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# The Effects of Induced Interpretive Biases on Memory and Emotional Vulnerability

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# THE EFFECTS OF INDUCED INTERPRETIVE BIASES ON MEMORY AND EMOTIONAL VULNERABILITY

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# THE EFFECTS OF INDUCED INTERPRETIVE BIASES ON MEMORY AND EMOTIONAL VULNERABILITY

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Cognitive theories propose that interpretive biases play an important role in the onset and maintenance of emotional disorders. To investigate the proposed causal role of interpretive biases, this study examined if it is possible to train interpretations of ambiguous situations, and if this training affects emotional vulnerability and memory. The results indicated that the interpretive training was effective in inducing the intended group differences in interpretive bias, but that the positive training was more effective than negative training. These findings also highlight the potential benefits of inducing positive interpretive biases on mood and emotional vulnerability for some individuals (i.e., individuals with high depression or rumination scores). Additionally, results from the current study demonstrate that manipulating interpretive biases can result in corresponding changes in memory. In sum, findings from the current study hold valuable implications for the effects of positively manipulating interpretive biases on mood, emotional vulnerability, and memory. Future research can further elucidate the relationship between interpretive biases and mood, as well as extend current findings to a clinical population.

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# Chapter 1: Introduction

## *Background*

Mood and anxiety disorders are by far the most common psychological disorders. One out of six people in the United States experience a major depressive episode at least once in their lifetime, and major depression is the leading cause of disability in the US for ages 15 to 44 (The World Health Organization [WHO], 2004). Symptoms of this debilitating disorder include extreme sadness, loss of interest in pleasurable activities, loss of appetite, feelings of worthlessness, and suicidality. Individuals with anxiety disorders experience a wide range of physical and psychological symptoms, such as irritability and worry, nervousness, fear of losing control, dizziness, shakiness, and racing and/or pounding heart. Due to the high prevalence and often chronic course of emotional disorders, it is important to understand which factors contribute to their onset, maintenance, and recurrence.

Cognitive models propose that certain beliefs, thoughts, and attitudes play an important role in the onset and maintenance of psychological disorders. Beck's cognitive model of depression (1967, 1979), for example, proposes that individuals who are vulnerable to depression are characterized by specific – and often latent- dysfunctional beliefs. When activated by stressors, these beliefs lead to negative automatic thoughts and biased processing of emotional material, thus causing individuals to develop negative views about themselves, the world, and their future. For example, an individual may possess dysfunctional beliefs about the importance of performing well in achievement situations. If this person performs poorly on an important exam, negative automatic thoughts become activated, such as s/he is a failure, s/he will fail out of college and

always fail in the future, and that everyone is smarter than he/she. Other differences in cognition that may create an increased vulnerability to the development of emotional disorders are levels of self-esteem (Roberts, Kassel, & Gotlib, 1995), self-efficacy (Jerusalem & Schwarzer, 1992), and optimism (Scheier & Carver, 1992). Similar to dysfunctional attitudes, low levels of self-esteem, self-efficacy, and optimism may create psychological vulnerabilities that interact with stress to increase risk for the onset and recurrence of these disorders.

In addition to these differences in specific thought content between depressed and non-depressed persons, cognitive theories propose that individuals with emotional disorders and individuals at risk for developing emotional disorders are also characterized by biased cognitive processes (Joormann, in press). These theories posit that depressed and anxious individuals exhibit cognitive biases in various aspects of information processing including attention, memory, and interpretation. In their recent review of empirical evidence for biased processing in depression and anxiety disorders, Mathews and MacLeod (2005) reported that individuals with anxiety disorders indeed demonstrate increased attention to threatening information, are biased to interpret ambiguous stimuli in a threatening way, and exhibit increased intrusive ideation about future events in the form of worry, while there is little support for memory biases. Research on individuals with depression provides evidence for negatively biased memory, intrusive ideation about past events in the form of rumination, mixed support for an interpretation bias, and little evidence for an attentional bias. Therefore, although cognitive models propose that biases in cognitive processes seem to play an important role in the onset and maintenance of

both mood and anxiety disorders, the empirical evidence suggests that different processes are important for different disorders.

*Memory and Interpretation Bias in Depression*

Memory biases are the most consistent finding in research on cognition in depression, supporting the notion that these individuals have enhanced memory for negative information. On explicit memory tasks, for example, depressed participants recall more negative than positive words (Matt, Vazquez, & Campbell, 1992). Furthermore, when asked to remember negative events from their lives, depressed individuals are able to do so more easily, displaying mood-congruent memory (Ridout, Astell, Reid, Glen, & O'Carroll, 2003; Watkins, Mathews, Williamson, & Fuller, 1992).

In addition to demonstrating biases in memory, individuals with depression also have a tendency to make negative interpretations when presented with ambiguous stimuli. Most studies using self-report measures of interpretive biases have shown that people with this disorder exhibit a higher probability of endorsing negative interpretations of ambiguous scenarios (Butler & Mathews, 1983; Miller & Norman, 1986). Self-report studies, however, are prone to demand characteristics and response biases. A study by Lawson and MacLeod (1999), therefore, assessed interpretive biases using response latencies. Dysphoric students were timed while reading continuations for ambiguous passages that confirmed or disconfirmed a negative outcome to the scenario. This study found no differences between the two groups, demonstrating that the dysphoric students did not show a negative bias. Lawson and MacLeod (1999) attributed their lack of evidence for an interpretive bias to the fact that the scenarios did not involve self-referent processing. Additionally, the use of reaction times as the main dependent variable may be

problematic as elevated levels of depression are often associated with the slowing of response times to execute voluntary responses (Azorin, Benhaim, Hasbroucq, & Possamai, 1995) and with an increased variability of latency measures (Byrne, 1976).

More recently, Lawson, MacLeod, and Hammond (2002) assessed interpretive biases using blink reflex magnitude, a physiological measure that is resistant to the potential influence of demand effects and response bias. The eye blink reflex, which is part of the human startle reflex, is greater in magnitude when participants view negative compared to neutral stimuli (cf. Bradley, Cuthbert, & Lang, 1999). In this study, participants were instructed to imagine visual images evoked by ambiguous words. Lawson and colleagues found that when depressed participants made more negative, rather than neutral, interpretations of the meaning of the words, the magnitude of their blink reflex was larger, providing evidence in support of a negative interpretive bias. Overall, the body of research on interpretation biases and depression seems to provide support for the loss of an emotionally positive interpretation bias and/or a negative interpretation bias.

Although these findings suggest that depression is characterized by mood-congruent biases in memory and interpretation, more research is needed to increase our understanding of the role of these biases in depression. Very few studies to date, for example, have tried to identify relations among cognitive biases. Increased elaboration of negative material either during or following encoding in depression may explain the ease with which this material is retrieved. In addition, memory biases could result from biased interpretations. A long tradition of research on constructive and reconstructive memory, beginning with Bartlett (1932), has demonstrated that the way in which events are

understood determines how they are remembered. If depressed individuals tend to interpret ambiguous situations in a negative manner, they may also be more likely to remember them in a way that reflects this initial interpretation. Memory biases found in depression may therefore be linked to initial biases in interpretation.

Preliminary evidence for the importance of paying attention to the relation among cognitive biases comes from a recent study by Hertel, Brozovich, Joormann, and Gotlib (2008). These authors investigated the connection between memory and interpretation in individuals diagnosed with generalized social phobia (GSP), a population which has been shown to exhibit negative interpretive biases (e.g., Amir, Foa, & Coles, 1998; Stopa & Clark, 2000). Participants were instructed to create endings for ambiguous social scenarios and then to recall the originally presented scenarios, as well as their own created endings. When asked to recall details from the originally presented ambiguous scenarios, socially anxious compared to non-anxious participants tended to produce more intrusions, or new facts, that reflected the valence of their initial (socially anxious) endings. The results of this study provide preliminary support for the notion that there may be a connection between interpretation and memory biases in emotional disorders. The present study was designed to investigate the relation between interpretation of ambiguous situations and memory biases in depression.

In addition, there is less research concerning *how* cognitive biases actually operate. More specifically, it is unclear if these biases play a causal role in the onset and/or maintenance of depression. Establishing this causal role could provide important information for the development of effective interventions. Therefore, in addition to investigating interpretive biases in depression, and the connection between memory and

interpretation, this study also intends to serve as a more fine-grained analysis into the functional role of these cognitive biases on emotional vulnerability. Memory bias may have important consequences for depressed individuals. The facilitated memory for negative events may affect depressives' judgments of how frequently these positive and negative events occur, and may bias their prediction of the likelihood of experiencing similar events in the future. This may lead to negative affect and hopelessness (MacLeod & Campbell, 1992). Interpretive biases and memory biases may therefore directly affect emotional responses to stressful experiences.

The goal of this study is to investigate the relation of interpretive biases and memory biases and to investigate whether these biases affect emotional responding to stressful experiences. A strong test of these hypotheses requires the experimental manipulation of cognitive biases. This study therefore proposes to examine the consequences of training interpretation on memory biases and emotional vulnerability. If interpretive biases lead to memory biases, can we experimentally manipulate interpretation and, as a result, affect memory and response to a stressor? The possibility of modifying a specific cognitive bias and demonstrating an effect on a different bias, as well as on emotional responses to a stressful situation, could provide valuable information regarding the functional role of these biases in depression and regarding interventions.

*Cognitive bias training studies in anxiety*

To better understand the causal role of cognitive biases in the onset and maintenance of emotional disorders, recent research has begun to investigate the possibility of training cognitive biases (e.g., Grey & Mathews, 2000; Mathews &

Mackintosh, 2000; Yiend, Mackintosh, & Mathews, 2005). These studies allow researchers to examine if these biases can be altered or trained, and to investigate the impact of modifying biases on various other outcome variables. According to stress-vulnerability models of emotional disorders, modifying biases may, in turn, decrease the psychological or cognitive vulnerabilities that interact with stress to bring about the onset of or maintain these disorders. To date, most of these training studies have focused on manipulating attentional and interpretive biases in individuals with average or high levels of trait anxiety to investigate training effects on state anxiety. No studies have examined whether training a specific cognitive bias affects other biases and whether training interpretations affects responses in situations that elicit negative mood instead of anxiety. After a brief overview of studies that have investigated the effects of training attentional biases on anxiety, the following sections will review the effects of manipulating interpretive biases in anxiety on two main areas: 1) cognitive changes, or the ability of the training to successfully train interpretive biases, and 2) emotional vulnerability, or emotional response to stressors.

*Training attentional biases in anxiety.* Much research has suggested that anxiety is associated with processing biases that favor attending to threatening information (e.g., Mathews & MacLeod, 1985; Mogg & Bradley, 1999; Mogg, Millar, & Bradley, 2000). Researchers investigating cognitive biases in anxiety have commonly used the dot probe task to examine attentional biases. In this task, two sets of stimuli (often a threatening and neutral picture or word) are simultaneously presented on two areas of a computer screen. Then, a visual probe, usually a small dot, appears on one side of the screen, and participants are required to press a button immediately when they detect the dot. By

examining the length of time to detect the dot, it is possible to determine if participants were attending to the threatening stimuli, based on the assumption that participants will respond more quickly to the probe if it was on the same side of the screen as the stimuli they were attending to. A faster response time for probes that appear at the same location of threat information in comparison with responses to probes at the opposite location of threat information is interpreted as an increased vigilance for threat.

In one of the first studies using this task to train biases, MacLeod, Rutherford, Campbell, Ebsworthy, and Holker (2002) instructed student participants to complete a version of the dot probe task designed to induce a biased attentional response to different emotional stimuli. One condition was intended to increase attention to threatening cues, while another condition was aimed at directing attention to emotionally neutral stimuli, or the avoidance of threatening stimuli. In each trial, a word pair with one emotionally negative word and one emotionally neutral word appeared on the screen. Following these word pairs, a small probe (a single pixel or two adjacent pixels) was presented in either of the two screen locations previously occupied by one of the words. For half of the participants, the probes always appeared in the vicinity of the neutral word, while for the other half, the probes always appeared on the side of the threatening word, with the intention of inducing the corresponding attentional bias. After the attentional training, participants were exposed to a stressful experience, which involved attempting to complete insoluble anagrams while being videotaped. Participants' levels of state anxiety and mood were measured before and after this stress task.

MacLeod and colleagues (2002) reported a significant Group x Probe Location interaction in the post-training phase, indicating the development of differential

attentional responses to emotional stimuli following the training. Additionally, there was a significant Group x Assessment Point x Test Phase interaction, meaning that the degree to which the stress manipulation elicited negative mood was dependent on the training condition. Thus, participants who were trained to attend to negative stimuli had significantly elevated mood scores following the stress task in comparison to those who were trained to attend to neutral information. Results from this study provided support for the use of attentional deployment tasks to experimentally induce biases, as well as the effectiveness of these biases to influence emotional vulnerability, at least in the short-term. Although these findings are encouraging, there is little evidence that orienting towards negative material is important for mood disorders (Bradley, Mogg, Falla, & Hamilton, 1998; Mogg, Millar, & Bradley, 2000) and this training paradigm is therefore unlikely to be of use for training depression-relevant biases.

*Training interpretive biases in anxiety*. Due to the large body of evidence supporting that individuals with high levels of anxiety demonstrate an increased tendency to make threatening interpretations when confronted with ambiguous stimuli (Hirsch & Mathews, 1997), recent training studies have been conducted to examine if it is possible to manipulate these interpretive biases (and if so, to examine its subsequent effects on anxiety levels). These studies would allow an examination into the causal pathway between interpretive biases and anxiety. In the first study to use an interpretation task, biases were trained using emotionally ambiguous homographs, such as "beat," in which participants were forced to either make threatening (to hit) or non-threatening (rhythmic sound in music) interpretations of the words (Grey & Mathews, 2000). Participants were told that they would view a series of cue words, which would help them solve word

puzzles immediately following each cue. For each trial, a single homograph or filler word appeared on the screen, later followed by a word fragment. Participants were instructed to use the cue to help them find a word that completed the fragment as quickly as possible, and were told to press the space bar when they thought they knew what the completed word was. For half of the participants, the fragments were constructed to correspond to words associated with a threatening meaning ("police") of the homograph, while for the other participants, the fragments were associated with a non-threatening meaning ("rhythm") of the homograph. The authors found that participants trained to complete word fragments consistent with its threatening meaning later displayed faster fragment completions for words associated with the threatening meaning of new homographs. They did not find the same results, however, for training with non-threatening meanings. Thus, their overall findings suggested that emotional interpretive biases can, in fact, be induced, and that, based on their questioning of participants, this change is not always conscious.

Building upon this notion of forced interpretation training, Mathews and Mackintosh (2000) used emotionally ambiguous scenarios to train individuals to make either positive (non-anxious) or negative (anxious) interpretations of ambiguous text. Each scenario consisted of a two to three-sentence description of a situation and ended with an incomplete word fragment, which participants were asked to complete. For individuals in the positive training condition, the completed word disambiguated the passage with a positive ending; whereas, in the negative training condition, the completed word fragment created a negative scenario. Participants were instructed to use their

understanding of the scenario to guide their solution of the word fragment, and to press the space bar as soon as they were able to solve the word fragment.

Following completion of 104 of these scenarios, participants were then shown a set of 20 ambiguous scenarios similar in structure, in which they were also asked to complete word fragments. For these test scenarios, however, the completed word fragment was designed to preserve the ambiguity of the passage, rather than resolve it. After viewing these test scenarios, participants completed a short filler task, and were then asked to rate four sentences on a scale of one to four according to how similar each was to the corresponding scenarios they just read, thus, assessing their own interpretations. Of these "recognition rating" sentences, one represented a possible positive interpretation, one a possible negative interpretation, and the remaining two were positive and negative foils in order to test any broader effects of the training. There was a significant Group x Probe Valence interaction, meaning that participants who were initially exposed to negative interpretations were faster to complete negative than positive probe fragments (scenarios of a fixed valence for all participants, regardless of induction condition), and vice versa for positively-trained participants. Additionally, there was a significant Group x Valence interaction for the recognition ratings, with individuals rating sentences corresponding to the valence of their training as being more similar (i.e. individuals in the positive training condition endorsing more positive interpretations and vice versa). Therefore, results from this study provided further support for the efficacy of training both positive and negative interpretive biases.

*The effects of training on anxiety levels and emotional vulnerability.* With research supporting the ability to experimentally induce biases in cognitive processes, the

next step is to examine whether manipulating these biases may play a role in increasing or decreasing levels of anxiety. In the study by Mathews and Mackintosh (2000), for example, the authors used the State-Trait Anxiety Inventory-State (STAI-S) to compare state levels of anxiety prior to and after the training. The authors obtained a significant Group x Time Interaction ($p < .01$), in which participants in the negative training condition displayed elevated levels of anxiety and participants in the positive training condition demonstrated decreased symptoms of anxiety, supporting the hypothesis that interpretive biases do seem to play a causal role in affecting anxiety levels.

In a study by Yiend, Mackintosh, and Andrews (2005), participants were trained to make positive or negative interpretations of ambiguous scenarios using the paradigm detailed by Mathews and Mackintosh (2000). Similarly, their anxiety levels were measured using the STAI-S before and after the interpretive training. The comparison of state anxiety scores pre- and post-training demonstrated a significant Training Group x Time interaction, showing an increase in anxiety scores between the two time points for the negative training group and a decrease in anxiety scores for the positive training group. To examine the durability of the training effects, Yiend et al. (2005) implemented a 24-hour delay between the training and subsequent test. Although there continued to be a significant Valence x Training Group effect, which reflected the persistence of a training-congruent effect on interpretive biases over 24 hours, the groups did not appear to change in their level of state anxiety according to the valence of training received. However, upon further analysis, combining data from both experiments revealed a significant relationship for the positively-trained group, demonstrating that the higher the initial trait anxiety, the greater reduction in state anxiety level across positive training.

Overall, these results provided further support for the influence of interpretative biases on anxiety levels and the durability of effects of interpretive training over a 24-hour period.

Additionally, by placing participants in a stressful situation, researchers can examine the impact of interpretive training on participants' emotional vulnerability and ability to cope with stressors. Stress-vulnerability models propose that biased processing becomes a problem when people are confronted with external stressors. In a recent study, participants who received interpretive training using ambiguous homophones were then shown four distressing television clips of real-life emergency rescue situations (Wilson, MacLeod, Mathews, & Rutherford, 2006). Using pre- and post-measures of the STAI-S, the authors found a significant interaction between Training Group and Mood Assessment Point, indicating that participants who were trained to interpret ambiguity in a non-threatening manner had an attenuated anxiety reaction to the subsequent video stressor. A recent study by Mackintosh, Mathews, Yiend, Ridgeway, and Cook (2006) provided further support for the effect of induced biases in interpretation on anxiety vulnerability. In addition to demonstrating that interpretive biases had durable effects on state anxiety 24 hours following the viewing of a stressful video, their results also indicated that participants receiving negative training exhibited larger increases in state anxiety after a stressor than those receiving positive training.

In a related study, Salemink, van den Hout, and Kindt (2007) employed the interpretation training scenarios described in Mathews and Mackintosh (2000). Although there was a significant main effect of time on depression and anxiety scores following the stress induction, there was no significant Group x Time interaction, illustrating that although the stress task was capable of increasing negative mood, this degree of elevation

did not differ across training conditions. Upon closer examination, these findings may be due to the nature of the stress task. Participants were given an insoluble anagram to complete, and were informed that although the task was difficult, most intelligent people are able to successfully complete it. They were also told that they would each have to meet with the experimenter afterwards to discuss their performance. However, the authors suggest that the participants may not have been fully invested in this task, and thus, this stress induction may not have been sufficiently effective in creating a stressful experience. Conflicting findings concerning the effects of training on stress reactivity may, therefore, be due to the nature of the stress-inducing event, rather than the training itself.

In sum, in an effort to better elucidate the factors contributing to emotional disorders, researchers have investigated cognitive biases that contribute to these disorders, and more recently, the effects of manipulating these biases on other outcome variables. Studies so far have examined non-disordered individuals and those with high levels of trait anxiety and have reported that training attentional and interpretive biases is successful in producing cognitive changes (Mathews & MacLeod, 2002). Additionally, several studies have demonstrated the effects of positive and negative interpretation training on emotional vulnerability, using measures of state anxiety. The current study aims to build upon these findings by examining the effects of interpretation training on mood, emotional vulnerability, and memory.

*Current study*

Cognitive models of depression posit that biased processing of emotional information contributes to the development and maintenance of depression. Individuals

with depression have been found to demonstrate biases in cognitive processes, such as enhanced memory for emotionally negative information, and negative interpretation of ambiguous information. Although previous studies have investigated the cognitive factors that characterize depression, no studies to date have attempted to experimentally manipulate these biases. Training studies in anxiety disorders have demonstrated the efficacy of experimentally inducing cognitive changes in both attention and interpretation, and the subsequent effects of the training on state anxiety ratings. The present study used the scenarios developed by Mathews and Mackintosh (2000) to train interpretive biases but attempted to apply these interpretive training paradigms to examine training effects on mood, emotional vulnerability, and memory biases. Examining the relationship between interpretive and memory biases is important because memory biases may play an important role connecting biased interpretation and emotional vulnerability.

Both Mathews and Mackintosh (2000) and Yiend et al. (2005) discuss the importance of the active generation of the interpretation biases; thus, it is crucial for participants to actively generate their own positive or negative interpretations, rather than passively be given the valenced word. Mathews and Mackintosh (2000) also proposed that the types of ambiguous scenarios used in training and their degree of self-relevance to the participant could influence the extent to which the interpretation bias develops and whether or not anxiety levels are affected. By adapting the ambiguous scenarios detailed in the study by Mathews and Mackintosh (2000) to reflect more depressive and self-referent concerns, this study trained interpretive biases by forcing participants to make negative interpretations of ambiguous scenarios and others to make positive

interpretations. Subsequently, the successfulness of this training was measured by assessing participant's interpretations of new scenarios. To investigate the possible relation between memory and interpretation biases, participants were asked to recall these ambiguous scenarios. Furthermore, to assess the effect of the training on mood and emotional vulnerability, mood and state self-esteem ratings were taken at several time points during the study.

When attempting to examine changes in emotional vulnerability, it is also crucial to establish what makes a stress-vulnerability manipulation successful, or sufficiently effective in inducing a true state of stress in an experimental setting. Based on a meta-analysis of 32 studies examining success-failure manipulations, the most powerful affective reactions were achieved using social perception tasks, with a mean effect size of .60 (95% CI = .56-.64) (Nummenmaa, & Niemi, 2004). These tasks involve informing the participant that they are being tested in areas such as their ability to perceive others emotions and develop successful interpersonal relationships. Additionally, for a task to be effective, participants must feel fully involved and invested, and must consider the success or failure of their performance to be important. Without these elements, participants would lack the motivation to achieve on the task, and thus, the manipulation would not possess the qualities necessary for them to form affective self-appraisals. Consequently, tests of social skills and fake intelligence tasks are often the most successful in inducing affective reactions in adults when attempting to experimentally examine emotional vulnerability (Nummenmaa & Niemi, 2004). Rather than employing the use of a distressing video or stressful anagram task, this study drew upon the recommendations outlined in Nummenmaa and Niemi's (2004) meta-analysis by having

participants complete a fake test of social perception. During this task, they were asked to identify the emotion shown in subliminal faces, and subsequently receive false negative feedback. In order to make participants feel more involved and invested in the task, they were informed that their performance on the task was indicative of their overall level of social skills, and was highly predictive of their success in various settings, such as work, school, and social relationships.

In summary, the main goals of this study were to determine if biases in interpretation can, in fact, be trained, and if so, if these biases would have a subsequent effect on mood and emotional vulnerability. By adapting Mathews and Mackintosh's (2000) test scenarios to be more depression-, rather than anxiety-related, this study examined the impact of manipulating interpretive biases on depressive cognitions, and provides important information regarding the ability to manipulate psychological vulnerabilities in individuals at risk for depression. Additionally, this study strived to examine the link between interpretive and memory biases to determine if manipulating interpretive biases would also, in turn, affect biases in recall, and thus subsequent emotional vulnerability.

To investigate these questions, half of the participants were trained to interpret ambiguous scenarios in a negative, self-relevant way and half of the participants were trained to interpret the same scenarios in a positive way (training phase). Each scenario consisted of a description of a situation and ended with an incomplete word fragment, which participants were asked to complete. One example was: "Having finished painting your apartment, you invite friends around to dinner. As they walk into your apartment, you can see that they are surprised. Their reactions are one of hor--r (horror)/pl--s--e

(pleasure)." For individuals in the positive training condition, the completed word disambiguated the passage with a positive ending ("pleasure"); whereas, in the negative training condition, the completed word fragment created a negative scenario ("horror").

In addition to the training scenarios, both groups also responded to probe scenarios that did not differ between the groups. In these scenarios the word fragment at the end of the sentence disambiguated the phrase to have either a positive or a negative meaning, regardless of the training group. The effectiveness of the training was measured by reaction times to these word fragments. We expected that during the second half of the training, individuals would complete word fragments corresponding to their training condition more quickly compared to word fragments that did not correspond to their training condition. After the training, participants were shown a new series of ambiguous scenarios similar to the scenarios used for training (test phase). In the test phase, however, word fragments did not disambiguate the meaning of the scenarios. Then, following a short filler task, participants were asked to rate positive and negative sentences in accordance with how similar they were to the previously viewed scenarios. These similarity ratings provided further information regarding the successfulness of the training.

