

EFFECTS OF DEBIASING ON PESSIMISTIC PREDICTIONS:  
A COMPARISON OF CLINICALLY ANXIOUS INPATIENTS  
AND NON-ANXIOUS COLLEGE STUDENTS

A DISSERTATION

SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE  
DEGREE OF DOCTOR OF PHILOSOPHY  
IN THE GRADUATE SCHOOL OF THE  
TEXAS WOMAN'S UNIVERSITY

COLLEGE OF ARTS AND SCIENCES

BY

STEPHANIE G. BARFIELD, M.A.

DENTON, TX

AUGUST 2009

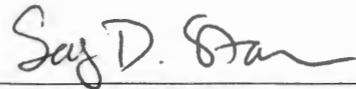
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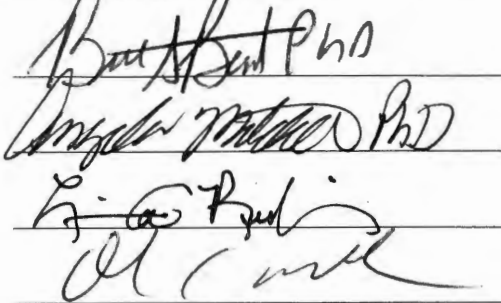
To the Dean of the Graduate School:

I am submitting herewith a dissertation written by Stephanie Barfield entitled "Effects of Debiasing on Pessimistic Predictions: A Comparison of Clinically Anxious Inpatients and Non-Anxious College Students." I have examined this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirement for the degree of Doctor of Philosophy with a major in Counseling Psychology.



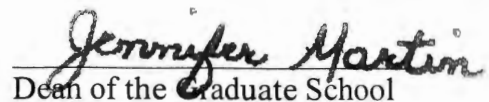
Sally D. Stabb, Ph.D., Major Professor

We have read this dissertation and recommend its acceptance:



Department Chair

Accepted:

  
Dean of the Graduate School

## DEDICATION

To members of the faculty, who brought such wonderful insight to how I experience the world and practice psychology. I am especially grateful to Dr. Bentz and Dr. Stabb who lent their expertise to guide me in becoming a better researcher and clinician. To my husband who always inspires me to give priority to the dearest things in life. To my children who help me to see wonderment and beauty in the here and now. To my loving parents and brother who somehow always believed me to be brilliant despite my failings. To the faculty of St. Joseph's Academy, who taught me to be a Catholic woman as equally strong in her faith as in her intellect. And finally to all of my Christian brothers and sisters whose unfailing prayers and support made my graduate experience possible.

## ABSTRACT

STEPHANIE BARFIELD

### EFFECTS OF DEBIASING ON PESSIMISTIC PREDICTIONS: A COMPARISON OF CLINICALLY ANXIOUS INPATIENTS AND NON-ANXIOUS COLLEGE STUDENTS

AUGUST 2009

Previous research has indicated that the Consider-An-Alternative debiasing procedure, which prompts individuals to generate positive alternatives to hypothetical events, reduced pessimistic judgmental predictions associated with anxiety. The purpose of this study was to expand the investigation of this procedure to include clinically anxious individuals and add a follow-up component. This investigation was achieved via archival data, which included clinical participants from an in-patient psychiatric hospital and undergraduate participants from a large public university in the Southwest. All participants had been randomly assigned to either a control or debiasing group. After completing the trait portion of the State-Trait Anxiety Inventory (STAI; Spielberger et al., 1970), they participated in a pre-test where they were asked to rate the likelihood of hypothetical events. After participating in either the debiasing or control exercises, they were administered a posttest and a follow-up one week later. While results supported previous findings that highly anxious individuals generate more pessimistic predictions of future events than their non-anxious counterparts, the current study did not find the

debiasing procedure to make significant improvements in pessimistic predictions at the posttest measure and one-week follow-up.

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## CHAPTER I

### INTRODUCTION

Everyone is curious about what the future may hold. Individuals are constantly assessing risks and benefits, predicting what might happen in the future. They estimate the probability of future events and consider what they may do to minimize the costs and increase the benefits of what lies ahead. Anticipation of such outcomes is functional in everyday life. For instance, a driver might make the prediction that a car in the next lane will not suddenly try to change lanes and cause an accident. Another example of predicting outcomes is how doctors assess the risk and benefits of proceeding with particular treatments. These predictions, which estimate future outcomes, greatly influence how individuals proceed with decisions.

People assess the potential risk involved in given situations by deriving information from various sources. From reading daily horoscopes to reviewing the 52-week track of a stock, some seek the advice of so called experts, while others review past experiences. No matter the source from which individuals derive their information, the contexts of their own situations are sure to affect how they see and interpret the likelihood of particular outcomes for pending situations. Sage advice would be to consider all of the possible outcomes before proceeding. However, most people do not attend to all possible information before making assumptions about the future, thereby creating biased contexts from which they base their interpretations.

Instead of considering all possible outcomes, individuals tend to rely on mental short-cuts to make assumptions about the future (Matlin, 2005). Such mental short-cuts and generalizations are called heuristics. While heuristics often support correct answers, they might also lead to faulty decisions and cause probability judgments about the future to be over- or underestimated (Kahneman & Frederick, 2002; Kahneman & Tversky, 1996). One of the most common heuristics is the availability heuristic, which is the tendency to estimate probability by how easy it is to generate relevant examples from memories (Tversky & Kahneman, 1973). Thus, when hypothetical events are difficult to imagine, the events are perceived to be not probable (Sherman, Cialdini, Schwartzman, & Reynolds, 2002).

As Counseling Psychologists, we strive to understand how context and processes, such as heuristics, might affect individuals' assumptions about life and attempt to help them discover whether their expectations are beneficial or detrimental to their emotional health (Yoder, 2003). There are several treatment modes by which psychologists attempt to help individuals improve emotional health. One of the most researched treatment methods is Cognitive-Behavioral Therapy (CBT). This mode of therapy has shown to be especially efficacious among individuals suffering from anxiety (Hirsch & Holmes, 2007; Hofmann, 2004; Hofman, Moscovitch, Kim & Taylor, 2004; Mathews, Mogg, Kentish, & Eyenck, 1995; Otto, 2005). Cognitive theorists have proposed that CBT is especially efficacious because it is believed that cognitive biases prime individuals to attend to threat-related information, thereby maintaining trait anxiety and possibly increasing state anxiety (Hirsch & Holmes, 2007; Huppert & Foa, 2004; MacLeod & Mathews, 1991;

Spokas, Rodebaugh, & Heimberg, 2007). In other words, individuals with anxiety are inclined to give attention to, remember, and make judgments that perpetuate their already established biases.

These biases toward threat-related information often result in anxious individuals overestimating the probability of future negative events (Bentz & Williamson, 1998; Bentz, Williamson, & Franks, 2004; Bentz, Williamson, & Smith, 1999; McManus, Clark, & Hackmann, 2000). As previously stated, erroneous judgments about future outcomes result from heuristics limiting the scope of information that individuals consider prior to making probability judgments. The availability heuristic, which stems from the tendency to use information that is most easily brought to mind, is thought to be the heuristic that aids probability judgments (Agnoli & Krantz, 1989; Dawes, 1998; Sherman et al., 2002; Tversky & Kahneman, 1973) and, thus, is likely to contribute to biases and subsequent judgment errors. Debiasing refers to the process of deliberately using cognitive techniques to reduce such judgment errors (Arkes, 1989; Fischhoff, 1982). Debiasing of the availability heuristic has shown to be the most efficacious when individuals take an active part instead of simply being made aware that an erroneous bias is present within the heuristics that they are using (Larrick, 2004).

The Consider-An-Alternative debiasing procedure asks individuals to be active in the generation of possible positive alternative outcomes for given situations (Hirt & Markman, 1995). This debiasing procedure has shown to be useful in broadening the scope of information to which individuals attend, remember, and base their subsequent judgments (Carroll, 1978; Hirt, Kardes, & Markman, 2004; Hirt & Markman, 1995;

Koehler, 1991; Sanna & Schwarz, 2003; Sanna, Schwarz, & Stocker, 2002). Instead of relying upon the eventual by-product of generating alternatives, the Consider-An-Alternative debiasing procedure explicitly instructs individuals to generate positive alternatives, thereby positively modifying interpretations and producing congruent emotional changes, such as decreased anxiety (Mathews, Ridgeway, Cook, & Yiend, 2007). Past research has shown the Consider-An-Alternative debiasing procedure to produce such congruency among subsequent probability judgments with both clinically anxious and non-anxious individuals (Bentz & Williamson, 1998; Bentz et al., 1999, 2004).

However, the full amount of positive effects from the debiasing procedure is not expected to carry-over into the follow-up assessment one week later. Though little research has included a follow-up component, one study showed that debiasing techniques that were not maintained across time only affected state anxiety, which was then free to return to cognitive biases that were congruent with trait anxiety (Mogg, Bradley, Millar, & White, 1995). These researchers proposed that more intense and longer maintained debiasing programs were needed in order to make a lasting affect on both the state and trait anxiety. In the proposed study, it is expected that all participants in the debiasing group will show a significant decrease in pessimistic probability judgment on the same day of the debiasing exercise and then will return to a pessimistic trend the following week, but slightly more positive than during the pre-test before the debiasing exercise. Such results could show that even though the effects of debiasing do not

completely maintain strength across time, debiasing has the potential to build upon residual effects in order to make lasting changes through continued treatment.

### Definition of Terms

**Anchor and Adjustment Heuristic** – “A decision-making heuristic in which people begin with a first approximation (an anchor) and then make adjustments to that number (the original anchor) on the basis of additional information” (Matlin, 2005, p. 495).

**Anxiety** – An emotion that may be experienced as the fear of losing control or the fear of dying, and manifest in avoidance of social interactions, unreasonable worry about future events, and invasive thoughts about anxiety-provoking stimuli (American Psychiatric Association, APA, 2000).

**Attention** – “A concentration of mental activity” (Matlin, 2005, p. 495).

**Availability Heuristic** – “A decision-making heuristic in which frequency or probability is estimated in terms of how easy it is to think of examples of something” (Matlin, 2005, p. 495).

**Bias Inoculation** – An educational debiasing method that instructs individuals to make adjustments to compensate for initial judgments (Mumma & Wilson, 1995).

**Cognitive-Behavioral Therapy (CBT)** – Psychotherapy that challenges cognitions, assumptions, beliefs, and behaviors so as to influence positively negative emotions that result from inaccurate appraisals (Beck & Clark, 1997; Hollon & Beck, 2004).

**Consider-An-Alternative** – A debiasing technique that prompts individuals to think of alternatives beyond their initial cognitive judgments (Hirt & Markman, 1995).

Consider-The-Opposite Debiasing Technique – A debiasing technique where individuals are prompted to focus on outcomes that are the opposite of their initial cognitive judgments (Mumma & Wilson, 1995).

Debiasing – Cognitive techniques that reduce judgment errors (Arkes, 1989).

Explicit Memory – Conscious memory that requires strategic and effortful retrieval of learned information (Coles & Heimberg, 2002).

Heuristics – “A general problem-solving strategy that typically produces a correct solution” (Matlin, 2005, p. 501).

Implicit Memory – Retrieved memory that originally was unintentionally learned through experience (Coles & Heimberg, 2002).

Judgmental Bias – Selective cognitive processing of irrelevant emotional information while ignoring more relevant aspects during problem-solving (Houde & Moutier, 2003; Mineka & Sutton, 1992).

Memory bias – Selective encoding, elaboration, and retrieval of information that reflects the current emotional state (MacLeod, 1991; MacLeod & Mathews, 1991; Mineka, 1992).

Note-taking – Debiasing initial cognitions by taking notes on relevant information, and thereby increasing attention to stimuli that would lead to more accurate judgments (Mumma & Wilson, 1995).

Representativeness Heuristic – “A decision-making heuristic by which a sample is judged likely if it is similar to the population from which it was selected” (Matlin, 2005, p. 506).



State Anxiety – Current level of anxiety (Spielberger, Gorsuch, & Lushene, 1970).

Trait Anxiety – General level of anxiety (Spielberger et al., 1970).

## CHAPTER II

### REVIEW OF LITERATURE

Cognitive theorists conceptualizing psychopathology have postulated that biases in information processing give rise to the maintenance of emotional disorders (Mathews & MacLeod, 2002). Specifically, the pessimistic processing of information pertaining to attention, memory, and judgment may play a role in the development and maintenance of pathological emotional states.

The reduction, or debiasing, of these processing biases has been investigated in analog populations of anxiety and dietary restraint (Bentz & Williamson, 1998; Bentz et al., 1999, 2004). In particular, a cognitive procedure that forces participants to generate positive alternative outcomes has been shown to significantly reduce pessimistic predications. However, this procedure has yet to be tested in any clinical population and its stability over time has not been established. The current study proposes to test the Consider-An-Alternative debiasing procedure in a clinical population and with a one-week follow-up. The review of the relevant literature will include research pertaining to anxiety, cognitive biases, cognitive heuristics, debiasing, and cognitive theories of psychopathology.

#### Anxiety

Approximately 40 million American adults have been diagnosed with some kind of anxiety disorder (Kessler, Chiu, Demler, & Walters, 2005). Broadly, anxiety disorders

include “Panic Disorder Without Agoraphobia, Panic Disorder With Agoraphobia, Agoraphobia Without History of Panic Disorder, Specific Phobia, Social Phobia, Obsessive-Compulsive Disorder, Posttraumatic Stress Disorder, Acute Stress Disorder, Generalized Anxiety Disorder, Anxiety Disorder Due to a General Medical Condition, Substance-Induced Anxiety Disorder, and Anxiety Disorder Not Otherwise Specified” (APA, 2000, p. 429). Symptoms of these various diagnoses can often be disruptive to the lives of those who suffer from anxiety. These symptoms often include heart palpitations, sweating, trembling, sensations of shortness of breath, feeling of choking, chest pain, nausea, dizziness, feelings of unreality, fear of losing control or going crazy, fear of dying, sensations of numbness, and chills or hot flashes (APA, p.432). The emotion also may be experienced as intense apprehension, fearfulness, terror, and impending doom. Anxiety often results in avoidance of places or situations, unreasonable worry about future events, difficulty with concentration, racing thoughts, muscle tension, difficulty falling asleep, exaggerated startle response, and invasive thoughts about anxiety-provoking stimuli (APA, 2000).

With such prevalence of anxiety-related diagnoses, it has become extremely likely for therapists to work with individuals who suffer from these symptoms. As such, the field of psychology has spent a lot of time investigating ways of alleviating anxiety. Cognitive Behavioral Therapy (CBT) exercises that test the pessimistic cognitions of those diagnosed with anxiety have been researched extensively and have been shown to be highly efficacious (Hollon & Beck, 2004). In reviews of therapeutic approaches, researchers have generally found Cognitive Behavioral Therapy exercises to be more

effective with symptoms of anxiety than other psychotherapies (Clark, 2001; Craske, Maidenberg, & Bystritsky, 1995; Hofman et al., 2004; Huppert & Foa, 2004; Lundh & Ost, 2001; Mathews et al., 1995; Otto, 2005; Rapee & Heimberg, 1997; Van den Hout, Arntz, & Hoekstra, 1994; Waters, Wharton, Zimmer-Gembeck, & Craske, 2008) and to have lasting effects at follow-up visits (Hofmann, 2004; Mersch, Emmelkamp, & Lips, 1991; Turner, Beidel, & Cooley-Quille, 1995). Cognitive behavioral theorists have proposed that CBT's effectiveness was due to the alterations of cognitive biases that otherwise served to initiate and maintain anxiety states (Clark, 2001; Hollen & Beck, 2004; Huppert & Foa, 2004; Rapee & Heimberg, 1997). Some theorists have posited that by teaching anxious individuals techniques for altering their cognitions, they gained a sense of control over their own thoughts and were able to break a cycle that primes them toward states of anxiety (Huppert, Pasupuleti, Foa, & Mathews, 2007).

### Cognitive Biases in Anxiety

In recent years, researchers of cognitive and cognitive-behavioral theories have expanded their focus to investigate the relationship between cognitions and emotions (Bower, 1981; Eysenck, 1984; Foa & Jaycox, 1999; Hirsch & Holmes, 2007; Huppert & Foa, 2004; Mathews et al., 1995; Mogg et al., 1995; Spokas et al., 2007; Westling & Ost, 1995). Literature in the field, such as Beck's work with schema theory (Beck, 1976) and Bower's semantic network theory (1981), have paved the way for cognitive theorists to increase their attention to cognitive aspects of emotion.

Over the years, literature on cognitions and emotions has shown evidence to support the idea that emotions, such as anxiety, were multidimensional (Otto, McNally,

Pollack, & Chen, 1994; Spokas et al., 2007). Cognitive behavioral theorists have proposed a six-system model to conceptualize the formation and maintenance of anxiety disorders (Wilken, Smith, Tola, & Mann, 1999). The model included physiological, behavioral, cognitive, affective, trait, and state components of anxiety.

