analyzing disengagement times by Block Order. First, mean disengagement times for Order 1 were analyzed using a 2 (Sad MI: Before and After) x 3 (Image Type: negative, positive, and neutral) mixed-model ANOVA. The main effect of Image Type was not significant, $F(2, 26) = 0.30$, $p = .740$, nor was the main effect of Sad MI, $F(1, 13) = 2.36$, $p = .148$. Mauchly's test found that the data was non-spherical (Mauchly's W(2) = .59, $p < .05$) for the Image Type by Sad MI interaction; therefore the Huynh-Feldt adjustment was applied to the ANOVA results' df

(ε = .768). The Image Type by Sad MI interaction was marginally significant, $F(1.54, 19.98) = 3.12$, $p = .077$. This interaction was followed up by conducting paired t-tests for each Image Type, before and after the sad MI, for the remitted depressed participants who received Order 1 (see Figure 7 below and Appendix D). The difference in mean disengagement times for negative images before the sad MI (M = 623 ms, SD = 168 ms) was not significantly different from those after the sad MI (M = 609 ms, SD = 140 ms; $t(13) = 0.43$, $p = .673$). The difference in mean disengagement times for neutral images before the sad MI (M = 585 ms, SD = 115 ms) and after the sad MI (M = 633 ms, SD = 143 ms) was significant, $t(13) = 2.71$, $p = .018$. In addition, the difference in mean disengagement times for positive images before the sad MI (M = 594 ms, SD = 146 ms) and after the sad MI (M = 648.09, SD = 158.25) was significant, $t(13) = 2.25$, $p = .042$. These results indicate that for remitted depressed participants who received Order 1 (Block 1 before the sad MI, Block 2 after the sad MI), the sad MI significantly increased disengagement times for positive and neutral images.

In contrast, in the analysis of the mean disengagement times for Order 2 for remitted depressed participants, none of the main effects or interactions were statistically significant (all p-values > .10; see Figure 8). This indicates that only for remitted depressed participants who received Order 1, did the sad MI affect disengagement times. This outcome was unexpected and was explored in several additional analyses described below.

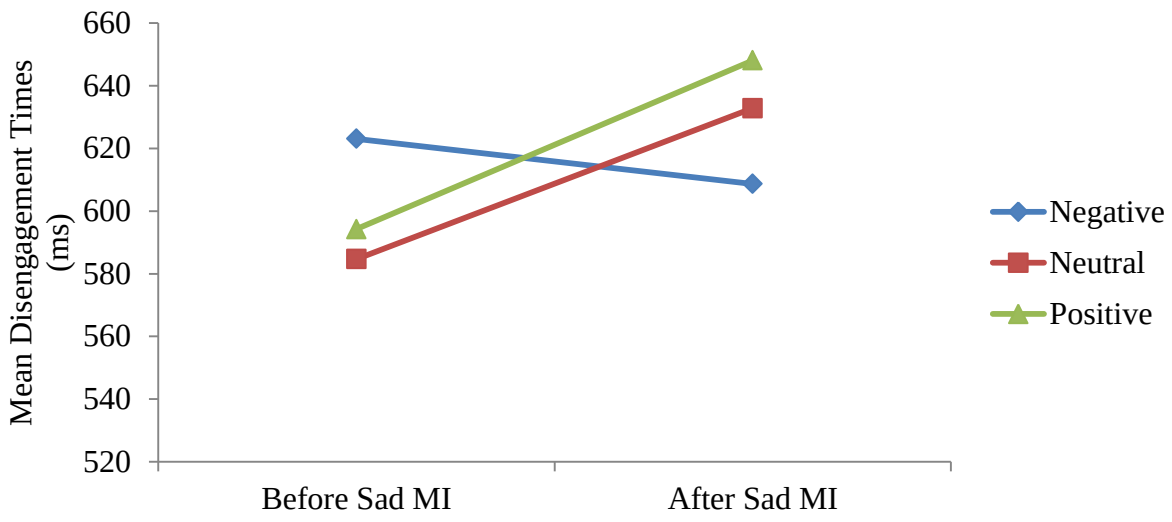

Figure 7. Mean disengagement times for remitted depressed participants (*n* = 14) in the Order 1 group (Block 1 of images was viewed before the sad MI, and Block 2 of images was viewed after sad MI).

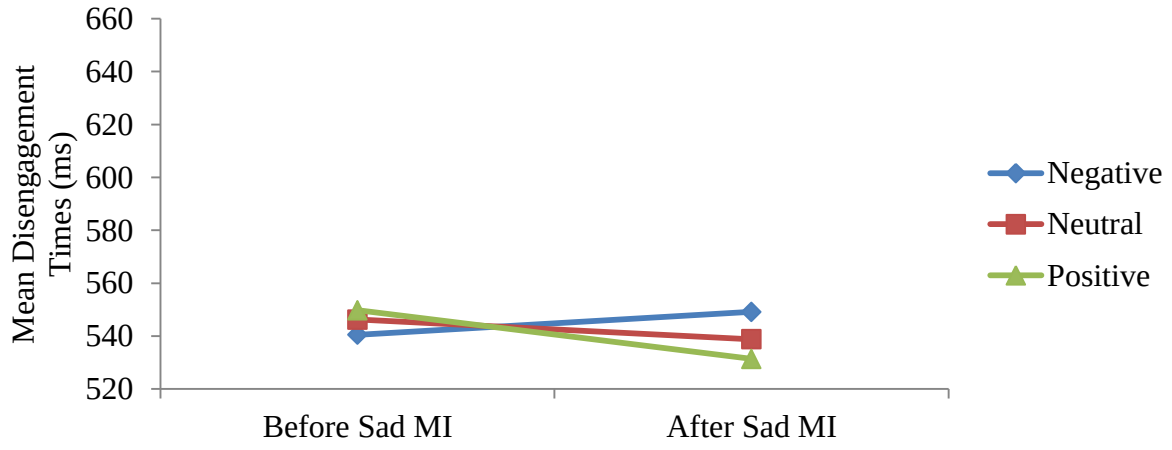

Figure 8. Mean disengagement times for remitted depressed participants (*n* = 13) in the Order 2 group (Block 2 of images was viewed before the sad MI, and Block 1 of images was viewed after the sad MI).