To measure the effect of this training on mood and on emotional vulnerability, we examined changes in participants' self-reported mood and self-esteem before and after the training, as well as prior to and following the stress-vulnerability task. Additionally, we assessed the effects of participants' interpretations on memory by asking participants to recall the test scenarios and by coding the number and valence of their reported intrusions, or new details not originally included in the scenarios. The number and

valence of intrusions were then compared to the valence of participants' initial interpretations. Lastly, depression and rumination scales were administered to determine how individual differences on these measures affected response to training and subsequent emotional vulnerability.

*Hypotheses*

The hypotheses for this proposed study were as follows:

1) Interpretive biases can be trained. The training effect was assessed by: a) participants' response times to complete the word fragments at the end of the probe scenarios, b) participants' ratings of similarity of positive and negative sentences to the test scenarios. If training was successful, the positive training group would show faster responses to positive probe fragments during the second half of training and higher similarity ratings for positive sentences, while the negative group would show faster responses to negative probe fragments during the second half of training and higher similarity ratings for negative sentences.

2) Induced changes in interpretive biases would affect participants' mood and self-esteem. Participants in the positive training condition would demonstrate increased positive mood (e.g., happy, hopeful) and self-esteem (e.g., confident, effective) ratings. Conversely, participants in the negative training condition would report increased negative mood (e.g. discouraged, sad) and decreased self-esteem ratings after the training.

3) Training in interpretive biases would affect later recall and memory for the scenarios. It was predicted that participants' recall of the ambiguous scenarios would reflect their initial interpretation of the scenario. Thus, participants in the positive

condition would exhibit more positive intrusions than individuals in the negative condition, whereas those in the negative training condition would exhibit more negative intrusions than those in the positive condition.

4) Induced changes in interpretive biases would affect participants' emotional vulnerability. Participants in the negative compared to the positive training condition would demonstrate increased negative mood and decreased positive mood and self-esteem ratings in response to a stressful task. These results would support the idea that positively manipulating interpretive biases may have a protective effect on emotional vulnerability, while inducing a negative interpretive bias has a detrimental effect on mood and self-esteem.

5) Training effects would be associated with individual differences in depression and rumination. Therefore, individual differences in levels of depression symptoms and rumination would be correlated with mood and emotional vulnerability. Additionally, levels of self-efficacy, self-esteem, and optimism would be examined in relation to their effects on mood ratings following the training and stress-vulnerability task.

## Chapter 2: Methods

### *Participants*

Participants for this study were recruited from the University of Miami undergraduate research participant pool. Those recruited were compensated with 1 credit per half hour for their participation in the study. 62 participants were recruited for the study: 31 participants were randomly selected and assigned to receive positive interpretation training and 31 participants were randomly selected and assigned to receive negative interpretation training. The number of participants selected was based on the estimated power of .92 needed to observe the predicted effect of biased interpretation on anxiety (see Salemink et al., 2007), and the average effect sizes used in previous studies on interpretation training in anxiety (mean d = 1.25) (Mathews & Mackintosh, 2000; Salemink et al., 2007, Yiend et al., 2005). Because there have been no studies on training specifically examining dysphoric mood symptoms (rather than anxiety) to date, power and effect sizes from analogous studies in the anxiety literature were applied. No exclusion criteria will be applied.

### *Measures*

*Demographics.* All participants completed a form concerning personal background. This included information on racial and ethnic background, age, gender, marital status, children, occupation, education, and income.

*Beck Depression Inventory (BDI-II; Beck & Steer, 1993; Beck, Steer, & Garbin, 1988).* Severity of current depressive symptomatology was assessed using this 21-item self-report measure. It is scored by summing the severity of individuals' symptoms rated from 0 to 3, with overall scores ranging from 0 to 63. It is one of the most widely used

self-administered depression rating scales used among adults, due to its strongly validated psychometric properties. Internal consistency ranges from .73 to .92 with a mean of .86 (Beck, Steer, & Garbin, 1988), and correlations with clinician ratings of depression range from .62 to .66 (Foa, Riggs, Dancu, & Rothbaum, 1993). (Appendix E)

*General Self-Efficacy Scale (GSE*; *Jerusalem & Schwarzer, 1992).* This self-report inventory was designed to assess an individual's sense of perceived self-efficacy to predict how well one would be able to adapt and cope following stressful life events. Containing ten items, each response is scored on a four-point scale, with an overall score range from 10 to 30. Using samples from 23 countries, reliability ranged from .76 to .90, with most in the high .80s. Correlation studies have found positive relationships between high scores on the GSE and favorable emotions, trait optimism, and satisfaction at work, and negative correlations with stress, somatic complaints, depression, and anxiety. (Appendix F)

*Life Orientation Test-Revised (LOT-R; Scheier, Carver, & Bridges, 1994).* This brief ten-item self-report measure was designed to assess levels of dispositional optimism and pessimism. Individuals were asked to rate the extent to which they agree or disagree with the given statements on a five-point scale. Of the ten statements, four are reverse scored. Of the six items on the scale that specifically measure optimism, the internal consistency is .78 and the test-retest reliability ranges from .56 to .79 over a 28-month period. (Appendix G)

*Resultant Self-Esteem Scale (RSES; McFarland & Ross, 1982).* This self-report measure was designed to assess participants' state self-esteem and current affect. Consisting of 77 adjectives, participants were asked to rate on a scale of 1 (not at all) to

11 (extremely), the extent to which each words described "how you feel right now." This study used an abbreviated version of the RSES, including subscales for positive affect (e.g., happy, hopeful), negative affect (e.g., frustrated, depressed), low self-esteem (e.g., inadequate, worthless), and high self-esteem (e.g., confident, effective). These items are specifically designed to examine the impact of success and failure feedback on affect following a performance-based task, such as the social perception task this study proposes to use. In a study by McFarland and Ross (1982), the adjectives listed in the negativity, positivity, and self-esteem scales accounted for 73.8% of the variance in affect for individuals following feedback on a social accuracy test. (Appendix H)

*Rosenberg Self-Esteem Scale (RSE; Rosenberg, 1989).* This ten-item self-report inventory assessed levels of self-esteem, which is an overall evaluation of one's worth or value. Self-esteem, in addition to self-efficacy and self-identities, are an important part of one's self-concept, and how one perceives oneself in relation to others. Overall scores range from 0 to 30, with 30 indicating the highest score possible. Each item is rated on a four-point Likert scale ranging from "strongly agree" to "strongly disagree," and five items are reverse-scored. Test-retest correlations are in the range of .82 to .88, and Cronbach's alpha for various samples range from .77 to .88 (Rosenberg, 1986). Previous studies indicate a unidimensional, as well as a two-factor (self-deprecation and self-confidence) structure to the scale). (Appendix I)

*Ruminative Response Scale (RRS; Nolen-Hoeksema & Morrow, 1993).* This 22-item self-report questionnaire is a subscale of the longer Response Styles Questionnaire (RSQ) (Nolen-Hoeksema & Morrow, 1993). It measures the tendency to respond to negative moods and negative life events with a ruminative coping style. Each item is

rated on a Likert scale ranging from 1 (almost never) to 4 (almost always) depending on the extent to which the individual responds to dysphoric mood in a way that is self-focused, symptom-focused, or focused on the possible causes and consequences of the depressed mood. Conway and colleagues (2000) found good internal consistency ($\alpha$=.91) and adequate test–retest reliability over a two- to three-week period ($r$=.70). The convergent and discriminant validity of the scale was supported using a large battery of questionnaires. (Appendix J)

Table 2.1

*Overview of dependent measures at various timepoints throughout study*

| | **Timepoint** | | | | |
|---|---|---|---|---|---|
| **Dependent Measures** | **1** | **2** | **3** | **4** | **5** |
| BDI | | | | | X |
| GSE | | | | | X |
| LOT-R | | | | | X |
| RRS | | | | | X |
| RSE | | | | | X |
| RSES | X | X | X | X | X |

*Procedure*

*Interpretation training phase.* Participants were presented with ten blocks of ten scenarios each (Appendix A). These ambiguous descriptions were adapted from the training studies by Mathews and Mackintosh (2000). The blocks and items within the blocks were presented in a random order. Within each block were eight training statements, whose outcomes were based on the direction of training (positive or negative), and two items with fixed valence for all participants, regardless of the training group (probe items). The text for each scenario appeared, and participants were asked to imagine themselves as the central character in the described scenario. Each training item was composed of two to three sentences, with the last word of the last sentence being a

word fragment for the participants to complete. Each fragment had only one possible solution, which was a valenced word that disambiguated the meaning of the social scenario. Thus, for the positive training group, the completed fragment produced an emotionally positive outcome for the scenario, while for the negative training group, the complete fragment produced an emotionally negative outcome. Participants were asked to press any key when they are able to solve the word fragment. In each case, they had up to 10 seconds to respond. The response times for how quickly participants were able to solve the probe items were also recorded in order to track the development of the induced training effects. An example training scenario is:

"While at the hairdressers, you are persuaded to try a completely different cut. In doubt about it, you ask a friend, who comments that the style makes you look…"

Either t e - - i – l e (terrible) *(negative training group)*

or a t - - - c - - v e (attractive) *(positive training group)*

Then, a comprehension question was given to test their understanding of each scenario. This comprehension question served to emphasize the valenced meaning of each scenario, as well as to test that participants understood the meaning of the text. An example comprehension question is:

"Did your friends like your new haircut? "

*Interpretation test phase.* Following the training phase, participants were presented with twenty ambiguous social scenarios, similar in structure to the ones they previously viewed (Appendix B). Adapted from some of the scenarios originally used by Mathews and Mackintosh (2000) to be more depression-related (than anxiety-focused), each consisted of an assigned title and three sentences of text. Participants were, again,

asked to read the scenarios, imagining themselves as the central character in the scenario, and then complete the incomplete word fragment at the end of the last sentence. Although there was only one possible solution for the word fragment, the resolved word maintained the ambiguity of the preceding text, allowing the participants to create their own valenced interpretations of the scenarios. These descriptions were presented in random order, and participants were unaware that their memory for these scenarios would be tested later.

An example of a test situation was:

*Meeting a friend*

"In the street, you bump into an old friend you haven't seen in a long time. She is too busy to stop so you arrange to meet later in a bar. You arrive a little late, but the bar is empty and a few minutes later, she is still not…"

t h - - e (there)

In order to maintain consistency, a comprehension question was also presented following the completion of the word fragment. However, unlike the comprehension questions during the training phase, these questions did not draw attention to the emotional implications of the scenario. The comprehension question for the scenario presented above was:

"Was anyone else in the bar? (no)"

After another short filler task, the Reverse Digit Span task from the Wechsler Adult Intelligence Scale (WAIS-R) (Wechsler, 1981), participants were given the title of the previously presented test scenarios and four sentences to rate. Each sentence was presented one at a time, and participants were asked to rate them in accordance to their

similarity to the original titled scenario (1: very different, 2: fairly different, 3: fairly similar, 4: very similar). In each case, two of these sentences were target sentences, which matched the positive and negative meanings of the text, and permitted the examination of the participants' own interpretations of the preceding text. The other two sentences were positive and negative foils, which did not match the meaning of the original text, but demonstrated generally positive or negative meanings. These foil statements allowed for the assessment of any broader valence effects of the training. For example, the positive foil sentence assigned a generally positive meaning to the scenario, but was not based on any information provided by the original text.

For instance, the following sentences corresponded to the ambiguous test item presented earlier:

*Meeting a friend*

"You arrange to meet in a bar and your friend arrives late." (positive target)

"You arrange to meet in a bar, but your friend doesn't turn up." (negative target)

"Your friend wants to meet again but you don't have time." (positive foil)

"Your friend tells you that she does not want to meet you." (negative foil)

Following these similarity ratings, participants were asked to free recall facts from the originally presented scenarios. Two independent raters were trained to code these facts for the number and valence of any memory intrusions, or new ideas, that the participants made. Once adequate levels of reliability were achieved, raters rated recalled facts as belonging to one of three categories: negative, positive, or neutral. The negative category was used to indicate negatively valenced facts (e.g., *everyone stares and laughs at you at the bar*). The positive category was for positively valenced facts (e.g., *you friend arrives*

*right as you walk in the door and is happy to see you*), and the neutral category was for neutral facts (e.g. *you have a seat and wait at the bar*).

*Success-failure manipulation.* To examine the effects of the training on the participants' emotional vulnerability, participants were asked to complete a success-failure manipulation on the computer to experimentally induce a stressful state (Appendix C). During this task, they were shown a series of faces subliminally and were asked to identify the emotion on the faces. More specifically, a rapid presentation of the face (e.g., 70 ms) was quickly followed by a picture of jumbled faces (see Figure 2.1).

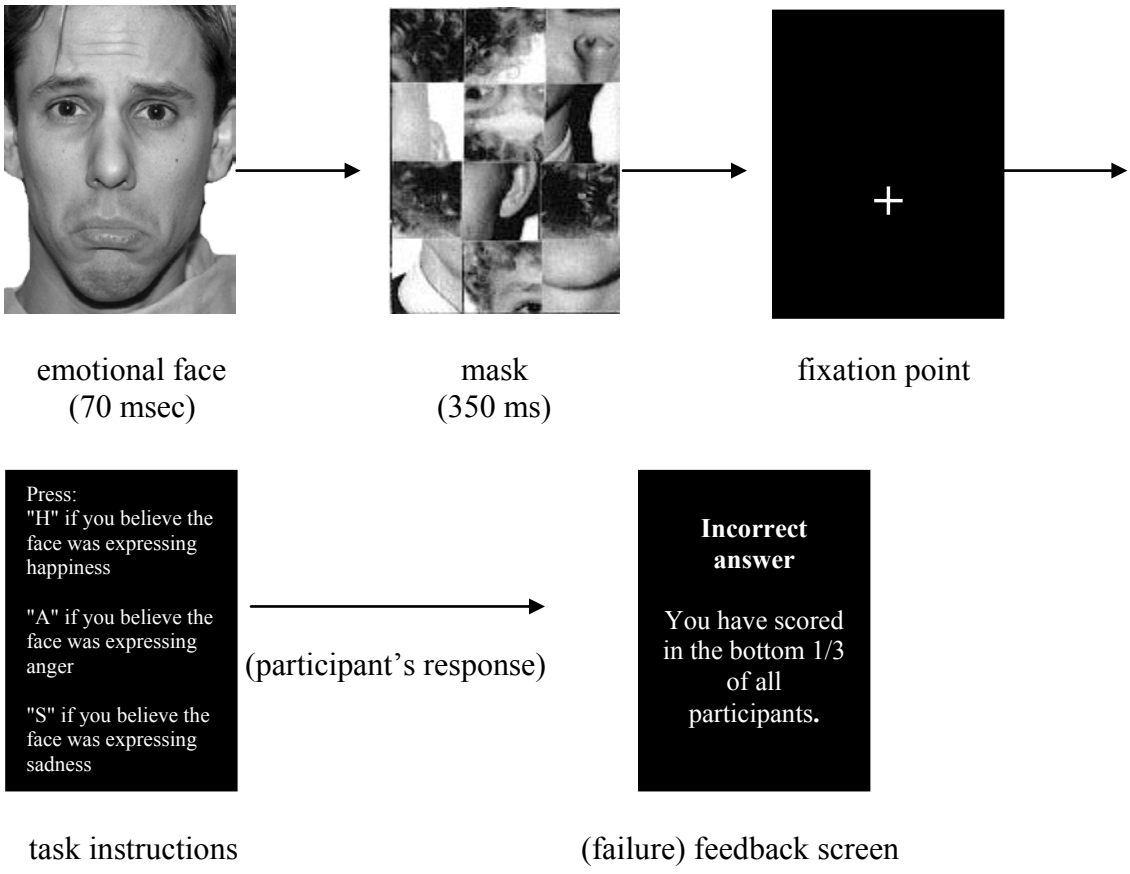



*Figure 2.1.* Screen shots of stress-vulnerability task

They were told that their ability to identify the emotion on the faces was indicative of their emotional intelligence and social perception skills, such as their ability

to read other peoples' emotions. In addition, it was reinforced that these skills are vital to functioning well in social situations, having good relationships, and being successful both academically and in the workplace. Throughout the task, however, participants received false-feedback indicating that they were performing below average. This task lasted approximately 20 minutes. Participants' mood and state self-esteem were measured prior to and following this success-failure manipulation to examine their emotional vulnerability following an external stressor.

Table 2.2

*Overview of dependent measures during various phases throughout study*

| | PHASE | | |
|---|---|---|---|
| **Dependent variable** | **Training phase** | **Test phase** | **Stress-vulnerability task** |
| 1.RTs for probes (effect of training) | X | | |
| 2.Recognition ratings (interpretation) | | X | |
| 3.Intrusions (memory) | | X | |
| 4.Mood and self-esteem ratings (RSES) | X | X | X |

*Assessment of learning a rule.* Whether participants explicitly learnt a rule about the emotional valence of the training statements was assessed in two ways, which were adapted from Salemink, et al (2007). First, they were asked to rate the following statement: "The stories in the present study often ended…" on a scale of 1 to 7, with 1 representing "very badly" and 7 representing "very well." Next, they were also asked: "If you had to characterize the typical ending of the stories you have read in this study, then you would say that the ending was often 1: negative, 2: positive, or 3: neutral."

*Procedures*

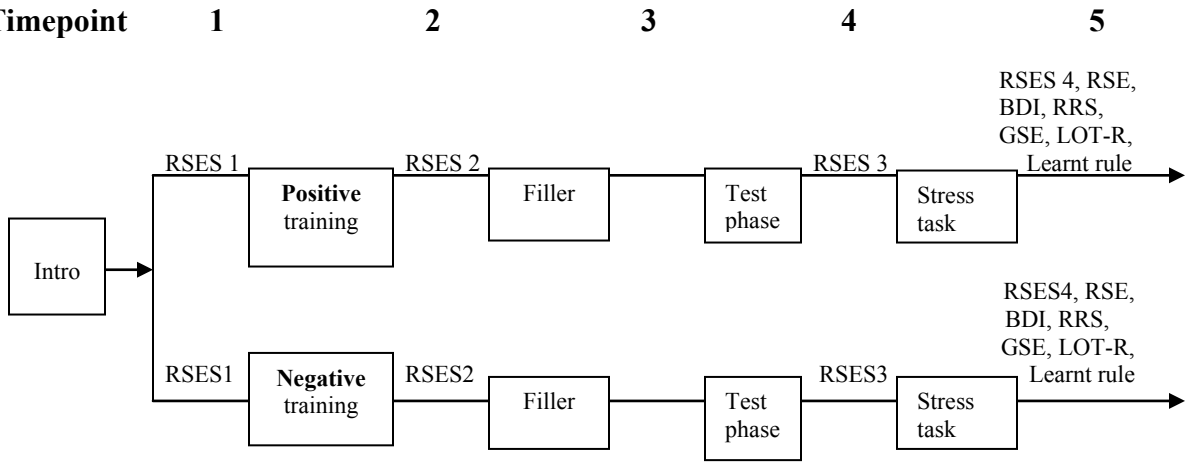



*Figure 2.2.* Study overview

At the beginning of the session, participants were informed that they are participating in a study examining concentration and memory, and that further information about the goals of the study would be provided at the end of the study session. After answering any questions they had, they were asked to sign an informed consent form. Participants then completed the Resultant Self-Esteem Scale (RSES), a measure of mood and self-esteem, as well as the training phase of the interpretation training (Appendix A). Following the training, participants again completed the RSES, a 15-minute word scramble filler task, and then the RSES again. Next, participants were placed in front of the computer for the test phase of the training. During this phase, they were asked to read a set of 20 emotionally ambiguous social scenarios, complete another brief filler task, the Reverse Digit Span task from the Wechsler Adult Intelligence Scale (WAIS-R), and then were asked to rate individual disambiguated sentences according to their similarity to the original passage they read. Then, their interpretation and memory for the meaning of these originally ambiguous scenarios was tested by asking the participants to free recall facts from the most recently presented scenarios, and their

mood was measured again using the RSES. Following the test phase, participants participated in a 20-minute false-feedback task on the computer. It was designed to elicit a stress response in order to examine the emotional vulnerability of the two different training groups following the stress task (Appendix C). Finally, participants were asked to complete various questionnaires measuring mood, self-esteem, optimism/pessimism, self-efficacy, the tendency to ruminate, and depression symptoms. The entire study session lasted approximately two hours. At the end of the session, participants were thanked, given the opportunity to ask questions, and compensated for their participation in the study. They were also debriefed on the purpose of the false-feedback task, as well as the false nature of the feedback (Appendix D). Participants were also asked if they were aware of the actual purpose of the study, which may have biased their responses, and were told to contact the researcher in case they had concerns regarding any part of the study.

## Statistical Analyses

*1. Effect of training on interpretation.* The first hypothesis was that interpretive biases could be trained. Analysis was conducted using a mixed-design ANOVA with training group (positive/negative interpretation training) as the between-subjects factor, and probe valence (positive/negative) and order presented (first/second half) as within-subjects factors. The dependent variable was the response time to complete the (positive and negative) probe fragments. A significant three-way interaction between training group, probe valence, and order presented was expected. Therefore, during the first half of training, there would no differences in response times to probe statements between training groups. During the second half of training, however, participants in the positive

condition would show shorter latencies when completing positive probe fragments and longer latencies for negative probe fragments, while those in the negative training condition would show shorter latencies when completing negative probe fragments and longer latencies for positive probe statements. Support for this hypothesis would provide preliminary support for the efficacy of the training. Additionally, hierarchical linear modeling (HLM) was used to examine if there were group-specific differences in response latencies over the course of the ten blocks of the training, demonstrating an effect of training on probe latencies. Separate analyses were conducted for positive and negative probes. A significant interaction of group by block would indicate a different trend over time for probes of the specified valence.

To provide further evidence for the effects of training, it was hypothesized that, during the test phase, participants would be more likely to make valenced interpretations matching their training condition, thus giving higher similarity ratings to the disambiguated sentences matching their training group. Again, a mixed-design ANOVA was used to evaluate the effect on similarity ratings. Factors included group (positive/negative interpretation training) as the between-subjects factor, and valence of the scenarios (positive/negative) and type of sentence (target/foil sentence) as the within-subjects factors. The successfulness of the training would be supported by a significant interaction between group, valence, and type of sentence; thus participants who received positive training would rate positive target compared to negative target sentences as being more similar to the ambiguous scenarios, while those who received negative training would rate negative target compared to positive target sentences as being more similar. Decision latencies for these recognition ratings were also examined in a similar manner.

*2. Effect of training on mood and self-esteem.* It was predicted that participants in the positive training condition would demonstrate increases on positive mood and self-esteem ratings, while individuals in the negative training condition would show increases in negative mood and decreases in self-esteem ratings. Mood and self-esteem ratings (based on the RSES), prior to and following the training procedure, were assessed using separate mixed-design ANOVAs with training condition as the between-subjects factor and assessment point (pre-training and post- training) as the within-subjects factor. A significant interaction between group and assessment point was expected, demonstrating changes in positive and negative mood and self-esteem that depend on the training group.

*3. Relationship between interpretation and memory.* Additionally, there was a hypothesized link between interpretation and memory, in which changes in interpretive biases would result in later effects on recall and memory. The number of positive, negative, and neutral intrusions made by each of the two training groups was compared. A mixed-design ANOVA was conducted with training condition as the between-subjects factor and valence as the within-subjects factor. If interpretation did, in fact, affect later recall, a significant interaction between training condition and valence would be expected. Thus, participants in the positive training group would exhibit more positive intrusions; while participants in the negative training group would exhibit more negative intrusions.

*4. Effect of training on emotional vulnerability.* It was predicted that participants in the negative compared to the positive training condition would demonstrate increased negative mood and decreased positive mood and self-esteem ratings in response to a stressor. To examine the change in mood and self-esteem ratings as a result of the stress

task, a mixed-design ANOVA was conducted with training condition as the between-subjects factor and assessment point (pre- and post-stress task) as the within-subjects factor. A significant interaction between training condition and assessment point would illustrate that different magnitudes of change in mood and self-esteem ratings are dependent on training condition. This pattern of results would support the hypothesis that positive interpretive training may have a protective effect on emotional vulnerability, while negative training may have a detrimental effect.

*5. Correlation with individual difference measures.* Finally, it was hypothesized that individual differences in levels of depressive symptoms (BDI), rumination scores (RSQ), optimism (LOT-R), self-esteem (RSE), and self-efficacy (GSE) would be associated with the efficacy of training and changes in mood and self-esteem following the training and stressor. Exploratory analyses were conducted to examine the relationship between these individual differences and changes in mood and emotional vulnerability.

# Chapter 3: Results

*Demographic characteristic*

Table 3.1 presents demographic characteristics of the sample. Participants in the two groups did not differ significantly on any of the demographic variables or questionnaires prior to the training phase. These findings indicate that random allocation of participants to groups was successful.

*Effect of training on interpretation*

Several analyses were conducted to assess whether the different training conditions did indeed affect participants' interpretations of ambiguous scenarios. As described previously, the study consisted of a training phase in which the training scenarios (positive vs. negative depending on the training group) were presented and a test phase in which novel scenarios were presented to evaluate the effect of the different training conditions on the interpretation of novel scenarios. In addition to the training scenarios, we also presented positive and negative probe scenarios in the training phase that were identical in both groups. In a first evaluation of the effect of the training on interpretation, we compared responses to these probe scenarios presented during the first half of the training phase to responses provided during the second half of the training phase. If the training is successful, we would expect to see group differences in response to these probes in the second half of the training.