Naturally, cognitive components of anxiety have been a focus of CBT. It has been believed that there is a cognitive bias that provokes anxiety (Bower, 1981; Foa & Jaycox, 1999; Huppert & Foa, 2004; Schulz, Alpers, & Hofmann, 2008; Spokas et al., 2007). Studies have found that individuals with high levels of anxiety have often encoded information so that they were primed to attend to threat-related information (Barlow, 2002; Dagleish et al., 2003; Hayes & Hirsch, 2007; MacLeod & Mathews, 1991; Mineka, 1992). One reason this may have occur is that information congruent with a state of emotion was easier to encode and retrieve (Coles & Heimberg, 2002; Reidy & Richards, 1997). Thus, much research on anxiety has focused on the processes by which cognitive biases develop. The areas of cognitive bias research included attentional, memory, and judgmental. Each area of research will be reviewed.

### *Attentional*

In order to process information, one must attend to the given information. Attention is a cognitive process of concentrating on selected information from surrounding stimuli (Matlin, 2005). Attention can be biased when a disproportionate amount of cognitive resources is given to particular emotional stimuli. Studies have found that highly-anxious individuals attended to threat-related information and allocated their cognitive resources accordingly (Mitte, 2007). There have been many examples

illustrating the idea that anxious individuals not only attended more to threat-related information, but also jumped to pessimistic conclusions when presented with ambiguous information (Bentz & Williamson, 1998; Bentz et al., 1999, 2004; Constans, Penn, Ihen, & Hope, 1999; Hayes & Hirsch, 2007; Mathews & Mackintosh, 1998; Mathews, Yiend, & Lawrence, 2004). Evidence of this attentional bias has been exhibited across three different methods of studies including Stroop color-naming tasks, dichotic listening tasks, and other visual selective-attention tasks.

First, the original Stroop color-naming task (1935) found that individuals named the ink color of conflicting color words slower than the ink color of non-word stimuli. Theoretically, the content meaning of the word interfered with attention and slowed responses, in comparison to the non-word stimuli. Since the original study, the Stroop color-naming task has been modified and used repeatedly to study anxiety. The modified version of the research method has required anxious and non-anxious participants to name the color of ink of various threat-related and non-threat-related words, while ignoring the content of each word meaning (Stroop, 1938). Studies using this modified version have consistently found significantly slower color-naming of threat-related words by individuals diagnosed with various anxiety disorders (Coles & Heimberg, 2002; Dalgleish et al., 2003; Ehler, Magraf, Davies, & Roth, 1988; Karademas, Christopoulou, Dimostheni, & Pavlu, 2008; Lundh & Ost, 2001; Mathews & MacLeod, 1985; Mattia, Heimberg, & Hope, 1993; Spector, Pecknold, & Libman, 2003; Watts, McKenna, Sharrock, & Trezise, 1986; Williams, Mathews, & MacLeod, 1996).

Vrana, Roodman, and Beckham (1995) studied Vietnam war veterans with and without posttraumatic stress disorder (PTSD) who participated in the modified Stroop color-naming task described above. The researchers found that, among veterans with PTSD, there was a delay in color-naming of Vietnam-related threat words. These findings suggested that there was an attentional bias toward the threat-related information, in this case, Vietnam-related threat words. Participants with higher anxiety levels found it more difficult to ignore the content of threat-related words and, thus, displayed difficulty by showing a delayed response before naming the color linked to those particular words compared to participants with lower anxiety levels.

Karademas, Christopoulou, Dimostheni, and Pavlu (2008) have exhibited a more recent example of employing the modified Stroop task in order to study anxiety. The researchers specifically examined whether anxiety about health issues translated into processing biases towards illness-related stimuli. In this study, 120 undergraduate university students completed a modified Stroop task and filled out questionnaires concerning current mood, state-anxiety, and anxiety toward health issues. The study yielded results indicating that participants with high levels of anxiety toward health issues also had greater time latency when presented with illness-related words than participants who had low levels of anxiety toward health issues. Ultimately, the researchers concluded that individuals with high levels of anxiety towards health issues experienced processing biases toward illness-related stimuli.

One criticism of using the modified Stroop task has been its apparent lack of specificity. For instance some researchers have proposed that clinically anxious

individuals may actually avoid the threat-related words, causing a delay in color-naming because cognitive resources are preoccupied with avoiding the anxiety-provoking stimuli (Bogels & Mansell, 2004; Vrana et al., 1995). Other researchers have found that non-significant latency differences between threat-related and depression-related stimuli among highly anxious individuals and highly depressed individuals (Daggleish, et al., 2003). However, Daggleish and his colleagues persisted in concluding that the delay in color-naming for threat-related words among highly anxious participants was due to an attentional bias. The researchers made this conclusion based on the congruent performance of the same highly anxious participants with a modified dot-probe measure, which showed more specificity between highly anxious and highly depressed participants.

Other studies have used modified dot-probe measures, supporting the conclusion that anxious individuals experience a processing bias toward threat-related stimuli (MacLeod, Mathews, & Tata, 1986; Mogg, Philippot, & Bradley, 2004; Musa, Lepine, Clark, Mansell, & Ehlers, 2003). In the study by MacLeod, Mathews, and Tata (1986) participants were presented with word pairs on a computer screen and instructed to read aloud only the top word. When that word was randomly replaced by a visual dot-probe, however, participants were to respond by pressing a button and reaction times were recorded. Reaction times indicated how much attention individuals had given to the word that directly preceded the dot-probe. The study found that when the word preceding the dot-probe was threat-related, individuals with higher levels of anxiety tended to have shorter reaction times. Thus, the study indicated that the participants had attended more



to the threat-related words than the neutral words. When the threat word was opposite the dot-probe, reaction times significantly decreased.

Yet another measure used to confirm bias cognitive processing toward threat-related stimuli among highly anxious individuals is the dichotic listening task. In the dichotic listening task, individuals were asked to listen simultaneously to competing auditory stimuli (Matlin, 2005). Each participant was then asked to focus on only one of the messages given to one of the ears and to ignore the message in the other ear. In the case of dichotic listening and the investigation of anxiety, participants were instructed to shadow the neutral message, thereby ignoring the threat information. Attention was measured either by a memory recall exercise or by reaction times toward visual stimuli.

Many studies have shown that participants with high levels of anxiety attend to and recall the message with threat-related content better than a message of neutral content (Bonanno, Davis, Singer, & Schwartz, 1991; Logan & Goetsch, 1993; Mathews & MacLeod, 1986; Mineka & Sutton, 1992; Wenzel, 2006). One of the most noted studies investigating dichotic listening and attentional bias was done by Mathews and MacLeod (1986). In this study, both clinically anxious and non-anxious participants were asked to respond to a visual probe while shadowing a message delivered to one ear. The non-shadowing ear presented both neutral and threat-related words. The researchers found that the clinically anxious participants responded slower than the non-anxious participants to the visual probe when it was preceded by a threat-related word in the unattended ear. Mathews and MacLeod (1986) concluded that this delay occurred

because the clinically anxious participants diverted their attention toward the threat-related word instead of toward the instructed task to respond to the visual probe.

A more recent example of the dichotic listening task supporting evidence of an attention bias toward threat-related stimuli among the highly anxious is a study by Wenzel (2006). This study included participants with diagnosed panic disorder, social phobia, and a control group of non-anxious individuals. All participants were asked to shadow ambiguous words that were presented in one ear while ignoring either panic-related, social anxiety-related, or neutral words in the other ear. Participants were also asked to simultaneously perform a simple reaction time task. The results showed that participants with anxiety diagnoses made more shadowing distortions, thereby supporting previous research that also found attention biases among highly anxious individuals.

In summary, research has shown that an attentional bias toward threat-related stimuli exists within highly anxious individuals. This conclusion has remained consistent across different methods of investigation and includes studies of Stroop color-naming, visual attention tasks, and dichotic listening.

### *Memory*

Memory bias is the selective encoding, elaboration, and retrieval of information that reflects the current emotional state (MacLeod, 1991; MacLeod & Mathews, 1991; Matlin, 2005; Mineka, 1992). In general, research has found that individuals' moods influence what they learn and remember resulting in better recall for stimuli that were congruent with their moods at the time that the stimuli were encoded (Bower, Gilligan, & Monteiro, 1981; Fiedler, 2001; Gilligan & Bower, 1983). Studies specifically have found

a memory bias among clinically anxious individuals for threat-related information (Coles & Heimberg, 2002; MacLeod, 1991; MacLeod & Mathews, 1991; Mineka, 1992; Reidy, 2004; Vassilopoulos, 2008).

Recently, researchers have specifically focused on what functions of memory are most biased by anxiety. Many researchers have suggested that previous research put too much emphasis on studying explicit memory bias over implicit memory bias (Harrison & Turpin, 2003; Hayes & Hirsch, 2007; Lang, Craske, Brown, & Ghaneian, 2001; Mineka & Sutton, 1992). Explicit memory, which often has been tested by free-recall or recognition exercises, is conscious memory that requires strategic and effortful retrieval of learned information (Coles & Heimberg, 2002). Implicit memory, on the other hand, is retrieved memory that originally was unintentionally learned through experience (Coles & Heimberg).

To account for the discrepancy between explicit and implicit memory biases, researchers have used cued recall exercises to test explicit memory bias and compared results to performance with word stem completion to test implicit memory bias (Harrison & Turpin, 2003; Oldenburg, Lundh, & Kivisto, 2002; Tarsia, Power, & Sanavio, 2003). The conclusion from such studies has suggested that threat-related information was encoded differently from other information, such as depression-related information (Lundh, Czyzykov, & Ost, 1997; Mathews & Mackintosh, 1998; Tarsia et al., 2003).

For example, Tarsia, Power, and Sanavio (2003) conducted a study comparing implicit and explicit memory biases in anxiety, depression and mixed anxiety-depression participants. All three groups completed a word identification task, testing implicit

memory and a task instructing free recall of depression relevant, anxiety relevant, and emotional positive and neutral words. This study showed that while all three groups displayed an explicit memory bias to words relevant to their diagnoses, the explicit memory bias was less pronounced than the implicit memory bias among participants only diagnosed with anxiety. These findings supported other research that has shown substantial evidence of an implicit memory bias for threat-related information in individuals with high levels of anxiety (Harrison & Turpin, 2003; Hayes & Hirsch, 2007; Lang, Craske, Brown, & Ghaneian, 2001; Mathews, Mogg, May, & Eysenck, 1989; MacLeod & McLaughlin, 1995; Mineka & Sutton, 1992).

In summary, the literature has progressed in recent years to show evidence that there is a link between anxiety and an implicit memory bias. Findings have suggested that threat-related information was not only encoded differently from other types of information, but was also retrieved differently, often in an unconscious manner. Regardless of what type of memory was used, the research has shown that individuals with anxiety more readily accessed threat-related information than non-threat-related information. In short, memory bias for threat-related information allowed for that information to be readily available when similar information was presented and needed interpretation.

### *Judgmental Bias*

Just as there is evidence of memory bias linked to anxiety, there is a great deal of evidence indicating a link between judgmental bias and anxiety (Bogels & Mansell, 2004; Hayes & Hirsch, 2007; Hirsch, Clark, & Mathews, 2006; McManus, Clark, &

Hackmann, 2000; Mineka & Sutton, 1992; Mogg et al., 2004; Wenzel, Frinstrom, Jordan, & Brendle, 2005). Judgmental bias is selective cognitive processing of irrelevant emotional information while ignoring more relevant aspects during problem-solving (Houde & Moutier, 2003; Mineka & Sutton, 1992). Emotional states have been found to influence judgmental biases so that individuals who were depressed and/or anxious were likely to predict that future negative events will happen (Bentz & Williamson, 1998; Bentz et al., 2004, 1999; Butler & Mathews, 1983; McManus et al., 2000). In the study of these two emotional states, several studies have found that this tendency toward pessimistic judgment biases in depressed individuals appeared to occur by a different process than in anxious individuals. For example, anxiety has shown to be more associated with attentional bias, while depression has been more associated with memory bias (Hayes & Hirsch, 2007; Mineka & Sutton, 1992, Tarsia et al., 2003). However, as stated earlier, memory bias in anxious individuals may have been difficult to detect because, while depression has been linked to an explicit memory bias, anxiety has been linked to an implicit memory bias. Also, depressed individuals were likely to predict pessimism globally whereas anxious individuals were likely to predict future negative events when the proposed scenario specifically involved them (Butler & Mathews, 1983; McManus et al., 2000). In other words, depressed individuals tended to be pessimistic about everything in general, while anxious individuals tended to limit their pessimism to personal future prospects.

Another factor in which depression and anxiety diverge in judgmental bias is in the content that produces the strongest judgment biases. A judgmental bias is more

prominent when the content of the stimuli applies specifically to the emotional state that is being tested. According to the content specificity hypothesis, the emotional concerns of individuals influence what information is processed and interpreted with a judgment bias (Bentz et al., 1999, Lamberton & Oei, 2008; Voncken, Bogels, & Peeters, 2007). For instance, Voncken et al. (2007) found that individuals with social phobia showed a judgmental bias in social situations but not in non-social situations. The participants with social phobia tended to have a pessimistic interpretation of social situations and judged social situations as more threatening than non-social situations. This study confirmed previous finding that showed evidence of content specific interpretation and judgment (Foa, Franklin, Perry, & Herbert, 1996; McManus et al., 2000; Voncken, Bogels, & de Vries, 2003).

Other studies investigating anxiety have chosen to focus on stimuli that were non-specific, namely ambiguous stimuli. Many of these studies have shown evidence that highly anxious individuals often selectively processed and judged emotional information such that ambiguous information was interpreted as having a threatening meaning (Eysenck, MacLeod, & Mathews, 1987; Eysenck, Mogg, May, Richards, & Mathews, 1991; Hayes & Hirsch, 2007; MacLeod & Cohen, 1993; Mathews, Richards, & Eysenck, 1989; Voncken et al., 2003; Wenzel et al., 2005). In a review of studies investigating information processing biases in generalized anxiety disorder, Hayes and Hirsch (2007) listed examples of ambiguous sentence materials that were often used in interpretation bias assessments. One such example was, “It has been very cold weather lately and you have been having the heater on high to help keep you and your family warm through the

night. When the gas bill arrives at the end of the month the amount is [affordable/unaffordable]” (Hayes & Hirsch, 2007, p. 179).

In general, studies have found that individuals with high levels of anxiety had a judgment bias that led them to overestimate the likelihood of negative events and the subsequent costs even when the given stimuli were ambiguous (Foa & Kozak, 1986; Gilboa-Schechtman, Franklin, & Foa, 2000; Hackmann, Clark, & McManus, 2000; Rheingold, Herbert, & Franklin, 2003). For example, Gilboa-Schechtman, Franklin, and Foa (2000) investigated probability and cost estimates among participants with social anxiety disorder and non-anxious controls. In the study, participants were asked to rate their emotional reactions to proposed negative and positive events. The researchers found that participants with social anxiety had judgmental biases that led them to rate the probability and cost of negative events as more likely to occur in comparison to positive events.

Within the research investigating judgmental biases of individuals with high levels of anxiety, an interaction between anxiety and sex has often been found. Bentz and Williamson (1998) demonstrated such a finding when they matched participants based on trait anxiety, perceived personal control, and sex. The results showed that all female participants, both those in the highly anxious and non-anxious groups, made more pessimistic ratings than all of the male participants. Researchers also found that females with high levels of anxiety were more likely to report higher probability of future threat in comparison with females of low levels of anxiety and all male participants. Thus, these findings indicated a two-way interaction of sex and anxiety group.

In subsequent studies investigating judgment bias, researchers confirmed an interaction of sex and anxiety group (Bentz et al., 1999, 2004). The results from these studies found that anxious female participants had a greater prediction bias toward future physically threatening events. The interaction of anxiety and sex was not surprising, due to the previous findings (Bentz & Williamson, 1998) and because of the higher prevalence of anxiety disorders among women (Barlow, 2002; Bekker & van Mens-Verhulst, 2007; MacKinaw-Koons & Vasey, 2000; Wittchen & Jacobi, 2005). It was also not surprising given the actual rates of domestic violence against women, constant social messages about the dangers of sexual assault, and very high rates of movie/TV portrayals of violence against women (Bekker, 1996, 2000; Chambless, 1989). These findings supported the exposure hypothesis, which states “women compared with men are more frequently exposed to anxiety-evoking traumas” (Bekker & van Mens-Verhulst, 2007, p. 184), thus making the availability heuristic an equally viable explanation for the higher prevalence of anxiety among women.

In summary, studies have found that both populations of depression and anxiety produce pessimistic judgmental biases such that participants with depression and anxiety had higher predictions of future negative events. Depressed individuals tended to predict negative events globally while anxious individuals tended to be more pessimistic when scenarios specifically apply to them. The literature has been particularly strong in showing that anxious individuals have a stronger judgmental bias when the content being presented was congruent with their current emotional state. However, even when the content was ambiguous, anxious individuals appeared to have a judgmental bias that led



them to interpret the given information as threatening. Finally, anxious women, in particular, had a tendency to overestimate the likelihood of future negative events and their possible costs.