First, the demographic information of the remitted depressed participants was broken down by block order. This information is listed in Appendix D. Nothing of particular importance appeared to differentiate these two groups of remitted depressed participants (i.e., those that received Order 1 and those who received Order 2). There were more remitted depressed participants in the Order 2 group who had been diagnosed with an anxiety disorder. There were slightly more remitted depressed participants in the Order 1 group who were currently in therapy for depression at the time of the study. In addition, more of the participants in Order 2 noted that they currently felt depressed, although the SCID assessment did not determine it to be at a clinical level.

Second, the VAMS and 11-point mood ratings were examined to see if these two groups of remitted depressed participants differed in the effect of the sad MI.[1] These data are listed in Table 11. The change in sad MI ratings (the difference of mood ratings before the sad MI to after the sad MI) for the 11-point mood scale and the VAMS were compared between the two groups of remitted depressed participants (Order 1 and Order 2 participants), in order to test for any differences in the effectiveness of the sad MI for the remitted depressed participants. The Order 1 participants had a significantly larger decrease in mood on the 11-point mood scale ($M = -4.36$, $SD = 1.95$), than the Order 2 participants ($M = -2.85$, $SD = 1.63$; $t(25) = 2.18$, $p = .039$). The same was true for the VAMS ratings, with the Order 1 participants having a larger decrease in mood ($M = -44.21$, $SD = 17.26$) than the Order 2 participants ($M = -36.54$, $SD = 16.89$), although this difference was not statistically significant, $t(25) = 1.17$, $p = .252$. These results suggest that the sad MI was more effective for the remitted depressed participants who received Order 1 than for those who received Order 2, which may explain why only the former participants' (Order 1) disengagement times were affected by the sad MI.

Table 11

Means and Standard Deviations of MI Information for Remitted Depressed Participants by Block Order

	Before SMI 11pt	Before SMI VAMS	After SMI 11pt	After SMI VAMS	Change SMI 11pt	Change SMI VAMS	Before PMI 11pt	Before PMI VAMS	After PMI 11pt	After PMI VAMS	Change PMI 11pt	Change PMI VAMS
Order 1 (*n* = 14)	2.93 (1.07)	71.93 (14.11)	−1.43 (1.91)	27.71 (13.91)	−4.36 (1.95)	−44.21 (17.26)	0.43 (1.34)	53.64 (12.97)	2.29 (1.54)	72.43 (15.19)	1.79 (0.98)	18.79 (11.86)
Order 2 (*n* = 14)	2.31 (1.65)	70.77 (13.24)	−0.54 (1.71)	34.23 (18.39)	−2.85 (1.63)	−36.54 (16.69)	0.85 (1.63)	52.85 (16.47)	1.85 (1.28)	68.38 (15.31)	1.00 (2.00)	15.54 (18.74)
RD Total (*n* = 27)	2.63 (1.39)	71.37 (13.45)	−1.00 (1.84)	30.85 (16.24)	−3.63 (1.93)	−40.52 (17.11)	0.63 (1.47)	53.26 (14.47)	2.07 (1.41)	70.48 (15.09)	1.41 (1.58)	17.22 (15.34)

Note. Order 1 = Block 1 of images before the Sad MI, and Block 2 of images after the Sad MI. Order 2 = Block 2 of images before the Sad MI, and Block 1 of images after the sad MI.

Discussion

The results of the present study did not fully support many of my predicted outcomes. I will now discuss each of the predictions and associated findings.

Image Type Effects

First, it was predicted that currently depressed participants would be slowest disengaging their attention from negative images, followed by the remitted depressed participants and the never depressed participants. Although the analyses showed that remitted depressed participants were 85 ms slower to disengage from images than never depressed participants, this difference was not specific to negative images, and currently and never depressed participants did not differ. For currently depressed participants, the absence of significantly slower disengagement from negative stimuli, and faster disengagement from positive stimuli, is in line with Wisco et al.'s (2012) findings. Wisco et al.'s disengagement task required participants to disengage from an emotional face and attend to a symbol, in order to identify as quickly as possible which symbol was being presented. They did not find any depression-associated delay in disengagement of attention from the sad faces, or facilitated disengagement from the happy faces. They reasoned that their null findings may have been due to the brief presentation time of the faces (250 ms) and that they had reduced statistical power with a small sample size (n = 39 for the control group, n = 35 for the depressed group). The present study addressed many of the concerns of Wisco et al.'s (2012) study, by using longer presentation times, using trials when disengagement was not required, and using an eye-tracking measure of disengagement, yet essentially the same results were obtained.

On the other hand, although the differences were not statistically significant, both the remitted depressed participants (M = 583 ms) and currently depressed participants (M = 549 ms)

were slower to disengage from negative images than the never depressed participants (*M* = 489 ms). If genuine, this pattern of results is consistent with the idea that attention disengagement from negative stimuli is impaired in dysphoric or depressed participants (e.g. Caseras et al., 2007; Koster et al., 2005; Koster et al., 2011; Sears et al., 2010; Sanchez et al., 2013). As discussed in the Strengths, Limitations, and Future Directions section below, several procedural modifications could provide a better test of group differences in disengagement times.

Mood Induction Effects

A second prediction was that after the sad MI, the remitted depressed participants would be slower to disengage from negative images, and the never depressed participants would be slower to disengage from positive images. Contrary to this prediction, the remitted depressed participants were not slower to disengage from the negative images after the sad MI (*M* = 580 ms) compared to before the sad MI (*M* = 583 ms). This finding does not support the cognitive models of depression proposing that attention biases are a vulnerability trait in those at risk for depression (e.g., De Raedt & Koster, 2010; Koster et al., 2011), which can become active under the stress of a dysphoric mood in remitted depressed individuals (e.g. Ingram et al., 1994; Just et al., 2000; Miranda & Gross, 1997; Scher et al., 2005; Teasdale & Dent, 1987). On the other hand, the never depressed participants were slower to disengage from the positive images after the sad MI (*M* = 518 ms) compared to before the sad MI (*M* = 499 ms), although this difference was not statistically significant.