Furthermore, we expected to see group differences in responses to the novel scenarios in the test phase that followed the training phase. During the test phase, participants were shown new, ambiguous scenarios and asked to rate positive and negative sentences based on their similarity to the novel scenarios (i.e., recognition

ratings). Group-specific differences in the recognition ratings of these new scenarios would provide support for the effect of the training on participants' interpretations of newly presented, ambiguous scenarios. Finally, we compared decisions latencies for these recognition ratings between the two groups. Together, significant group differences in these analyses would provide support for an effect of the training on participants' interpretation.

*Probe latencies.* First, we analyzed response latencies to positive and negative probe statements presented during the training phase. These probe statements were similar to the other brief scenarios presented during the training (e.g., induction statements, filler statements), except that the completion of the ending word fragment disambiguated the scenarios in the same valence (positive or negative meaning) for all participants, regardless of their training group. One positive and one negative probe statement were presented during each of the ten blocks of the training phase. Because there were ten blocks of training trials, there were five positive and five negative probe statements in each half. Latencies to complete the probe statements for the positive and negative probe statements were averaged. These mean latencies were entered into a mixed-effects ANOVA with training group (positive vs. negative) as the between-subjects factor, and probe valence (positive vs. negative) and order presented (first vs. second half) as within-subjects factors.

Support for successful training is demonstrated by a significant three-way interaction demonstrating group differences in responses to positive vs. negative probe statements in the second half of the training. Accordingly, we would expect the positive training group to be faster to respond to positive than negative probes and the negative

group to be faster to respond to negative than positive probes in the second half of training. After accounting for outliers who exceeded the quartiles by more than three times the inter-quartile range, .2% of responses were eliminated. Results of these analyses are presented in Table 3.2. An inspection of Figure 3.1 suggests that whereas no differences in responding to positive and negative probes were found for the negative training group in half one or half two, the positive training group exhibited differences in their responding to positive and negative probe statements at time one but even more so at time two.

Table 3.2 presents the complete ANOVA table, but only significant findings will be discussed in the text. The analysis yielded a significant main effect of valence, $F(1,60) = 11.45$, $p < .01$, with participants responding more slowly to negative rather than positive probes. This main effects was qualified by a significant time by group interaction, $F(1,60) = 4.12$, $p < .05$, a significant valence x group interaction, $F(1,60) = 8.69$, $p < .01$, and a marginally significant three-way interaction between valence, time, and group, $F(1,60) = 3.67$, $p < .06$.

To decompose the three-way interaction, a separate 2 x 2 ANOVA was conducted for each training group with valence (positive vs. negative) and time (first vs. second half) as within-subjects factors. When examining the negative group, there were no significant effects of valence, $F(1,30) = .10$, *ns,* or time, $F(1,30) = .03$, *ns.* There was also no significant interaction between valence and time, $F(1,30) = 1.18$, *ns.* For the positive group, however, there was a significant main effect of valence, $F(1,30) = 19.39$, $p < .01$, indicating that participants in the positive group responded more quickly to positive than negative probes. There was also a significant effect of time, $F(1,30) = 9.38$, $p < .01$, with

slower response latencies during the second compared to the first half. The valence x time interaction, though, was not significant, $F(1,30) = 2.72$, *ns*.

To further investigate if there were group-specific differences in response latencies over the course of the ten blocks of the training phase, we used hierarchical linear modeling (HLM) to compare response latencies to the probe statements block by block. Table 3.3 illustrates that although there was a significant effect of block for the positive probes, $F(9, 106) = 10.79$, $p < .01$, indicating that there is a trend over time, there was no significant effect of group, $F(1, 159) = .45$, *ns*. Therefore, group membership did not influence the pattern of response latencies over time for the positive probes. Additionally, there was no significant interaction between group and block, $F(1, 106) = .86$, *ns*.

On the other hand, when examining results for negative probes, there was a significant effect of block, $F(9, 130) = 5.16$, $p < .01$, indicating a trend in response latencies over time. There was also a significant effect of group, $F(1, 322) = 9.31$, $p < .01$ suggesting that training group did influence the trend in response latencies for negative probes. Lastly, there was a significant effect of group by block, $F(9, 130) = 2.12$, $p < .05$. This finding implies that when examining response latencies for the negative probes, there were different trends over time for each training group. As seen in Figure 3.2, the positive group appears to demonstrate slower response latencies for negative probes over the course of the training. These results are in accordance with the findings from the ANOVA analyses which indicate a trend of slower response times for negative compared to positive probes, but for participants in the positive group only.

*Recognition ratings for novel scenarios.* Following the training phase and a 15-minute filler task, participants entered the test phase. During the test phase, participants were presented with 20 novel ambiguous scenarios, each with a corresponding title, and were again asked to complete word fragments at the end of each scenario. These completed words, however, did not disambiguate the meaning of the scenarios. Following a brief filler task, participants were again presented with the titles of these test scenarios, and were asked to rate four sentences, one at a time, based on their similarity in meaning to the originally-presented scenario on a 4-point scale (very different to very similar). Of these four sentences, two were target sentences, which represented possible interpretations of the text and allowed the examination of the participants' own interpretations of the preceding text. The other two sentences were foils, which did not match the meaning of the original text, but demonstrated generally positive or negative meanings. These foil statements allowed for the assessment of any broader valence effects of the training.

To examine the effect of the training conditions on participants' interpretations of newly presented ambiguous descriptions, we analyzed group differences in the recognition ratings of positive and negative meanings of these new scenarios. Ratings were entered into a mixed-effects ANOVA with group (positive vs. negative training) as the between-subjects factor and valence of the statements (positive vs. negative) and type of statement (target vs. foil) as within-subjects factors. Support for successful training is demonstrated by a significant three-way interaction between group, valence, and type of statement, indicating higher recognition ratings for disambiguated statements which match the valence of the training group, as well as higher recognition ratings for target

statements (i.e., possible interpretations) than foil statements (i.e., statements that had generally positive or negative meanings, but whose meanings were not represented in the text).

A complete ANOVA table is presented in Table 3.4, although only significant findings will be presented in the text. There was a significant main effect of type, $F(1,60) = 385.52$, $p < .001$, indicating that participants were more likely to endorse target statements as being similar to the scenarios compared to foil statements. Additionally, analyses revealed a significant main effect of valence, $F(1,60) = 34.47$, $p < .001$, indicating that positive sentences were rated as being more similar in meaning than negative statements, regardless of training group. These main effects, however, were qualified by a significant group by valence interaction, $F(1,60) = 43.26$, $p < .001$, and the predicted three-way interaction of group, valence, and type, $F(1,60) = 19.13$, $p < .001$, as seen in Figure 3.3.

To decompose the significant three-way interaction, a separate 2 x 2 ANOVA was conducted for each training group with valence (positive vs. negative) and type (target vs. foil) as within-subjects factors. Analyses for the negative group failed to show any significant differences in recognition ratings between valences, $F(1,30) = .20$, *ns*. There was, however, a significant main effect of type, $F(1,30) = 197.67$, $p < .001$, indicating higher recognition ratings for target compared to foil statements. This main effect was qualified by a significant valence by type interaction, $F(1,30) = 6.28$, $p < .05$. Follow-up t-tests were computed to interpret this interaction. Further analyses revealed significant differences between ratings for positive targets and positive foils, $t(30) = 13.03$, $p < .01$, indicating that participants exposed to negative interpretations during training were more

likely to rate positive target statements as being similar to the scenarios than positive foil statements. Similarly, these same participants were also more likely to rate negative target statements as being more similar than negative foil statements, $t(30) = 12.95$, $p < .01$. Participants in the negative group, however, did not demonstrate significant differences between recognition ratings for positive and negative targets, $t(30) = -1.36$, *ns*; thus, there did not appear to be any reliable differences in their tendency to rate possible positive interpretations versus possible negative interpretations as being more similar to previously shown ambiguous descriptions. They also did not demonstrate significant differences between their ratings for positive and negative foil statements, $t(30) = .79$, *ns*, ruling out any broader valence effects of the training. Together, these findings suggest that although participants in the negative group were more likely to rate target statements as being more similar than foil statements following the training, they did not differ in their tendency to rate newly presented ambiguous scenarios as having a positive or negative meaning. Therefore, previous exposure to scenarios of a negative valence did not influence their tendency to subsequently rate novel ambiguous scenarios as having a negative meaning.

In the positive training group, the follow-up analysis yielded a significant main effect of valence, $F(1,30) = 101.08$, $p < .001$, reflecting higher endorsements of positive statements, as well as type, $F(1,30) = 187.85$, $p < .001$, indicating higher recognition ratings for target statements. Similar to findings for the negative group, these main effects were qualified by the predicted valence by type interaction, $F(1,30) = 12.85$, $p \leq .001$. When comparing target and foil statements, significant differences in recognition ratings were obtained between positive target and positive foil statements, $t(30) = 11.65$, $p < .01$,

indicating that participants previously exposed to positive scenarios were more likely to rate positive targets as being similar than positive foils. Additionally, they were also more likely to rate negative targets as being more similar to the ambiguous scenarios than negative foils, $t(30) = 12.49$, $p < .01$. These results suggest that like participants in the negative group, participants in the positive group also endorsed target statements as being more similar to the previously shown ambiguous descriptions than foil statements for both positively- and negatively-valenced statements.

Contrary to the negative training group, follow-up tests also revealed significant differences in recognition ratings when comparing positive and negative targets, $t(30) = 8.33$, $p < .01$, as well as positive and negative foils, $t(30) = 7.21$, $p < .01$. Accordingly, participants in the positive group rated positive statements as being more similar in meaning than negative statements for both target and foil statements. These results indicate that participants previously exposed to positive interpretations subsequently rated positive as opposed to negative statements as being more similar to the novel, ambiguous test scenarios.

*Decision latencies for recognition ratings.* We also examined differences in response latencies for the recognition ratings to examine if the training had an effect on participants' time to complete the ratings. These response latencies were intended to measure if participants developed an inclination towards recognizing and making interpretations of a specific valence. Decision latencies were entered into a mixed-effects ANOVA with group (positive vs. negative training) as the between-subjects factor and valence of the statements (positive vs. negative) and type of statement (target vs. foil) as within-subjects factors. Group-specific differences demonstrating faster decision

latencies for valenced statements corresponding to the respective training group (i.e., faster latencies for positive statements in the positive group, and faster latencies for negative statements in the negative group) are another indication of the effect of training conditions.

A complete ANOVA table is presented in Table 3.5, although only significant findings will be presented in the text. After accounting for outliers who exceeded the quartiles by more than three times the inter-quartile range, .2% of responses were eliminated. The analysis yielded a significant main effect of type, $F(1,54) = 4.21$, $p < .05$, indicating that participants took more time to rate target sentences than foils. This significant main effect, however, was qualified by a significant three-way interaction of valence, type, and group, $F(1,54) = 4.91$, $p < .05$, as seen in Figure 3.4.

To further decompose this interaction, separate analyses were conducted for each training group. For each group, a 2 x 2 ANOVA was conducted with type (target vs. foil) and valence (positive vs. negative) as within-subjects factors. Analyses of the negative training group failed to show any reliable effects of valence, $F(1,27) = 2.85$, *ns*, type, $F(1,27) = 1.89$, *ns*, or valence x type, $F(1,27) = .16$, *ns*. Analyses of the positive group; however, revealed a significant valence by type interaction, $F(1, 27) = 8.62$, $p < .01$. There were no significant differences between response latencies for positive and negative foil statements, $t(27) = 1.96$, *ns*. Further follow-up t-tests, however, revealed a significant difference between response latencies for positive and negative target statements, $t(28) = -2.69$, $p <. 05$, reflecting faster response times for positive compared to negative target statements. Response latencies for positive target and positive foil statements did not differ significantly, $t(28) = -.72$, *ns*, but analysis comparing latencies

for negative target and negative foil statements, $t(28) = 3.45$, $p < .01$ yielded a significant effect. Thus, participants in the positive group demonstrated faster responses to negative foils than negative targets. In summary, participants previously exposed to positive interpretations were able to more quickly and easily recall and rate novel ambiguous scenarios as having had positive rather than negative meanings, and they were also able to more quickly differentiate between generally negative interpretations and possible negative meanings of novel disambiguated scenarios.

*Effect of training on mood and self-esteem*

After evaluating the effect of the training on interpretation, a second important goal of the current study was to examine the effects of the training on participants' mood and self-esteem. It was predicted that participants in the positive group would demonstrate an increase in positive mood and self-esteem, while participants trained to make negative interpretations would show increases in negative mood and decreases in ratings of self-esteem. Changes in mood and self-esteem scores (based on the RSES) were assessed using separate mixed-design ANOVAs with training condition as the between-subjects factor and time (pre- and post-training) as the within-subjects factor. Significant interactions between group and time would demonstrate that changes in mood and self-esteem were influenced by the interpretive training.

Tables 3.6, 3.7, and 3.8 present ANOVA tables for changes in positive mood, negative mood, and self-esteem respectively; however, only significant results will be discussed in the text. When exploring changes in positive mood and self-esteem, analyses revealed a significant main effect of time for both positive mood, $F(1,60) = 53.87$, $p < .001$ and self-esteem, $F(1,60) = 13.54$, $p < .001$. These results reflect a decrease in both

positive mood and self-esteem for all participants following the training. No significant effects, however, were observed for negative mood ratings.

*Relationship between interpretation and memory*

To examine the relationship between interpretive and memory biases, and test the hypothesis that changes in interpretive biases would result in subsequent effects on memory, participants were asked to free recall details from the ambiguous scenarios that were presented during the test phase. Then, group differences in the number of positive, negative, and neutral intrusions (i.e., information that was not presented in the original scenarios) were examined. Differences in number of intrusions were assessed using a mixed-design ANOVA with training condition as the between-subjects factor and valence (positive vs. negative vs. neutral) as the within-subjects factor. Support for the idea that changes in interpretive biases could later affect recall and memory would be illustrated by a significant interaction between training group and valence of intrusions. Therefore, participants in the positive training group would exhibit more positive intrusions, while participants in the negative training group would exhibit more negative intrusions.

Results from the ANOVA in Table 3.9 indicate that although there was no overall main effect of group, $F(1,56) = .00$, *ns,* on the number of intrusions reported for each valence, there was a significant main effect of valence, $F(2, 112) = 108.61$, $p < .001$. These findings indicated a significantly higher number of neutral than positive or negative intrusions. This main effect, however, was qualified by the predicted significant interaction between training group and intrusion valence, $F(2, 112) = 5.60$, $p < .01$. Results from follow-up t-tests indicate that the groups did not differ in the number of reported neutral intrusions, $t(56) = -.68$, *ns*. As anticipated, though, the groups did differ

in both the number of positive, $t(56) = 4.60$, $p < .001$, and negative, $t(56) = -2.57$, $p < .01$, intrusions "recalled."

Next, follow-up tests were conducted to examine the number of intrusions reported within groups. For the positive group, there was a significant difference between the number of positive and negative intrusions, $t(28) = 3.41$, $p < .01$, positive and neutral intrusions, $t(28) = -6.47$, $p < .001$, and negative and neutral intrusions, $t(28) = -9.11$, $p < .001$, reported. For the negative group, there was also a significant difference in the number of positive and negative intrusions, $t(28) = -3.71$, $p < .01$, positive and neutral intrusions, $t(28) = -11.10$, $p < .001$, and negative and neutral intrusions, $t(28) = -6.19$, $p < .001$, reported. As illustrated in Figure 3.5, both groups reported significantly more neutral intrusions than positive and negative intrusions. Additionally, participants in each group reported more intrusions corresponding to the valence of their trained condition. The positive group "recalled" more positive intrusions than the negative group, while the negative group "recalled" more negative intrusions than the positive group.

*Effect of training on emotional vulnerability*

In addition to examining the effects of the training on mood and self-esteem, participants were also placed in a stressful situation to examine the hypothesis that training would affect subsequent emotional vulnerability. Ratings of positive mood, negative mood, and self-esteem were examined prior to and following the stressor using separate mixed-effects ANOVAs with training condition as the between-subjects factor and time (pre- and post-stressor) as the within-subjects factor.

Tables 3.10, 3.11, and 3.12 present ANOVA tables for changes in positive mood, negative mood, and self-esteem respectively; however, only significant results will be

discussed in the text. Analyses yielded significant main effects for time for positive mood, $F(1,58) = 6.14$, $p < .05$ and self-esteem, $F(1,58) = 20.81$, $p < .001$, indicating decreases in positive mood and self-esteem scores. Additionally, analyses revealed a significant main effect of time for negative mood, $F(1,58) = 21.36$, $p < .001$, demonstrating an increase in negative mood following the stressor for all participants, regardless of group. These results indicate that the stressor was, in fact, successful at inducing a stressful situation for the participants, but that the groups did not differ significantly in their responses to the stressor. (Note that due to errors in data collection, data for two participants was not able to be included in these analyses).

*Correlation with individual difference measures*

Several questionnaires were administered to examine individual differences in levels of depression (BDI-II), rumination (RRS), self-esteem (RSE), self-efficacy (GES), and optimism (LOT-R). Exploratory analyses were conducted to examine if these individual difference measures were associated with the effect of training on interpretation, as well as whether these measures had an effect on changes in mood and self-esteem following the training and stressor. First, these measures were included as covariates to examine the impact of individual differences on the training. Then, we used hierarchical regression analyses to examine if individual differences were associated with the effects of training on mood, self-esteem, and emotional vulnerability. For each regression analysis, two main effects (e.g., group and individual difference measure) were entered in Step 1 and then the interaction term (group x individual difference measure) was entered in Step 2 as predictors. Changes in mood and self-esteem following the training and stressor were entered as the criterion. The group variable was dummy

coded (0, 1), and continuous individual difference measures were centered to reduce multicollinearity between predictors and the interaction terms.

*Effect of training on interpretation.* ANCOVAs were conducted for probe latencies, recognition ratings, and decision latencies for recognition ratings. The inclusion of the individual difference measures as covariates did not alter the findings; therefore, there was no effect of individual difference measures on training.

*Effects of individual differences on mood.*

*BDI.* First, we examined whether symptoms of depression (i.e., BDI scores) were correlated with changes in mood and self-esteem following the training. Table 3.13 contains the statistics for these regression analyses examining the relationship between group, BDI scores, and change in positive mood scores after the training. A regression analysis revealed that the interaction between group and BDI scores reliably predicted change in positive mood scores after the training ($b = .09$, $p < .01$). Together, group, BDI scores, and their interaction accounted for 12.2% of the variance in change in positive mood following the training. Figure 3.6 demonstrates that for participants in the negative group, lower BDI scores were associated with a greater decrease in positive mood after the training. For participants in the positive group, however, lower BDI scores were associated with less of a decrease in positive mood after the training.

Individual differences in BDI scores were also related to differences in emotional vulnerability. Data in Table 3.14 presents results of the regression analyses examining the relationship between group, BDI scores, and change in self-esteem scores following the stressor. The interaction between group and BDI scores was a significant predictor of change in self-esteem scores after the stressor ($b = .08$, $p = .02$). The main effects of

group and BDI, and the interaction of these two factors accounted for 16.1% of the variance of change in self-esteem after the stressor. As seen in Figure 3.7, for participants in the negative group, BDI scores were not associated with the magnitude of change in self-esteem scores following the stressor. In the positive group, however, lower BDI scores were associated with less of a decrease in self-esteem scores following the stressor. These results suggest that the positive training may have had protective effects on mood and self-esteem for individuals with lower depression scores.

*RRS.* Next, we examined whether individual differences in rumination were associated with changes in mood and self-esteem after the training. Regression analyses examining the relationship between group, RRS scores, and change in negative mood scores after the training are presented in Table 3.15. The interaction between group and RRS scores reliably predicted change in negative mood scores after the training (b = .08, $p$ = .03). This interaction, as well as the main effects of the predictors of group and RRS scores, accounted for 14.1% of the variance in change in negative mood after the training. Figure 3.8 illustrates that in the negative group, lower rumination scores were associated with less of a decrease in negative mood scores following the training. Conversely, for participants in the positive group, rumination scores were not associated with the degree of change in negative mood scores following the training.

Additionally, we examined the impact of rumination scores on differences in emotional vulnerability. Table 3.16 contains results of the regression analyses examining the relationship between group, RRS scores, and change in self-esteem scores following the stressor. Analyses revealed that the interaction of group and RRS scores was a significant predictor of the variance in change in self-esteem scores (b = .04, p = .01).

Group and RRS scores, and their interaction, accounted for 16.2% of the variance in change in self-esteem following the stressor. Similar to results previously reported on the relationship between BDI scores and change in self-esteem scores following the stressor, Figure 3.9 shows that rumination scores were not associated with the magnitude of change in self-esteem scores following the stressor for participants in the negative group. For participants in the positive group, though, lower rumination scores were associated with less of a decrease in self-esteem scores. Similar to results for individuals with low BDI scores, these results suggest that the positive training may have had protective effects for individuals with low rumination scores.

*LOT-R.* Lastly, we examined if levels of optimism had an impact on change in mood and self-esteem following the training. Regression analyses examining the relationship between group, LOT-R scores, and change in self-esteem scores after the training are presented in Table 3.17. The interaction of group and optimism scores reliably predicted change in self-esteem scores following the training ($b = -.12$, $p < .01$). Together, group, optimism scores, and their interaction accounted for 15.5% of the variance in change in self-esteem scores. As seen in Figure 3.10, participants in the negative group with higher optimism scores experienced a greater decrease in self-esteem following the training, while participants in the positive group with higher optimism scores demonstrated less of a decrease in self-esteem scores following the training.

# Chapter 4: Discussion

## *Effect of training on interpretation*

The results of the present study support the conclusion that our interpretive training was indeed effective in inducing the intended group differences in interpretive bias. Our results also suggest that positive training was more effective than negative training. Group differences in probe response times during the training phase provide initial support for the efficacy of the training. Whereas the negative training group did not change in their responses to positive and negative probes over the course of the training, the positive training group responded faster to positive compared to negative probes as the training progressed.

We initially predicted that each group would respond more quickly to probes corresponding to the valence of their trained condition as the training progressed (i.e., during the second half of the training). Our results show, however, a general trend to slower responding over the course of the training which is probably due to increasing fatigue and concentration difficulties in response to the rather lengthy training phase. Despite this general slowing in response time, the finding that the positive group was faster to respond to positive compared to negative probes while no such effect was observed in the negative group supports our conclusion that the positive training worked.

Other unexpected findings include the main effect of valence and the fact that the positive group responded differently to positive and negative probes presented during the first half of training. Participants in both groups responded faster to positive compared to negative probes overall. This positivity bias and the fact that our positive training worked better than the negative training may be due to our recruitment of an unselected

undergraduate sample. Several studies comparing interpretive biases in socially anxious versus non-socially anxious samples found evidence for positive interpretive biases in non-clinical controls (Hirsch & Mathews, 1997; 2000). The mean BDI score in our sample was 8.85 (7.53), indicating a low level of depressive symptoms in our group. It is therefore possible that our non-clinical, undergraduate sample is characterized by a positivity bias in the interpretation of ambiguous scenarios. This positivity bias may have made it difficult to train these participants to adopt negative interpretations and may have led to some of the main effects of valence observed in this study.

Also unexpectedly, the positive training group exhibited differences in responding to positive and negative probes already during the first half of the training. It is important to keep in mind, however, that the first half is an aggregate of response latencies over the first five blocks of the training and is not a true baseline. The difference in responding to positive and negative probes during the first half may therefore reflect early effects of the training. This interpretation of the obtained results is further supported by the observation that as participants entered deeper into the training during the second half, differences in responding to positive and negative probes became even more pronounced.

Our result that training effects were observed in the positive group only is in contrast to past training studies which found effects of training for both positive and negative training groups (Mathews & Mackintosh, 2000; Yiend et al., 2005; Salemink et al., 2007). Similar to the current study, all of these studies trained non-clinical and undergraduate samples using the scenarios by Mathews and Mackintosh (2000). Future studies are needed to examine these discrepant findings.

Further support for the effect of our training conditions on interpretations comes from the group differences observed in the recognition ratings during the test phase. These findings again demonstrated that prior interpretive training, did, in fact, influence interpretations of novel, ambiguous scenarios. Similar to the probe latency findings, though, these training effects appeared only in the positive group. The negative group was not more likely to make positive or negative interpretations of the novel scenarios and did not differ in their time to rate the similarity of these scenarios. Hence, previous exposure to negatively valenced scenarios did not influence the interpretation of novel ambiguous scenarios in this group. The positive training group, however, was more likely to interpret novel ambiguous scenarios in a positive than in a negative way and was also faster in doing so. This suggests that individuals previously exposed to positive interpretations were more likely to rate novel, ambiguous descriptions as possessing positive meanings. Additionally, these same participants were also able to more quickly differentiate between generally negative interpretations and possible negative meanings of novel disambiguated scenarios, as these generally negative foil statements were probably most different from the positive interpretations that they were most inclined to make following the positive training.

Although we proposed to find an effect of training in both groups, again, the effect of training on interpretation of novel scenarios was found solely in the positive group. Importantly, though, these training effects were not just valence effects, as seen when comparing ratings for target and foil statements. Though foils were included as potential options in the similarity ratings to test for broader valence effects of the training and to control for response biases, participants across groups rated targets, or possible

interpretations, as being more similar to the new disambiguated scenarios than foils. Higher ratings for targets than foils suggest that participants were taking into account their own interpretations of the scenarios when making the ratings, rather than merely responding according to their trained valence. Contrary to our initial predictions that groups would assign higher similarity ratings to statements corresponding to their trained valence, an overall positive bias was evidenced. Therefore, participants in both groups rated positive sentences as more similar than negative ones. These findings may again be attributed to our non-clinical, undergraduate student sample.