### *Cognitive Models of Anxiety*

Cognitive researchers have used the evidence of attention, memory, and judgmental biases for building various models to explain how anxiety occurs and is maintained. One of the earlier models by Tversky and Kahneman (1974) suggested that individuals' predictions and probability judgments occurred via heuristics. Individuals may have compared the presented evidence with possible outcomes and based decisions on the similarity of these two sets of information. However, both this and subsequent studies (Evans, 1984, 1989; Tversky & Kahneman, 1983) found that biases interfere with the heuristics, thus prompting a tendency to interpret stimuli using irrelevant factors and to ignore relevant ones when problem-solving.

Evans (1984, 1989) built upon Tversky and Kahneman's work with heuristics and probability judgment and suggested that there existed two stages in problem-solving. The first stage was the heuristic stage during which apparent relevant information was selected. Then the analytic stage allowed for further processing, concluding with inferences. According to this theory, the heuristic-analytic theory, errors in problem-solving arose when there was a selective attention that incorrectly biased the inference.

Lang's (1984) model went on to suggest that such selective and biased attention, along with biased encoding and retrieval of threat-related information, thereby producing a fear network. The basic idea was that cognitions about fear were organized into

networks so that when attention was given to related topics, the network was activated and lead to the emotion of fear. The stronger the network, the more likely many topics would quickly relate back to fear by activation of the fear network and subsequent use of heuristics.

A more detailed model that attempted to explain anxiety was by Beck and Clark (1997). In this model, the processing of anxiety occurred in three stages. In the first stage individuals quickly processed information without being aware that they were doing so. The end result of this stage was to unconsciously decide the priority of the information presented. The information was then processed in a semi-automatic manner in stage two. In this second stage, information was quickly and involuntarily processed. However, this stage also involved more elaborative processing that resulted in assigning an initial threat impression. If this stage activated the primal threat mode, then individuals would have experience involuntary anxious thoughts from biased cognitive processing. In the third and final stage, there was a more conscientious thought process where individuals had a secondary elaboration that activated other schemas that related back to individuals' personal concerns. This stage involved a slower, deeper, and more effortful processing where individuals could become aware of their thinking patterns and could have an opportunity to deliberately alter their thought processes.

Other models have offered detailed and complex explanations of how anxiety occurs and is perpetuated. Mathews and Mackintosh (1998) explained what has been termed the threat evaluation system (TES). The TES model proposed that attentional bias occurred when two or more stimuli were processed simultaneously and competed for

attentional resources. For example, in the Stroop exercise, individuals simultaneously processed information regarding the color and information regarding the meaning of the word. Information from the TES helped individuals decide whether the presented stimuli were threat-related. The TES was likely to influence evaluations when anxiety states were high and therefore produced pessimistic interpretations.

Mathews and Mackintosh (1998) also proposed that automatic use of the TES occurred when the potentially threatening stimuli had been previously presented or were biologically prepared. Novel stimuli also caused the TES to be accessed. However, the process was thought to be more intentional via higher-level processes. For individuals suffering from a current state of anxiety, it was thought that the threshold for activating the TES and producing a pessimistic interpretation was lowered. It was proposed that activation of the TES was greater in anxious individuals because of a predisposition for lower TES thresholds and/or frequent activation of the TES led to a wider array of stimuli that may activate the TES. These assumptions have been supported by research findings that have shown an apparent bias for most people to produce positive evaluations of stimuli (Taylor & Brown, 1988), while anxious individuals more often produced pessimistic evaluations. The authors proposed that propensity toward the activation of the TES may have been overcome by intentionally attending to possible positive interpretations of presented stimuli.

A more recent model by Houde and Moutier (2003) went deeper into explaining the process by which unintentional attention was allocated to either relevant or irrelevant information when making a judgment. This model supported previous conclusions that

judgmental biases interfered with the problem-solving process so that relevant and positive information was ignored while irrelevant and negative information led individuals to incorrect assumptions. This model suggested that the ignoring of relevant information occurred because of an executive-inhibition failure in working memory and did not necessarily indicate of irrationality. Houde and Moutier posited that instead of being labeled as irrational in problem-solving, these individuals who ignored relevant and positive information were more correctly labeled as inefficient inhibitors because of their judgmental biases and failure to inhibit attention to irrelevant information.

As with the models described above, other models have continued the trend of focusing on how heuristics act as the catalyst for incorrect attention to irrelevant information and subsequent probability judgments. Though some models did not specify what type of heuristic was being activated, or labels the heuristic as a judgmental heuristic, the simplest way of categorizing these heuristics was by labeling them availability heuristics. The availability heuristic is “a decision-making heuristic in which frequency or probability is estimated in terms of how easy it is to think of examples of something” (Matlin, 2005, p. 495). An availability heuristic explanation fits well with most cognitive models that have attempted to explain the processes by which probability judgments occurred. Even within models that have proposed the use of specific cognitive networks, it has been clear how availability heuristics worked as the organizational system that were used to interpret threat-related information and activate fear (Bentz et al., 2004).

In summary, theorists have agreed that initial processing of potentially threatening stimuli occurred in an unconscious state. These researchers also have agreed that sometime during the unconscious processing, the presented stimuli were somehow linked back to similar information that was previously stored. The result of this comparison was the assignment of priority and threat level. Most supporting research for these models have concluded that anxious individuals diverged from non-anxious individuals by finding it easier to link present stimuli, even when ambiguous in nature, to previously processed anxiety provoking stimuli. This link back to anxiety not only led to pessimistic interpretation of presented stimuli but also led to pessimistic predictions about the outcomes of future scenarios.

### Probability Forecasting

As stated above, the manner in which people process presented stimuli affects their predictions about the outcomes of future events. This processing and subsequent probability forecasting of future events is used on a daily basis for making numerous decisions, such as perception of risk and prediction of financial outcomes, meteorological outcomes, and other people's behaviors (Fisk & Pidgeon, 1997; Matlin, 2005). However, it has been well known that predictions about what will happen in the future often can be incorrect. In fact, many studies have shown that otherwise rational adults often exhibited irrational behavior that goes against the fundamental rules of probability (Houde & Moutier, 2003).

People often enter into their erroneous conclusions with a great deal of overconfidence. Research has found that individuals without a psychological diagnosis tended to be

overconfident in their unrealistic optimistic predictions about future occurrences in their lives (Armor & Taylor, 2002; Buehler, Griffin, & Ross, 2002; Einhorn & Hogarth, 1978; Hoch, 1985; Weinstein & Klein, 2002). It has been found that individuals tended to predict desirable futures for themselves as more likely to occur than they predicted to occur in the lives of other individuals who were similar to themselves (Weinstein & Klein, 2002; Zakay, 1983). However, individuals with anxiety diagnoses tended to generate pessimistic predictions (Kverno, 2000). These trends occurred because individuals failed to attend to disconfirming information when developing probability forecasts and, instead, recruited evidence to support their initial conclusions (Hoch, 1985; Weinstein & Klein, 2002), which were likely to be congruent with how they generally felt.

### *Access to Information*

Erroneous probability forecasts may have been due to an incomplete amount of information, whether it was because the information simply was not given or because individuals failed to attend to any information that did not confirm their optimistic or pessimistic tendencies. Studies have found that initial incomplete representations of scenarios not only led to errors in forecasting, but also generated false confidence in the incorrect assumptions (Griffin & Tversky, 2002; Wright & Ayton, 1987). Other research has shown that when individuals were asked to generate a more complete list of possible positive and negative outcomes they were less likely to be overconfident about an erroneous probability forecast (Armor & Taylor, 2002; Hoch, 1985).

An increase in knowledge and, therefore accuracy, also occurs as expertise increases. Perhaps this increase in breadth of knowledge is the reason why many studies have found a difference in the forecasting abilities of experts versus their novice counterparts. For instance, Thomson, Onkal, Acioglu, and Goodwin (2004) found a significant difference in the probability forecasts of aviation risk among expert pilots and novice pilots. The authors reported that the probability forecasts of relative aviation risk among expert pilots had a higher correlation with the true frequency of accidents than the probability forecasts among novice pilots. This finding supported previous results where researchers found that participants considered to be experts in a particular topic showed superior performance in comparison to their semi-expert and novice counterparts (Koehler, Brenner, & Griffin, 2002; Onkal & Muradoglu, 1996; Wright, Rowe, Bolger, & Gammack, 1994).

One other factor that affects probability forecasts is when scenarios are made personal to the forecasters. Researchers have found that overconfidence was especially prevalent when the topic integrated personal involvement. One example of mis-estimating probability forecasts with regard to personal involvement was exhibited by Mitte (2006), who found that anxious individuals estimated the probability of future personal risk as higher than the risk that would come to others. This conclusion was compatible with previous studies, which showed that mis-estimation of probability forecasts became more pronounced when posited scenarios were more personal and salient to participants (Griffin & Tversky, 2002; Wright & Ayton, 1989).

Other studies have investigated the effects of temporary mood states versus stable personality traits on processing emotional information. Coles and Heimberg (2002) proposed that mood states and personality traits interacted with one another so that mood states may have tempered or accentuated personality traits while personality traits may predispose individuals toward particular mood states. When studying the interactions between state anxiety, trait anxiety, and pessimistic probability judgments, Coles and Heimberg (2002) found that there was a stronger relationship between trait anxiety and probability judgment.

Studies have found a global effect of trait anxiety on probability judgment and that neither state anxiety, social desirability, or depression adequately explained subjective probability judgment (Kverno, 2000; Stober, 1997). These studies proposed that trait anxiety predicted probability judgments better than state anxiety because trait anxiety was more closely related to the expectations that people have for their lives in general.

Mis-estimations in probability forecasts also occur when individuals attempt to predict the perceptions of others. Even in some of the most intimate of relationships, studies have found substantial errors in the probability forecasts of loved ones' opinions. For instance, in a study by Davis, Hoch, and Ragsdale (1986) participants were asked to predict their spouses' preferences or reactions to a product. The researchers found that participants anchored on their own preferences and attempted to adjust for ways in which they were likely to differ from their loved ones. Despite these efforts toward making



correct probability forecasts, the researchers found that most participants were not very accurate in predicting their spouses' preferences.

Rheingold, Herbert, and Franklin (2003) brought together factors of personal involvement and perceptions of others and found that individuals diagnosed with anxiety tended to overestimate the costs and probability of others forming critical opinions of them. Individuals in this study rated negative social events as more probable to occur in their own lives than in the lives of others. This outcome was in direct opposition with findings among individuals without anxiety diagnoses who tended to predict desirable life events as more probable for their own lives than for the lives of others with similar demographics (Weinstein & Klein, 2002; Zakay, 1983).

#### *Proposed Models of Probability Forecasting*

As stated earlier, many theorists have believed that erroneous probability forecasts, such as the ones described above, occurred as a result of faulty or incomplete collection of information and generation of evidence. According to a model proposed by Hoch (1985), this collection and generation of information was the first of a three-stage process of predictive judgment. In the second stage individuals evaluated the strength of the evidence they generated. And finally, Hoch proposed that individuals evaluated how confident they were about their conclusions. The second and third stages were closely linked to the outcome of the first stage in that if individuals were unable to generate plausible rival hypotheses, then they may have been overconfident in their original judgments. In a review of studies investigating the causes and consequences of optimistic time predictions, Buehler, Griffin, and Ross (2002) found these three stages to be true.

Across the studies, researchers found that participants started with some initial information, considered how confident they were in that information, and then made judgments that generally were overly optimistic because of a failure to attend to contradicting information. Other studies have found probability forecasts to be more accurate when individuals participated in exercises that required them to generate reasons for why a future event might happen and then reasons for why it might not happen (Hoch, 1984; Johnson & Raye, 1981; Newby-Clark, Ross, Buehler, Koehler, & Griffin, 2000; Slamecka & Graf, 1978; Weinstein & Klein, 2002).

In summary, there has been empirical evidence demonstrating that people were often overconfident in their probability forecasts. Whether it was an optimistic or pessimistic conclusion, individuals tended to neglect evidence that rivaled their original hypotheses. These errors were especially prevalent when presented scenarios included personal involvement and/or the prediction of how others may have reacted in given situations. Erroneous conclusions could be corrected by an increase in knowledge so as to produce a more accurate and holistic mosaic from which to draw conclusions. Exercises that work to broaden the scope of possible outcomes to be considered have been shown to increase accuracy and positively affect all stages of probability forecasting. These exercises would then counteract the over-reliance upon heuristics that led to judgment bias.

### Cognitive Heuristics

Probability judgments about uncertain future events are particularly vulnerable to using inferences that are based upon, what seems to be relevant information from an

initial memory search (Hoch, 1984). As previously stated, much of the literature on probability judgment has shown that individuals rarely followed probability laws in their everyday lives and, instead, utilized heuristic principles (Nisbett, Krantz, Jepson, & Kunda, 2002; Wright, Lawrence, & Collopy, 1996). A heuristic is “a general problem-solving strategy that typically produces a correct solution” (Matlin, 2005, p. 501). However, many studies have found that heuristics were sometimes overused and led to incorrect conclusions that neglected other vital information (Kahneman & Frederick, 2002; Kahneman & Tversky, 1996).

In their investigation of heuristics, Tversky and Kahneman (2002) found that when people did not have formal models to guide their judgment process, they relied on intuition in judging their own certainty in the matter. As was discussed earlier, inattention to information that may disconfirm people’s hypotheses could have caused them to become overconfident in their probability estimates about future events, which often were based on unreliable or inappropriate sources (Bishop & Trout, 2002; Carlson, 1995). These sources were typically used to confirm their already held hypotheses and were more readily available than disconfirming information (Barron, 1998; Idson, Drantz, Osherson, & Bonini, 2001). Some studies have even shown that disconfirming information was not taken seriously even when people were able to recall information that countered their original hypotheses (Simon, Pham, Le, & Holyoak, 2001). These results showed the immense strength of readily available and biased heuristics.

In 1972, Kahneman and Tversky proposed that there were three heuristics that assist people in the decision-making process, including when making decisions about

probability judgments. These heuristics consisted of anchoring and adjustment heuristic, representative heuristic, and availability heuristic. Tversky and Kahnman have since confirmed the 1972 study in subsequent publications (1982 & 2002).

The anchor and adjustment heuristic is “a decision-making heuristic in which people begin with a first approximation (an anchor) and then make adjustments to that number on the basis of additional information” (Matlin, 2005, p. 495). This particular heuristic has often yielded incorrect judgments because individuals heavily relied upon the initial approximation, or anchor, and made minimal adjustments before the final judgments (Baron, 2000). According to Chapman and Johnson (2002), insufficient adjustments occurred when there was a lack of effort or cognitive resources to make the appropriate adjustments, especially when making judgments about other people (Gilbert, 2002; Griffin & Tversky, 2002; Kunda, 1999).

Many researchers have found that probability judgments also often utilized the representativeness heuristic (Kahneman & Frederick, 2002; Shafir, Smith, & Osherson, 1990; Tversky & Kahneman, 1982). Researchers found that when faced with probability judgments, individuals tended to base their judgments on how they have judged similar situations. This heuristic is “a decision-making heuristic by which a sample is judged likely if it is similar to the population from which it is selected” (Matlin, 2005, p. 506). In other words, it was a cognitive strategy that compared the current stimuli to previously stored prototypes that seemed to have similar characteristics. However, mistakes were made when people failed to recognize that they may have a limited and biased amount of prototypes to which they compared the presented sample (Poulton, 1994). With

probability judgments, individuals considered the similarity of the given situation to a prototypical situation and the resulting outcome of that prototype (Kahneman & Frederick, 2002).

Although both heuristics discussed above have been known to affect judgment, the availability heuristic has been more closely linked with the process of giving probability judgments about scenarios involving one's own future. These types of probability judgments often have been affected by how easily certain prototypes could be generated and may even overridden other logic (Agnoli & Krantz, 1989; Dawes, 1998; Matlin, 2005; Tversky & Kahneman, 1973). Tversky and Kahneman (1973) observed that the availability heuristic was used to estimate probability judgments about future events by how easy it was to generate cognitively the mental image of that proposed event. That is, the easier it was for individuals to picture similar examples and their outcomes, the more likely the outcome was perceived to occur in uncertain probability judgments. Conversely, Sherman, Cialdini, Schwartzman, and Reynolds (2002) found that when hypothetical events were difficult to generate and explain, individuals reported them as being improbable. This study by Sherman and his colleagues supported Anderson, Lepper, and Ross's (1980) previous findings, which proposed that the availability heuristic was influenced by the ease with which individuals were able to perceive cause or reasons for the proposed events and by the ease with which individuals generated imagery of the proposed events.

In summary, researchers have concluded that there exist three types of cognitive heuristics, which have served as shortcuts to solving cognitive problems. These heuristics

have been the representativeness heuristic, availability heuristic, and the anchor and adjustment heuristic. An individual's choice of which heuristic to use has depended on the factors of the given situation. As was found by Tversky and Kahneman (1971, 1973, 1983, 2002), when individuals were dealing with similarity, they tended to choose to utilize the representativeness heuristic, and when they were required to remember examples, they chose to utilize the availability heuristic. Finally, anchor and adjustment heuristics were used when individuals first generate an approximation, especially when the approximation was in reference to others' behaviors and attitudes.