Sad Mood Induction Effect on Disengagement Times for Remitted Depressed Participants

An unexpected four-way interaction between Group, Image Type, Sad MI, and Block Order was found. When the data for remitted and never depressed participants was examined separately, it was found that only for the remitted depressed participants' was there an interaction

of Image Type, Sad MI, and Block Order. For the remitted participants who were presented with Block Order 1, there was evidence that the sad MI increased disengagement times for positive and neutral images. It was found that the Block Order 1 participants had a significantly larger decrease in mood on the 11-point mood scale than the Block Order 2 participants following the sad MI. This suggests that the Block Order 1 participants were more affected by the sad MI than the Block Order 2 participants, and that this larger effect of the sad MI led to slower disengagement times. If true, then had the Block Order 2 remitted depressed participants been as affected by the sad MI, they too may have shown slower disengagement from neutral and positive images following the sad MI.

For remitted depressed participants, the slower disengagement times for positive and neutral images following the sad MI may reflect a positivity bias. A positivity bias towards positive/happy images following a sad MI can be interpreted as an attempt to repair one's mood, and is thought to be a form of resiliency (DeRaedt & Koster, 2010; Joormann & D'Avanzato, 2010; Peckham et al., 2010). If participants are engaging more with positive or neutral images in an attempt to repair their mood, it follows that they would have slower disengagement times for these images. Perhaps this particular group of remitted depressed participants had more resiliency in recovering from a sad mood than the Block Order 2 remitted depressed participants. This type of mood repair effect on disengagement times was predicted for never depressed participants, and it is interesting that it was observed for only remitted depressed participants who were more affected by the sad MI. As mentioned previously, the never depressed participants were slower to disengage from the positive images after the sad MI (M = 518 ms) compared to before the sad MI (M = 499 ms), although this difference was not statistically significant.

As to why one group of remitted depressed participants (Block Order 1) was on average more affected by the sad MI than the other group of remitted depressed participants (Block Order 2), is not entirely clear. As mentioned in the Results section, with a small sample size, there weren't any obvious patterns or differences between the two participant groups, regarding the demographics and questionnaires of depression and anxiety. By using a sad MI about a young child dying of brain cancer, it can be speculated that in the present study, participants who had young children, or who have lost a loved one to cancer, may be more personally affected by the sad MI. This data was not collected during the testing however. Different methods for inducing a sad mood may avoid any differential effects of the sad MI, and will be discussed further in the Strengths, Limitations, and Future Directions section below.

Group Differences in Mood Change

With respect to the analyses looking at changes in participants' mood, both the MI main effects of the sad MI and positive MI were found to be significant across the different time points in which mood was measured. Overall, however, there were no significant differences of group, or interactions from the effects of the MIs on each participant group. When looking at the remitted and never depressed participants, it appears that on both mood scales, from the time immediately after the sad MI, to before the positive MI, both groups had a natural improvement in their mood, as the difference on both scales from after the sad MI, to before the positive MI, were significant. With respect to the effects of mood repair from the positive MI, it was expected that the currently depressed participants would not show as large of an increase in mood following the positive MI. Although the currently depressed participants had a smaller change in score on the 11-point mood scale (M = 1.47) and VAMS (M = 10.28), compared to the remitted depressed (11-point mood scale M = 1.41; VAMS M = 17.22) and never depressed participants

(11-point mood scale *M* = 1.65; VAMS *M* = 18.30), these differences in mood repair were not significant between the three participant groups.

Implications

The study of attention disengagement from emotional information, particularly in depression, is a newly developing research area. The present study did not support recent studies that have suggested slower disengagement from negative stimuli in depressed and dysphoric individuals (Everaert et al., 2012; Joormann & D'Avanzato, 2010; Koster et al., 2005; Koster, et al., 2011; Sanchez et al., 2013; Sears et al., 2010). In addition, the prediction that remitted depressed individuals' disengagement times from negative images would be affected by a sad MI (e.g. De Raedt & Koster, 2010; Ingram et al., 1994; Just et al., 2000; Koster et al., 2011; Miranda & Gross, 1997; Scher et al., 2005; Teasdale & Dent, 1987) was not supported in the present study. Taken together, the results of the present study do not offer any support to the impaired disengagement hypothesis (Koster et al., 2011), which proposes that the processing of negative information (which can occur in rumination) may lead to prolonged negative affect (De Raedt & Koster, 2010).

Although the present study did not offer any support to the previously mentioned studies and theories, since the study of attention disengagement in depression is a new focus in attention and depression research, my study was able to further inform the literature in this area. By testing attention disengagement with new methodologies, and amongst remitted depressed participants, my study was able to inform the literature as to how disengagement can continue to be tested in the future, and opened new avenues for research in this area. Some of the ways in which improvements upon limitations of my research, as well as the continued use of some of the strengths I was able to apply, can inform future research, is discussed in the next section.

Strengths, Limitations, and Future Directions

The present study improved upon previous research on attention disengagement in depression in several ways. First, by including a sad MI in the study of attention disengagement, my research was able to shed light on any affects that a sad MI may have on attention disengagement, which, to my knowledge, has yet to be included in research studies of this nature. Second, by testing a remitted depressed participant group, along with a currently and never depressed group, new comparisons regarding attention disengagement amongst these three groups were discovered. Research in this area generally compares dysphoric or clinically depressed participants to never depressed participants only. Third, by using an endogenous auditory cue to signal attention disengagement during the task, participants were required to make a deliberate and conscious shift of attention, which is argued to be a preferable cue type in attention disengagement tasks, and is different than most research on attention disengagement conducted thus far. Fourth, using naturalistic images that were presented one at a time, for longer presentation durations, allowed me to measure attention disengagement directly from a single image type at a time, with images that are more representative of real world stimuli. Finally, by using eye-tracking technology to measure attention disengagement, my study was able to collect a direct measure of participants' attention disengagement, rather than make interpretations regarding disengagement by using manual response based tasks.