Although this is the first study to examine decision latencies for recognition ratings as a measure of efficacy, previous training studies have commonly used recognition ratings to examine the effectiveness of training. Whereas the current study found effects of training on recognition ratings in the positive group only, these studies found that participants in both groups endorsed higher recognition ratings for statements of their trained valence (Mathews & Mackintosh, 2000; Yiend et al., 2005; Mackintosh et al., 2006; Salemink et al., 2007). Similar to the current study, these studies examined the effects of training in non-clinical undergraduate and community samples using the recognition ratings from Mathews & Mackintosh (2000). Despite these discrepant findings, both the present and past studies demonstrate biases in recognition ratings towards target and positive sentences. This positive bias exhibited across studies may be due to the non-clinical community and undergraduate samples used in all of these studies, as opposed to samples with high levels of depression and/or anxiety. Again, given the general positivity biases exhibited in non-clinical populations (Hirsch & Mathews, 1997; 2000), results from the current suggest that it may be more difficult to train away these

positive biases than to reinforce them. Again, future studies are needed to further explore these discrepant findings.

*Effect of training on mood and self-esteem*

Although previous studies have reliably found effects of training on interpretation using the training procedure employed in the current study, evidence for the effects of modifying interpretative biases on other psychological variables is more mixed. Past studies have focused primarily on the causal influence of manipulating biases on levels of state anxiety (e.g., Mathews & Mackintosh, 2000; Yiend et al., 2005). This study intended to extend previous findings to examine the effects of manipulating interpretive biases on mood, self-esteem, and emotional vulnerability. Our results suggest that there were no effects of training condition on mood and self-esteem.

When we take individual difference measures into account, however, this changes. For instance, low BDI scores were associated with a greater decrease in positive mood following the training for the negative group, while they were related to less of a decrease in positive mood after the training for the positive group. This suggests the positive training may have had protective effects on mood for individuals with low BDI scores. Low rumination scores in the negative group were related to a greater increase in negative mood scores following the training, while rumination scores in the positive group were not associated with the magnitude of change in negative mood scores after the training. These findings suggest that the positive training may have held protective effects for low ruminators, as these individuals did not display the increase in negative mood scores evidenced in the negative group. Lastly, for individuals in the negative group, higher optimism scores were associated with more of a decrease in self-esteem

following the training, while the positive group demonstrated the opposite relationship. Thus, for individuals with high optimism scores, the positive training did appear to demonstrate a potential beneficial effect of training.

Although there is little research examining the effects of training on mood, we hypothesized similar outcomes to past studies focusing on anxiety. We proposed that the positive training would increase positive mood and self-esteem and the negative training would increase negative mood and decrease self-esteem. The overall adverse effects seen in the current study may be due to the length and tedious nature of the training paradigm, which may have created feelings of boredom and frustration in many of the undergraduate participants, regardless of training group. Also, because the relationship between interpretive biases and mood is less established than the connection between interpretive biases in state anxiety, training participants to make positive interpretations may not result in the same favorable consequences on mood as has been found with levels of anxiety. More research exploring the causal relationship between interpretive biases and mood is needed to better explore the effects of the training on mood. Also, though causal relationships cannot be drawn from the findings on individual differences, they may lend background support for further research on the causal relationship between individual differences and their effects on mood and emotional vulnerability.

Findings of this study appear to be in contrast to results of past studies on anxiety. While participants in previous studies who received positive training demonstrated beneficial effects from the training, the current study suggests negative effects for all participants, regardless of group. Upon closer examination, though, it seems that the effect of training on mood depends on individual differences. Previous studies have

focused on examining changes in mood between training groups, while ignoring the influence of individual differences. Holmes, Mathews, Dalgleish, and Mackintosh (2006), utilizing a non-clinical community sample, and Mathews, Ridgeway, Cook, and Yiend (2007), using a sample of highly anxious individuals, found that participants in the positive training demonstrated enhanced positive mood and reduced trait anxiety scores. These studies, however, focused solely on the effects of a positive training condition, and did not have a negative comparison group. Also, Holmes et al. (2006) used imagery training, in which participants were asked to visualize the meaning of the scenarios presented. Holmes and Mathews (2005) hypothesized that mental images may elicit higher levels of emotion than verbal thoughts; thus, training using imagery may have been more effective in improving mood than verbal content.

Mathews and Mackintosh (2000) and Yiend et al. (2005) recruited undergraduate and non-clinical samples from the community to examine the effects of positive and negative training on anxiety. They found that levels of state anxiety increased in the negative group, whereas levels of state anxiety decreased in the positive group. However, these past studies measured changes in anxiety, while the present study examined changes in mood. Also, given that the scenarios used in the current study were developed for use in studies on anxiety and have been primarily used for this purpose, they may be more influential in affecting levels of anxiety, rather than mood. Previous literature suggests that interpretive biases are more of a feature of anxiety than depression (Stopa & Clark, 2000; Lawson & McLeod, 1999). For that reason, manipulating interpretive biases may influence anxiety more than mood, accounting for some of the differences between past studies on anxiety and the present study. Despite these discrepant results, these

findings present important clinical implications for the use of positive interpretive training. Although results do not indicate a main effect of training on mood, they demonstrate that depending on levels of optimism, training positive interpretive biases may have beneficial effects on mood.

*Effect of training on emotional vulnerability*

In contrast to studies which have examined the effects of altering interpretive biases on anxiety reactivity (Wilson et al., 2006; Mackintosh et al., 2006), this study explored the effects of manipulating interpretive biases on emotional vulnerability. More specifically, changes in mood and self-esteem following a self-relevant stressor were examined. Our initial findings suggest that participants in both groups experienced negative effects on mood and self-esteem after the stressor. Similar to our findings for the effects of training on mood and self-esteem, though, these findings change when taking into account individual differences in levels of depression and rumination. Depression and rumination in the negative group were not correlated with changes in self-esteem. In the positive group, however, lower levels of depression and rumination were associated with less of a drop in self-esteem scores. These results indicate that the positive training may have had beneficial effects on emotional vulnerability for individuals with lower levels of depression and rumination.

Our findings were in contrast to our initial hypotheses that participants in the negative compared to the positive group would demonstrate increased negative mood and decreased positive mood and self-esteem ratings in response to a stress task. The negative impact of the stressor may have outweighed the benefits of the positive training, thus eliminating any beneficial effects of the training. Also, given that the stress task was

introduced about one hour after the training, it is possible that the effects of the training were not powerful enough to endure for this duration of time.

Our findings were in accordance with results found in a study by Salemink, van den Hout, and Kindt (2007), in which undergraduate participants in both training groups experienced an increase in negative mood following an anagram stress task. Although the stressor was sufficient to produce adverse effects, differences in trained interpretive biases did not appear to affect subsequent emotional vulnerability. Conversely, past studies provide support for a detrimental effect of negative/threatening training on anxiety reactivity, in which participants in the negative group demonstrated worse outcomes on anxiety than those in the positive group. Mackintosh et al. (2006) and Wilson et al. (2006) both used distressing video clips of individuals in real-life emergency situations to induce stress in participants. Tapping into participants' visual pathways may have elicited stronger emotional response (Holmes & Mathews, 2005). Again, this difference in findings may be due to variations in the way emotional vulnerability was measured or in types of stressors used.

While the aforementioned studies primarily used levels of state anxiety to measure emotional vulnerability following a stressful event, the current study examined the effects on mood and self-esteem. It is possible that modifying interpretive biases has a different effect on mood than on anxiety. Because this is one of the first studies to examine the causal relationship on interpretive biases and mood, more research is needed to better understand the relationship between biases in interpretation and mood. Also, because self-esteem is considered to be more stable and trait-like (Trzesniewski,

Donnellan, & Robins, 2003) it may be more difficult to influence with such a short-term intervention, thus explaining the lack of effects on self-esteem.

Additionally, our correlational findings suggest that individual differences in depression and rumination, in particular, may influence the relationship between interpretive biases and emotional vulnerability. These differences may explain some of the discrepant findings between the current study and previous studies, as past studies have not examined relationships between individual differences in emotional vulnerability. Though varying levels of depression and rumination were not associated with different outcomes after the stressor for individuals in the negative group, individuals in the positive group indicating low levels of depression and/or rumination experienced less of a decrease in self-esteem following the stressor. Although causal relations cannot be inferred from these findings, results suggest that for some individuals, training positive interpretive biases may hold protective or beneficial effects on emotional vulnerability. However, further research in this area is needed to explore the relations between individual differences and emotional vulnerability.

*Relationship between interpretation and memory*

The second important extension of earlier work provided by this present study involves examining the link between two important cognitive processes - interpretation and memory. By studying the effect of changing one process (i.e., interpretation) on another (i.e., memory), the potential implications of manipulating one cognitive bias on others and the relationship between different cognitive processes can be better elucidated. Our findings suggest that manipulating biases in interpretation can, in fact, affect biases in memory. Participants in the positive group reported more positive intrusions than

individuals in the negative group, whereas those in the negative group reported more negative intrusions than those in the positive group. These results suggest that although negative training may negatively influence later memory, positively training interpretive biases may positively affect subsequent memory.

We initially predicted that participants' subsequent recall of the novel, ambiguous scenarios would reflect their initial interpretation of the scenarios. Although their "recalled" intrusions did reflect the valence of their training condition, it is not accurate to say that it was a reflection of their original interpretations of the test scenarios. Participants in the negative group failed to show a tendency toward negative interpretations during the test phase. Nevertheless, these participants still reported more negative intrusions than the positive group. It seems that although the negative training did not appear to train biases in interpretation, it did have effects on subsequent memory.

Exploring the relationship between interpretation and memory in generalized social phobia (GSP), Hertel et al. (2008) recently found that GSP participants produced more intrusions in line with their originally socially anxious continuations for social scenarios. These results suggest that biases in interpretation can affect later biases in memory. In this study, however, Hertel et al. (2008) used a clinical population to examine the association between naturally occurring interpretive biases and memory, whereas the present study examined the effects of trained biases in a non-clinical student sample. To date, no studies have been conducted to examine the effects of training one cognitive bias on another.

Our findings are in line with research on reconstructive and constructive memory (e.g., Barlett, 1932), which demonstrates that how events are interpreted affects how they

are subsequently recalled. Memory errors, then, can be caused by externally generated errors made during recall, as well as internally generated errors made during the initial interpretation. Thus, intrusions, or new details, reported by participants in the current study may have been due to both memory errors at the time of recall and biases in their original interpretations. Given the efficacy of the positive training, these results suggest that training positive interpretive biases can also subsequently result in positive memory biases. Given the evidence for memory (Matt et al., 1992; Watkins et al., 1992) and interpretive biases (Lawson et al., 2002) in depression, as well as the potential benefits for positively training cognitive biases, this is a critical future area for further exploration.

*Limitations*

There are a number of limitations of this study. Without a control or no training condition, we were not able to determine whether group differences were due to the positive group getting better or the negative group getting worse or both. Nevertheless, for some of our measures we were able to examine participants' performance before, during, and after the training which allowed us to evaluate the effect of our training on interpretations in more detail. In addition, we assessed mood and self-esteem pre- and post-stressor, and were therefore able to account for individual differences that existed prior to this manipulation. It would be helpful, though, if future studies could include a real baseline condition, in which participants would respond to the same stimuli without a biased induction. Due to the design of the recognition task, it was not possible to conduct a pre-test to measure baseline interpretations ratings. Showing participants the same scenarios a second time would inherently influence their recognition ratings. Again, although we were not able to assess pre-training biases in interpretation, there were no

significant group differences in response latencies for probes in the first half of training, indicating that the groups did not differ in interpretation biases prior to the task.

One might argue that the presentation of the recognition task prior to the free recall task affected the free recall. Although it is not ideal to have either presented first, much thought was given to the order of these tasks. Placing the free recall task first would have presented with a number of problems. During this exercise, participants are given more time to elaborate on their memory of the previously presented scenarios; therefore, their subsequent recognition ratings would be primarily assessing how participants recalled the descriptions during the free recall, rather than how they remembered and interpreted the situation initially. Because we predicted that participants would recall biased versions of the original scenarios, including new information that may not have been included in the initial scenarios (i.e., intrusions), the free recall task would have had powerful effects on the following recognition ratings. In our design, however, the recognition task is presented as a brief exercise in which participants are asked to quickly indicate their similarity ratings based on what they remembered from the previously shown scenarios. Given the instructions, they are allowed less time to elaborate on what they remember, consequently having less of an effect on the free recall task. Also, both groups are exposed to the same four sentences (2 targets and 2 foils) corresponding to each ambiguous scenario; hence, both groups would be subject to the same biases, if any. Lastly, because the scenarios and corresponding sentences to rate during the recognition task are all presented in a random order, any systematic effects on the free recall task should be eliminated. It is very interesting to see that the results show effects of the training on both recognition ratings and intrusions in free recall.

Finally, because a decrease in both positive mood and self-esteem following the training was exhibited in both groups, the induction appeared to have negative consequences for both groups. These results were potentially due to the length and design of the training, which may have induced feelings of boredom and frustration in our sample of undergraduate students. Possibly changing the format or length of the training to include more breaks or to make it more interesting for participants would reduce the negative effects of the training. Additionally, because the present study used a one-time training, we were not able to examine the effects of using such a training over a longer period of time (i.e., weeks, months). Repeated and continuous training may increase the efficacy of the training, as well as its subsequent effects. Also, given the time-limited design of this study, the durability of the effects of the interpretation training itself, as well as the effects of the training on later mood and emotional vulnerability, were not explored. Altering the duration, frequency, and format of the training would allow further examination into these questions.

*Future directions*

Recommendations for future studies examining the effectiveness of interpretive training include using a clinical sample to examine if using an interpretive training paradigm is effective in manipulating interpretive biases, and in turn other cognitive processes, in individuals with depression. Because this is the first study to examine the effects of interpretive training on mood, rather than symptoms of anxiety, as well as study to investigate the relation between cognitive biases (i.e., interpretation and memory), an undergraduate sample was used. Using an undergraduate sample allowed us to observe these variables without the influence of other complicating factors, such as the pre-

existing cognitive biases and elevated mood ratings, often seen in a clinical sample. Using a clinical sample, however, would provide an opportunity to further examine the differential effects of such a training in individuals already prone to negative cognitive biases compared to individuals who are not.

In a similar vein, given our findings on the relationship between other individual differences (e.g., levels of optimism) and changes and mood and self-esteem, future experimental studies should strive to examine the causal relationship between these factors. Furthermore, it is critical to continue examining the implications of altering these biases on mood and emotional vulnerability and to better clarify the causal relationship between interpretive biases and mood. Continued research in these areas would provide further information on the efficacy of such inductions in a clinical setting in conjunction with current evidence-based treatments for depression. Because the training used in this study resulted in negative consequences for both mood and self-esteem (when not accounting for individual differences), it may be beneficial to develop training procedures that are more enjoyable, and thus provide individuals with more of an incentive and motivation to complete. Furthermore, exploring the use of positive trainings may provide important insights into how to both prevent and treat the onset of depressive episodes. Ultimately, more research on the durability of the effects of the training, both on cognitive biases, as well as on mood symptoms, would also provide additional information regarding the utility of the training in clinical settings.

*Summary*

Given the important role that cognitive processes play in the onset and maintenance of mood disorders, findings from the current study on interpretive and

memory biases hold far-reaching implications for the development of these disorders. By experimentally manipulating cognitive biases, this study was able to examine the relationship between cognitive biases, as well as conduct a fine-grained analysis into the functional role of these biases on emotional vulnerability. Results from the current study present several important findings. First, this study supports evidence from previous studies which suggest that emotional biases in interpretation can be reliably induced. More importantly, the current results highlight the potential benefits of positively manipulating interpretive biases for some individuals (i.e., individuals with high optimism scores or low depression or rumination scores). For these individuals, positively changing their interpretive biases may hold protective effects on mood, self-esteem, and emotional vulnerability in the face of a stressful event. Inducing positive changes in interpretation could, thus, consequently reduce the risk of onset or recurrence of emotional disorders. Continuing to examine the effects of manipulating positive interpretative biases on mood and self-esteem, in addition to exploring the role of interpretive biases on depression, may provide critical information regarding the prevention and treatment of depressive episodes.

Given the strong evidence for memory biases in depression (Ridout et al., 2003; Watkins et al., 1992), the potential effects of manipulating interpretation biases on memory also hold important clinical implications. Facilitated memory for negative events affects depressives' judgments of how frequently positive and negative events happen, as well as how likely they expect these types of events to occur in the future. Negatively biased memories and expectations may lead to lowered self-esteem, negative affect, and hopelessness (MacLeod & Campbell, 1992). Positively manipulating biases in memory

and interpretation may positively influence one's mood and emotional vulnerability following stressful experiences, thus also potentially reducing the risk for onset and recurrence of emotional disorders. Future studies should continue to extend these findings in clinical populations. They should also continue to examine the durability of the training effects, while modifying the training to reduce the overall negative effects on mood exhibited in this study. Future findings may hold valuable implications for the treatment and prevention of depression, and provide more insight into the role of interpretive biases in depressive disorders.

References

Amir, N., Foa, E.B., & Coles, M.E. (1998). Negative interpretation bias in social phobia. *Behaviour Research and Therapy, 36*, 945-957.

Azorin, J., Benhaim, P., Hasbroucq, T., & Possamai, C.A. (1995). Stimulus preprocessing and response selection in depression: A reaction time study. *Acta Psychologica, 89,* 95–100.

Bartlett, F. C. (1932). *Remembering-A Study in Experimental and Social Psychology.* Cambridge: Cambridge University Press.

Beck, A.T. (1967). *Depression: Clinical, experimental, and theoretical aspects*. New York: Harper Row.

Beck, A.T., Rush, A. J., Shaw, B.F., & Emery, G. (1979). *Cognitive Therapy for Depression.* New York: Guilford Press.

Beck, A. T., & Steer, R. A. (1993). *Beck Depression Inventory−Manual*. San Antonio: Psychological Corp.

Beck, A. T., Steer, R.A., & Garbin, M. G. (1988) Psychometric properties of the Beck Depression Inventory: Twenty-five years of evaluation. *Clinical Psychology Review 8(1),* 77-100.

Bradley, M. M., Cuthbert, B. N., & Lang, P. J. (1999). Affect and the startle reflex. In M. E. Dawson & A. M. Schell (Eds.), *Startle modification: Implications for neuroscience, cognitive science, and clinical science* (pp. 157–183). New York: Cambridge University Press.

Bradley, B.P., Mogg, K., Falla, S.J., & Hamilton, L.R. (1998). Attentional bias for threatening facial expressions in anxiety: manipulation of stimulus duration. *Cognition and Emotion, 12,* 737-53.

Butler, G., & Mathews, A. (1983). Cognitive processes in anxiety. *Advances in Behaviour Research and Therapy, 5*(1), 51–62.

Byrne, D. G. (1976). Choice reaction times in depressive states. *British Journal of Clinical Psychology, 15,* 149–156.

Foa, E. B., Riggs, Dancu, C. V. S., & Rothbaum B. O. (1993). Reliability and validity of a brief instrument for assessing Post Traumatic Stress Disorder. *Journal of Traumatic Stress, 6*(4), 459-473.

Grey, S., & Mathews, A. (2000). Effects of training on interpretation of emotional ambiguity. *Quarterly Journal of Experimental Psychology, 53A,* 1143-1162.

Hertel, P.T., Brozovich, F., Joormann, J., & Gotlib. I.H. (2008). Biases in interpretation and memory in generalized social phobia. *Journal of Abnormal Psychology, 117*(2)*,* 278-288.

Hirsch, C. R., & Mathews, A. (1997). Interpretive inferences when reading about emotional events. *Behavior Research and Therapy, 35*(12), 1123-1132.

Hirsch, C. R., & Mathews, A. (2000). Impaired positive inferential bias in social phobia. *Journal of Abnormal Psychology, 109*(4), 705-712.

Holmes, E. A., & Mathews, A. (2005). Mental imagery and emotion: A special relationship? *Emotion*, *5*, 489–497.

Holmes, E. A., Mathews, A., Dalgleish, T., & Mackintosh, B. (2006). Positive interpretation training: Effects of mental imagery versus verbal training on positive mood. *Behavior Therapy, 37*(3), 237-247.

Jerusalem, M., & Schwarzer, R. (1992). Self-efficacy as a resource factor in stress appraisal processes. In R. Schwarzer (Ed.), *Self-efficacy: Thought control of action* (pp. 195-213). Washington, DC: Hemisphere.

Joormann, J. (in press). Cognitive aspects of depression. In I.H. Gotlib & C. Hammen (Eds.), *Handbook of depression*. New York, NY: Guilford.

Lawson, C., & MacLeod, C. (1999). Depression and the interpretation of ambiguity. *Behaviour Research and Therapy, 37,* 463-474.

Lawson, C., MacLeod, C., & Hammond, G. (2002). Interpretation revealed in the blink of an eye: Depressive bias in the resolution of ambiguity. *Journal of Abnormal Psychology, 111,* 321-328.

Mackintosh, B., Mathews, A., Yiend, J. Ridgeway, V., & Cook, E. (2006). Induced biases in emotional interpretation influence stress vulnerability and endure despite changes in context. *Behavior Therapy*, *37*(3), 209-222.

MacLeod, C., & Campbell, L. (1992). Memory accessibility and probability judgments: An experimental evaluation of the availability heuristic. *Journal of Personality and Social Psychology, 63*(6), 890-902.

MacLeod, C., Rutherford, E., Campbell, L., Ebsworthy, G., & Holker, L. (2002). Selective attention and emotional vulnerability: Assessing the causal basis of their association through the experimental manipulation of attentional bias. *Journal of Abnormal Psychology, 111*, 107-123.

Mathews, A., & Mackintosh, B. (2000). Induced emotional interpretation bias and anxiety. *Journal of Abnormal Psychology, 109,* 602-615.

Mathews, A., & MacLeod, C. (1985). Selective processing of threat cues in anxiety states. *Behaviour Research & Therapy, 23*, 563-569.

Mathews, A., & MacLeod, C. (2002). Induced processing biases have causal effects on anxiety. *Cognition and Emotion, 16*(3), 331-354.

Mathews, A., & MacLeod, C. (2005). Cognitive vulnerability to emotional disorders. *Annual Review of Clinical Psychology, 1*, 167-95.

Mathews, A., Ridgeway, V., Cook, E., & Yiend, J. (2007). Inducing a benign interpretational bias reduces trait anxiety. *Journal of Behavior Therapy and Experimental Psychiatry, 38*(2), 225-236.

Matt, G. E., Vazquez, C., & Campbell, W. K. (1992). Mood-congruent recall of affectively toned stimuli: A meta-analytic review. *Clinical Psychology Review, 12*, 227–255.

McFarland, C., & Ross, M. (1982). Impact of causal attributions on affective reactions to success and failure. *Journal of Personality and Social Psychology*, *43*, 937–946.

Miller, I. V., & Norman, W.H. (1986). Persistence of depressive cognition within a subgroup of depressed inpatients. *Cognitive Therapy and Research*, *10*, 211-224.

Mogg, K., & Bradley, B.P. (1999). Some methodological issues in assessing attentional biases for threatening faces in anxiety: a replication study using a modified version of the probe detection task. *Behaviour Research and Therapy, 37*, 595-604.

Mogg, K., Millar, N., & Bradley, B.P. (2000). Biases in eye movements to threatening facial expressions in generalized anxiety disorder and depressive disorder. *Journal of Abnormal Psychology, 109*, 695-704.

Nolen-Hoeksema, S. & Morrow, J. (1993). Effects of rumination and distraction on naturally occurring depressed mood. *Cognition and Emotion*, *7,* 561–570.

Nummenmaa, L., & Niemi, P. (2004). Inducing affective states with success-failure manipulations: A meta-analysis. *Emotion, 4*(2), 207-214.

Ridout, N., Astell, A.J., Reid, I.C., Glen, T., & O'Carroll, R.E. (2003). Memory bias for emotional facial expressions in major depression. *Cognition and Emotion, 17*(1), 101-122.

Roberts, J., Kassel, J., & Gotlib, I. (1995). Level and stability of self-esteem as predictors of depressive symptoms. *Personality and Individual Differences, 19*(2), 217-224.

Rosenberg, M. (1986). *Conceiving the Self*. Malabar, FL: Krieger.

Rosenberg, M. (1989). *Society and the Adolescent Self-Image*: *Revised edition.* Middletown, CT: Wesleyan University Press.

Salemink, E., van den Hout, M., & Kindt, M. (2007). Trained interpretive bias and anxiety. *Behaviour Research and Therapy, 45*(2), 329-340.

Scheier, M. F., & Carver, C. S. (1992). Effects of optimism on psychological and physical well-being: Theoretical overview and empirical update. *Cognitive Therapy and Research, 16,* 201-228.

Scheier, M. F., Carver, C. S., & Bridges, M. W. (1994). Distinguishing optimism from neuroticism (and trait anxiety, self-mastery, and self-esteem): A re-evaluation of the Life Orientation Test. *Journal of Personality and Social Psychology*, *67,* 1063-1078.