### Debiasing

Widespread evidence of the existence of biases has prompted researchers to investigate ways of decreasing biases that result in overconfidence, under use of base rates, and non-representative samples (Hayes & Hesketh, 1989; Nay, Thorpe, Roberson-Nay, Hecker, & Sigmon, 2004). According to Arkes (1989), debiasing referred to cognitive techniques that reduced judgmental errors. Research on the process of reducing judgmental errors has shown substantial success with debiasing techniques (Arkes, 1991; Bentz et al., 2004; Hirt & Markman, 1995; Lim & Benbasat, 1997; McKenna & Albery, 2001; Mumma & Wilson, 1995), which required that individuals first acknowledge that bias has occurred and then attempted to correct it (Wilson, Centerbar, & Brekke, 2002). Bias inoculation was an educational debiasing method that instructs individuals to make adjustments to compensate for initial judgments (Mumma & Wilson, 1995). Note-taking has been another technique that debiases initial cognitions by taking notes on relevant information, and thereby increasing attention to stimuli that would lead to more accurate

judgments (Mumma & Wilson, 1995). One other educational debiasing technique has involved simply informing participants about the likelihood of a bias being present, thereby increasing their awareness and prompting them not to commit such a bias (Bogels & Mansell, 2004; Pohl & Hell, 1996). The consider-the-opposite debiasing technique has been known as more active than the educational methods that prompted individuals to focus on outcomes that were the opposite of their initial cognitive judgments (Mumma & Wilson, 1995).

One of the first studies of how debiasing may work to correct judgmental errors was by Fischhoff (1977). In this study participants were asked to estimate their own abilities to correctly answer 75 general questions that they were asked. Some participants were also asked to participate in the educational debiasing method of bias inoculation. These individuals were informed about the bias by one of the researchers or were asked to work harder on giving the correct answer. Results from this study indicated no significant reduction of bias and that participants overestimated how much they knew prior to being given the correct answers to the general questions.

A more recent area of research that has addressed debiasing has been known as the hindsight bias. The hindsight bias has been known as the tendency to misestimate the perceived inevitability of events after outcomes were revealed (Fischhoff, 1975; Fischhoff & Beyth, 1975; Schwarz & Vaughn, 2002). Pohl and Hell (1996) asked German college students difficult knowledge questions to which the students gave numerical answers. The treatment group was given an educational debiasing technique whereby they were informed in advance about the hindsight bias phenomenon. However, a significant

difference between the treatment and control group was not found. Pohl and Hell concluded that knowledge about the bias phenomenon did not help the participants in the treatment group to avoid committing the hindsight bias. This result supported other findings (Larrick, 2004; Sharpe & Adair, 1993), which concluded that simple awareness of possible judgment errors and biases did not significantly reduce hindsight biases.

Other studies have found that the hindsight bias was more effectively corrected when individuals were asked to take an active part in the debiasing process rather than just being informed that a bias is present. For example, Davies (1992) investigated the effects of cognitive restructuring on hindsight bias. The researcher asked 291 college students questions on general knowledge items and then instructed some of them to generate reasons that contradicted the correct answers to the general knowledge questions. Other students were asked to generate reasons that supported the revealed answers. While still others were not asked to generate any reasons for the correct answers to the general knowledge questions. Davies (1992) found that active generation of contradicting reasons reduced hindsight bias significantly more than the other two groups. This conclusion has supported more recent proposals for reducing biases by prompting consideration of multiple alternatives, which has been found to be so strong that the debiasing effects have been able to be carried over into topics outside of the domain that was originally debiased (Hirt et al., 2004).

Larrick (2004) referred to biases that occur within probability judgments, which are rooted in the availability heuristic as association-based errors, which were activated automatically by the cognitive accessibility of associated information within the memory.



Therefore, debiasing techniques in probability judgment exercises have focused on increasing individuals' availability to information that represented alternatives to their original association-based errors. Both the consider-the-opposite and the closely related Consider-An-Alternative techniques have been thought to be effective because they directly worked to expand participants' sample of information from which to draw probability judgments (Larrick, 2004). Educational techniques, on the other hand, made the assumption that individuals will automatically consider a wider base of information once they were made aware of a bias being present.

Hirt, Kardes, and Markman (2004) have confirmed earlier studies that have found consideration of alternatives to be a useful debiasing technique (Carroll, 1978; Hirt & Markman, 1995; Koehler, 1991; Sanna & Schwarz, 2003; Sanna et al., 2002). In their study, the researchers investigated whether the Consider-An-Alternative exercise would be effective in transferring from one domain to debias judgments in unrelated domains. In the study, 240 undergraduate psychology students who considered themselves knowledgeable about basketball were given information about the upcoming divisional race. Participants were then asked to write explanations for a division championship by the Portland Trail Blazers. Then, groups of participants were asked to engage in the Consider-An-Alternative exercise. Some of the participants were asked to write counter-explanations for either plausible or implausible championship wins within the domain of basketball. Instead of writing counter-explanations within the domain of basketball, other participants were asked to generate either two or eight alternatives to the favorite to win in either the related domain of football or the unrelated domain of TV sitcoms. The St.

Louis Rams were the favorite to win the Super Bowl and M\*A\*S\*H was the favorite to win the title of best sitcom.

All participants then were asked to estimate the probability that the Portland Trail Blazers would win the division, that the Saint Louis Rams would win the Super bowl, and that M\*A\*S\*H would win best sitcom. Participants were asked to report their confidence in their predictions. Finally, participants were asked to rate the ease or difficulty of each of the explanations or generation tasks they performed. The results indicated that alternative generation tasks that were experienced as easy not only debiased judgments in the same domain but also generalized to debias judgments in unrelated domains. These results occurred within the groups that considered wins by plausible teams and those who only needed to generate two instead of eight alternatives. It has been thought that debiasing occurred within these groups because they had practiced forming a wider base of information in the Consider-An-Alternative exercises.

Many studies have suggested that imagining alternative conclusions to scenarios increased accessibility to a wider base of information and participants experienced these alternative conclusions as more probable than participants who did not imagine alternatives (Bentz et al., 1999; 2004; Bentz & Williamson, 1998; Carroll, 1978; Hirt & Markman, 1995; Lim & Benbasat, 1997; McKenna & Albery, 2001). This imagining of alternatives has been thought to be effective not only because it increased the information base, but also because it slowed the momentum with which individuals moved toward and latched on to their initial conclusions (Koehler, 1991). However, just as Hirt, Kardes,

and Markman (2004) found, the experience of ease with which these alternatives were generated was essential to the success of the debiasing process.

Participants must not be put in situations where they experience the exercises as being too difficult. For instance, Sanna, Schwarz, and Stocker (2002) demonstrated that the experience of accessibility was also an important component for the Consider-An-Alternative debiasing exercise. These researchers asked participants to either generate two or 10 alternatives to how the British-Gurkha war could have ended, depending upon to which group participants were assigned. Participants who generated two alternatives reported experiencing this task as easy, while participants who generated 10 possible alternatives reported that the task was difficult.

Recently, there has been research on the process of debiasing within the context of emotion (Bentz et al., 2004). Bentz, Williamson, and Franks assigned 476 undergraduate students participants to either the highly anxious or non-anxious group, depending upon their respective scores on the State-Trait Anxiety Inventory (STAI; Spielberger et al., 1970). All participants were asked to give their probability judgments for 20 experimental stimuli scenarios, half of which were threat-related situations and the other half positive situations. Then, participants were randomly assigned to either the debiasing or the control groups. The debiasing group then were presented with 10 scenarios and asked to participate in the Consider-An-Alternative exercise that directed them to generate three alternative positive outcomes for each scenario. The control group were given the same 10 scenarios but instead were just asked to identify and write out three of the nouns and verbs present in each of the paragraphs depicting the scenarios.

Finally, all participants were given a posttest whereby they were presented with another 20 scenarios and asked to give probability judgments about the conclusions of each scenario. Researchers found that all participants who had done the Consider-An-Alternative exercise decreased their pessimistic probability judgments from the pretest to the posttest.

In summary, research investigating the efficacy of debiasing techniques has found that educational techniques that merely heighten people's awareness about the presence of biases were relatively ineffective with association-based errors. These association-based errors, which were thought to be the cause of pessimistic probability judgments, were more effectively corrected when individuals made an active effort to widen their base of information regarding the given scenario and consider alternatives to their original conclusions.

### Role of Debiasing in Cognitive-Behavior Therapy

As stated earlier, CBT has been a well-established mode of treatment for anxiety both in practice and within research literature (Hirsch & Holmes, 2007; Hofmann, 2004; Hofman et al., 2004; Otto, 2005; Spokas et al., 2007; Waters et al., 2008). This mode of psychotherapy has worked to challenge cognitions, assumptions, beliefs, and behaviors so as to positively influence negative emotions that resulted from inaccurate appraisals (Beck & Clark, 1997; Hollon & Beck, 2004). In a review of recent studies investigating the efficacy of CBT with anxiety, Hollon and Beck (2004) concluded that CBT programs showed a particular effectiveness with individuals suffering from anxiety disorders. These programs functioned on the conclusion that interpretational biases caused

emotional vulnerability to anxiety and that reduction of these biases would help to reduce proneness to anxiety (Mathews et al., 2007).

Much of the work by CBT researchers and theorists have posited that highly anxious individuals lacked the positive cognitive biases that low anxious individuals exhibited (Garner, Mogg, & Bradley, 2006; Hirsh & Mathews, 1997, 2000). Thus, CBT programs and research have worked to develop ways of facilitating positive biases while decreasing cognitive attention to negative biases. For instance, Spokas, Rodebaugh, and Heimberg (2007) proposed that high states of anxiety reduced the breadth of attention limiting it to threat-related cues. The researchers went on to suggest that treatment programs had the ultimate goal of increasing attention to non-threatening aspects of given situations so as to generate more positive re-appraisals of possible outcomes.

Two well-known publications for practicing therapists wanting to use CBT in treatment of anxiety have been the *Mastery of Your Anxiety and Panic* (MAP-II; Barlow & Craske, 1994) and the *Mastery of Your Anxiety and Worry* (MAW; Craske, Barlow, & O'Leary, 1992) texts, which since have been revised and published as the *Mastering your Fears and Phobias* text (Antony, Craske, & Barlow, 2006). All of these treatment programs recognized the importance of cognitive restructuring in order to decrease pessimistic predictions of future threatening events. However, these CBT programs did not focus specifically on the Consider-An-Alternative method. Instead, all of these programs stated that participants' end goal was to spontaneously generate alternatives to their previously negative cognitive biases as a result of a combination of CBT techniques that did not explicitly include the Consider-An-Alternative method.

Recent studies of experimentally manipulated interpretational biases strengthen the CBT position that there was a causal link between mood and interpretation (Grey & Mathews, 2000; Mathews & Mackintosh, 2000; Wilson, MacLeod, Mathews, & Rutherford, 2006; Yiend, Mackintosh, & Mathews, 2005). For instance, Mathews and Mackintosh (2000) randomly assigned non-anxious participants to groups that would either be trained to make negative or benign interpretations of ambiguous texts. All participants were presented with ambiguously threatening social situations with an emotional outcome being resolved only by the final word, which was presented in fragment form. Participants then were instructed to complete the fragment and answer a question designed to reinforce the intended interpretation and emotional outcome, either negative or benign. The researchers found that participants allocated to the negative interpretation training group reported a congruent increase in anxiety, as opposed to those allocated to the benign interpretation group who did not report an increase in anxiety.

Other researchers have tested specific techniques that were believed to increase attention toward non-threatening cues and train individuals toward benign or positive bias, thereby, positively affecting their mood. For instance, in a study by Grey and Mathews (2000), researchers found that individuals could train their interpretation biases through a series of exercises that required participants to imagine themselves in the ambiguous situations described to them that would then be concluded in either a positive or negative manner. Similarly, Mathews, Ridgeway, Cook, and Yiend (2007) supported the finding that biases could be altered through cognitive training. Mathews, Ridgeway, Cook, and Yiend tested a four-session program that worked to train individuals high in

trait anxiety to resolve descriptions of ambiguous events in an increasingly positive way across the four sessions. In comparison to participants in the control group, who were not trained to interpret ambiguous descriptions in positive ways, the treatment group showed more positive interpretations at the end of the four-session program. Also, the treatment group showed a greater decrease in their respective trait anxiety scores than the control group. Mathews, Ridgeway, Cook, and Yiend (2007) suggested that these findings lent support to CBT techniques in general by suggesting that the modification of interpretation biases produced congruent emotional changes.

CBT theorists have long held the assumption that mental imagery was a key component to positively manipulating emotion (Holmes & Mathews, 2005). One example that displayed the power of mental imagery with anxiety was the study by Holmes, Mathews, Dalgleish, and Mackintosh (2006). They first presented all participants with scenarios that initially were ambiguous as to whether the outcomes were positive or not. Then those participants randomly assigned to the treatment group were asked to imagine themselves as the central character of the same scenarios, which now concluded in positive ways, while the control group simply listened to the positive conclusions and were not asked to imagine themselves in the scenarios. The researchers found that participants in the treatment group reported a greater increase in positive affect, suggesting that positive cognitive training could be enhanced more by self-imagery than by verbal processing alone.

Other CBT techniques, such as the ones described above, have had the implicit goal of increasing the ability to generate positive alternatives assuming that generation of

positive alternatives would eventually occur in an automatic manner. The most recent study investigating the Consider-An-Alternative procedure was by Bentz, Williamson, and Franks (2004). Researchers examined the ability of the Consider-An-Alternative procedure to reduce pessimistic judgmental predictions associated with anxiety, which had shown some efficacy in previous studies (Bentz et al., 1999; Bentz & Williamson, 1998). The researchers recruited undergraduate volunteers to participate in the study, all of whom completed the trait portion of the State-Trait Anxiety Inventory (STAI; Spielberger et al., 1970). Next, participants were assigned to either the high anxiety or low anxiety groups, depending upon their respective scores on the STAI. All participants then indicated their probability judgments on 20 experimental stimuli situations. Members of each group were then randomly assigned to either the control group or the treatment group. The treatment group was asked to participate in the Consider-An-Alternative procedure, in which participants generated three positive alternative conclusions to ten described situations, while the control group simply named the parts of speech present within ten written paragraphs. Finally, all participants were asked, once again, to give their probability judgments on 20 experimental stimuli situations. The researchers found that the Consider-An-Alternative debiasing procedure was effective in reducing the pessimistic judgment predictions in both the high and low anxiety groups. However, Bentz, Williamson, and Franks (2004) did not test the lasting effects of the Consider-An-Alternative procedure. Just as Mogg, Bradley, Millar, and White (1995) found, debiasing affects upon attentional biases may not have been stable enough to sustain across time without reinforcement.



In summary, efficacy studies have shown the positive effects of CBT programs in treating anxiety. However, most CBT programs have used a combination of various CBT techniques, making it difficult to specify which aspects of the programs were most effective. While these programs have shown positive results, most of the CBT techniques used in the programs did not address directly the goal of considering positive alternatives to original assumptions.

### Diversity Considerations

#### *Anxiety*

While symptoms of anxiety have been found across different age groups and ethnicities, the most significant differences have been between the two sexes (APA, 2000). In addition to the sex differences noted earlier in the work of Bentz and his colleagues (Bentz & Williamson, 1998; Bentz et al., 1999, 2004), some additional considerations of gender are noteworthy. For instance, though it was true that anxiety was reported to be more prevalent in females than in males (MacKinaw-Koons & Vasey, 2000; Wittchen & Jacobi, 2005), some researchers have proposed that this discrepancy was partly due to underreporting of anxiety symptoms among males (MacKinaw-Koons & Vasey, 2000). Underreporting by males may have various causes. One possible reason for underreporting has been the traditional masculine stereotype that views seeking help as a weakness (Bekker, 1996; Bruch, 2007; MacKinaw-Koons & Vasey, 2000; Moscovitch, Hofmann, & Litz, 2005). Other traditional, masculine-stereotyped behavior may have served to mask the possible presence of anxiety. For instance, males may have self-medicated anxiety symptoms through alcohol abuse, which masked the anxiety

symptoms (Bekker, 1996). Another possible masking of anxiety symptoms among males has been in reference to social anxiety, where males were pressured to work outside of the home, thereby suppressing anxiety expression and making it difficult to indulge avoidance tendencies (Chambless, 1989; Plaisier et al., 2008; Thorpe & Burns, 1983).