Although the present study was able to improve on previous studies by addressing the methodological issues raised previously, there were several limitations that may have significantly affected the results. A major limitation was the small sample size. Because participants were not assigned to specific groups until after they completed the SCID during the laboratory session, it was difficult to recruit a large and even number of participants for each

participant group. With a larger never depressed control group I would have had increased statistical power for my analyses. In fact, having a larger group of remitted depressed individuals would have likely helped too, given the interaction with Block Order that was discovered within this particular group.

Another methodological limitation that may require revision in future studies involves the use of the auditory cue for attention disengagement. The use of both a high and low tone was important in the present study, so that participants would not become used to only looking in one direction for disengagement throughout the task; however, the tones could have been more distinct from one another. During the practice trials, the high and low tones were shown back to back, and participants were asked if they could distinguish between the two tones. The tones are easy to distinguish from one another when played back to back, but once a number of non-probed trials occur in between the cued/probed trials, some participants expressed difficulty remembering which tone was high or low. Although the percentage of correct disengagements was high (approximately 83%), and some participants made errors simply due to anticipation of a tone in general, it would be helpful to have more distinct tones. In my follow up study, I will be using recordings of the words “up” and “down”, which are more distinct and require less time for the participant to interpret. In addition, I will be adding disengagement markers to the right and left of the image. The present study used central disengagement markers above and below the image, in order to avoid any confounds of potential right or left hemispheric differences, as noted by Pereira and Khan’s (2016) research; however, it may be easier to disengage by moving one’s eyes up or down, rather than moving them left or right. My follow up study will use a design that requires disengagement to fixation markers above, below, and to the left and right of the image.

Along with this design, recordings of the words “up”, “down”, “right”, and “left”, will be used to avoid ambiguity of the auditory cues.

In addition, since the present study used a within-subjects design of attention disengagement, there may have been practice effects of the disengagement task, which could have affected the results of the remitted and never depressed participants’ attention disengagement after the sad MI. As noted in the analysis of the percentage of correct gaze fixations (a measure of accuracy of the disengagement task), the main effect of Sad MI was significant, with correct disengagements higher after the sad MI (M = 86%, SE = 0.02), compared to before the sad MI (M = 84%, SE = 0.02). A between-subjects design would have prevented this effect, however having a measure pre- and post- sad MI with the same participants has its own benefits as well. Another issue with the within-subjects design for my study involved the length of the study. With the completion of two eye-tracking tasks, as well as the SCID, questionnaires, and two MI videos, the total study length of the study was close to 120 minutes, and was likely quite fatiguing for participants. Again, a between-subjects design for this type of study in the future can avoid these potential issues.

Finally, using one specific video for the sad MI was found to more strongly affect some remitted depressed participants, and may have differentially affected many of the participants, due to its content. With specific content relating to a young child and brain cancer, the sad MI video in the present study was likely more personally relevant for some participants compared to others. Although the sad MI was 79.7% effective in inducing a sad mood amongst the remitted and never depressed participants, simply inducing a sad mood may not be what is most important in potentially activating any latent attention biases that different individuals may have. If the sad MI was not personally relevant to a participant, they may have felt sad and empathetic, but that is

perhaps not as effective as a sad mood that is caused by something more personally relevant to an individual. Other methodologies in inducing a sad mood should be explored in future research, because if the goal is to induce a sad mood that will activate any latent attention biases an individual may have, then the sad mood should be more personally relevant, in order for it to realistically relate to depressive rumination symptoms.

One example of a sad MI methodology that could be used in future research, involves the use of sad music, in which participants are instructed to focus on personally relevant sad memories, or imagine a loved one passing away. Another option could be to have a few different sad MI videos available, and ask participants different questions before choosing a sad MI, to determine which video would be most effective and relevant for them (ie: choosing videos that have upsetting content about pets or animals, if the participant notes that they are an animal lover, and would be most upset by this type of content). Lastly, when studying the effects of a sad MI in the future, it would be important to collect questions about the personal relevance of the sad MI to the participant, as well as how much they felt it affected them (ie: did they try not to cry, did they cry while watching, etc.).

Conclusion

It is important that research continues to examine whether attention disengagement is impaired in those currently in a depressive episode and those who have recovered from a past depressive episode. The present study did not find unequivocal support for previous research that reported that disengagement is impaired in those with depression. In addition, the prediction that disengagement times would be slowed in remitted depressed individuals experiencing a dysphoric mood was not supported. There were, however, several intriguing findings for the remitted depressed participants that warrant additional research. Most important, for the remitted

depressed participants most affected by the sad MI there was evidence of delayed disengagement from positive and neutral images. The results of the present study offer several new avenues for future research on attention disengagement. A thorough exploration of attention disengagement in depression, as well as the effects of temporary dysphoric states, will inform future research into the treatment and prevention of relapse in depression.

Endnotes

[1]Moderator analyses were conducted in order to test if the degree of mood change from the sad MI moderated the effects of the disengagement times for remitted and never depressed participants. The sad MI change ratings (difference in MI ratings before and after the sad MI) were first centered for both the 11-point mood scale and the VAMS. The never depressed and remitted depressed participant groups were then dummy coded (0 and 1, respectively), in order to create an interaction variable of Group x Change in MI, for both the 11-point mood scale and the VAMS. The dummy coded group, along with the centered mood change ratings (for both the 11-point mood scale and VAMS separately) were entered into the regression analysis, along with the interaction variable, to test the effects for each image type's mean disengagement time, following the sad MI. There were no significant effects of moderation by including the mood change ratings in these analyses, and therefore the degree of change in mood did not appear to significantly moderate the disengagement times for participants who received the sad MI. This finding should be taken with caution, as the sample size and power may have affected the results.