Stopa, L., & Clark, D.M. (2000). Social phobia and interpretation of social events. *Behaviour Research and Therapy, 38*, 273-283.

Trzesniewski, K. H., Donnellan, M. B., & Robins, R. W. (2003). Stability of self-esteem across the life span. *Journal of Personality and Social Psychology, 84,* 205-220.

Watkins, P.C., Mathews, A., Williamson, D.A., & Fuller, R.D. (1992). Mood-congruent memory in depression: Emotional priming or elaboration? *Journal of Abnormal Psychology*, *101*(3), 581-586.

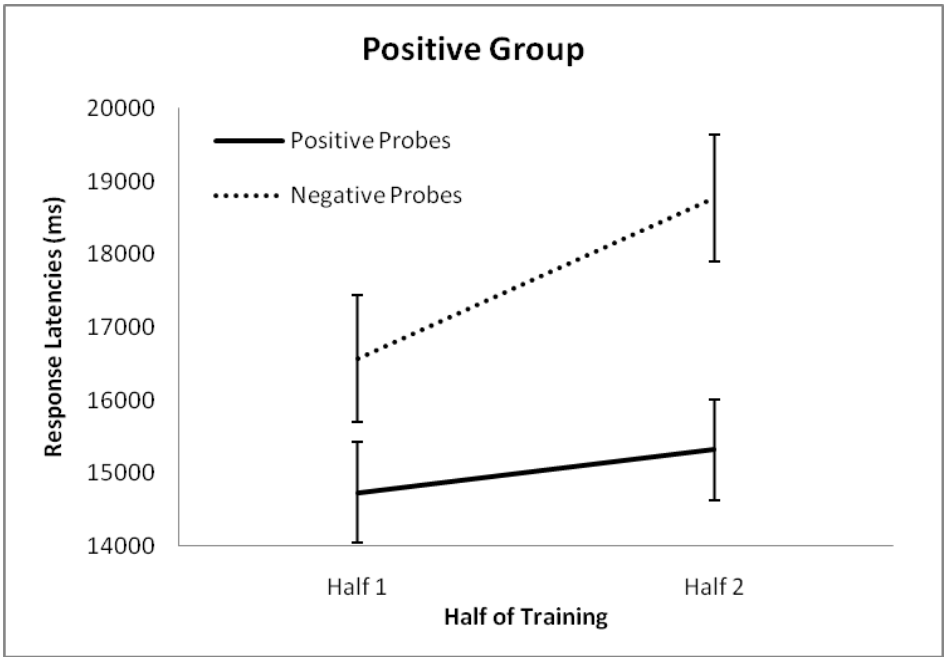
Wechsler, D. (1981). *Manual for the Wechsler Adult Intelligence Scale – Revised.* San Antonio, TX: Psychological Corporation.

Wilson, E. J., MacLeod, C., Mathews, A., & Rutherford, E. M. (2006). The causal role of interpretive bias in anxiety reactivity. *Journal of Abnormal Psychology, 115*, 103-111.

The World Health Organization. (2004). T*he World Health Report 2004: Changing History, Annex Table 3: Burden of disease in DALYs by cause, sex, and mortality stratum in WHO regions, estimates for 2002*. Geneva: WHO.

Yiend, J., Mackintosh, B., & Andrews, M. (2005). Enduring consequences of experimentally induced biases in interpretation. *Behaviour Research and Therapy, 43,* 779-797.

Chapter 3 Figures



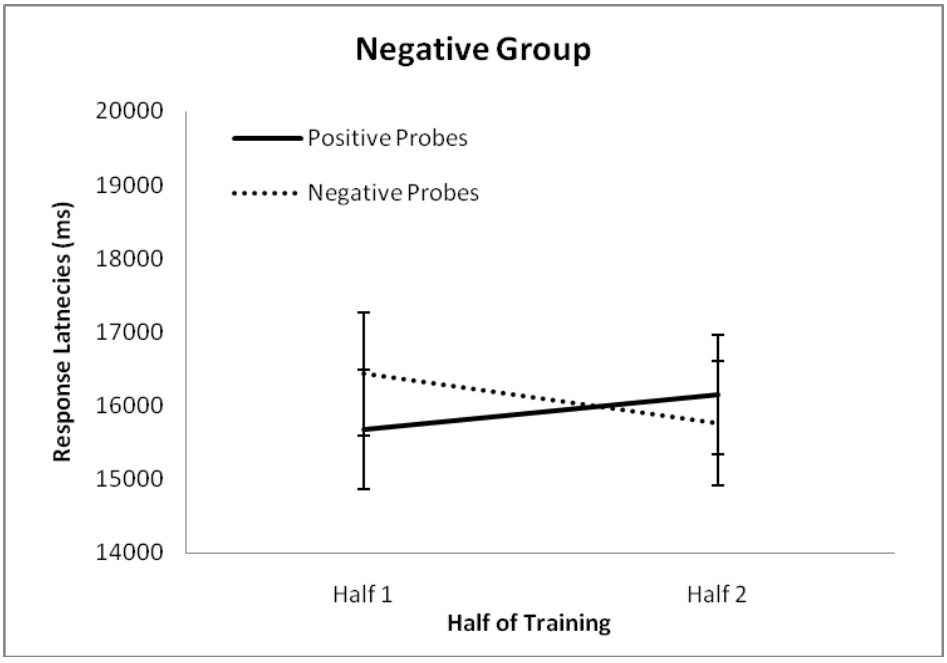




*Figure 3.1.* Response latencies (in ms) to positive and negative probe statements during the first and second halves of the training phase separated by training group. Error bars represent 1 standard error.

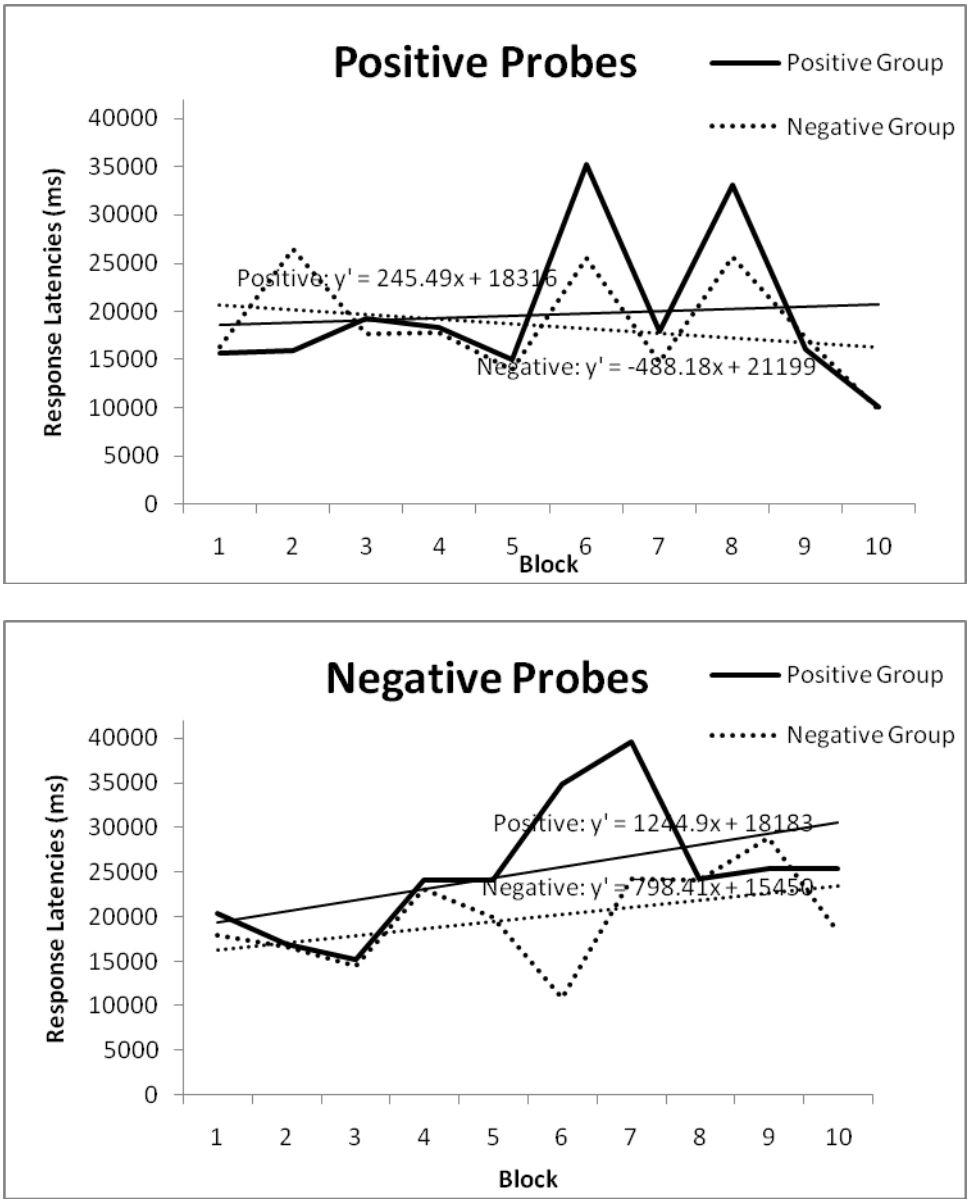



*Figure 3.2.* Response latencies (in ms) for the positive and negative training group during each block of the training phase separated by positive and negative probe statements.

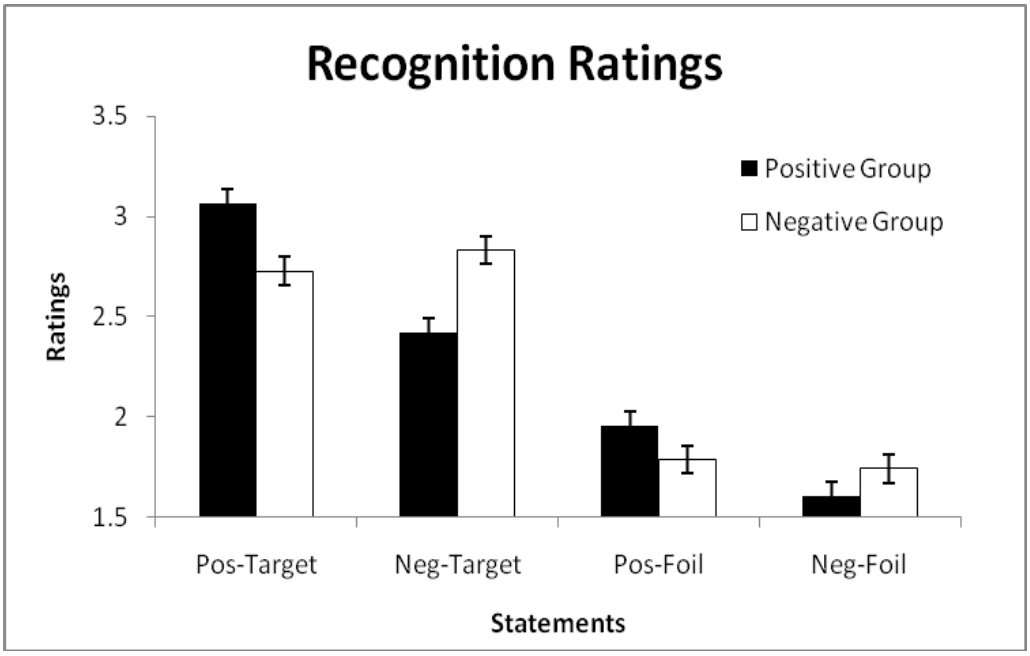
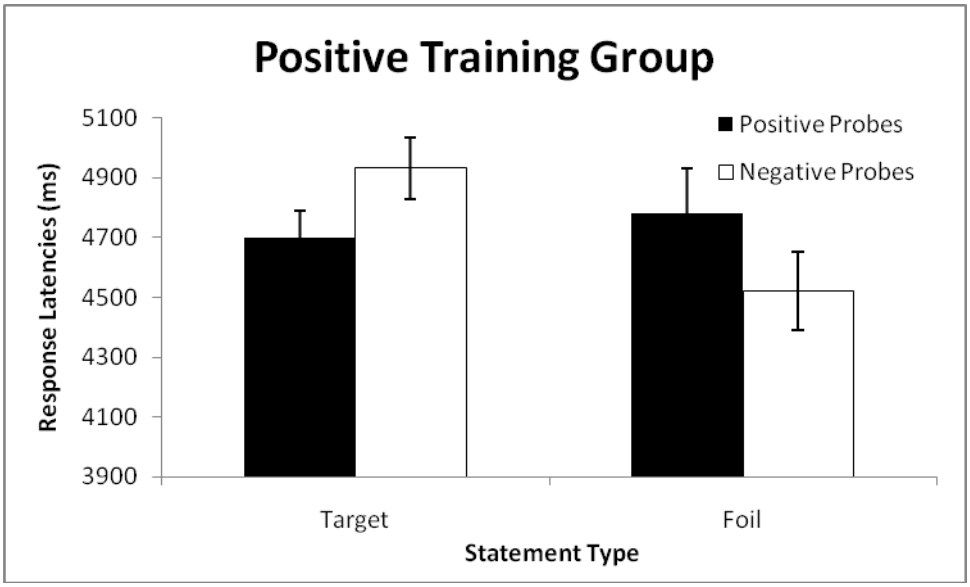



*Figure 3.3.* Mean recognition ratings for positive and negative target and foil statements when rating new ambiguous scenarios separated by training group. Error bars represent 1 standard error.



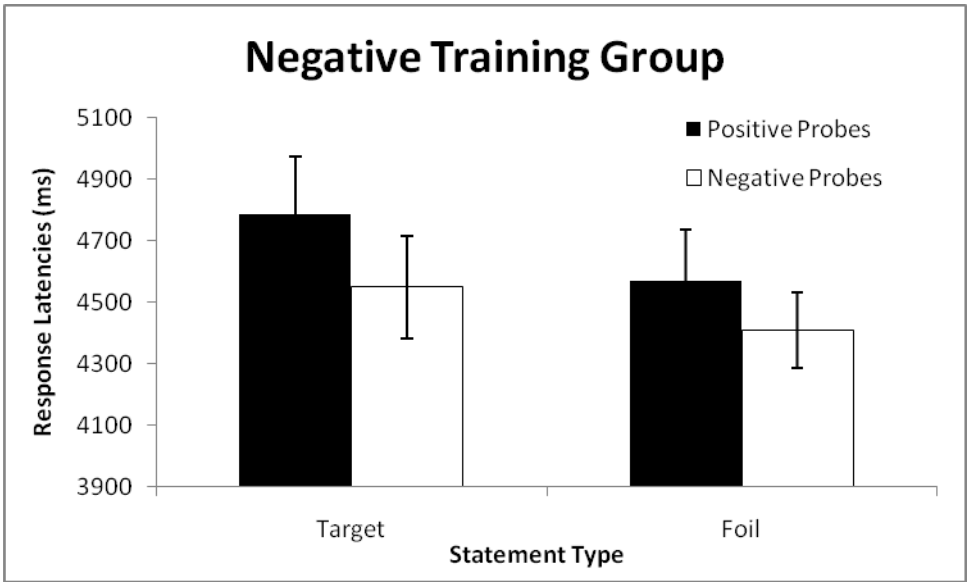




*Figure 3.4.* Mean response times to complete recognition ratings for positive and negative target and foil statements for new ambiguous scenarios separated by training group. Error bars represent 1 standard error.

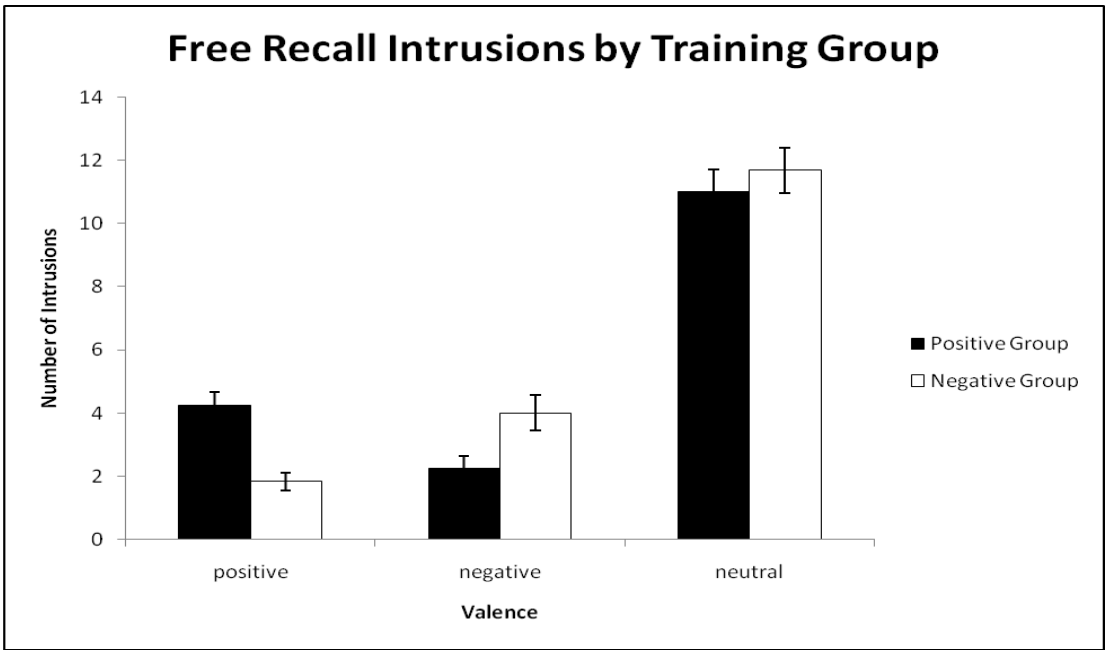



*Figure 3.5.* Number of positive, negative, and neutral intrusions (i.e., material that was not originally presented) made by each training group during free recall task. Error bars represent 1 standard error.

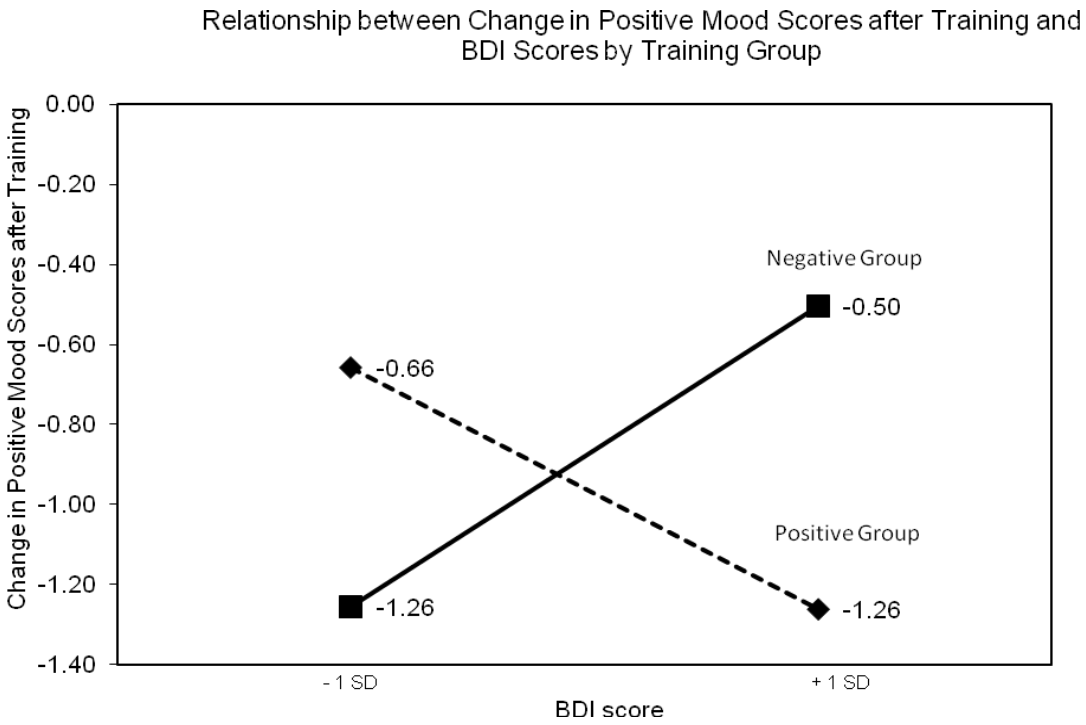



*Figure 3.6.* Regression lines for relations between BDI scores and change in positive mood scores after training phase as moderated by group status (a 2-way interaction).

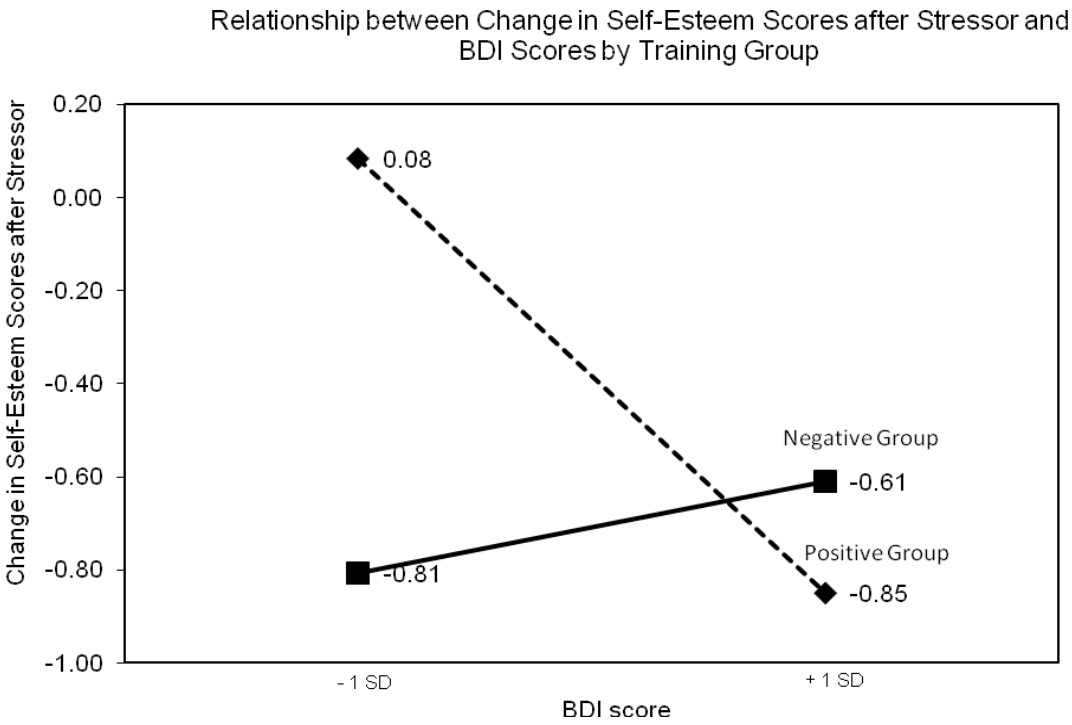



*Figure 3.7.* Regression lines for relations between BDI scores and change in self-esteem scores after stressor as moderated by group status (a 2-way interaction).

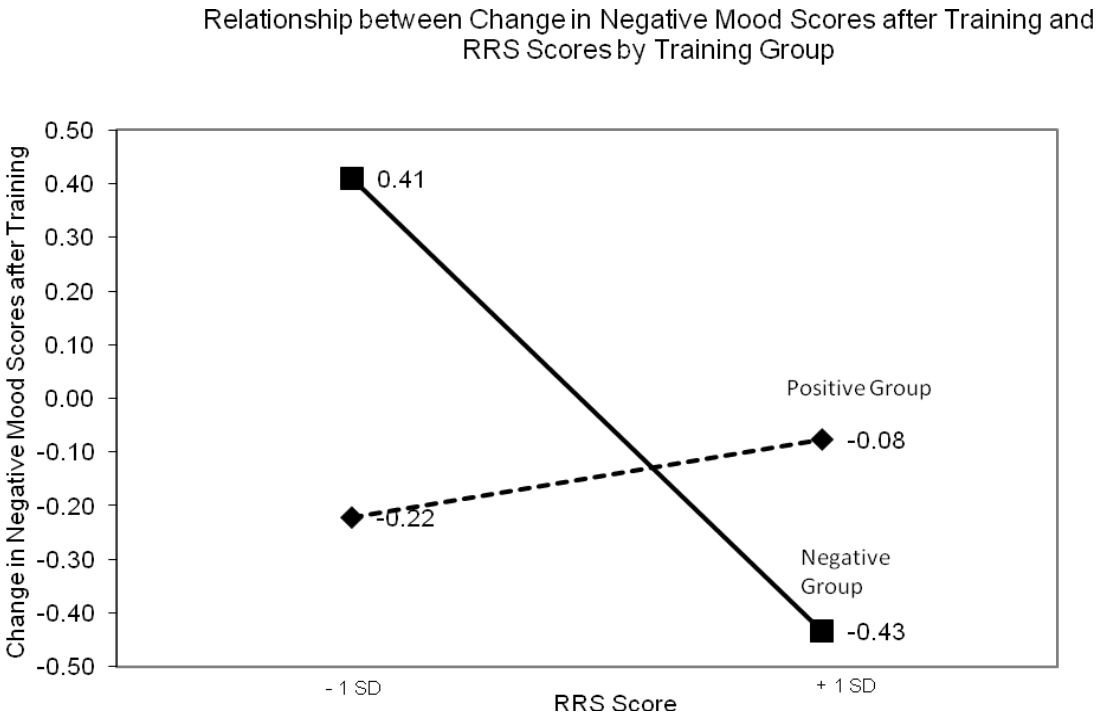



*Figure 3.8.* Regression lines for relations between RRS scores and change in negative mood scores after training phase as moderated by group status (a 2-way interaction).