Converse to males, many researchers have posited that traditional feminine stereotype roles primed females for anxiety diagnoses (Al-Ilssa, 1980; Bekker, 1996, 2000; Chambless & Goldstein, 1982; Gelfond, 1991; Plaisier et al., 2008). For instance, some have argued that traditional feminine sex roles fostered dependence while discouraging assertiveness (Al-Ilssa, 1980; Gelfond, 1991). Another example of traditional sex roles and anxiety, once again, involved the work place. It has been proposed that females working inside the home were more likely to have symptoms of social anxiety because they were not under daily pressure to overcome avoidance tendencies (Chambless, 1989; Thorpe & Burns, 1983). However, even within the context of work, females were more at risk for developing work-related anxiety because they reported lower levels of decision latitude than men, thereby experiencing less personal control within their environments (Plaisier et al., 2007).

Some theorists have proposed that females had a higher prevalence of anxiety diagnoses because, compared to men, they have been exposed more frequently to anxiety-provoking experiences (Bekker & van Mens-Verhulst, 2007). For instance, females have sustained more emotional trauma throughout their lives, such as sexual violence, domestic violence, and poverty (Bekker, 2000). This higher frequency of traumatizing events among females was likely to be the cause of the subsequent higher

prevalence of Post-Traumatic Stress Disorder among females (Stein, Walker, & Forde, 2000).

Still others have proposed that the discrepancy in prevalence of anxiety between males and females was in part due to biological differences. For instance, in studying Panic Disorder, researchers have suggested that hormonal changes related to the menstrual cycle contributed to vulnerability for panic attacks (Kulkarni, 2004). This conclusion was evidenced by an increase in panic disorder symptoms among females diagnosed with Panic Disorder during the late luteal phase. It has been suggested that during the late luteal phase there was “the repetitive binding and unbinding of compounds” (p. 59) that may have increased vulnerability towards panic disorder symptoms within females who already had a tendency to the disorder. However, these hormonal shifts and their effect upon anxiety disorders, such as Panic Disorder would require future research before being conclusive.

By virtue of anxiety occurring across different ethnicities, one way to address future research in the area of investigating how biology (e.g., age and sex) and social setting interact to affect anxiety disorders is by conducting future cross ethnicity research. While there has been little empirical research concerning anxiety and ethnicity, there has been even less in the area of anxiety with sex and culture as covariates (Zvolensky, McNeil, Porter, & Stewart, 2001). The research that has existed on the matter of anxiety and ethnicity has echoed to a lesser degree some of the conclusions within research of anxiety and sex. For instance, many researchers have concluded that the few discrepancies in prevalence of anxiety across ethnicities was likely to be largely a result

of how anxiety was experienced and the subsequent symptoms, not absence or presence of anxiety (Boehnlein, 2001; Wagner, Silove, Marnane, & Joukhador, 2008).

In addition to the above conclusions, researchers have found that while reactions to anxiety-provoking stimuli and the stimuli themselves may differ across ethnicities, the cognitive processes of interpreting the given stimuli were the same (Boehnlein, 2001). Within the realm of probability judgment, researchers have found that the point of difference among ethnicities was in whether decisions were made with regard to personal precedents or if the perceived precedents of others was held in higher esteem, and therefore was more cognitively available (Yates, Lee, Sieck, Choi, & Price, 2002). These researchers have found that individuals from individualistic cultures tended to rely upon first hand precedents, while individuals from collectivists cultures tended to rely upon the perceived precedents of others.

### *Debiasing*

Regardless of the mode by which probability judgments developed, the specifics of the surrounding situation, and any subsequent symptoms of anxiety, CBT techniques have been found to be effective across different ethnicities (Hinton et al., 2004; Pina, Silverman, Fuentes, Kurtines, Weems, 2003; Schraufnagel, Wagner, Miranda, & Roy-Byrne, 2006; Wagner et al., 2008), different age groups (Walker & Clarke, 2001), and both sexes (Starcevic, Latas, Kolar, & Berle, 2007; Taylor, 2000). Additionally, specific exercises, such as the Consider-An-Alternative procedure, also have been expected to do equally as well these different groups. However, it should also be noted that research has found that though CBT techniques themselves remain effective across these diverse

groups, CBT techniques are most effective when they are tailored to fit individuals according to their sex, ethnicity, and age (Hinton et al., 2004). For example, it is likely that the Consider-An-Alternative procedure would be most beneficial if presented scenarios are relevant to individuals' specific life circumstances and past experiences.

### Rationale for the Current Study

Previous research has shown attentional, memory, and judgmental biases among highly anxious individuals. Highly anxious individuals tend to allocate more attention toward threat-related stimuli. These highly anxious individuals more easily retrieve threat-related information from memory than benign information, and are pessimistic about future scenarios. Pessimistic judgmental biases are particularly strong among individuals who score high in trait anxiety, such as in the case of clinically diagnosed anxiety. As a result of using the availability heuristic, anxious individuals easily generate anxiety-provoking examples that are similar to present scenarios and, therefore, perceive the possibility of future negative outcomes as highly probable. These individuals not only jump to pessimistic conclusions, but also do so with a high sense of certainty, especially when the given scenarios pertain to them.

In order to counteract pessimistic biases associated with the availability heuristic, individuals need to do more than be made aware of the presence of biases. Instead, more active efforts, such as the Consider-An-Alternative debiasing procedure, need to be utilized. By explicitly asking individuals to generate positive alternatives, they will widen the scope of possibilities and decrease their reliance on heuristic shortcuts. Thus, the current researcher had the goal of replicating previous studies investigating the Consider-

An-Alternative debiasing procedure, which have been shown to decrease pessimistic probability judgments in past research (Bentz & Williamson, 1998; Bentz et al., 1999; 2004). More importantly, the current study expanded the investigation of the Consider-An-Alternative debiasing procedure in two ways; first, to include clinically anxious individuals and second, to add a follow-up component to test the duration of debiasing effects over a one-week period.

## Hypotheses

### *Hypothesis 1*

It was hypothesized that the highly anxious participants would show a significantly higher pessimistic prediction of future negative events in comparison to the non-anxious participants.

### *Hypothesis 2*

It was hypothesized that the debiasing group participants would show a significantly lower pessimistic prediction of future negative events in comparison to the control group participants.

### *Hypothesis 3*

It was hypothesized that the debiasing groups would show a significant reduction in pessimistic predictions of future negative events from the pretest scores to the posttest scores, and then a significant increase in pessimistic predictions from the posttest scores to the follow-up scores.

## CHAPTER III

### METHODS

#### Overview of Design

The archival data used in this experiment collected by the author as a research team member in a previous study conducted by Dr. Bret Bentz. The current study was a 2 X 3 X 2 (clinically anxious group versus non-anxious group x pretest versus posttest versus follow-up x debiasing group versus control group) mixed factorial design of that archival data. An inpatient, clinically anxious sample, as well as a non-anxious college student sample, were utilized for the first factor. Half of each sample were randomly selected to be administered the debiasing intervention; the other half served as a control group. This selection process resulted in four groups (anxious-debiasing, anxious-control; non-anxious debiasing and non-anxious control). The groups were matched on sex and treatment group so that each individual in both the anxious-debiasing and anxious-control groups were matched with a non-anxious individual of the same sex and treatment group (debiasing or control).

#### Participants

A total of 68 participants were included in the study, 50 females (73.53%) and 18 males (26.47%). The debiasing groups consisted of 12 females and five males from the inpatient hospital setting who were matched with 12 females and five males from the university setting. The control groups consisted of 13 females and four males from the

inpatient hospital setting where were matched with 13 females and four males from the university setting. The mean age of these individuals was 30.95 years old (minimum age 18; maximum age 71; standard deviation 11.89). Of the 68 participants, 45 were Caucasian (66.18%), 10 were African American (14.71%), 10 were Hispanic (14.71%), 2 were Asian (2.94%), and 1 self-identified as Other (1.47%). Demographics of education indicated that 7 achieved high school as their highest degree (10.24%), 45 achieved some college (66.18%), 11 achieved a college degree as their highest degree (16.18%), 4 achieved a master's degree as their highest degree (5.88%), and 1 achieved a doctoral degree as their highest degree (1.47%). Finally, of the 34 participants from the inpatient hospital setting, 29 (85.29%) had a primary diagnosis of PTSD, 4 (11.77%) had a primary diagnosis of GAD, and 1 (2.94%) had a primary diagnosis of OCD. The demographics of participants are illustrated in Table 1.

Table 1

*Characteristics of the Sample*

Variable	<i>Frequency</i>	<i>%</i>	<i>M</i>	<i>Range</i>	<i>SD</i>
Age in Years	NA	NA	30.96	18-71	11.89
Gender					
Female	50	73.53			
Male	18	26.47			



Table 1 (Continued)

*Characteristics of the Sample*

Variable	Frequency	%	<i>M</i>	Range	<i>SD</i>
Race/Ethnicity					
Caucasian	45	66.18			
African American	10	14.71			
Hispanic	10	14.71			
Asian	2	2.94			
Other	1	1.47			
Years of Education					
High School	7	10.26			
Some College	45	66.18			
College Grad.	11	16.18			
Master's Deg.	4	5.88			
Doctoral Deg.	1	1.47			
Diagnosis Among Anxious					
PTSD	29	85.29			
GAD	4	11.77			
OCD	1	2.94			

*Note.* NA = Not Applicable; PTSD = Post Traumatic Stress Disorder; GAD =

Generalized Anxiety Disorder; OCD = Obsessive-Compulsive Disorder.

## Instruments

### *Demographic Questionnaire*

The demographic questionnaire used in the original study from which the current study drew archival data allowed participants to self-report gender (male or female), race (Caucasian, African American, Hispanic, Asian, or other), and highest level of education (high school, some college, college graduate, master's degree, or doctoral degree; See Appendix A).

### *Spielberger State-Trait Anxiety Inventory (STAI)*

The STAI (Spielberger et al., 1970) is a self-report inventory consisting of two separate series of questions designed to measure anxiety in adults (See Appendix B). The state portion of the STAI was designed to measure the current anxiety levels adults upon the time of assessment, which may fluctuate over time. The trait portion of the STAI was designed to measure the general and stable tendencies of individuals toward anxiety. Individuals may yield raw scores between 20 and 80 depending upon how they respond to statements such as, "I am a steady person," on a Likert scaled with 1-4 (1 = almost never, 2 = sometimes, 3 = often, 4 = almost always). Higher scores indicate more anxiety.

This measure was developed and normed for both females and males in the age group of 19 and older and its scoring protocol indicates that higher scores reveal higher levels of state or trait anxiety. Reliability of the measure was assessed with female and male high school and college students in test-retest intervals ranging from one hour to 104 days, finding that reliability decreased as the time between intervals increased. However, the trait portion of the assessment had a coefficient range of .65 to .86,

showing greater stability than the state portion, which had a coefficient range of .16 to .62.

### *Experimental Stimuli*

The experimental stimuli used in the pre-test, post-test, and follow-up portions of the study originated from threat-related prediction paragraphs that were validated by Bentz and Williamson (1998) and have been used in subsequent studies (Bentz et al., 1999, 2004). The experimental stimuli consisted of ten negative (threat-related) scenarios, such as, "It has been raining very hard and windy all day and there has been a flood and tornado advisory reported on the news. Your home is built in a low area with a history of water and wind damage in the past." The remaining ten items were positive (non-threat-related) scenarios, such as, "You are in a large auditorium with very few other people watching a movie. At the end of the movie, people begin to move toward the exits." Bentz and Williamson (1998) found a distinct difference in perceived threat among the 20 scenarios, with ten of the prediction paragraphs being rated as significantly more threat-related than the other ten.

The instructions appearing on the experimental stimuli told participants to read each scenario and imagine themselves in the specific situation that was being presented. The participants then were asked to rate the probability that the event posited would occur. Participants rated their probability judgments by marking along a line that went from 0% to 100%. A marking at 0% indicated that the outcome had no chance of occurring, 50% indicated that the outcome had an equal chance of occurring or not occurring, and 100% indicated that the outcome would definitely occur. Probability

ratings were made on the number line, just as was done in previous studies using the same stimuli (Bentz & Williamson, 1998; Bentz et al., 2004). Participants made their marks anywhere along the number line; to avoid confusion, participants were explicitly asked not to write a number.

Half of all stimuli presented were done in a reversed-scored manner so as to disguise the measurement of pessimistic predictions. Thus, there were five negative scenarios that had matching negative questions, five negative scenarios that had matching positive questions, five positive scenarios that had matching positive questions, and five positive scenarios that had negative questions. The post-test assessment differed from the pre-test in that the different scenarios were given reverse scoring and the order of scenarios was different. However, both the post-test and follow-up assessments presented scenarios in the same order and with the same reverse scoring items. The experimental stimuli showing these judgment ratings and questions are presented in Appendix C (pre-test), Appendix D (post-test), and Appendix E (follow-up). The order of presentation of the stimuli is illustrated in Table 2.

#### *Consider-An-Alternative Debiasing Stimuli*

Hirt and Markman (1995) first developed the Consider-An-Alternative procedure. The goal of the Consider-An-Alternative procedure was to increase the salience and accessibility of alternative outcomes of the experimental situations. The procedure consisted of generating three positive alternative outcomes. According to Hirt and Markman, this exercise forces the activation of alternative information to counteract initial pessimistic probability judgments (See Appendix F).

### *Control Stimuli*

In place of generating positive alternative outcomes, participants were randomly assigned to the control group and asked to complete the control stimuli. These stimuli consisted of 10 separate paragraphs describing various scenarios. Participants were asked to identify and write down three nouns and three verbs from the paragraphs. The control stimuli was designed to ensure that participants in the control group read each situation and move at approximately that same pace as the participants in the experimental group (See Appendix G).

Table 2

### *Diagram of Experimental Design and Order of Presentation*

	Demographic Questionnaire	STAI	Pre- Test	Treatment	Post- Test	Follow- Up
Group						
Control	A	B	C	E	F	G
Debiasing	A	B	C	D	F	G

*Note.* Letters in the table represent the following instruments: A = Demographic questionnaire, B = Spielberger State-Trait Anxiety Inventory, C = Pre-testing experimental stimuli, D = Consider-An-Alternative debiasing stimuli, E = Control stimuli, F = Post-testing experimental stimuli, G = Follow-up experimental stimuli.

## Procedures

### *Recruitment of Clinical Participants*

Clinical participants were recruited from an in-patient psychiatric hospital in the Southwest. Announcements for the study were made at the beginning of group therapy sessions. Patients in the group therapy session were told that the topic of the study was to investigate a particular CBT treatment for anxiety, the approximate time commitment, and the exclusion criteria. Group therapy members then were asked to raise their hands if they were interested in participating in the study. Individuals with a psychotic diagnosis were excluded from participation in the study. An additional qualification criterion separate from the original study from which these data were collected was an exclusion of participants who did not complete the follow-up component. At times, the groups volunteering to participate from the in-patient setting were as small as one individual. Therefore, participants were sometimes given individual direction, depending upon the size of the group on the day of recruitment and participation.

### *Recruitment of Undergraduate Participants*

Undergraduate participants were recruited from a large public university in the Southwest through an online posting from their respective instructors. Volunteer participants were asked to attend one of three different research sessions and their respective follow-up sessions. Each of the three and subsequent follow-up sessions were held in a classroom on the university campus. The room capacity was 50; thus, the students were informed in the online posting that only the first 50 people attending each of the initial sessions (pre-test, debiasing or control, and post-test) would be allowed to

participate. Students who showed a desire to participate in the study but had come to the classroom after the first 50 students were instructed to come to one of the other remaining sessions. All participants were given research participation credit. Participation in research experiences was a requirement of these courses. However, students were not required to participate in any one particular study.

### *Informed Consent*

A copy of the cover letter and informed consent (see Appendix H) was given to each participant and read aloud by the researcher to the entire group. The document indicated an explanation and purpose of the research, research procedures, potential risks, and participation benefits. Within the section explaining the potential risks, participants were informed that their confidentiality would be protected to the extent that is allowed by law. For example, instead of indicating their names, participants were assigned a number to be used on all data materials after the initial signing of the consent form. Then the consent form with their identifying information were separated from all other materials and stored separately in locked filing cabinets. The participants were informed that their participation in the study was completely voluntary and that they could discontinue participation at any time.

### *Administration of Instruments*

After consent was obtained, participants were asked to complete the demographic questionnaire and the trait portion of the STAI (Spielberger et al., 1970). Directions for each document were read aloud to the group. Participants completed the 20 item trait portion of the STAI, which was administered during the first of two sessions and the data

from this inventory were used to determine each of the participant's general tendencies toward anxiety. The researcher individually collected the informed consent, demographic questionnaire, and STAI when participants indicated that they had finished these portions of the study by raising their hands.

Next, all participants were given the pre-test portion of the study. The directions to the pre-test were read aloud to the whole group and were all instructed to complete all 20 items in the pre-test according to the directions given. Participants were also asked to indicate completion of the pre-test by raising their hands and told that the researcher would then give them further directions as to how to continue in the study. The researcher individually collected the pre-test portion of study when the participants indicated completion by raising their hands.