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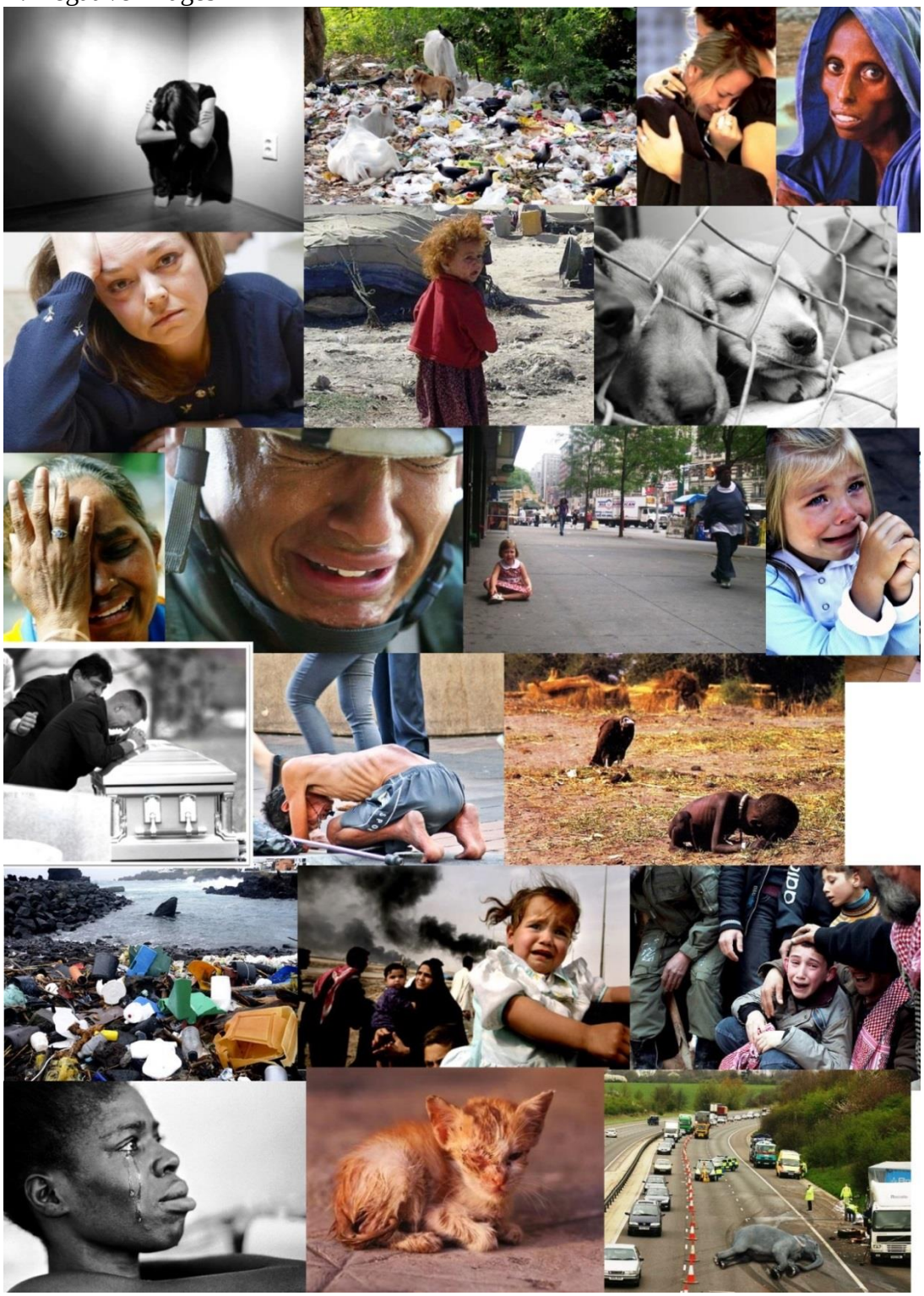
Appendix A