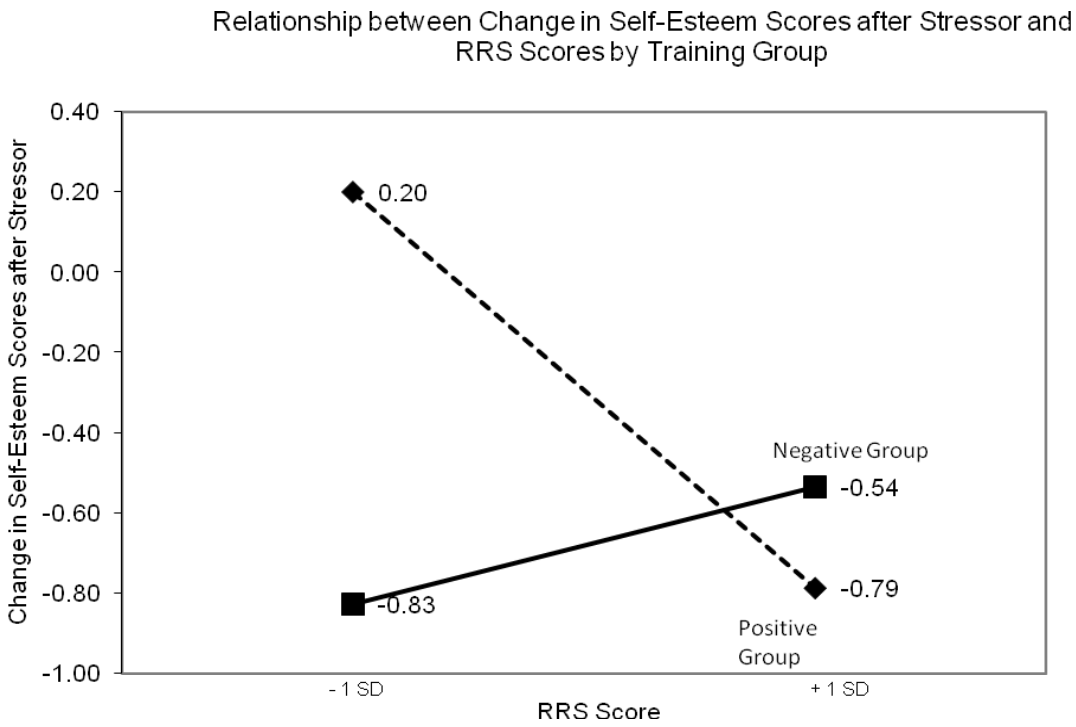



*Figure 3.9.* Regression lines for relations between RRS scores and change in self-esteem scores after stressor as moderated by group status (a 2-way interaction).

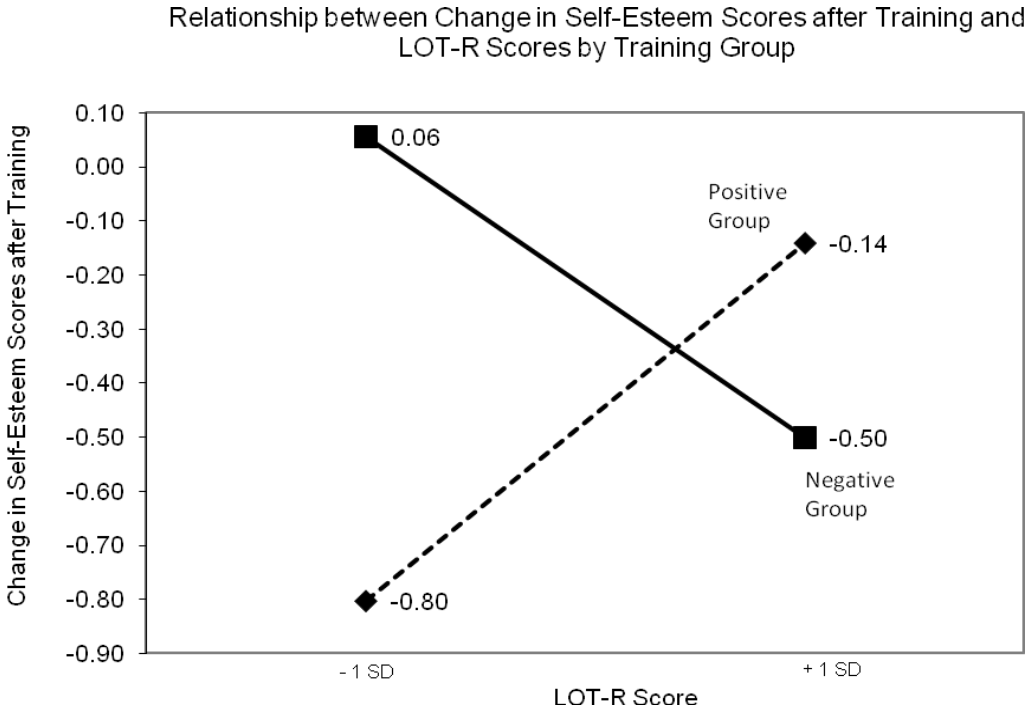



*Figure 3.10.* Regression lines for relations between LOT-R scores and change in self-esteem scores after training phase as moderated by group status (a 2-way interaction).

Chapter 3 Tables

Table 3.1

*Characteristics of Participants Assigned to Each Training Condition*

| | Positive training | Negative training | | |
|---|---|---|---|---|
| Characteristic | *M (SD)* | *M (SD)* | *t(df)* | *p* |
| N | 31 | 31 | | |
| Gender | 15 F, 16 M | 14 F, 17 M | | |
| BDI-II | 8.9 (7.6) | 8.8 (7.6) | .00(59) | .96 |
| RRS | 49.8 (13.4) | 44.4 (15.3) | 2.14(59) | .15 |
| RSE | 58.4 (8.0) | 56.9 (7.8) | .49(59) | .49 |
| GES | 33.3 (4.3) | 35.0 (3.5) | 2.63(59) | .11 |
| LOT-R | 21.8 (3.9) | 22.5 (6.3) | .25(59) | .62 |

*Note. N* = 62, BDI-II = Beck Depression Inventory-II, RRS = Ruminative Response Scale, RSE = Rosenberg Self-Esteem Scale, GES = General Self-Efficacy Scale, LOT-R = Life Orientation Test- Revised

Table 3.2

*Analysis of Variance of Time to Complete Probe Statements by Group, Valence, and Time*

| Source | *df* | *F* | $\eta^2$ | *p* |
|---|---|---|---|---|
| Group | 1 | .14 | .00 | .71 |
| Error (group) | 60 | (54491508.80) | | |
| Valence | 1 | 11.45** | .16 | .00 |
| Valence x Group | 1 | 8.69** | .13 | .01 |
| Time | 1 | 3.13 | .05 | .08 |
| Time x Group | 1 | 4.12* | .06 | .05 |
| Valence x Time | 1 | .11 | .00 | .75 |
| Valence x Time x Group | 1 | 3.67 | .05 | .06 |
| Error(Valence) | 60 | (10815496.33) | | |
| Error (Time) | 60 | (8349430.06) | | |
| Error (Valence x Time) | 60 | (8108085.60) | | |

*Note.* Values enclosed in parentheses represent mean square errors.

*$p > .05$, ** $p > .01$

Table 3.3

*Summary of Hierarchical Linear Regression Analysis Examining Response Latencies for Probe Statements Over Ten Blocks of Training Phase Separated by Valence of Probe Statement (N = 62)*

| Source | *df* | *F* | *p* |
|---|---|---|---|
| Negative Probes | | | |
| Intercept | 1 | 696.51** | .00 |
| Group | 1 | 9.31** | .00 |
| Block | 9 | 5.16** | .00 |
| Group x Block | 9 | 2.12* | .03 |
| Positive Probes | | | |
| Intercept | 1 | 490.02** | .00 |
| Group | 1 | .45 | .51 |
| Block | 9 | 10.79** | .00 |
| Group x Block | 9 | .86 | .56 |

*$p > .05$, ** $p > .01$

Table 3.4

*Analysis of Variance of Recognition Ratings by Group, Valence, and Type*

| Source | *df* | *F* | $\eta^2$ | *p* |
|---|---|---|---|---|
| Group | 1 | .02 | .00 | .89 |
| Error (group) | 60 | (.38) | | |
| Valence | 1 | 34.47** | .37 | .00 |
| Valence x Group | 1 | 43.26** | .42 | .00 |
| Type | 1 | 385.52** | .87 | .00 |
| Type x Group | 1 | .28 | .01 | .60 |
| Valence x Type | 1 | 1.98 | .03 | .17 |
| Valence x Type x Group | 1 | 19.13** | .24 | .00 |
| Error(Valence) | 60 | (.10) | | |
| Error (Type) | 60 | (.16) | | |
| Error (Valence x Type) | 60 | (.04) | | |

*Note.* Values enclosed in parentheses represent mean square errors.

*$p > .05$, ** $p > .01$

Table 3.5

*Analysis of Variance of Decision Latencies for Recognition Ratings by Group, Valence, and Type*

| Source | *df* | *F* | $\eta^2$ | *p* |
|---|---|---|---|---|
| Group | 1 | .50 | .01 | .48 |
| Error (group) | 54 | (2675317.67) | | |
| Valence | 1 | 2.26 | .04 | .14 |
| Valence x Group | 1 | 1.67 | .03 | .20 |
| Type | 1 | 4.21* | .07 | .05 |
| Type x Group | 1 | .01 | .00 | .92 |
| Valence x Type | 1 | 2.58 | .05 | .11 |
| Valence x Type x Group | 1 | 4.91* | .08 | .03 |
| Error(Valence) | 54 | (287402.54) | | |
| Error (Type) | 54 | (393017.82) | | |
| Error (Valence x Type) | 60 | (232710.61) | | |

*Note.* Values enclosed in parentheses represent mean square errors.

*$p > .05$, ** $p > .01$

Table 3.6

*Analysis of Variance of Positive Mood Ratings by Group for All Participants Following Training*

| Source | *df* | *F* | $\eta^2$ | *p* |
|---|---|---|---|---|
| Group | 1 | .32 | .01 | .57 |
| Error(Group) | 60 | (1.03) | | |
| Time | 1 | 53.87** | .47 | .00 |
| Time x Group | 1 | .00 | .00 | .99 |
| Error(Time) | 60 | (.51) | | |

*Note.* Values enclosed in parentheses represent mean square errors.

*$p > .05$, ** $p > .01$

Table 3.7

*Analysis of Variance of Negative Mood Ratings by Group for All Participants Following Training*

| Source | *df*` | *F* | $\eta^2$ | *p* |
|---|---|---|---|---|
| Group | 1 | .21 | .00 | .65 |
| Error(Group) | 60 | (2.37) | | |
| Time | 1 | .16 | .00 | .69 |
| Time x Group | 1 | 1.14 | .02 | .29 |
| Error(Time) | 60 | (.38) | | |

*Note.* Values enclosed in parentheses represent mean square errors.

*$p > .05$, ** $p > .01$

Table 3.8

*Analysis of Variance of Self-Esteem Ratings by Group for All Participants Following Training*

| Source | *df* | *F* | *p* | $\eta^2$ |
|---|---|---|---|---|
| Group | 1 | 1.05 | .02 | .31 |
| Error(Group) | 60 | (2.18) | | |
| Time | 1 | 13.54** | .18 | .00 |
| Time x Group | 1 | .39 | .01 | .54 |
| Error(Time) | 60 | (.29) | | |

*Note.* Values enclosed in parentheses represent mean square errors.

*$p > .05$, ** $p > .01$

Table 3.9

*Analysis of Variance of Intrusions in Free Recall by Group and Valence (Positive, Negative, and Neutral)*

| Source | *df* | *F* | $\eta^2$ | *p* |
|---|---|---|---|---|
| Group | 1 | .00 | .00 | .95 |
| Error(Group) | 56 | (1.29) | | |
| Valence | 2 | 108.61** | .66 | .00 |
| Error(Valence) | 112 | (12.17) | | |
| Valence x Group | 2 | 5.60** | .09 | .01 |

*Note.* Values enclosed in parentheses represent mean square errors.

*$p > .05$, ** $p > .01$

Table 3.10

*Analysis of Variance of Positive Mood Ratings by Group for All Participants Following Stressor*

| Source | *df* | *F* | $\eta^2$ | *p* |
|---|---|---|---|---|
| Group | 1 | .17 | .00 | .70 |
| Error(Group) | 58 | (5.69) | | |
| Time | 1 | 10.06** | .15 | .00 |
| Time x Group | 1 | .81 | .01 | .37 |
| Error(Time) | 58 | (.61) | | |

*Note.* Values enclosed in parentheses represent mean square errors.

*$p > .05$, ** $p > .01$

Table 3.11

*Analysis of Variance of Negative Mood Ratings by Group for All Participants Following Stressor*

| Source | *df* | *F* | $\eta^2$ | *p* |
|---|---|---|---|---|
| Group | 1 | .81 | .01 | .37 |
| Error(Group) | 58 | (3.52) | | |
| Time | 1 | 21.36** | .27 | .00 |
| Time x Group | 1 | .11 | .00 | .75 |
| Error(Time) | 58 | (.67) | | |

*Note.* Values enclosed in parentheses represent mean square errors.

*$p > .05$, ** $p > .01$

Table 3.12

*Analysis of Variance of Self-Esteem Ratings by Group for All Participants Following Stressor*

| Source | *df* | *F* | $\eta^2$ | *p* |
|---|---|---|---|---|
| Group | 1 | .07 | .00 | .79 |
| Error(Group) | 58 | (4.62) | | |
| Time | 1 | 20.81** | .26 | .00 |
| Time x Group | 1 | 1.82 | .03 | .18 |
| Error(Time) | 58 | (.43) | | |

*Note.* Values enclosed in parentheses represent mean square errors.

*$p > .05$, ** $p > .01$

Table 3.13

*Summary of Hierarchical Regression Analysis for Variables Predicting Change in Positive Mood Scores after Training (N = 60)*

| Variable | *B* | *SE(B)* | β | *t* | *p* |
|---|---|---|---|---|---|
| Step 1 | | | | | |
| Group | .08 | .26 | .04 | .32 | .75 |
| BDI | .01 | .02 | .08 | .57 | .57 |
| Step 2 | | | | | |
| Group | .08 | .25 | .04 | .33 | .74 |
| BDI | -.04 | .02 | -.26 | -1.49 | .14 |
| Group x BDI | .09 | .03 | .48 | 2.71** | .01 |

*Note.* $R^2 = .01$ for Step 1; $\Delta R^2 = .12$ for Step 2 ($p < .01$)

*$p > .05$, ** $p > .01$

Table 3.14

*Summary of Hierarchical Regression Analysis for Variables Predicting Change in Self-Esteem Scores after Stressor (N = 60)*

| Variable | *B* | *SE(B)* | β | *t* | *p* |
|---|---|---|---|---|---|
| Step 1 | | | | | |
| Group | -.33 | .24 | -.18 | -1.38 | .18 |
| BDI | -.02 | .02 | -.20 | -1.53 | .13 |
| Step 2 | | | | | |
| Group | -.33 | .23 | -.18 | -1.44 | .16 |
| BDI | -.06 | .02 | -.50 | -2.88** | .01 |
| Group x BDI | .08 | .03 | .43 | 2.48* | .02 |

*Note.* $R^2 = .07$ for Step 1; $\Delta R^2 = .10$ for Step 2 ($p < .05$)

*$p > .05$, ** $p > .01$

Table 3.15

*Summary of Hierarchical Regression Analysis for Variables Predicting Change in Negative Mood Scores after Training (N = 60)*

| Variable | *B* | *SE(B)* | β | *t* | *p* |
|---|---|---|---|---|---|
| Step 1 | | | | | |
| Group | .13 | .23 | .07 | .55 | .58 |
| RRS | -.01 | .01 | -.23 | -1.76 | .08 |
| Step 2 | | | | | |
| Group | .14 | .22 | .08 | .63 | .53 |
| RRS | .01 | .01 | .09 | .48 | .64 |
| Group x RRS | -.03 | .02 | -.42 | -2.23* | .03 |

*Note.* $R^2 = .06$ for Step 1; $\Delta R^2 = .08$ for Step 2 ($p < .05$)

*$p > .05$, ** $p > .01$

Table 3.16

*Summary of Hierarchical Regression Analysis for Variables Predicting Change in Self-Esteem Scores after Stressor (N = 60)*

| Variable | *B* | *SE(B)* | β | *t* | *p* |
|---|---|---|---|---|---|
| Step 1 | | | | | |
| Group | -.37 | .24 | -.20 | -1.52 | .13 |
| RRS | -.01 | .01 | -.14 | -1.04 | .30 |
| Step 2 | | | | | |
| Group | -.39 | .23 | -.21 | -1.68 | .10 |
| RRS | -.03 | .01 | -.53 | -2.79** | .01 |
| Group x RRS | .04 | .02 | .52 | 2.75** | .01 |

*Note.* $R^2 = .01$ for Step 1; $\Delta R^2 = .12$ for Step 2 ($p < .01$)

*$p > .05$, ** $p > .01$

Table 3.17

*Summary of Hierarchical Regression Analysis for Variables Predicting Change in Self-Esteem Scores after Training (N = 60)*

| Variable | *B* | *SE(B)* | β | *t* | *p* |
|---|---|---|---|---|---|
| Step 1 | | | | | |
| Group | .15 | .20 | .10 | .74 | .46 |
| LOT-R | -.02 | .02 | -.15 | -1.11 | .27 |
| Step 2 | | | | | |
| Group | .25 | .19 | .16 | 1.31 | .20 |
| LOT-R | .06 | .04 | .43 | 1.85 | .07 |
| Group x LOT-R | -.12 | .04 | -.69 | -2.90** | .01 |

*Note.* $R^2 = .01$ for Step 1; $\Delta R^2 = .12$ for Step 2 ($p < .01$)

*$p > .05$, ** $p > .01$

Appendices

Appendix A: Interpretation Training Scenarios

**Each block**: 2 probe (#1 negative, #2 positive), 8 induction statements (positive/negative), 3 fillers

**Block 1**

***Probes***

**Neg** 1. "During a discussion, you end up debating an issue with your classmates. You later discover that they found your views unusual. When the issue comes up next in group conversation, you expect that you will be
excluded\excl---d
Did the others find your views interesting? (N)

**Pos** 2. "A housebound neighbor asks you to get a present for her niece's birthday. She asks you to choose something suitable. When you give it to her to wrap up, you can see that she thinks it is
perfect\per---t
Did you get the idea what your neighbor liked your choice? (Y)

***Inductions***

**I** 3. "Having finished painting your apartment, you invite friends around to dinner. As they walk into your apartment, you can see that they are surprised. Their reactions are one of
horror\hor--r\pleasure\pl--s--e
Did your friends like what you had done?

**I** 4. "You are at a seminar that your company has sent you on. The seminar leader asks each member of the group to stand up and introduce themselves. After your brief presentation, you guess the others thought you sounded
shy\sh-\confident\con--d--t
Did you feel dissatisfied with your speech?

**I** 5. "You arrange to meet a friend in town. Last time you met, you had an argument and parted on bad terms. Just before you leave, she phones to say that she can't make it. You think that this is because she is feeling
angry\an--y\unwell\unw--l
Did you think your friend has forgiven you?

**I** 6. "A friend suggests that the two of you join an evening class on creative writing. The thought of other people looking at your writing makes you feel
embarrassed\emb-----sed\enthusiastic\enth----st-c
Would you expect to feel uncomfortable if others look at your work?

**I** 7. "You join a tennis club and before long, you are asked to play in a doubles match. You lose and afterwards you discuss your performance with your partner. S/he thinks that you played
terribly\ter--b-y\brilliantly\br-l---n-ly
Did your partner feel pleased with your play?

**I** 8. "One evening, you are late home from work. The family have prepared a meal and eaten theirs, but they did not wash up. As you begin to clear up, your neighbor arrives. He probably thinks that you are
untidy\unt--y\busy\b--y
Did you feel that your neighbor disapproved of you?

**I** 9. "A vacancy for a post of reporter arises at your local newspaper. You are interested in what would be involved and ask for details. On hearing the details, you think that you would be
incapable\inca---le\ideal\id--l
Do you think that your chances of getting the job are low?

**I** 10. "Your orchestra asks you to play a solo at the next concert. You practice a few times until you feel ready to play it with the orchestra. At the first rehearsal, you make a mistake. The conductor will think that your work is
rushed\rus--d\promising\pro--s-ng
Did you feel disappointed with your performance?

***Fillers***

**F** 11. "You are traveling in a steady stream of traffic. As you approach a set of traffic lights they turn red and so you apply your
brakes\br---s
Were you traveling in heavy traffic? (Y)

**F** 12. "A friend suggests that you meet up for dinner one evening. You arrive at the restaurant and are quickly seated. The waiter hands you a menu and as you read it under his gaze you notice that you are feeling quite
hungry\hu-g-y
Were you eating alone? (N)

**F** 13. "You help your daughter draw up a plan for her exam revision and encourage her to stick to it. The next day she comes home from school and goes straight to her room. When you go to see her she is
working\wo-k--g
Is your daughter following your suggestions? (Y)

**Block 2**

***Probes***

**Neg** 1. "As part of a language course, you are required to take an oral exam. The material has been briefly covered in class and you were requested to do some individual research. As you wait your turn, you feel that your work has been
inadequate\ina--q---e
Are you expecting to pass the exam? (N)

**Pos** 2. "You have an English assignment to write and try very hard to make sure it is comprehensive. The final copy is quite long. When your professor reads it, you think that she will find the amount you have written is
sufficient\su-f-----t
Will your professor say your assignment is complete? (Y)

***Induction***

**I** 3. "Your partner asks you to go to an anniversary dinner that his/her company is holding. You have not met any of his/her work colleagues before. Getting ready to go, you think that the new people you will meet will find you
boring\bo---g\friendly\fri--d-y
Were you disliked by your new acquaintances?

**I** 4. "While at the hairdressers, you are persuaded to try a completely different cut. In doubt about it, you ask a friend, who comments that the style makes you look
terrible\te--i-le\attractive\at---c--ve
Did your friend like your new haircut?

**I** 5. "Reflecting one day, you look back at achievements and disappointments that you have experienced during your life. Overall, your main feeling about life so far is one of
regret\reg---\satisfaction\sa---f-ct-on
Are you generally unhappy about the events experienced in your life?

**I** 6. "You receive an essay back from your professor and did not get the grade that you were expecting. She tells you that this is because on this occasion, your work was
muddled\mu-dl-d\outstanding\ou-s--n---g
Did you get a better grade than you expected?

**I** 7. "You have just moved to a new area and your neighbors ask if you would like to go to your local bar that evening. When you arrive, they are not yet there. After your earlier conversation, they probably thought you were
dull\d--l\likeable\lik----e
Did you make a bad impression on your new neighbors?

**I** 8. "While shopping, you buy a new jacket on the spur of the moment. When trying it on at home, you decide that you do not really like it that much and take it back to the shop. The assistant gives you a refund and her attitude is

reluctant\rel-c---t\cooperative\co-p-----ve
Was the assistant agreeable when you asked for a refund?

**I** 9. "At your word processing lesson you finish your work early and so the lecturer gives you a new task to do. You read through it and cannot think how to start so you ask for advice. Your lecturer might see you asking for help as a sign of
weakness\we-k---s\competence\com--t---e
Was your lecturer understanding when you asked for help?

**I** 10. " You organize a Christmas party for your friends every year. Last year, it did not go all that well and so you have changed the plans slightly. You anticipate that the problems of the last party will be
repeated\rep--t-d\forgotten\fo-g----n
Do you believe you will have problems with you party again this year?

***Fillers***
**F** 11. "You arrange to meet a friend in your local bar one evening. As you arrive, you cannot help noticing that the sign in front has been
painted\pa-n--d
Has your bar changed its appearance? (Y)

**F** 12. "It is your partner's birthday soon and you want to do something special. After much consideration, you decide to book a weekend break. When your partner opens the tickets, s/he looks
surprised\su-pr---d
Will you be traveling for a week long holiday on your partner's birthday? (N)

**F** 13. "One day at work, your boss rings through and asks you to go into his office. He tells you that a colleague is leaving soon and he wants you to organize a
party\p--ty
Is one of your work colleagues leaving soon? (Y)

**Block 3**
***Probes***
**Neg** 1. "You are required to give a presentation to a group of classmates that you know well. You feel that their knowing you will cause them to evaluate your performance more harshly\har---y
Were your colleagues critical when they evaluated your performance? (Y)

**Pos** 2. " You are looking after a friend's child for a few hours. During a visit to the park, she falls over and scratches her knee. You pick her up and take her home. Your friend thinks that your babysitting skills are
excellent\ex--l---t
Was your friend upset with how you cared for her daughter? (N)

**Inductions**

**I** 3. " You arrive at a party in a new outfit. Everyone turns to look at you as you walk in and you decide that they must think your outfit is

awful\aw--l\smart\sm--t
Did everyone at the party like your new outfit?

**I** 4. "You go to the hairdressers for a new haircut. When your friends see your new cut, they pause and look at it. You decide they think your new haircut is
ugly\ug-y\stylish\st-li-h
Do your friends like your new haircut?