After completing the pre-test portion, participants were randomly assigned to either the debiasing or control group. After randomization, the researcher returned individually to the participants and gave them either the debiasing stimuli or control stimuli, depending upon the group to which they were randomly assigned. The researcher individually reviewed the written instructions of the given stimuli and answered any questions that participants had. After participants completed the example item and indicated understanding of the directions, they were asked to complete the remaining control or debiasing exercises, depending upon their groups. The participants were also asked to raise their hand after completing the given exercise to indicate being finished and that the researcher then would collect that portion of the study and give further instructions.



Once participants indicated that they were finished with their respective tasks (debiasing or control), the researcher individually addressed participants by giving them the post-test portion of the study and reading with them the instructions that were printed on the front of the post-test. The post-test portion contained 20 positive and negative scenarios for probability judgment by the participants and was to be completed in the same fashion as the pre-test portion of the study. Participants were instructed to indicate when they had finished the post-test portion of the study by submitting the completed post-test portion to the researcher. Student participants then were asked to return to the same classroom at the same time exactly one week later to participate in the follow-up component of the study. Participants recruited from the psychiatric hospital were told that the researcher would return to the hospital exactly one week later to administer the follow-up portion of the study, provided that they still consented to participate.

Exactly one week after the initial research session, which included the consent form, demographic questionnaire, STAI, pre-test, debiasing or control, and post-test, participants were asked to continue in the study by completing the follow-up component. Participants were given the follow-up component as a group and the directions were read aloud by the researcher. Once again, participants were presented with 20 scenarios and asked to give probability judgments for each. Participants were asked to indicate completion of the follow-up by individually bringing it up to the researcher. Upon receiving the completed follow-up portion, the researcher gave participants each a copy of the consent form for their own records.

## Analysis

As earlier indicated, the following data was obtained from individuals in the original study, from which the current study drew archival data. Data that was excluded from the current study's analyses included all participants who did not complete the follow-up component of the study and female student participants with STAI t-scores over 60. It is important to note that some of the non-anxious male participants' data were found with trait anxiety t-scores greater than 60 and yet were included in the study. This was required due to the very low number of male participants in the non-anxious control group. The current study also used only the negative threat stimuli probability ratings in the statistical analyses. The first reason for doing so was because the study was focused on the reduction of pessimistic predictions after debiasing and did not target the reduction of optimistic predictions. Second, excluding the positive stimuli ratings made the interpretation of findings easier. Third, the debiasing procedure included only the generation of positive outcomes and, therefore, unlikely to have significantly changed predictions that were already optimistic. Finally, the current study was meant to build upon the existing research, which used the same stimuli and did not include the positive stimuli ratings in the statistical analyses (Bentz & Williamson, 1998; Bentz et al., 1999, 2004). The positive stimuli scenarios were included at the administration portion of the present and previous studies in order to disguise the objective of the stimuli and minimize the demand characteristics within the stimuli themselves.

As noted earlier, the experimental design of the study was a 2 X 3 X 2 (clinically anxious group versus non-clinically-anxious group x pretest versus posttest versus

follow-up x debiasing group versus control group) mixed factorial design. The first between subject independent variable included samples from two populations consisting of a clinically anxious group and a non-clinically-anxious group. The design included one within subject independent variable that consisted of the pretest, posttest, and follow-up ratings of probability estimates by participants. The second between subject independent variable included treatment groups (debiasing and control).

The dependent variable for the study consisted of the mean score of the 10 threat probability ratings obtained from the pretest, posttest, and follow-up experimental stimuli. The 10 positive experimental stimuli did not be included in the analysis of the current study but were used in the original collection of data in order to disguise the purpose of the study.

### Specific Hypotheses

Several statistical procedures were used to examine the experimental data. In order to control for Type I error, several mixed factorial Analysis of Variance statistical procedures were used. An alpha level of .05 was used and all statistical findings falling above that level were noted as non-significant; findings below .01 were noted separately.

The dependent variable consisting of the ten threat-related scenarios imbedded within the pretest, posttest, and follow-up (Appendix C, D, and E) were scored by recording the value of the participants' ratings on the number lines. The five threat-related situations that were positively worded questions were reversed scored. Then all of the threat-related ratings were averaged to give the mean value of the threat probability rating for each participant.

A mixed factorial 2 X 3 X 2 analysis of variance (clinically anxious versus non-anxious group X pretest versus posttest versus follow-up X debiasing versus control group) was conducted to test the hypothesized differences between the three independent variables. The ANOVA was also used to illustrate any interaction effects between the three independent variables.

First, it was hypothesized that the clinically anxious participants would show significantly higher pessimistic predictions of future negative events in comparison to the non-anxious participants. A main effect for anxiety was expected. The expected outcome would lend further support for past research, which has found a main effect for trait anxiety and increased pessimistic predictions of future threat (Bentz & Williamson, 1998; Bentz et al., 1999).

Second, it was hypothesized that the debiasing group participants would show a significantly lower pessimistic prediction of future negative events in comparison to the control group participants. A main effect for treatment was expected. This expected outcome would lend further support to past research, which found the Consider-An-Alternative debiasing procedures to be effective in reducing judgmental errors (Hirt & Markman, 1995; Mumma & Wilson, 1995).

Finally, a one-way interaction was predicted. Specifically, a one-way interaction of treatment group and repeated measure was expected. It was hypothesized that the debiasing groups would show a significant reduction in pessimistic predictions of future negative events from the pretest scores to the posttest scores, and then a significant increase in pessimistic predictions from the posttest scores to the follow-up scores. The

expected outcome would lend support to past research that found CBT treatment to be successful in reducing judgmental biases but that without reinforcement the effects of debiasing does not sustaining such overtime (Mogg et al., 1995). There was no similar hypothesized change across the repeated measures of control group.

## CHAPTER IV

### RESULTS

Descriptive statistics are presented first in this section in order to give an overview of the data. Following this, analyses of each hypothesis are presented in detail.

#### Descriptive Statistics

Of 142 potential participants, 68 participants met all of the inclusion criteria as listed in the Method section. The other 74 participants were not included in further analysis for reasons of incomplete protocols or Spielberger State-Trait Anxiety Inventory (STAI) t-scores outside of the appropriate range for their respective groups. Once again, it is important to note that of the nine non-anxious male participants, five were found with trait anxiety t-scores greater than 60. This inclusion of non-anxious males with t-scores greater than 60 was required due to the very low number of male participants in the non-anxious control group. Descriptive statistics for the trait portion of the STAI are presented in Table 3.

Table 3

*Descriptive Statistics for the t-score on the Trait Portion of the STAI*

Group	<i>N</i>	<i>M</i>	<i>Range</i>	<i>SD</i>
Clinically Anxious	34	81.12	67-102	8.53
Females	25	81.40	67-102	9.28
Males	9	80.33	70-90	6.40
Non-anxious	34	40.06	25-64	8.31
Females	25	46.88	38-59	5.53
Males	9	51.00	25-64	13.34
Total	68	65.10	38-102	18.03

*Note.* STAI = Spielberger State-Trait Anxiety Inventory

Table 4

*Means and Standard Deviation for Probability Ratings*

Group	Pretest		Posttest		Follow-up	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Anxious Debiasing	61.00	3.50	54.28	3.97	57.40	3.51
Anxious Control	59.34	3.50	56.49	3.97	58.88	3.51
Non-Anxious Debiasing	47.27	3.50	43.41	3.97	50.35	3.51
Non-Anxious Control	51.49	3.50	52.02	3.97	51.38	3.51

### Threat-Ratings Results

Probability ratings for each of the ten threat-related situations were scored and averaged to yield a mean threat probability rating for the pretest, posttest, and follow-up of all participants. All participant ratings were scored in terms of the pessimistic probability outcome. These data were used as the repeated measures dependent variable.

The first hypothesis stated that the clinically anxious participants would show a significantly higher pessimistic prediction of future negative events in comparison to the non-anxious participants. An analysis was conducted on the threat-related probability ratings using only the pretest data to investigate the initial threat ratings among all participants regardless of the repeated measure treatment. A 2 X 2 ANOVA (clinically anxious versus non-clinically anxious X debiasing group versus control group) using the pretest scores as the dependent variable was performed to demonstrate the equal starting points of participants within their respective anxiety groups. The difference between the clinically anxious debiasing and clinically anxious control groups was nonsignificant on the pretest scores (Debias group  $M = 61.00\%$ ,  $SD = 3.50\%$ ; Control group  $M = 59.34\%$ ,  $SD = 3.50\%$ ). Likewise, there was no significant difference on pretest scores when comparing the non-anxious debiasing group to the non-anxious control group (Debias group  $M = 47.27\%$ ,  $SD = 3.50\%$ ; Control group  $M = 51.49\%$ ,  $SD = 3.50\%$ ). Anxiety group (clinically anxious versus the non-anxious participants) was the only factor yielding significance between subjects (Clinically anxious group  $M = 60.17\%$ ,  $SD = 2.48\%$ ; Non-anxious group  $M = 49.38\%$ ,  $SD = 2.48\%$ ). These findings support the



conclusion that participants in the anxious control and anxious debiasing groups had equal starting points at the pre-test, just as the non-anxious control and non-anxious debiasing groups had equal starting points at the pre-test. Furthermore, these results support that as a group, anxious participants were significantly different from non-anxious participants.

Table 5

*2 X 2 ANOVA Indicating Between Subjects Effects*

Source	<i>Sum of Squares</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>
Anxiety Group (A)	1977.48	1	1977.48	9.48	.003*
Treatment Group (T)	27.83	1	27.83	.13	.716
A X T	147.35	1	147.35	.71	.404
Error	13354.36	64	208.66		

*Note.* \* Indicates  $p < .01$

A 2 X 3 X 2 repeated measures ANOVA (clinically anxious versus non-anxious group X pretest versus posttest versus follow-up X debias versus control group) was conducted to test the main hypotheses of the study. The design included one within subject independent variable, the repeated measure, and two between subject, independent variables, anxiety group, and treatment group. Table 6 presents the results of the repeated measures ANOVA.

Table 6

*Summary of the Mixed Factorial ANOVA Results on the Threat-Related Probability Ratings and Effect Sizes*

Source	Sum of Squares	df	MS	F	p	Effect Size
Between subjects						
Anxiety (A)	3751.35	1	3751.35	6.92	.011*	.098
Treatment (T)	357.88	1	357.88	.66	.419	.010
A X T	198.83	1	198.83	.37	.547	.006
Between error	34691.24	64	542.05			
Within subjects						
Trial (R)	2.52	1	2.52	.03	.859	.000
R X A	105.00	1	105.00	.32	.254	.020
R X T	.01	1	.01	.00	.993	.000
R X A X T	85.29	1	85.29	1.08	.304	.017
Within error	5075.46	64	79.30	79.30		

*Note.* Trial (R) source represents the repeated measure independent variable, pretest, posttest, and follow-up. \* Indicates  $p < .01$

As presented in Table 5, only a main effect for anxiety was found to be significant (Clinically anxious group  $M = 57.90\%$ ,  $SD = 2.31\%$ ; Non-anxious group  $M = 49.32\%$ ,  $SD = 2.31\%$ ). Thus, the second hypothesis, which stated that the debiasing group

participants would show a significantly lower pessimistic prediction of future negative events in comparison to the control group participants, was not supported. A main effect for treatment group was not found as expected.

Mixed results were found for the third hypothesis in the 2 X 3 X 2 repeated measures ANOVA. Of most importance, the debiasing group did not show a significant decrease in pessimistic predictions of future negative events from the pretest to the posttest and then a significant increase from the posttest to the follow-up; thus, Hypothesis 3 was not supported.

Finally, exploratory analyses were performed via t-tests to identify any significant differences between gender and anxiety groups. The first t-test, which compared the mean STAI t-scores of the non-anxious males against the mean STAI t-scores of the non-anxious females, found no significant difference between these two groups  $t(32) = 2.09, p > .05$ . The second t-test analysis compared the mean STAI t-scores of the clinically anxious males against the clinically anxious females and found no significant difference between the two groups  $t(32) = -.32, p > .05$ . The third analysis compared the mean STAI t-scores of the non-anxious males against the mean STAI t-scores of the clinically anxious males and found a significant difference between the two groups  $t(16) = -3.94, p < .01$ . The last analysis compared the mean STAI t-scores of the non-anxious females against the mean STAI t-scores of the clinically anxious females and found a significant difference between the two groups  $t(39.15) = 15.98, p < .01$ .

## CHAPTER V

### DISCUSSION

#### Summary of Findings

In addition to replicating previous studies investigating the Consider-An-Alternative debiasing procedure (Bentz & Williamson, 1998; Bentz et al., 1999; 2004), the goal of the current study was to expand the investigation of the procedure to include clinically anxious individuals and to add a follow-up component to test. As with previous studies, the current study anticipated a main effect for anxiety. Thus, the first hypothesis predicted that the highly anxious participants would show a significantly higher pessimistic prediction of future negative events in comparison to the non-anxious participants. Analysis of the data was conducted via a 2 X 2 ANOVA (clinically anxious versus non-clinically anxious X debiasing group versus control group) and a 2 X 3 X 2 ANOVA (clinically anxious group versus non-clinically anxious group X pretest versus posttest versus follow-up X debiasing group versus control group). Both analyses showed statistical significance supporting the first hypothesis and suggesting that the clinically anxious individuals did generate more pessimistic predictions of future negative events in comparison to their non-anxious counterparts. This first hypothesis was the only proposed hypothesis statistically supported.

The second hypothesis predicted that the debiasing group would show a significantly lower pessimistic prediction of future negative events in comparison to the

control the group participants. However, the 2 X 3 X 2 ANOVA showed no statistical significance and, thus did not support the proposed hypothesis. This outcome suggests that participants in the debiasing group did not gain significant benefits from the procedure in comparison to the participation in the control group. Upon a detailed examination of the 2 X 3 X 2 ANOVA results, the mean scores revealed a pattern where the debiasing procedure appeared to benefit non-anxious members of the debiasing group, while the non-anxious control group maintained their similar levels of pessimism across measures. However, the mean scores also revealed an unexpected pattern among the clinically anxious participants where both the debiasing and control groups yielded a decrease in pessimistic predictions of future events.

One potential explanation for why clinically anxious participants within the control group yielded similar scores when compared to the clinically anxious debiasing group is that this particular inpatient hospital often allows their population to participate in several different psychological studies in addition to their ongoing treatment within their hospitalization. Thus, much of the population at this particular inpatient hospital may have had exposure to research and may have come to expect certain outcomes from their experience in research. For instance, many of the clinically anxious control group participants commented on the helpfulness of the control procedure (i.e., identifying verbs and nouns within paragraphs). In other words, the resulting pattern explained above may have been caused by demand characteristics where participants attempt to discern and confirm the experimenter's hypotheses.

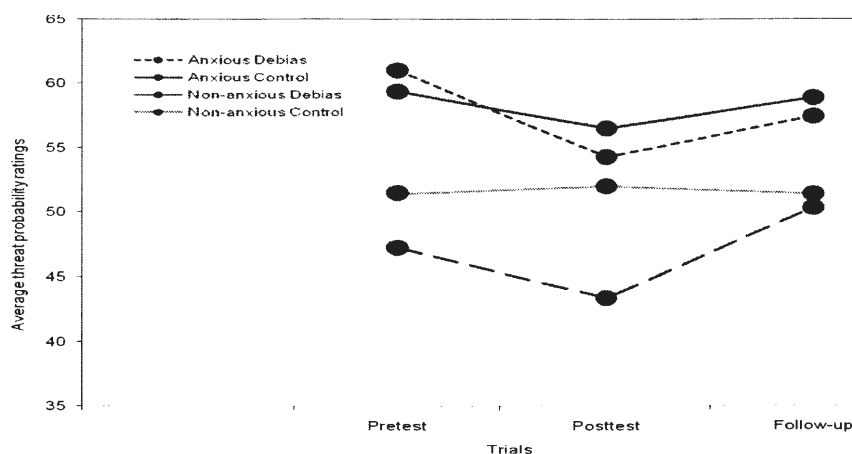
One other possible explanation for why both the control and debiasing group decreased in pessimistic prediction after their respective treatments is the repeated exposure to proposed scenarios. It may be possible that upon further review, whether through the debiasing or control exercise, participants in both groups may have applied Cognitive Behavioral Therapy (CBT) skills they had learned as part of their general inpatient treatment to decrease pessimistic predictions. In other words, an outside source may well have impacted the posttest results regardless of their respective treatment groups. However, if this were a major confound variable, it would be most likely that all clinically-anxious participants would have maintained the decreased pessimistic prediction level that had been established at the posttest.

The third hypothesis expanded upon the expectations of the second hypothesis. It predicted that the debiasing groups would show a significant reduction in pessimistic predictions of future negative events from the pretest to the posttest scores, and then a significant increase in pessimistic predictions from the posttest scores to the follow-up scores. In other words, participants in the debiasing group were expected to yield results that would show a significant decrease in pessimistic predictions and then return close to their original level of pessimism, while control group participants were expected to maintain their level of pessimism across all three measures. The 2 X 3 X 2 ANOVA showed no statistical significance for the third hypothesis. This outcome suggests that participants in the debiasing group were not only immediately unaffected by the debiasing procedure, but also remained unaffected by the passage of time from the posttest to the follow-up.