Figure A1
Block 1: Negative Images



Appendix A

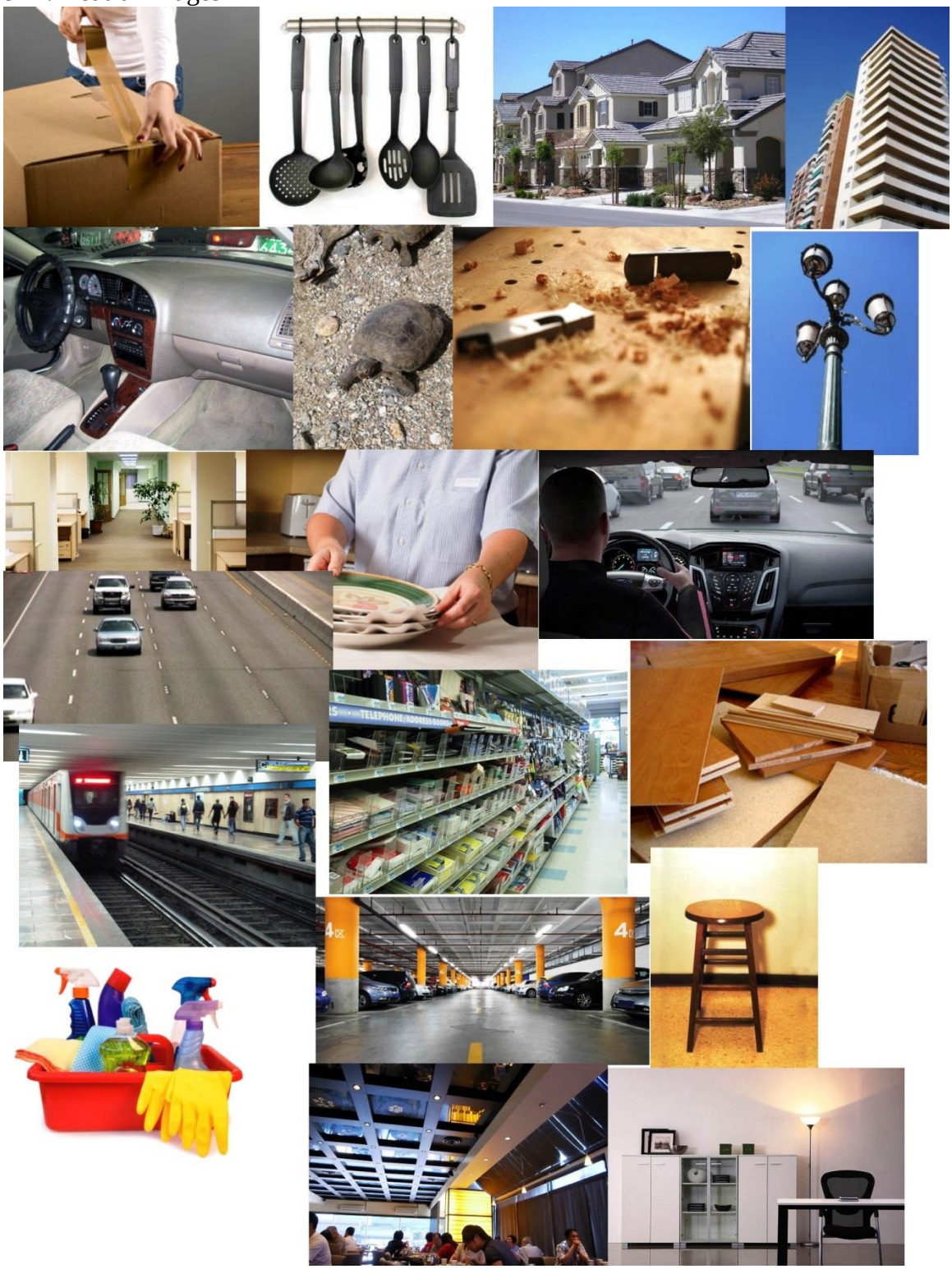
Figure A2
Block 2: Negative Images

Appendix A

Figure A3
Block 1: Neutral Images

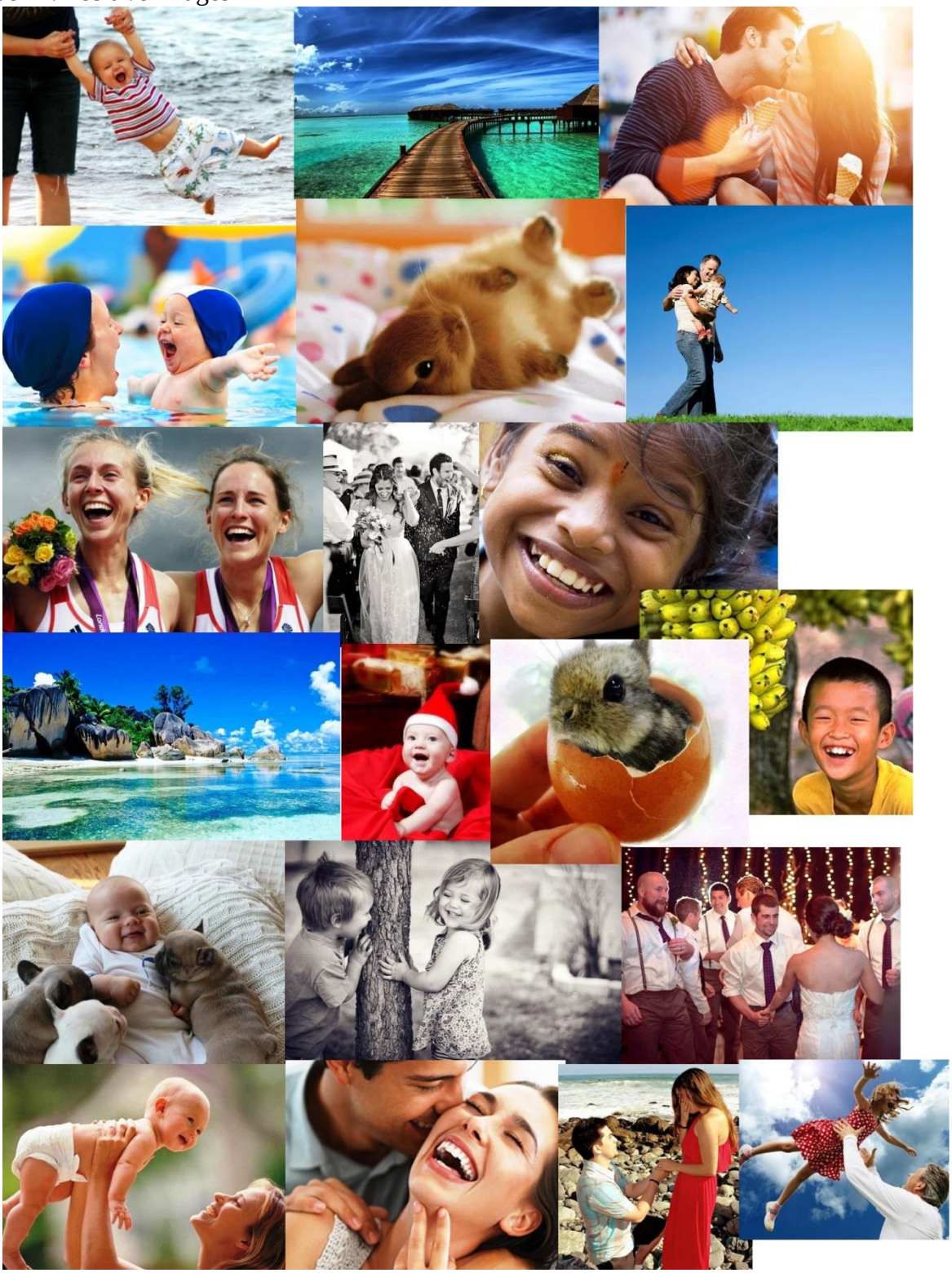
Appendix A

Figure A4
Block 2: Neutral Images



Appendix A

Figure A5
Block 1: Positive Images

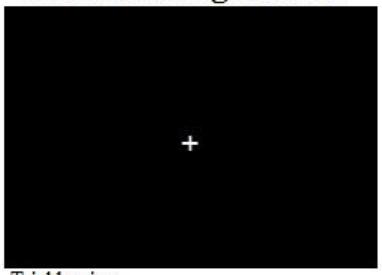


Appendix A

Figure A6
Block 2: Positive Images

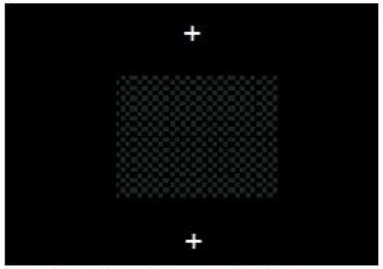
Appendix B

Probed Image Trial:

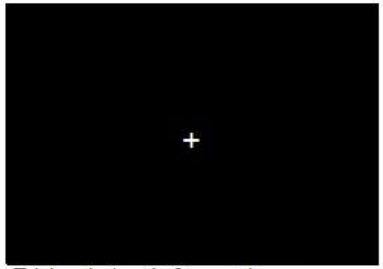


Trial begins

High/low auditory tone plays after 1500, 2000, or 2500 ms (at random)

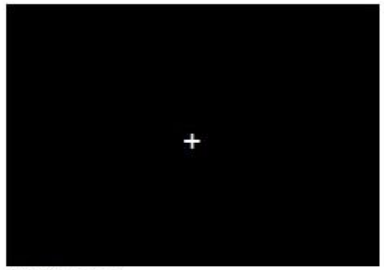


Checkered mask covers the image once gaze shifts to top/bottom fixation cross



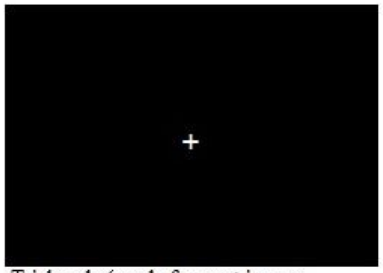
Trial ends (ready for next image presentation)

Non-Probed Image Trial:



Trial begins

No auditory tone is played. Image is presented for 4000 ms



Trial ends (ready for next image presentation)

Appendix C

Frequencies and Percentages of Participant Ethnicity:

	Born in Canada	Aboriginal	Arab/ West Asian	Black	Chinese	Japanese	Latin American	South Asian	South East Asian	White
CD (n = 33)	22 (66.7%)	2 (6.1%)	2 (6.1%)	1 (3.0%)	1 (3.0%)	0 (0.0%)	2 (6.1%)	3 (9.1%)	4 (12.1%)	18 (54.5%)
PD (n = 27)	21 (77.8%)	1 (3.7%)	2 (7.4%)	1 (3.7%)	1 (3.7%)	1 (3.7%)	0 (0.0%)	1 (3.7%)	1 (3.7%)	18 (66.7%)
NC (n = 20)	14 (70.0%)	1 (5.0%)	0 (0.0%)	0 (0.0%)	3 (15.0%)	0 (0.0%)	2 (10.0%)	0 (0.0%)	1 (5.0%)	13 (65.0%)
Total (N = 80)	57 (71.3%)	4 (5.0%)	4 (5.0%)	2 (2.5%)	5 (6.3%)	1 (1.3%)	4 (5.0%)	4 (5.0%)	6 (7.5%)	49 (61.3%)

Appendix D

Table D1