**I** 5. "As a member of a local charity you are asked to promote your fund raising events on local radio the following week. You know that the station is widely listened to and expect that the other committee members will think you spoke
hurriedly\hu-r--d-y\convincingly\con--nc--g-y
Do you think your committee members thought you were a poor speaker?

**I** 6. "You haven't been doing well in your classes lately. You advisor asks to meet with you. When you sit down, she tells you she thinks your future looks
dismal\d-sm-l\hopeful\ho-ef-l
Does your advisor think you will do well in the future?

**I** 7. "Some important people are visiting your office and you are asked to present a project to them. On the day, you arrange your slides and mentally prepare yourself. You think that your performance will be evaluated as
unprofessional\unp--f-s-----l\organized\or--n-z-d
Were the visitors unimpressed with your performance?

**I** 8. "You are given the task of arranging the annual office party. Despite having very little time, you do your best to prepare food, drink and entertainment. As the night approaches, you think that the event will be a
disaster\dis----r\success\su----s
Did everyone enjoy the party you planned?

**I** 9. "You have been a member of a choir for several years and enjoy performing at concerts. One evening, you are asked to sing at very short notice with another group. Afterwards, you feel that the others found your contribution
disappointing\dis-p----t-ng\valuable\va--ab-e
Were the other members of the choir unhappy with your singing?

**I** 10. "Your friends are all going to a party. You were not invited, but decide to tag along. When the host sees you, she looks
annoyed\ann-y-d\excited\-xc-t-d
Was the host happy to see you?

***Fillers***

**F** 11. "You decide to take up jogging and plan to go out every morning before class. On the first morning, you get up early and put on your tracksuit. You have gone a short way before you notice that your breathing is
heavy\he--v-
Did you have some difficulty during your jog? (Y)

**F**12. "Your neighbors ask if you would like to go out for a drink the following evening. When you arrive, there are other people there and you soon find yourself being
introduced\in---d-c-d
Did you have to wait for others to arrive at the bar? (N)

**F**13. "You take a food hygiene course at a local college as you need the certificate for your job. The course lasts a whole day, but the class was able to visit the cafeteria for lunch\l-nc-
Did you get a break to eat during your class? (Y)

**Block 4**

***Probes***

**Neg** 1. " You are on tour with your soccer team and are sharing a hotel room with someone you do not know very well. As you unpack, there is little conversation between you. You feel that sharing a room with them will be
strained\str-in-d
Will it be difficult to get along with your new roommate? (Y)

**Pos** 2. " If people who are important to you disapprove of the way you dress, you might feel
amused\am---d
Would it bother you if others disapproved of your clothes? (N)

***Inductions***

**I** 3. "You have been waiting in the doctor's waiting room for a while to get your test results. When the doctor comes out to speak with you, he looks
pessimistic\p-ss-m- - t-c\relieved\r-l- - v-d
Did the doctor have good news to tell you?

**I** 4. "You have taken an exam as part of an evening course and feel you did well. At the next class the grades are on the notice-board and everyone is looking at them. The thought of others comparing your grade with theirs makes you feel
apprehensive\ap---h-n--ve\happy\h-p-y
Were you upset others could compare their grade with yours?

**I** 5. "You have just moved into a new apartment and have finally finished the decorating. Your partner invites his/her family around one night to show them your efforts. As they leave, you are sure that his/her mother thought the color scheme was

tasteless\ta-te-e-s\tasteful\ta---f-l
Did your mother disapprove of your color scheme?

**I** 6. "At your evening class, you are given a task to complete for the next week. You finish it early and ask the professor for his opinion. He says the work is good, apart from missing out a section. You feel that he will think you are
careless\car----s\learning\le-rn--g
Was your professor pleased with the quality of work on your paper?

**I** 7. "You are at a seminar and during a brief break, you call your partner. You are late back into the lecture hall and the others will think that choosing now to call your partner must mean that you are
slacking\sl--k--g\concerned\co-c-rn-d
Did people think you were irresponsible when you were late returning?

**I** 8. " Your bathroom looks rather dingy and so you decide to put new tiles up. When you finish, you look at your work and decide that your efforts were
futile\fu-i-e\worthwhile\wo---w---e
Did the new tiles make the room brighter?

**I** 9. " Your swimming club asks you to swim in a competition, as they are short of speed swimmers. You lose your first race and as you get out of the pool, your teammates are ready to talk with you. They say that you swam
badly\b-d-y\well\w--l
Were your team mates angry because of your swimming performance?

**I** 10. " At a dinner party, you are introduced to someone new and chat to them for quite a while. When you telephone him the next week to suggest meeting again, he replies that it would be
pointless\po--t---s\great\g--at
Was your new acquaintance eager to meet with you again?

***Fillers***
**F** 11. "An acquaintance calls to ask you for some advice about a relationship problem. The conversation soon drifts onto other things and before you realize the time, you find that you have spent most of the afternoon
talking\ta-k--g
Did you speak with your friend in the evening? (Y)

**F** 12. "You go for a job interview at a firm of solicitors. When you get to the offices, you report to reception. The secretary asks you the time of your
appointment\ap--in-m--t
Did you speak to the secretary before your job interview? (Y)

**F** 13. "The priest at your church asks you to read the lesson the next week. He tells you what it will be and you look over it in advance. The chosen verses will be easy to read, because they are quite
short\sh-r-
Will you be singing in the church choir next week? (N)

**Block 5**

***Probes***

**Neg** 1. "The final part of your interview involves taking a written intelligence test. Ten minutes before the end, you glance around the room to see how the others are doing. Compared with them, you think that your answers will make you seem
inferior\inf----r
Did you do poorly on the intelligence test? (Y)

**Pos** 2. " Your best friend arranges a blind date for you and as you sit in the bar waiting to meet them for the first time, you wonder how it will go. You feel that your date will think you are
pleasant\pl--s--t
Will you make a bad impression on your date? (N)

***Induction***

**I** 3. "Your firm enters a team for a volleyball league which starts the next week. You are asked to be captain. You lose your first match so at the next practice you give a team talk. Due to your talk, you think that the team morale is
low\l--\raised\ra---d
Did you discourage your team with your talk?

**I** 4. "Your partner asks you to buy a present for his/her sister's birthday tomorrow, as s/he is too busy. You dash into town and pick up some perfume. When she opens it she thanks you. Knowing her as you do, she probably thinks it is
unsuitable\unsu---b-e\lovely\lo---y
Did your partner's sister appreciate your gift?

**I** 5. " The morning of your first review with your new boss has arrived. She has a reputation for having strong views and as you wait to go in, you think that she might find your work
uninteresting\uni---r-st--g\satisfactory\sa--s--ct--y
Do you think your new boss has an unfavorable opinion of your work?

**I** 6. "You go to a party at a club. While dancing, you spot an old friend not far away and call out. S/he does not reply and after a moment, turns and leaves the dance floor, heading for the bar. You decide that this is because s/he was
irate\ir-t-\distracted\d-st-act-d
Was your friend ignoring you in the club?

**I** 7. "When you pick up your child from school, you hear some of the parents talking about other people. As you walk closer to them, you overhear your name. When they see you, they smile and greet you. What they were saying makes you feel
hurt\h--t\accepted\ac--p--d
Were the parents speaking fondly of you?

**I** 8. " It is your first day at a new job and you report to your manager. Her first impression of you is probably that you are very
nervous\ne----s\eager\e-g-r
Did your manager think you were anxious about your first day?

**I** 9. "You receive a letter out of the blue from an old friend who you have not seen for ages. She wants to meet and explains that she has changed a lot since you last saw her. You feel that she will think you have changed too - for the
worse\w---e\better\b-t--r
Did your friend think you had changed in a positive way?

**I** 10. "You are persuaded to go on vacation to Rome - a place you had always wanted to visit. The flight and lodgings are really more than you can afford, but you pay for them on your credit card. Later, you think the decision to go was
unwise\unw--e\sensible\se---b-e
Was the trip to Rome worth the cost?

***Fillers***

**F** 11. "You attend a reunion at your old college and meet up with lots of people you have not seen for some time. You go to the bar and when you return you find that most of your friends are dancing to loud
music\m--ic
Did you attend your college reunion? (Y)

**F**12. "Your child brings a note home from his elementary school, asking for volunteers to go in and help with various classroom activities. Because you are too busy, however, you must
decline\de-l--e
Are you going to volunteer at your son's school? (N)

**F**13. "You are asked to give a speech at a friend's wedding. Beforehand, you have a few glasses of wine and when you get up to speak, you feel rather
lightheaded\li--t--ad-d
Did you drink alcohol before speaking at your friend's wedding? (Y)

**Block 6**

***Probes***

**Neg** 1. " If your close friends disapprove of your choice of partner, you might feel rather distressed\dis-r-s--d
Would your friend's negative opinion of your partner bother you? (Y)

**Pos** 2. "Your colleagues decide to go out for lunch and ask you to join them. You accept, but will have to wear your work clothes. When you arrive, the other diners turn to look at you. You think this is because your outfit is
stylish\st---sh\y
Did the other diners think you were dressed inappropriately? (N)

***Induction***
**I** 3. "You arrange to meet your date at 8 p.m. in a local bar. You arrive on time and find that s/he is not there yet. After your last conversation, you thought that s/he found you boring\bo---g\sociable\s-c--b-e
Was your date interested in you after your last conversation?

**I** 4. "You work in a large office along with your supervisors. One morning, you have to ring your mother. Everyone else is working quietly and can hear what you say. You guess that they think calling your mother from work means you are
slacking\sl-ck--g\troubled\tr--b--d
Were others displeased because you rang your mother from work?

**I** 5. "As a member of the fundraising team at a local charity, you are asked to organize a fair. You do your best, although there is little time. At the opening, you are invited to say a few words. You think the event will be a
fiasco\fi-s-o\winner\wi---r
Was your fundraising fair successful?

**I** 6. "Your boss calls a meeting to discuss a new project which will involve most of the staff at your office. You are suddenly asked to contribute your ideas to the discussion. You think that your colleagues will find your ideas
unimportant\un-mp--t-nt\exciting\ex--t--g
Did your boss dismiss your ideas at the meeting?

**I** 7. " You meet someone at a party and feel that you got along well. Later, you phone and suggest meeting again. The reply you get makes you feel that she thinks meeting again would be
fruitless\fr---l--s\marvelous\m--v-l--s
Did the person from the party accept your invitation for a meeting?

**I** 8. "A friend invites you to a dinner party that she is holding. She tells you who the other guests are, but you do not recognize any of the other names. You go anyway and on the way there, you think that the other guests will find you
annoying\ann-y--g\sociable\so--a-le
Were you well liked at the party?

**I** 9. "You buy a new outfit, which is very different from your usual style of clothes. When you show it to a friend, she comments that it makes you look

ridiculous\ri--c---us\attractive\att--ct-v-
Did your friend think your new suit looked foolish?

**I** 10. " You take your partner's mother into town to do some shopping and on the way, put on your favorite radio station. You are sure that she found the music
inappropriate\in-p---pr---e\agreeable\ag--e-b-e
Did your partner's mother approve of your music choice?

***Fillers***
**F**11. "As part of one of your classes, you have to make a presentation to another group. You rewrite your notes several times until you are happy that the draft you have is
final\f-n-l
Did you write your presentation in one draft? (N)

**F**12. "You are having family problems and decide to talk them over with a friend. You find that your friend's views are quite
liberal\li-er-l
Did you confide your problems to a friend? (Y)

**F**13. "A friend arranges a blind date for you and you are told to meet in a local restaurant. On the evening, you chat as you eat and your date remarks that the soup is very
hot\h--
Did you have a date with an old friend? (N)

**Block 7**
***Probes***
**Neg** 1. " You are persuaded to join a quiz team in a tournament. You are told that most of the questions will be asked individually. The first game is hard and you feel that the others found your efforts particularly
feeble\f--b-e
Did your team mates feel positive about your efforts in the tournament? (N)

**Pos** 2. " You invite work colleagues to your house for a formal dinner party, although you know they don't always get along. As you are clearing up afterwards, you think that the evening was
entertaining\en---t---i-g
Did you enjoy yourself at your dinner party? (Y)

***Inductions***
**I** 3. "Your boss asks you to do a job at work. You finish it before the deadline, although there is a small mistake in it. You are new to the job and feel that your boss will think you are
negligent\ne---g--t\progressing\pr--r-s---g
Was your new boss disappointed with your performance?

**I** 4. "As a mandatory course requirement, you have to make a presentation to your classmates and professors. You prepare to start and as you arrange your cue cards, you think that your performance will be evaluated as
inarticulate\in--t-c-l--e\polished\po--sh-d
Did you give a good presentation for your course?

**I** 5. "You decide to redecorate your kitchen, although the work involved looks quite tricky. When you have finished, you look at your handiwork and think to yourself that your efforts were
shabby\sh-b-y\skilled\sk-l--d
Were you disappointed with your workmanship in the kitchen?

**I** 6. "You recently applied to join a local volunteer organization and were sent questionnaires to complete. As you finish the last page, you wonder how others may have responded. You decide that in relation to them, you will seem
mediocre\me-i-c-e\desirable\de--r-b-e
Were the responses on your questionnaire superior to the others'?

**I** 7. "You recently had an interview for a job you really wanted. The person you interviewed with left a message for you to call back. On the answering machine, he sounded
somber\s-mb-r\excited\-xc- t-d
Did it sound he wanted to offer you a job?

**I** 8. "Your firm decides to raise money for a local hospital. You are put in charge of your department's efforts and discover a slight apathy among the others. You appeal to their better nature at a meeting. Afterwards, their spirits are
unimproved\un--p--v-d\lifted\li---d
Did your talk at the meeting increase donations for the charity?

**I** 9. "A friend is having problems with her boyfriend and asks you for advice. You tell her what helped when you were in that situation. You expect that s/he will find your advice
impractical\im---ct---l\constructive\co--tr--t-ve
Was your friend thankful for your advice?

**I** 10. "A new professor is appointed for your history class and you hear that he is very disciplined and hard-working. When you meet him for the first time to discuss your interests, you think that he found your work
uninspiring\un--sp----g\thorough\th-r---h
Did your new professor have a bad opinion of your work?

***Fillers***

**F**11. "You and a friend decide to join an evening class in pottery. When you arrive on the first night, you discover that the class is held in a converted barn. Because it was chilly outside you think you should have brought a

sweater\sw--t-r
Does your new pottery class meet in the evening? (Y)

**F**12. "You are a member of a hockey club and regularly play for the second team on Saturday afternoons. One week, the captain tells you that there is to be a midweek match\m--ch
Do you play hockey on the first team? (N)

**F**13. "As a Parent Governor at your local school, you are asked to give an interview to the evening newspaper about recent exam results. Afterwards, you think that the interviewer asked too many
questions\qu--t-on-
Did you give an interview for the local TV news? (N)

**Block 8**

***Probes***

**Neg** 1. "You have started a new job and you are given a task to do that normally takes a few days. You manage to finish it the same day. As you go over it, your boss finds only one mistake in your calculations. You expect he thinks your work is
careless\car----s
Was your boss pleased with your work? (N)

**Pos** 2. "On entering the interview room, the panel of interviewers welcome you. You are the third candidate to be seen today and as you sit down, you think that they probably see you as
calm\c-l-
Will the interviewers see you as a nervous person? (N)

***Inductions***

**I** 3. "As you are walking down a crowded street, you see your neighbor on the other side. You call out, but she does not answer you. You think that this must be because she was annoyed\ann-y--\preoccupied\pr--c-upi-d
Did your neighbor ignore your call to her in the street?

**I** 4. "You are at a party and are introduced to a stranger. After a few minutes of talking, you think the stranger looks
bored\b-r-d\interested\-nt-r-st-d
Did the stranger seem interested in your conversation?

**I** 5. "A new task is assigned to your department at work and your supervisor asks you to be responsible for it. You have no guidelines to follow, and you ask a colleague for his advice. Your colleague probably sees this as a sign of
failure\fa-l--e\proficiency\pr-f----n-y
Did you make a mistake by asking for advice on the new project?

**I** 6. " You have just had a new patio laid in your garden and decide to have a barbecue, as the weather is so nice. As your friends arrive, you can see that they have noticed something different. Their reactions are one of
dismay\dis--y\approval\ap---v-l
Did your friends have a negative reaction when they saw your new patio?

**I** 7. "You are shopping with a friend and show her a shirt that you are thinking of buying. When you ask her what she thinks, she says it looks
unfashionable\unf-sh- - n – bl-\stylish\st- - i-h
Did you friend like the shirt you were thinking of purchasing?

**I** 8. "Recently, you argued with your brother. You decide to break the ice by asking him out for a drink. You get ready and as you are about to leave, he phones to say he can't make it after all. You think that this is because he is feeling
annoyed\an--y-d\feverish\fe--r-sh
Is your brother breaking your meeting because he is angry with you?

**I** 9. " Discussing your experiences with a friend, you think about things you might change if you had to repeat your life. You decide that your feelings about life so far are mainly ones of
remorse\re--rs-\contentment\co---n-m--t
Are you satisfied with your past experiences?

**I** 10. "You are on the committee of an amateur drama group, which is planning a new production. At the first meeting, the director asks you for ideas about which play to perform. You think that the others will find your suggestions
irrelevant\ir--l-v--t\commendable\co-men--bl-
Were your suggestions for the play overlooked by the director?

***Fillers***
**F** 11. "Your aunt buys you a hat for Christmas. You think that her choice of gift is unusual, as you do not normally wear hats. Your aunt remarks that the hat is very warm because it is
thermal\th--m-l
Did your aunt buy you a Christmas gift? (Y)

**F**12. "It is almost time for your town's spring festival. A friend of yours is on the committee and asks if you would be willing to help out with the barbecue in the park. You hope that on that day it will be
sunny\su--y
Does your town hold a festival in the spring? (Y)

**F** 13. "Your firm organizes a bowling trip as an annual social event. Because you are a new employee, this will be your first trip. Many people were going so everyone traveled by
coach\c--ch
Did your office go on a fishing trip? (N)

**Block 9**

***Probes***

**Neg** 1. "You arrange to meet up with a friend who you have not seen for many years. As you drive to the station to pick him up, you are sure he will think that your looks have deteriorated\de-er-or - - ed
Will your friend think you have changed in a negative way? (Y)

**Pos** 2. "Friends arrive unexpectedly one evening, as you are in the process of clearing out the attic. You have almost finished, but piles of books, old toys and clothes still cover the lounge. Your friends will probably think you are
productive\pr-d-ct-v-
Are your friends critical when they see you clearing out the attic? (N)

***Inductions***

**I** 3. " You overhear some work colleagues discussing other people that they like and hear your name mentioned. What they say makes you feel
offended\of--n--d\valued\va--ed
Were your colleagues gossiping about your faults?

**I** 4. " An opportunity arises for a promotion in your department. You ask for more details of what it will entail. After hearing what would be required of candidates, you decide that if you applied for the job, you would be
rejected\re---t-d\welcomed\we--o--d
Do you think you have a good chance of getting the promotion?

**I** 5. "You organize a day out with family and friends. The outing does not go very well and you feel disappointed. Some weeks later you meet again and this time plan something different. You predict that this time a successful outcome is
unlikely\u-li--ly\likely\li-e-y
Did the next outing with your family also turn out badly?

**I** 6. "You have completed a first aid course and have to take a practical test. You have completed some practical work and the teacher has given out notes to revise from. As you wait your turn, you feel that your preparation has been
incomplete\inc--p---e\ample\am--e
Do you think you are unprepared for the practical test?

**I** 7. "You have been writing to a pen-pal in Belgium for several years and finally arrange for him to come and stay with you. As you stand at the airport waiting for his flight to arrive, you think that his first impression of you will be
lifeless\li-el--s\charming\ch--m--g
Do you make a good impression on your penpal at the airport?

**I** 8. " Your sister asks you to pick up your nephew from school one afternoon. The traffic is bad and you are late. When you arrive, you find a teacher waiting with him. Your sister will think your babysitting skills are
lacking\la-k--g\admirable\ad--r---e
Did your sister think were irresponsible when caring for her son?

**I** 9. "Some of your friends get together and form a baby-sitting group. You are asked to organize the rotation and when you give it out, a few people complain about how you have completed it. You think that your ability to organize things is
ineffective\in-f-----ve\good\go--
Are you pleased with your organizational skills?

**I** 10. "You are thinking about running for president of a club that you are a member of. When you tell your friends your idea, they are
pessimistic\p-ss-m-st-c\supportive\s-pp- - t-ve
Do your friends think it is a good idea for you to run for president?

***Fillers***
**F** 11. "Last week you went for a job interview and are expecting to hear the results by mail. One morning you hear the letter box rattle as you walk past it. You think that the mail has been
delivered\de--ve-ed
Did you interview for a new job in the past week? (Y)

**F** 12. "You inherit an old dining table and chairs and decide to restore them to their former glory. You spend hours in the garage working on them. When you have finished, you bring them into the
house\h--se
Did you buy and old dining set? (N)

**F** 13. "You arrange to visit a friend who lives some distance away and plan to travel by bus. When you get on, the bus is fairly empty and so you take a double seat at the front. After several hours of travel you start to feel
sleepy\sl-e-y
Did you sit in the back of the bus on your trip? (N)

**Block 10**

***Probes***

**Neg** 1. " You meet someone new at a meeting and have a stimulating discussion. Towards the end you find that she disagrees with something that you have said. When the next discussion group meets you expect that you will be
ignored\ig----d
Will you be brought into the next discussion meeting? (N)

**Pos** 2. " You write a poem to enter in a competition and need someone to proof read it. The thought of a friend reading your work makes you feel
proud\pr--d
Are you looking forward to having a friend read your poem? (Y)

***Inductions***

**I** 3. "You are discussing politics with an acquaintance. She does not seem to agree with your views. In the future, you expect her opinion of you to be
wary\w--y\unaltered\un-lt-r-d
Does the person who disagreed with you have a bad impression of you?

**I** 4. " Your supervisor asks you to write a report. The finished document is quite brief but took a lot of time and effort. As she reads through it the next afternoon, you think that she will find that the amount you have written is
scant\sc--t\sufficient\s-ff-c--nt
Did your supervisor think your report was comprehensive?

**I** 5. " You spend an evening with a friend and end up talking about her relationship problems. You expect that she will find your advice
unhelpful\u-h-lp--l\helpful\he--f-l
Did your friend think you gave them good advice about relationships?

**I** 6. "You are shopping with a friend, who persuades you to buy a stereo that you really like, but cannot afford. When you get home, you put on your favorite music and sit down to listen. You think your decision to buy it now was
inadvisable\in--v--ab-e\reasonable\re-s---b-e
Was it a bad choice to buy the stereo now?

**I** 7. "You are required to go to a conference in London for your firm. Your usual companion on the trip falls ill a few days before you leave, so your boss asks someone you don't know to go in his place. You think the trip will be
tense\t-n-e\stimulating\st-m---t--g
Are you looking forward to your business trip with a new colleague?

**I** 8. "You have almost completed a computing course and part of your grade will be determined by a presentation that is to be graded by your fellow classmates. You know most of them and feel that this will make them evaluate your work more

strictly\st--c--y\leniently\le---nt-y
Will your course-mates grade your presentation advantageously?

**I** 9. "You receive a phone call that you mother is in the hospital. When you meet with the doctor, he says that her prognosis is
dismal\d-sm-l\hopeful\h-p-f-l
Does it look like your mom will get better soon?

**I** 10. " Your boss asks to see you following the recent submission of a paper you researched. He tells you that he wants to talk to you because your work was
unclear\u-cl--r\exceptional\ex--pt-o-al
Were you going to get a bad review from your boss?

***Fillers***
**F** 11. "You go out for a night on the town with some friends, ending up in a nightclub. You leave the group briefly to say hello to another friend. When you return, your friends are all drinking beer and you suspect some are
drunk\d--nk
Were you drinking with your friends in a club? (Y)

**F** 12. "At a party, you begin talking to someone you have not met before. You get on well and chat for a while. Later on, you ask her for her phone number and she writes it down for you on a
napkin\n-pk-n
Did you meet someone new at a wedding? (N)

**F** 13. "You want to buy a new car and need a bank loan, so you make an appointment to see your bank manager. After waiting a short while the bank manager comes out to see you and invites you into her
office\of--ce
Did you need a loan in order to buy a car? (Y)

Appendix B: Test Scenarios

**1. The wedding reception**
A) Your friend asks you to give a speech at her wedding reception. You prepare some remarks and when the time comes, you get to your feet. As you speak, you notice some people in the audience start to
l a u g h\l - - g h\a (complete continuation)

Did you stand up to speak? (Y) (comprehension question, but has no emotional implications)

B) The wedding reception
a) As you speak, people in the audience laugh appreciatively (positive target)
b) As you speak, some people in the audience find your efforts laughable (negative target)
c) As you speak, everyone in the audience bursts into applause (positive foil)
d) As you speak, you notice somebody in the audience start to yawn (negative foil)

**2. The local club**
A) You are invited to attend a social at a local club, although you don't know any of the members very well. As you approach the door you can hear conversation and loud music, but when you enter the room it stops for a m o m e n t \m o - - - t \m

Do you know most of the club members? (N)

B) the local club
a) As you enter the room the music stops for a moment (positive target)
b) As you enter the room everyone stops and stares at you (negative target)
c) As you enter the room someone greets you warmly (positive foil)
d) As you enter the room someone asks why you are there (negative foil)

**3. The bus ride**
A) You get on a bus and find an empty seat, next to one that has a small rip in it. At the next stop, several people get on who you know, but all of them go and sit somewhere else so the seat next to you remains
v a c a n t \v a - - - t \c

Were the people who got on strangers to you? (N)

B) the bus ride
a) No one can sit next to you because the seat has a rip in it (positive target)
b) No one chooses to sit with you so the seat next to you stays empty (negative target)
c) The person in the seat next to you talks to you in a friendly way (positive foil)
d) The person in the seat next to you makes a rip in the fabric (negative foil)

**4. The job interview**
A) You see a job advertised that you would really like. You apply and are invited to an interview, where you answer the questions as well as you can. Reflecting later, you think that the quality of your answers decided the o u t c o m e\o u - - o m -\t

Did you think about your answers later?