While statistical analyses did not indicate a significant effect resulting from the debiasing procedure, a detailed examination of the 2 X 3 X 2 ANOVA results revealed a general trend where the debiasing procedure appeared to give a small and immediate short-lived benefit for non-anxious members of the debiasing group, while the non-anxious control group maintained their similar levels of pessimism across all three measures. However, the mean scores also revealed an unexpected general trend among the clinically anxious participants, where both the debiasing and control groups yielded a decrease in pessimistic predictions of future events and then did not significantly increase again in pessimistic predictions at the follow-up. These results are illustrated in Figure 1.

Figure 1

*Plot of interaction effect of the debiasing condition across trials*



As previously stated, one potential explanation for why the clinically anxious participants did not maintain their level of pessimism from the pretest to the posttest is

demand characteristics. Additionally, it should be noted that clinically anxious participants continued to receive anti-anxiety treatment (e.g., medication, psychotherapy, group therapy) across the duration of their participation in the original study from which the current study draws archival data. Thus, beneficial treatment received within the context of the inpatient setting may have prevented the clinically anxious debiasing group from returning to their original pessimistic levels. However, it should also be noted that all inpatient participants received similar anti-anxiety treatment at their inpatient setting during the duration of the study and, thus, works to ensure that the only aspect differentiating the debiasing anxious group from the control anxious group was the Consider-An-Alternative procedure.

Finally, exploratory analyses were conducted to identify any significant differences between gender and anxiety groups. The results of the first t-test comparing non-anxious males against the non-anxious females showed that the difference between the two groups was not significant. These results demonstrated that the inclusion of non-anxious male participants with STAI t-scores of 60 or slightly above was not likely to skew the overall results pertaining to the non-anxious group as a whole. Additionally, the t-test comparing the non-anxious males against the clinically anxious males showed enough differentiation between the two groups to assume that despite the elevated t-scores the non-anxious males were not as distressed by anxiety as their clinically-anxious male counterparts. Thus, though it was not optimal to include non-anxious males who showed elevated levels of anxiety, it did not appear to significantly impact the overall finding of this study.



The remaining t-tests demonstrated that there was no significant difference between the STAI t-scores of the clinically anxious males and clinically anxious females. These results inferred that across gender anxiety levels were similar. Next, t-tests results comparing non-anxious females with clinically anxious females demonstrated a similar pattern to that of the male participants. These results indicated that clinically anxious females were significantly more anxious than their non-anxious female counterparts. Together, t-test results supported the assumption that gender did not skew results such that starting levels of anxiety would be too similar between the clinically anxious group and the non-anxious group. Additionally, gender did not generate great dissimilarity within the clinically anxious group and within the non-anxious group.

#### Implications for Theory

Just as previous studies have found a positive relationship between level of anxiety and higher ratings of future threat (Bentz & Williamson, 1998; Bentz et al., 1999; 2004; Butler & Mathews, 1983; MacLeod & Byrne, 1996), the data from the current study support the conclusion that as anxiety increases, so does pessimism about the probable occurrence of threatening events. Specifically, the main effect for anxiety found in the current study supports the assumptions made from research regarding the threat evaluation system (TES) model (Mathews & Mackintosh, 1998; Taylor & Brown, 1988). The current findings support the TES model by confirming that individuals suffering from anxiety have an apparent lower threshold for making pessimistic judgmental biases about given scenarios.

Implications of both current and previous findings help to maintain confidence in the conclusion that highly anxious individuals tend to generate pessimistic judgmental biases (Bogels & Mansell, 2004; Hayes & Hirsch, 2007; Hirsch et al., 2006; McManus et al., 2000; Mineka & Sutton, 1992; Mogg et al., 2004; Wenzel et al., 2005). The main effect for anxiety supports conclusions made within the heuristic-analytic theory (Evens, 1984, 1989), which posited that attentional biases toward negative aspects of given scenarios readily lead to the use of pessimistic heuristics and judgmental biases among those with high levels of anxiety. Additionally, the lack of evidence within the current investigation to support the Consider-An-Alternative debiasing exercise suggests that the attentional biases and subsequent judgmental biases were so strong that those diagnosed with anxiety disorders failed to give attention to disconfirming information even when participants took an active role in generating positive alternatives. These results support previous research in probability forecasting, which found that individuals diagnosed with anxiety would not readily attend to information that disconfirmed thoughts generated within their anxious state, thereby producing pessimistic predictions (Hoch, 1985; Kverno, 2000; Simon et al., 2001; Weinstein & Klein, 2002).

Conversely, the lack of evidence to support the Consider-An-Alternative debiasing exercise does not confirm previous debiasing research. Previous researchers found a decrease in erroneous probability forecasts as individuals generated more extensive lists of future possible endings to scenarios than what they had originally considered (Armor & Taylor, 2002; Hoch, 1985). Previous models of probability forecasts simply concluded that erroneous probability judgments could be countered by

the generation of alternative possible outcomes (Hoch, 1985). Additionally, researchers have found that numerous sessions of debiasing exercises produce effective cognitive alterations among individuals with high trait anxiety (Mathews et al., 2007). In light of these previous researchers' findings, the current study raises questions about the extensiveness, intensity, and frequency that must occur in order to positively affect pessimistic biases and counteract the over-reliance upon erroneous heuristics. These questions are particularly important with regard to individuals with anxiety diagnoses who have histories of strongly held pessimistic beliefs and may not attend as readily to positive alternative as non-anxious individuals.

As previously stated, the lack of significant change across trials within the current study does not directly lend support specifically to the Consider-An-Alternative procedure. However, it should be noted that the results of the current study do not fully contradict the utility of the Consider-An-Alternative procedure either. For instance, results among non-anxious students showed some decrease in pessimism of the occurrence of threatening events after participating in the Consider-An-Alternative procedure, whereas the non-anxious control group did not show such a decrease. Likewise, clinically anxious individuals showed a decrease in pessimism of the probable occurrence of threatening events after participating in the Consider-An-Alternative procedure. However, the similar decrease among clinically anxious participants in the control group makes it unclear if the decrease among the debiasing group was in response to the Consider-An-Alternative procedure or merely a response to some other variable such as demand characteristics.

Finally, predictions among the non-anxious student participants appeared to return close to their prior levels of pessimism after a one week delay, lending some support to the theory that ongoing active intervention is warranted for long term improvement of anxiety (Mogg et al., 1995). This assumption cannot be drawn from the clinically anxious group not only because of the differing pattern when compared to the non-anxious students, but also because these inpatient participants also received various treatments for managing anxious cognitions and emotions.

### Implications for Future Research

As a result of this study, several ideas for future research have emerged. First, it would be beneficial for all non-anxious participants to have STAI t-scores below 60. This criteria would more strongly ensure the difference in the level of trait anxiety among the non-anxious participants in comparison to the level of trait anxiety among clinically-anxious participants. Additionally, non-anxious t-scores below 60 would be more representative of the general population. One way of improving the possibility of obtaining a more representative sample of the population would be to greatly increase the sample size, generating a more robust and powerful study. Future research utilizing a larger sample size may also provide opportunities to match clinically-anxious and non-anxious participants on other variables.

Another possible direction for future research would be to increase the number of times participants are exposed to the Consider-An-Alternative exercise. This increase in number of debiasing sessions would take into greater consideration the work done by Grey and Mathews (2000). As indicated earlier, these researchers found that biases

among high trait anxiety individuals were strongly curtailed only after several debiasing sessions. For example, future researchers may want to include three to four once-a-week follow-up sessions where participants are once again exposed to Consider-An-Alternative exercises. Participants may also then complete a probability rating assessment in order to monitor pessimistic probability ratings. Additionally, each session may also include the state portion of the STAI in order to monitor emotional fluctuations that would be indicated in their current state of anxiety. Finally, one month after completing the last Consider-An-Alternative exercise, researchers may administer another probability rating assessment along with the trait portion of the STAI so as to compare and assess whether participants have experienced more permanent improvements in their anxiety. Thus, future research may find greater efficacy and long-term effects from participants engaging in several instances of the Consider-An-Alternative debiasing exercise.

Future research may also expand the study to other inpatient settings that would include populations that do not have such an extensive experience with participation in research. By gaining access to a more inexperienced clinically-anxious population it is the hope that the risk of demand characteristics would be decreased. Additionally, other possible benefits for future research exist with the recruiting clinically-anxious participants from a different inpatient setting. For example, another inpatient setting may provide a more diverse and representative distribution of anxiety disorders. Furthermore, another inpatient setting may allow for greater control over other treatment variables so that the control and debiasing groups are better defined and differ more from one another in their experiences in overcoming anxiety.

Finally, future researchers may still wish to attend to gender issues related to anxiety, subsequent pessimistic predictions, and the Consider-An-Alternative debiasing procedure. For instance, past research has found that as trait anxiety increased, female participants were found to report increasingly more pessimistic predictions of future events in comparison to male participants both before and after participation in the Consider-An-Alternative debiasing procedure (Bentz et al., 1999, 2004; Bentz & Williamson, 1998). Additionally, it has been found that anxious women overestimated the probability of future threatening events, suggesting that gender-related judgmental bias may play a role in the development and maintenance of certain anxiety disorder (Bentz & Williamson), such as generalized anxiety disorder and social phobia (APA, 2000).

#### Implications for Practice in Counseling Psychology

The results of the study are consistent with previous research supporting differing judgmental biases between highly-anxious and non-anxious individuals (Bentz et al., 1999, 2004; Bentz & Williamson, 1998; Bogels & Mansell, 2004; Hayes & Hirsch, 2007; Hirsch et al., 2006; McManus et al., 2000; Mineka & Sutton, 1992; Mogg et al., 2004; Wenzel et al., 2005). This relationship between anxiety and judgmental bias, which is continually supported throughout research, is important to the field of counseling psychology because it offers evidence for judgmental biases as a main source of how anxiety is likely to develop and be perpetuated within individuals. Furthermore, though results do not confirm the efficacy of the Consider-An-Alternative debiasing procedure found in previous studies, the current study shows a general trend of a decrease in

pessimistic judgmental bias after the debiasing procedure. This trend is particularly evident among the non-clinically anxious sample, which showed a decrease in pessimistic judgmental bias among the debiasing group and virtually no change among the control group. In other words, the current study's findings do not disconfirm the utility of such CBT skills, especially among non-clinically anxious populations. Additionally, the current study shows a trend of all groups resuming levels close to their original pessimistic states at the follow-up measure. It, therefore, may be deduced that such CBT skills must be reinforced across time in order to reap long-term benefits. Thus, this study lends some support to the already strong evidence for the use of CBT skills in general when working with individuals suffering from symptoms of anxiety but who are not at the clinical level (Hirsch & Holmes, 2007; Hofmann, 2004; Hofman et al., 2004; Mathews, Mogg, et al., 1995; Otto, 2005). However, such skills may need to be presented more than once within the context of therapy in order to show lasting effects and any substantial efficacy among the clinically-anxious.

However, it should also be noted that the current study does not fully and specifically support the Consider-An-Alternative mode of treatment for anxiety. Other more generic factors, such as the therapeutic relationship, may be more influential on outcome than any specific techniques. In fact, literature is very strong in supporting focus on good therapeutic rapport instead of on any one specific technique and has been shown to lay fertile ground for effective therapy in general (Beutler et al., 2004; Bohart, Elliott, Greenberg, & Watson, 2002; Elliot, Greenberg, & Lietaer, 2004; Horvath & Bendi, 2002; Martin, Garske, & Davis, 2000). Furthermore, a strong therapeutic alliance often provides

opportunities for therapists and clients to explore specific techniques that may be advantageous to therapeutic progress, such as the one examined in the current study.

Finally, the current study showed a decrease in pessimistic prediction for the control and debiasing groups among the clinically anxious. It should be noted that clinically anxious individuals within this particular inpatient setting tended to have the expectation that any intervention during their inpatient treatment, whether it be related to research or not, works towards the decrease of anxiety symptoms. Thus, the lack of full disclosure regarding the nature and purpose of the debiasing versus control exercises may have lead to many clinically anxious participants to assume that the control exercise was designed to benefit symptoms of anxiety. For example, one of the inpatient participants expressed gratitude for having been instructed to generate nouns and verbs in the control exercise and stated that the exercise was helpful. Such demand characteristics have possible implications for practice in the field of counseling psychology in that demand characteristics may also occur in the therapeutic relationship when clients artificially produce results that they assume therapists expect. This highlights the importance of collaboration and transparency with clients so as to bring about the most authentic therapeutic changes.

### Implications for Training

Just as the relationship between anxiety and judgmental bias is important to the field of counseling psychology in general, evidence of such a connection is important for implications in training students to understand anxiety from the source of biases within thoughts. Thus, students may learn various theoretical orientations in light of



understanding evidence for judgmental biases as a main source of how anxiety is likely to develop and be perpetuated within individuals. By not lending specific support for the Consider-An-Alternative debiasing procedure among clinically anxious individuals, the current study implies the necessity for a broad base of training when learning theoretical orientations and techniques, which should include CBT as well as other evidence-based models.

Additionally, this study has implications for students to understand the possible treatment differences that may arise between non-clinical and clinical populations. For instance, while the results produced a trend indicating some benefits of using the Consider-An-Alternative debiasing procedure among the non-clinically anxious participants, no similar trend was noted among clinically anxious participants. As implied earlier, these different trends may be evidence that as the severity of anxiety changes, so must the approach. In other words, the results of this study may teach students to not always expect success among differing gradients of a particular diagnosis.

Finally, the results indicated no significant benefits over the period of a week to participating in the Consider-An-Alternative debiasing procedure. Thus, the results of this study may be used to teach that one should not expect for a one-time treatment to significantly improve such long-standing cognitions and symptoms. In other words, this study supports broad based training that encourages scientist-practitioners to understand long term change within the context of an ongoing process.

#### Limitations of Study

As briefly indicated above, the current study had certain limitations that should be taken into consideration in the interpretation of the findings. For instance, the most profound limitation was the limited sample size. This relatively small number of participants not only affected the general power of the study, but also limited the population to which the current study generalizes. This limitation was especially true with regard to archival data that had been collected from men, inhibiting the ability to include only non-anxious participants with STAI t-scores below 60. As stated earlier, the inclusion of non-anxious men with STAI t-scores of 60 or above compromises the ability to strongly differentiate them from the clinically-anxious participants.

Furthermore, the sample was limited to one specific geographic area of the United States, limiting the generalizability of the study's findings. It should be noted that even within the limitations of the geographic area, the study also suffers from the fact that all clinically-anxious participants were recruited from one particular inpatient setting. The collection of archival data from only one inpatient source may have resulted in the current study being exposed to confound variables specific to that particular inpatient setting that may not be a general aspect of most other inpatient settings. For instance, participants at this inpatient setting had had multiple experiences in participating in research that may have altered their performance on the procedures of the current study. Additionally, the current study's results must be interpreted with the knowledge that the clinically-anxious sample did not provide a distribution of anxiety disorders that is proportional to what has been documented in prevalence rates (APA, 2000).

Finally, the current study was limited by the nature of conducting archival research. This mode of research restricts the population from which data are drawn in more stringent ways than if it were not an archival study. For instance, in a non-archival study the collection of data may have continued longer so as to provide an opportunity to better apply exclusion criteria.

### Conclusion

Though this study indicated inconclusive evidence for the efficacy of the Consider-An-Alternative debiasing procedure with both clinically anxious and non-anxious individuals, the study did indicate that clinically-anxious individuals have a more pessimistic judgmental bias. Therefore, it can be deduced that the clinically anxious are more pessimistic in their cognitions than their non-anxious counterparts. While well-established CBT interventions are likely to remain permanent fixtures in the treatments plans for those suffering from anxiety, the promising exercise of Consider-An-Alternative awaits additional study to be unequivocally added to this repertoire.

With the current study serving as a starting point, future research in this specific area of treatment for anxiety may lead to more robust and powerful examinations of the Consider-An-Alternative procedure and similar CBT skills. Thus, future studies may also have the same goals as the current investigation, which sought not only to expand the Consider-An-Alternative research to clinically-anxious individuals but also examine the long-term effects of such an exercise.

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## APPENDIX A

### Demographic Questionnaire

## Demographic Questionnaire

Part. No. \_\_\_\_\_

Date \_\_\_\_\_

## Demographic Questionnaire

Gender:      Male \_\_\_\_\_      Female \_\_\_\_\_

Age:      \_\_\_\_\_

Race:      Caucasian      \_\_\_\_\_

African Amer. \_\_\_\_\_

Hispanic      \_\_\_\_\_

Asian      \_\_\_\_\_

Other      \_\_\_\_\_

Education:      High School      \_\_\_\_\_

Some College      \_\_\_\_\_

College Grad.      \_\_\_\_\_

Master's Deg.      \_\_\_\_\_

Doctoral Deg.      \_\_\_\_\_



## APPENDIX B

### Self-evaluation Questionnaire STAI Form Y-2

Self-evaluation Questionnaire  
STAI Form Y-2

This copyrighted instrument can be obtained by contacting Mind Garden at 1690  
Woodside Road, Suite 202, Redwood City, CA 94061 and by phone at (650) 261-3500.