Mean and SD Demographics for Remitted Depressed Participants by Block Order

	Age	SCID # of Depressive Episodes	BMI	SR # of Depressive Episodes	BDI-II Score	RRS Score	ATQ Score	PHQ Score	BAI Score
B1-B2 Order (n = 14)	33.50 (12.63)	3.29 (3.47)	24.04 (5.73)	3.36 (0.75)	9.14 (5.93)	50.07 (11.12)	47.79 (17.01)	5.43 (4.57)	7.71 (6.89)
B2-B1 Order (n = 13)	28.69 (6.70)	1.69 (1.18)	26.00 (6.15)	2.54 (0.88)	10.00 (8.01)	42.92 (7.30)	49.38 (18.40)	7.23 (6.04)	10.85 (9.14)
RD Total (N = 27)	31.19 (10.32)	2.52 (2.71)	24.94 (5.89)	2.96 (0.90)	9.56 (6.89)	46.63 (9.98)	48.56 (17.37)	6.30 (5.31)	9.22 (8.05)

Appendix D

Table D2

Frequencies and Percentages Demographics for Remitted Depressed Participants by Block Order

	Bereavement	In Relationship	Marital Status			
			Married/ Living with Someone	Widowed	Divorced	Never Married
B1-B2 Order (n = 14)	3 (21.4%)	13 (92.9%)	8 (57.1%)	0 (0.0%)	0 (0.0%)	6 (42.9%)
B2-B1 Order (n = 13)	0 (0.0%)	8 (61.5%)	5 (38.5%)	0 (0.0%)	0 (0.0%)	8 (61.5%)
RD Total (N = 27)	3 (11.1%)	21 (77.8%)	13 (48.1%)	0 (0.0%)	0 (0.0%)	14 (51.9%)

Appendix D

Table D3

Frequencies and Percentages of Ethnicity for Remitted Depressed Participants by Block Order

	Born in Canada	Aboriginal	Arab/ West Asian	Black	Chinese	Japanese	Latin American	South Asian	South East Asian	White
B1-B2 Order (*n* = 14)	13 (92.9%)	1 (7.1%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (7.1%)	1 (7.1%)	10 (71.4%)
B2-B1 Order (*n* = 13)	8 (61.5%)	0 (0.0%)	2 (15.4%)	1 (7.7%)	1 (7.7%)	1 (7.7%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	8 (61.5%)
RD Total (*N* = 27)	21 (77.8%)	1 (3.7%)	2 (7.4%)	1 (3.7%)	1 (3.7%)	1 (3.7%)	0 (0.0%)	1 (3.7%)	1 (3.7%)	18 (66.7%)