B) the job interview
a) You think it must have been your clear answers that got you the job (positive target)
b) Reflecting later, you think the quality of your answers lost you the job (negative target)
c) Reflecting later, you think it was a good thing you did not take the job (positive foil)
d) You think that your appearance may have made a bad impression (negative foil)

**5. Meeting a friend**
A) In the street you bump into an old friend you haven't seen for a long time. She is too busy to stop, so you arrange to meet later in a bar. You arrive a little late but the bar is empty and a few minutes later she is still not t h e r e\t h - - e\e

Was anyone else in the bar? (N)

A) meeting a friend
a) You arrange to meet in a bar and your friend arrives late (positive target)
b) You arrange to meet in a bar, but your friend doesn't turn up (negative target)
c) Your friend wants to meet again but you don't have time (positive foil)
d) Your friend tells you that she does not want to meet you (negative foil)

**6. Your birthday**
A) It is your birthday and you wake up looking forward to your day. You wonder how many friends will send you a birthday card. However, you have to go to work as usual, and by the time you leave, no cards have a r r i v e d \ a r r - - - d\i

Do you receive any cards before you leave? (N)

B) your birthday
a) You leave for work before the postman brings all your cards (positive target)
b) You leave for work thinking that no one has sent you a card (negative target)
c) You leave for work feeling pleased with the presents you received (positive foil)
d) You leave for work knowing that it is going to be a stressful day (negative foil)

**7. Your first painting**
A) You have taken up painting as a hobby, and have just finished your first picture. You hang it on the wall for your friends to see. Later you overhear your friends making remarks that make clear their opinion of your p i c t u r e\p i - t - r -\c

Did you leave the painting on an easel? (N)

B) your first painting
a) You overhear your friends saying how much they loved your painting (positive target)
b) You overhear some friends making critical remarks about your picture (negative target)
c) You overhear some complimentary remarks about your furniture (positive foil)
d) You overhear your friends making fun of your taste in furniture (negative foil)

**8. The house-warming party**
A) Your neighbor has a house warming party and you are invited. You arrive to find many other guests whom you do not know. You try talking to some of them, and get an impression of how much they are interested in your c o n v e r s a t i o n \c - - v e r - - t i - n\o

Was the party thrown by a relative of yours? (N)

B) the house-warming party
a) You meet some guests and they find your comments very entertaining (positive target)
b) You talk to some guests but see they find your conversation uninteresting (negative target)
c) You meet a lot of guests whom you know and arrange to meet again (positive foil)
d) You don't know any guests and they all ignore you completely (negative foil)

**9. The evening class**
a) You have just started going to an evening class. The instructor asks a question and no one in the group volunteers an answer, so he looks directly at you. You answer the question, aware of how your voice must sound to the o t h e r s \o t h - - s\e

Have you been going to the evening class for a long time? (N)

B) the evening class
a) You answer the question, noting that the others listen very attentively (positive target)
b) You answer the question, aware of how unsteady your voice sounds (negative target)
c) You answer the question and then realize what a good answer it is (positive foil)
d) You answer the question, but realize that you have made a mistake (negative foil)

**10. The local bar**
A) You are with a group of new friends at a local bar. You decide to tell a joke you heard recently. Everyone looks at you as you start telling the joke, and you see their expressions change when you get to the punch l i n e \l - - e\i

Did you hear the joke you told quite recently? (Y)

B) the local bar
a) When you get to the end, you see everyone starting to laugh (positive target)
b) When you get to the punch line, everyone looks confused (negative target)
c) When you leave, you receive many enthusiastic compliments (positive foil)
d) When you start telling your joke, someone interrupts you (negative foil)

**11. The swimming pool**
A) Your friend persuades you to go swimming in an attempt to get fit. As you pull on your bathing suit beforehand, you realize that it has been a long time since you have worn it. When you arrive at the swimming pool, you notice that other people turn to look in your d i r e c t i o n\d-r-ct-on\c

Was your bathing suit an old one? (Y)

B) the swimming pool
a) As you walk in, some people seem to be admiring your swimsuit (positive target)
b) As you walk in, some people seem to be making fun of your bathing suit (negative target)
c) As you walk in, some people seem to be discussing what a great swimmer you are (positive foil)
d) As you walk in, some people seem to be discussing what a slow swimmer you are (negative foil)

**12. The second date**
A) You recently went on a first date with an acquaintance. The date started off well, but seemed less comfortable as the night went on. Nevertheless, you agree to a second date. When you call him/her to confirm your plans, the phone rings many times before s/he picks up the t e l e p h o n e\t-l-p-on-\e

Have you known your date for a long time? (N)

B) the second date
a) When s/he picks up the phone, s/he says that s/he is happy to hear from you (positive target)
b) When s/he picks up the phone, s/he sounds disappointed to hear from you (negative target)

c) When s/he picks up the phone, s/he tells you how much s/he has missed you (positive foil)
d) When s/he picks up the phone, s/he tells you that s/he is busy and will have to call you back (negative foil)

**13. The bank meeting**
A) Your account at the bank is $1000 overdrawn. You receive a phone call from your bank manager, asking you to come in and discuss the situation. As you arrive, she smiles briefly at you and you feel that the meeting will be q u i c k\qui-k\c

Did you receive an email from your bank manager? (N)

B) the bank meeting
a) The bank manager tells you that it will be ok and the bank will take care of it (positive target)
b) The bank manager tells you that this is a large problem (negative target)
c) The bank manager tells you that the problem was their fault and apologizes for their mistake (positive foil)
d) The bank manager tells you that they can no longer handle your account at their bank (negative foil)

**14. The piano recital**
A) You have been practicing a difficult piece on the piano for several months. You intend to play it at your upcoming piano recital, but are nervous about performing in front of an audience. After performing the piece, you notice some people in the audience begin to s t a n d\st-n-\n

Did you practice your piece for more than a month? (Y)

B) the piano recital
a) After you finish, some people in the audience begin to stand and clap appreciatively (positive target)
b) After you finish, some people in the audience walk out of the room (negative target)
c) After you finish, some people give you a standing ovation and ask you to play another piece (positive foil)
d) After you finish, some people decide they do not want to hear anymore and go home (negative foil)

**15. The final exam**
A) You have been studying for a difficult final exam for the past few days. It counts for a large portion of your grade, and you are currently in danger of failing the class. After the exam, your professor says she is surprised with your grade and calls you into her office to discuss your final g r a d e s\gr-d-s\d

Were you doing well in the class? (N)

B) the final exam
a) Your professor tells you that you passed the class (positive target)
b) Your professor tells you that you did not pass the class (negative target)
c) Your professor tells you that you received the best grade in the class (positive foil)
d) Your professor tells you that you will have to repeat all of the coursework over the summer (negative foil)

**16. The class presentation**
A) You have been working on a presentation with your classmates for the past several days. Although everyone is required to present, you have the largest part. After the presentation, your classmates approach you to speak with you about your p e r f o r m a n c e\p-rf—m—c-\f

Are you responsible for the largest part of the presentation? (Y)

B) the class presentation
a) Your classmates tell you that you did a great job presenting (positive target)
b) Your classmates tell you that they did not think you did a good job presenting (negative target)
c) Your classmates tell you that they liked your outfit (positive foil)
d) Your classmates tell you they think the professor found your presentation boring (negative foil)

**17. The movie date**
A) Your have not spent much time with your partner lately because s/he has been extremely busy with schoolwork. You have plans to see a movie together tomorrow night, but s/he calls to cancel because s/he needs to stay in to s t u d y\s-u-y \t

Were you supposed to go to the library with your partner tomorrow night? (N)

B) the movie date
a) Your partner needs to stay home to study for his/her classes (positive target)
b) Your partner would rather stay home to study than to go to the movies with you (negative target)

c) Your partner later changes his/her mind and decides to go to see the movie with you (positive foil)
d) Your partner is lying to you and is not really staying home to study (negative foil)

**18. The political discussion**
A) At lunch time, you find yourself involved in a discussion about politics. One of your classmates expresses views, which you do not agree with. When you express how you feel, you see the expression on your friend's face begin to c h a n g e\ch—g- \h

Do you disagree with your friend's views? (Y)

B) the political discussion
a) While you express your opinion, you friend listens attentively to what you have to say (positive target)
b) While you express your opinion, you friend seems to look annoyed at your disagreement (negative target)
c) After you expression your opinion, your friend realizes that you make a good point (positive foil)
d) After you express your opinion, your friend beings to argue with you (negative foil)

**19. Selecting music**
A) You are throwing a surprise party for your best friend and are responsible for picking out the music. As the guests start to arrive, you hear them discussing the musical selections. As you move closer to a group of friends, you are able to hear their comments more c l e a r l y \cl—r-y\r

Are you only responsible for picking out the food for the party? (N)

B) selecting music
a) You overhear your friends saying how much they are enjoying the music (positive target)
b) You overhear your friends saying that they do not like the music that is playing (negative target)
c) You overhear your friends saying how much they are enjoying the food at the party (positive foil)
d) You overhear your friends saying how much they dislike the food at the party (negative foil)

**20. The review meeting**

A) You are scheduled to meet with your boss for your semi-annual review. When he is ready, he calls you into his office for your scheduled meeting. He tells you to relax, while discussing your

e v a l u a t i o n\ev-l—ti-n\u

Are you meeting for your monthly review with your boss? (N)

B) the review meeting

a) Your boss tells you that you have been doing a good job (positive target)

b) Your boss tells you that you will need to make improvements in several areas (negative target)

c) Your boss tells you that he is giving you a promotion (positive foil)

d) Your boss tells you that you may need to start looking for a new job (negative foil)

# Appendix C: Stress-Vulnerability Task Script

In this activity we are measuring the accuracy with which you are able to identify an emotional face that is presented subliminally (below your threshold to see it clearly).

People's ability to subliminally perceive emotions has been found to be strongly associated with their interpersonal skills. These skills are thought to reflect high emotional intelligence (EQ), which is vital to functioning well in social situations. Specifically, research has shown that those with high EQ are more successful in the workplace and are able to form more meaningful relationships (Goleman, 2005).

We have found that individuals who do well on this computer activity have a good understanding of people and are well-liked by others.

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A happy, angry, or sad face will be flashed on the screen very briefly, followed by a neutral face. Then a "?" will appear for 2 seconds. When you see the "?", press a key to indicate the emotion you think was depicted in the subliminal face: happiness, anger, or sadness.

Press the key as quickly and accurately as you can - you will only have 2 seconds to respond before the next face appears. Even if you feel that you did not see the emotional face well, make a guess as to which of these three emotions was expressed.

You should keep your fingers on the three response buttons throughout the task.

Press:
"H" if you believe the face was expressing happiness
"A" if you believe the face was expressing anger
"S" if you believe the face was expressing sadness

---

You will begin with a set of practice trials. After this practice, you will begin the experiment.

During the experiment you will occasionally receive feedback about how you are doing, followed by some questions. Receiving a "SUCCESS!" feedback indicates that you performed in the top third of all people we have tested. A feedback of "AVERAGE" indicates that you were as accurate as the middle third of the people we tested. Finally, a "FAILURE!" feedback indicates that you performed poorly - in the bottom third of all the people who have participated in this activity.

Please try your best as this task provides us important information about your emotional intelligence.

If you have any questions about the task, please ask the experimenter now.

# Appendix D: Debriefing Script

You have now completed the session. Do you have any questions?

Was the experiment entirely clear? Did all aspects of the procedure make sense? Everyone reacts to things in different ways and it would be helpful to hear about your feelings about and reactions to the experiment.

Did you find any aspect of the procedure odd, confusing, or disturbing?

Do you think there may have been more to the experiment than meets the eye? [ask him/her to elaborate on the answers]

We all experience and deal with stressful situations differently. However, it is still not clear what factors may play a role in how well people are able to cope with difficult situations. Many researchers think that the way people think about situations may affect their ability to handle stressful situations. For example, some people may tend to make more negative interpretations of situations, while others may make more positive interpretations. Therefore, this study was designed to examine if training people to make positive or negative interpretations would later affect their ability to deal with a stressful situation. Given this goal, there were some aspects of the study that we could not discuss with you in advance.

The first computer task that you completed in this experiment was intended to implicitly train you to make either positive or negative interpretations of the scenarios that you read. The following computer tasks were then designed to test if, in fact, you were more prone to making interpretations in the direction that you were previously trained. Because we are interested in how you would then react to a stressful situation following this training, we had to create a situation that would create an emotional response. Therefore, the results for the last computer task that you completed, which involved identifying the emotions on the faces, was not real. It was very important for us to present every participant in our study with same information so that we could study each individual's responses to the same stressful event. So to make sure that everyone was on the same page, we presented the same negative feedback to all of our participants, regardless of your actual answers on the task. Thus, the negative feedback you received about how you were doing on the task was not real and did not say anything about your social perception skills.

We regret that we had to present this fake negative feedback to you, but this really was our only option to be able to interpret our results. We realize that this might induce

feelings of frustration but we hope that our explanation clears up any negative feelings you might have. We really appreciate your participation in this study.

How are you feeling right now that you learned more about our study?

[If they are okay]
Your participation really helps us understand depression better, and we are really thankful that you participated.

[If they are upset/ have questions]
Discuss further and offer resources if participants seem more depressed or anxious. If the participants have any questions or comments, please ask them to contact Jutta Joormann at jjoormann@psy.miami.edu, or (350) 2842641, or Lira Yoon at klira@psy.miami.edu anytime.

# Appendix E: Beck Depression Inventory (BDI-II)

This questionnaire consists of 21 groups of statements. Please read each group of statements carefully, and then pick out the ONE STATEMENT in each group that bests describes the way you have been feeling during the PAST TWO WEEKS, INCLUDING TODAY. Circle the number beside the statement you have picked. If several statements in the group seem to apply equally well, circle the highest number for that group. Be sure that you do not choose more than one statement for any group, including Item 16 (Changes in sleeping pattern) or Item 18 (Changes in Appetite).

**1. Sadness**
- 0 I do not feel sad.
- 1 I feel sad much of the time.
- 2 I am sad all the time.
- 3 I am so sad or unhappy that I can't stand it.

**2. Pessimism**
- 0 I am not discouraged about my future.
- 1 I feel more discouraged about my future than I used to be.
- 2 I do not expect things to work out for me.
- 3 I feel that my future is hopeless and will only get worse.

**3. Past Failure**
- 0 I do not feel like a failure.
- 1 I have failed more I should have.
- 2 As I look back, I see a lot of failures.
- 3 I feel I am a total failure as a person.

**4. Loss of Pleasure**
- 0 I get as much pleasure as I ever did from the things I enjoy.
- 1 I don't enjoy things as much as I used to.
- 2 I get very little pleasure from the things I used to enjoy.
- 3 I can't get any pleasure from the things I used to enjoy.

**5. Guilty Feelings**
- 0 I don't feel particularly guilty.
- 1 I feel guilty over many things I have done or should have done.
- 2 I feel quite guilty most of the time.
- 3 I feel guilty all of the time.

**6. Punishment Feelings**
- 0 I don't feel I am being punished.
- 1 I feel I may be punished.
- 2 I expect to be punished.
- 3 I feel I am being punished.

**7. Self-Dislike**
- 0 I feel the same about myself as ever.
- 1 I have lost confidence in myself.
- 2 I am disappointed in myself.
- 3 I dislike myself.

**8. Self-Criticalness**
- 0 I don't criticize or blame myself more than usual.
- 1 I am more critical of myself than I used to be.
- 2 I criticize myself for all of my faults.
- 3 I blame myself for everything bad that happens

**9. Suicidal Thoughts or Wishes**
- 0 I don't have any thoughts of killing myself.
- 1 I have thoughts of killing myself, but I would not carry them out.
- 2 I would like to kill myself.
- 3 I would kill myself if I had the chance.

**10. Crying**
- 0 I don't cry any more than I used to.
- 1 I cry more than I used to.
- 2 I cry over every little thing.
- 3 I feel like crying, but I can't.

**11. Agitation**

0 I am no more restless or wound up than usual.
1 I feel more restless or wound up than usual.
2 I am so restless or agitated that it's hard to stay still.
3 I am so restless or agitated that I have to keep moving or doing something.

**12. Loss of Interest**

0 I have not lost interest in other people or activities.
1 I am less interested in other people or things than before.
2 I have lost most of my interest in other people or things.
3 It's hard to get interested in anything.

**13. Indecisiveness**

0 I make decisions about as well as ever.
1 I find it more difficult to make decisions than usual.
2 I have much greater difficulty in making decisions than I used to.
3 I have trouble making any decisions.

**14. Worthlessness**

0 I don't feel I am worthless.
1 I do not consider myself as worthwhile and useful as I used to.
2 I feel more worthless as compared to other people.
3 I feel utterly worthless.

**15. Loss of Energy**

0 I have as much energy as ever.
1 I have less energy than I used to have.
2 I don't have enough energy to do very much.
3 I don't have enough energy to do anything.

**16. Changes in Sleeping Pattern**

0 I have not experienced any change in my sleeping pattern.

---

1a I sleep somewhat more than usual.
1b I sleep somewhat less than usual.

---

2a I sleep a lot more than usual.
2b I sleep a lot less than usual.

---

3a I sleep most of the day.
3b I wake up 1-2 hours early and can't get back to sleep.

**17. Irritability**

0 I am no more irritable than usual.
1 I am more irritable than usual.
2 I am much more irritable than usual.
3 I am irritable all the time.

**18. Changes in Appetite**

0 I have not experienced any change in my appetite.

---

1a My appetite is somewhat less than usual.
1b My appetite is somewhat greater than usual.

---

2a My appetite is much less than before.
2b My appetite is much greater than usual.

---

3a I have no appetite at all.
3b I crave food all the time.

**19. Concentration Difficulty**

0 I can concentrate as well as ever.
1 I can't concentrate as well as usual.
2 It's hard to keep my mind on anything for very long.
3 I find I can't concentrate on anything.

**20. Tiredness or Fatigue**

0 I am no more tired or fatigued than usual.
1 I get more tired or fatigued more easily than usual.
2 I am too tired or fatigued to do a lot of the things I used to do.
3 I am too tired or fatigued to do most of the things I used to do.

**21. Loss of interest in Sex**

0 I have not noticed any recent change in my interest in sex.
1 I am less interested in sex than I used to be.
2 I am much less interested in sex now.
3 I have lost interest in sex completely.

## Appendix F: General Self-Efficacy Scale (GSE)

1 = Not at all true  2 = Hardly true  3 = Moderately true  4 = Exactly true

_____ 1. I can always manage to solve difficult problems if I try hard enough.

_____ 2. If someone opposes me, I can find the means and ways to get what I want.

_____ 3. It is easy for me to stick to my aims and accomplish my goals.

_____ 4. I am confident that I could deal efficiently with unexpected events.

_____ 5. Thanks to my resourcefulness, I know how to handle unforeseen situations.

_____ 6. I can solve most problems if I invest the necessary effort.

_____ 7. I can remain calm when facing difficulties because I can rely on my coping abilities.

_____ 8. When I am confronted with a problem, I can usually find several solutions.

_____ 9. If I am in trouble, I can usually think of a solution.

_____ 10. I can usually handle whatever comes my way.

## Appendix G: Life Orientation Test – Revised (LOT-R)

Please be as honest and accurate as you can throughout. Try not to let your response to one statement influence your responses to other statements. There are no "correct" or "incorrect" answers. Answer according to your own feelings, rather than how you think "most people" would answer.

A = I agree a lot
B = I agree a little
C = I neither agree nor disagree
D = I disagree a little
E = I disagree a lot

1. In uncertain times, I usually expect the best.
[2. It's easy for me to relax.]
3. If something can go wrong for me, it will.
4. I'm always optimistic about my future.
[5. I enjoy my friends a lot.]
[6. It's important for me to keep busy.]
7. I hardly ever expect things to go my way.
[8. I don't get upset too easily.]
9. I rarely count on good things happening to me.
10. Overall, I expect more good things to happen to me than bad.

---

Note:

Items 2, 5, 6, and 8 are fillers. Responses to "scored" items are to be coded so that high values imply optimism. Researchers interested in testing the potential difference between affirmation of optimism and disaffirmation of pessimism should compute separate subtotals of the relevant items.

Appendix H: Resultant Self-Esteem Scale (RSES)

This scale consists of a number of words or phrases that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. **Indicate to what extent you feel this way right now**. Use the following scale to record your answers:

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|
| very slightly or not at all | | a little | | | moderately | | | quite a bit | | extremely |

| | | |
|---|---|---|
| _____ contented | _____ disappointed | _____ energetic |
| _____ satisfied | _____ calm | _____ self-centered |
| _____ angry | _____ thankful | _____ safe |
| _____ optimistic | _____ sad | _____ upset |
| _____ discouraged | _____ confident | _____ effective |
| _____ shame | _____ fearful | _____ helpless |
| _____ inadequate | _____ pride | _____ disgust |
| _____ frustrated | _____ insecure | _____ incompetent |

# Appendix I: Rosenberg Self-Esteem Scale (RSE)

Please answer the following questions, using the scale below.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| Totally disagree | Disagree very much | Disagree slightly | Neutral | Agree slightly | Agree very much | Totally agree |

| | |
|---|---|
| 1. On the whole, I am satisfied with myself. | 1 2 3 4 5 6 7 |
| 2. At times I think that I am no good at all. | 1 2 3 4 5 6 7 |
| 3. I feel that I have a number of good qualities. | 1 2 3 4 5 6 7 |
| 4. I am able to do things as well as most other people. | 1 2 3 4 5 6 7 |
| 5. I feel that I do not have much to be proud of. | 1 2 3 4 5 6 7 |
| 6. I certainly feel useless at times. | 1 2 3 4 5 6 7 |
| 7. I feel that I'm a person of worth, at least on an equal plane with others. | 1 2 3 4 5 6 7 |
| 8. I wish I could have more respect for myself. | 1 2 3 4 5 6 7 |
| 9. All in all, I am inclined to feel that I am a failure. | 1 2 3 4 5 6 7 |
| 10. I take a positive attitude toward myself. | 1 2 3 4 5 6 7 |

# Appendix J: Ruminative Response Scale (RRS)

People think and do many different things when they feel depressed. Please read each of the following items and indicate whether you never, sometimes, often, or always think or do each one when you feel down, sad, or depressed. Please indicate what you generally do, not what you think you should do.

| | | Almost Never | Some-times | Often | Almost Always |
|---|---|---|---|---|---|
| 1. | Think about how alone you feel | 1 | 2 | 3 | 4 |
| 2. | Think "I won't be able to do my job/work because I feel so badly." | 1 | 2 | 3 | 4 |
| 3. | Think about your feelings of fatigue and achiness | 1 | 2 | 3 | 4 |
| 4. | Think about how hard it is to concentrate | 1 | 2 | 3 | 4 |
| 5. | Think about how passive and unmotivated you feel | 1 | 2 | 3 | 4 |
| 6. | Analyze recent events to try to understand why you are depressed | 1 | 2 | 3 | 4 |
| 7. | Think about how you don’t seem to feel anything anymore | 1 | 2 | 3 | 4 |
| 8. | Think “Why can’t I get going?” | 1 | 2 | 3 | 4 |
| 9. | Think “Why do I always react this way?” | 1 | 2 | 3 | 4 |
| 10. | Go away by yourself and think about why you feel this way | 1 | 2 | 3 | 4 |
| 11. | Write down what you are thinking about and analyze it | 1 | 2 | 3 | 4 |
| 12. | Think about a recent situation, wishing it had gone better | 1 | 2 | 3 | 4 |
| 13. | Think “Why do I have problems other people don’t have?” | 1 | 2 | 3 | 4 |
| 14. | Think about how sad you feel | 1 | 2 | 3 | 4 |
| 15. | Think about all your shortcomings, failings, faults, mistakes | 1 | 2 | 3 | 4 |
| 16. | Think about how you don’t feel up to doing anything | 1 | 2 | 3 | 4 |
| 17. | Analyze your personality to try to understand why you are depressed | 1 | 2 | 3 | 4 |
| 18. | Go someplace alone to think about your feelings | 1 | 2 | 3 | 4 |
| 19. | Think about how angry you are with yourself | 1 | 2 | 3 | 4 |
| 20. | Listen to sad music | 1 | 2 | 3 | 4 |

| | | | | | |
|---|---|---|---|---|---|
| 21. | Isolate yourself and think about the reasons why you feel sad | 1 | 2 | 3 | 4 |
| 22. | Try to understand yourself by focusing on your depressed feelings | 1 | 2 | 3 | 4 |
| 23. | What am I doing to deserve this? | 1 | 2 | 3 | 4 |
| 24. | I won't be able to concentrate if I keep feeling this way. | 1 | 2 | 3 | 4 |
| 25. | Why can't I handle things better? | 1 | 2 | 3 | 4 |