Appendix D

Table D4

Percentages and Frequencies of Antidepressant Treatment Information for Remitted Depressed Participants by Block Order

	Current Antidepress.	Previous Antidepress.	Length of Antidepressant Treatment (months)						Currently Feel Depressed
			1-6	7-12	13-18	19-24	> 24	N/A	
B1-B2 Order (n = 14)	5 (35.7%)	4 (28.6%)	1 (7.1%)	1 (7.1%)	0 (0.0%)	0 (0.0%)	2 (14.3%)	3 (21.4%)	1 (7.1%)
B2-B1 Order (n = 13)	4 (30.8%)	4 (30.8%)	1 (7.7%)	2 (15.4%)	0 (0.0%)	1 (7.7%)	1 (7.7%)	1 (7.7%)	4 (30.8%)
RD Total (N = 27)	9 (33.3%)	8 (29.6%)	2 (7.4%)	3 (11.1%)	0 (0.0%)	1 (3.7%)	3 (11.1%)	4 (14.8%)	5 (18.5%)

Appendix D

Table D5

Depressive Episode Length Since Percentages and Frequencies for Remitted Depressed Participants by Block Order

	Length Since Previous Depressive Episode (months)					
	Current	< 1	< 6	< 12	< 24	> 24
B1-B2 Order (*n* = 14)	0 (0.0%)	0 (0.0%)	4 (28.6%)	6 (42.9%)	0 (0.0%)	4 (38.6%)
B2-B1 Order (*n* = 13)	2 (15.4%)	1 (7.7%)	2 (15.4%)	0 (0.0%)	1 (7.7%)	5 (38.5%)
RD Total (*N* = 27)	2 (7.4%)	1 (3.7%)	6 (22.2%)	6 (22.2%)	1 (3.7%)	9 (33.3%)

Appendix D

Table D6

Percentages and Frequencies of Overcoming Depression for Remitted Depressed Participants by Block Order

	How did you overcome depression					
	Nothing, Went Away	Antidepressants	Professional Counselling	Antidepressants & Counselling	Other	N/A
B1-B2 Order (n = 14)	5 (35.7%)	0 (0.0%)	1 (7.1%)	4 (28.6%)	3 (21.4%)	1 (7.1%)
B2-B1 Order (n = 13)	3 (23.1%)	1 (7.7%)	2 (15.4%)	4 (30.8%)	1 (7.7%)	2 (15.4%)
RD Total (N = 27)	8 (29.6%)	1 (3.7%)	3 (11.1%)	8 (29.6%)	4 (14.8%)	3 (11.1%)

Appendix D

Table D7

Depression Counselling Therapy Percentages and Frequencies for Remitted Depressed Participants by Block Order

	Depression Diagnosis	Present Counselling	Past Counselling	Length of Counselling Therapy (months)					
				< 1	1-6	7-12	13-18	> 24	N/A
B1-B2 Order (n = 14)	5 (35.7%)	4 (28.6%)	5 (35.7%)	0 (0.0%)	3 (21.4%)	1 (7.1%)	0 (0.0%)	1 (7.1%)	3 (57.1%)
B2-B1 Order (n = 13)	6 (46.2%)	2 (15.4%)	8 (61.5%)	0 (0.0%)	3 (23.1%)	1 (7.7%)	0 (0.0%)	2 (15.4%)	1 (7.7%)
RD Total (N = 27)	11 (40.7%)	6 (22.2%)	13 (48.1%)	0 (0.0%)	6 (22.2%)	2 (7.4%)	0 (0.0%)	3 (11.1%)	4 (14.8%)

Appendix D

Table D8

Anxiety Diagnosis, Therapy, Medication Percentages and Frequencies for Remitted Depressed Participants by Block Order

	Anxiety Diagnosis	Present Therapy for Anxiety	Previous Anxiety Therapy	Currently Anxiety Medication	Previously Anxiety Medication	Currently Feeling Anxious	Comorbid Anxiety (SCID)
B1-B2 Order (n = 14)	2 (14.3%)	2 (14.3%)	2 (14.3%)	2 (14.3%)	0 (0.0%)	6 (42.9%)	3 (21.4%)
B2-B1 Order (n = 13)	6 (46.2%)	1 (7.7%)	5 (38.5%)	2 (15.4%)	5 (38.5%)	5 (38.5%)	2 (15.4%)
RD Total (N = 27)	8 (29.6%)	3 (11.1%)	7 (25.9%)	4 (14.8%)	5 (18.5%)	11 (40.7%)	5 (18.5%)

Appendix D

Table D9

Mean DT Time and % of Correct Responses for Remitted Depressed Participants by Block Order

	Before Sad MI						After Sad MI					
	Neg Images DT	Neutral Images DT	Pos Images DT	Neg Images % Correct	Neutral Images % Correct	Pos Images % Correct	Neg Images DT	Neutral Images DT	Pos Images DT	Neg Images % Correct	Neutral Images % Correct	Pos Images % Correct
B1-B2 Order (*n* = 14)	623 (163)	585 (120)	594 (137)	83.0 (15.9)	78.0 (19.7)	86.5 (11.7)	609 (163)	633 (140)	648 (130)	83.6 (13.1)	88.4 (11.7)	86.9 (13.4)
B2-B1 Order (*n* = 13)	541 (117)	546 (113)	550 (113)	81.7 (20.1)	88.6 (11.3)	89.9 (9.1)	549 (110)	539 (103)	531 (94)	88.8 (12.3)	92.4 (18.4)	88.8 (13.2)
RD Total (*N* = 27)	583 (141)	566 (117)	573 (126)	82.4 (17.7)	83.1 (16.8)	88.1 (10.5)	580 (137)	588 (122)	592 (113)	86.1 (12.8)	90.3 (15.1)	87.8 (13.1)