## APPENDIX C

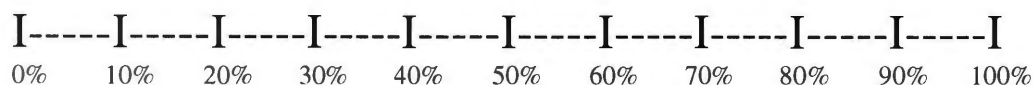
### Pretest

## Pretest

Participant Number \_\_\_\_\_

Pre

**Directions:** Please read the following paragraphs and imagine yourself in that situation. Then, rate the probability that the event listed will happen to you on the following scale, given the situation that you read. You may use any numeric value between 0% and 100%.



0% = The outcome has no chance of occurring.

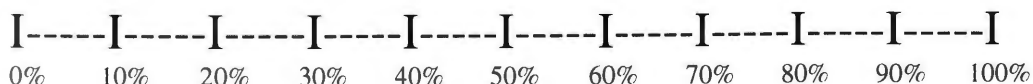
50% = The outcome has an equal chance of occurring or not occurring.

100% = The outcome will definitely occur.

Please make only a line to indicate your rating of the probability that the event will occur, given the situation that was presented. You may draw your line at any point on the scale provided. **DO NOT WRITE A NUMBER**

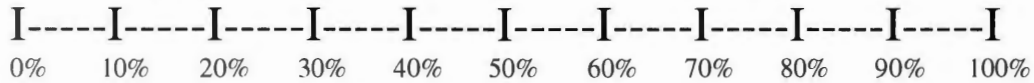
Example: Your car's engine has not been running very well over the last month and it has been very hard to start at times, but you have been unable to take it to a mechanic to have it checked.

What is the probability that your car will break down today?



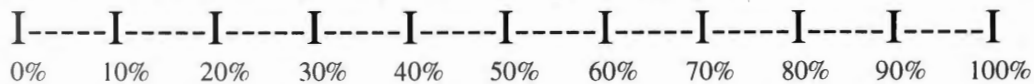
1. It has been raining very hard and windy all day and there has been a flood and tornado advisory reported on the news. Your home is built in a low area with a history of water and wind damage in the past.

What is the probability that your home will sustain damage from the storm?



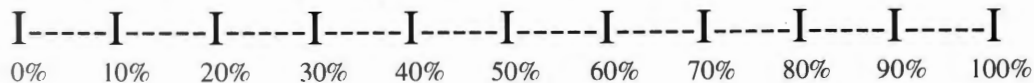
2. You are in a large auditorium with very few other people watching a movie. At the end of the movie, people begin to move toward the exits.

What is the probability that you will be injured trying to leave the auditorium?



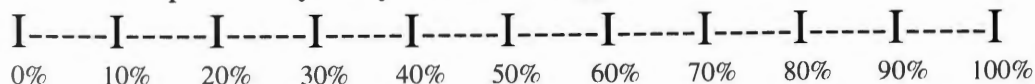
3. You are passing one of your classes but it is early in the semester. There are several more tests remaining for your grade to change.

What is the probability that you will fail the class?



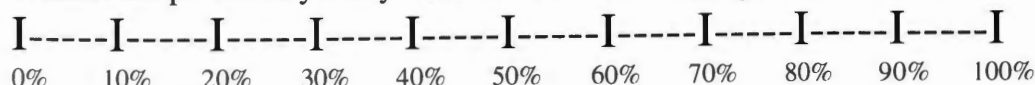
4. Late at night, you are walking to your car in a part of town that is known for a high crime rate. Your car is parked in an area that has very poor lighting.

What is the probability that you will be mugged?



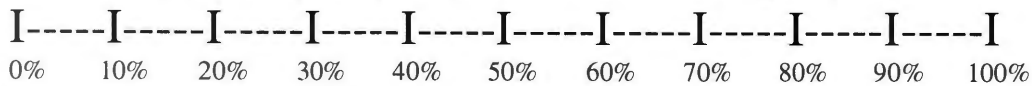
5. It has been a sunny day with very few clouds in the sky. You live in a home that has never had a history of water or wind damage from a storm.

What is the probability that your home will avoid damage from the storm?



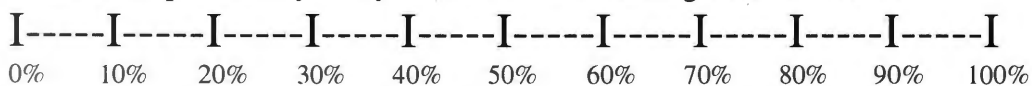
6. late at night, you are driving on a highway that is totally deserted. One of your tires blows out and you pull off the road to check for damage.

What is the probability that you will be stranded on the highway?



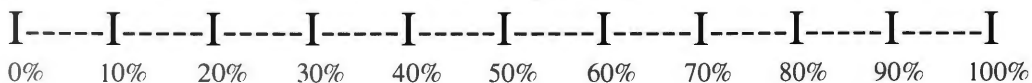
7. You have just graduated from college and taken a job that will move you away from your hometown. This job will take you to a city with a low crime rate and you will be living in a safe part of town.

What is the probability that you will avoid becoming a crime victim?



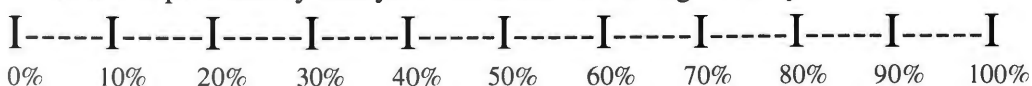
8. You have a job that you enjoy but the company is having financial problems and will lay off several employees in the near future.

What is the probability that you will keep your job?



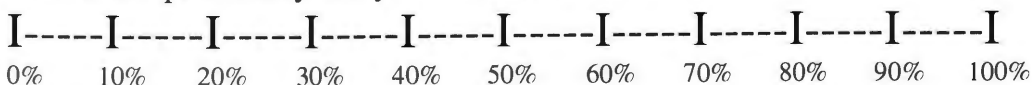
9. You are riding a bicycle down a large hill when you realize that the brakes of the bike are not working and a sharp turn is just ahead.

What is the probability that you will avoid wrecking the bicycle?



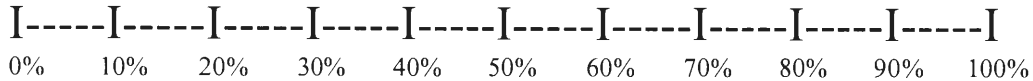
10. You are driving to a meeting across town, but you don't expect to be late. The weather is fine and traffic is average.

What is the probability that you will be in a car accident?



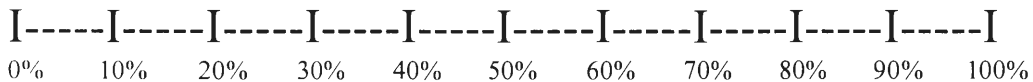
11. You have just graduate from college and taken a job that will move you away from your hometown. This job will take you to a city with a high crime rate and you will be living in an unsafe part of town.

What is the probability that you will become a crime victim?



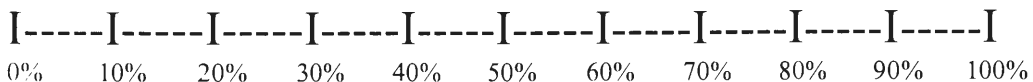
12. You have a job that you enjoy and the company is financially having no problems. There is little risk that the company will lay off any employees in the near future.

What is the probability that you will lose your job?



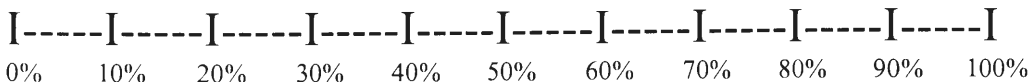
13. During the day, you are walking to your car in a part of town that is familiar to you. Your car is parked in an area that often has others around, but at this time you do not see anyone.

What is the probability that you will avoid being mugged?



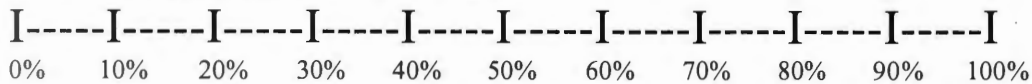
14. During the day, you are driving on a highway that has few other cars. You know that one of your tires has a slow air leak, but you checked the air pressure in the morning.

What is the probability that you will avoid being stranded on the highway?



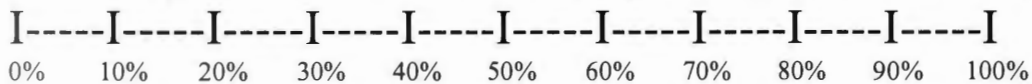
15. You are failing one of your classes and it is already halfway through the semester. There are only two tests remaining to pull your grade up to a passing level.

What is the probability that you will pass the class?



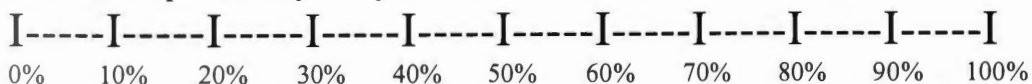
16. You are in a large auditorium with hundreds of people watching a movie. You have a faint smell of smoke when an alarm goes off and people begin running to the exits.

What is the probability that you will avoid being injured trying to leave the auditorium?



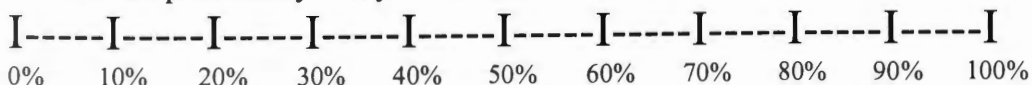
17. You are out on the ocean, deep sea fishing with some friends when a large storm beings to roll in. You try to start the engine, but mechanical problems prevent the engine from starting.

What is the probability that you will be lost at sea?



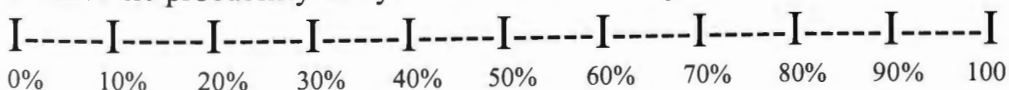
18. You are late for an important meeting across town so you are driving above the speed limit. It starts to rain heavily and the traffic around you is hard to see clearly.

What is the probability that you will avoid a car accident?



19. You are riding a bicycle on a relatively flat road with no other cars or bicycles in sight. The brakes of your bike are working just fine.

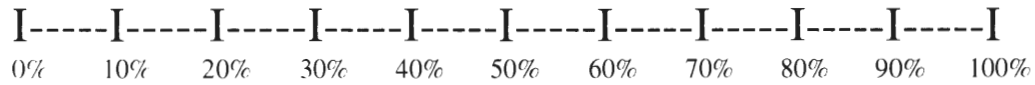
What is the probability that you will wreck the bicycle?





20. You are out on the ocean, deep sea fishing with some friends and it is sunny with few clouds in the sky. Your boat has never had any mechanical problems.

What is the probability that you will get home safe?



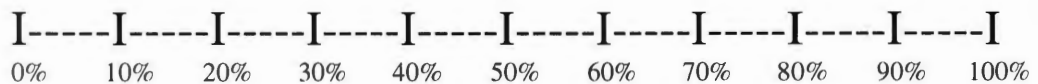
## APPENDIX D

### Posttest

## Posttest

Participant Number \_\_\_\_\_  
Post

**Directions:** Please read the following paragraphs and imagine yourself in that situation. Then, rate the probability that the event listed will happen to you on the following scale, given the situation that you read. You may use any numeric value between 0% and 100%.



0% = The outcome has no chance of occurring.

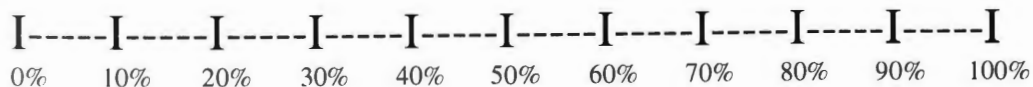
50% = The outcome has an equal chance of occurring or not occurring.

100% = The outcome will definitely occur.

Please make only a line to indicate your rating of the probability that the event will occur, given the situation that was presented. You may draw your line at any point on the scale provided. **DO NOT WRITE A NUMBER**

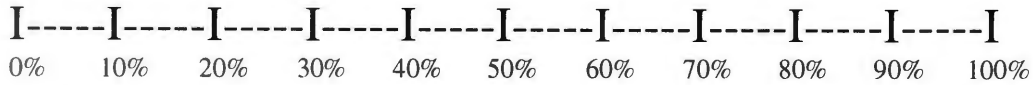
Example: Your car's engine has not been running very well over the last month and it has been very hard to start at times, but you have been unable to take it to a mechanic to have it checked.

What is the probability that your car will break down today?



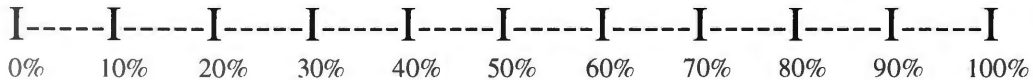
1. You are driving to a meeting across town, but you don't expect to be late. The weather is fine and traffic is average.

What is the probability that you will avoid being in a car accident?



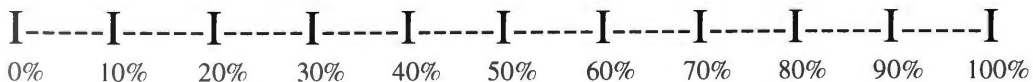
2. You are riding a bicycle down a large hill when you realize that the brakes of the bike are not working and a sharp turn is just ahead.

What is the probability that you will wreck the bicycle?



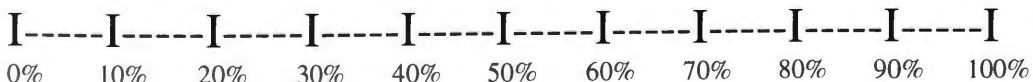
3. During the day, you are driving on a highway that has few other cars. You know that one of your tires has a slow air leak, but you checked the air pressure in the morning.

What is the probability that you will be stranded on the highway?



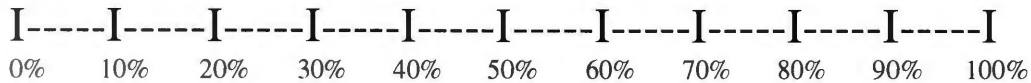
4. You are in a large auditorium with hundreds of people watching a movie. You have a faint smell of smoke when an alarm goes off and people begin running to the exits.

What is the probability that you will be injured trying to leave the auditorium?



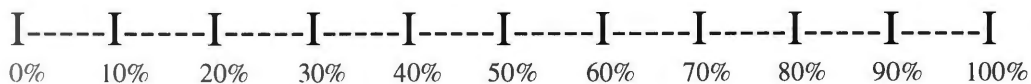
5. You have a job that you enjoy but the company is having financial problems and will lay off several employees in the near future.

What is the probability that you will lose your job?



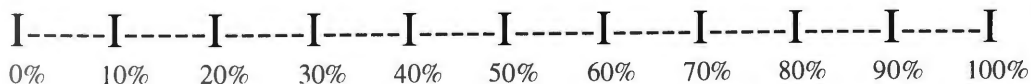
6. You are out on the ocean, deep sea fishing with some friends when a large storm begins to roll in. You try to start the engine, but mechanical problems prevent the engine from starting.

What is the probability that you will get home safe?



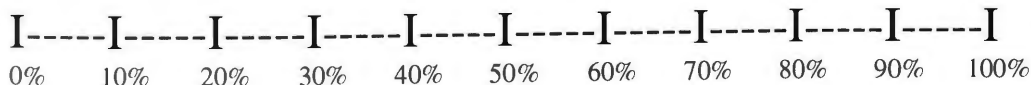
7. You have a job that you enjoy and the company is financially having no problems. There is little risk that the company will lay off any employees in the new future.

What is the probability that you will keep your job?



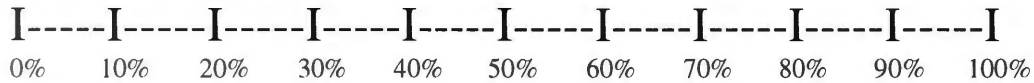
8. Late at night, you are driving on a highway that is totally deserted. One of your tires blows out and you pull off the road to check for damage.

What is the probability that you will avoid being stranded on the highway?



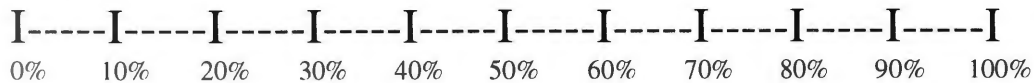
9. You are riding a bicycle on a relatively flat road with no other cars or bicycles in sight. The brakes of your bike are working just fine.

What is the probability that you will avoid wrecking the bicycle?



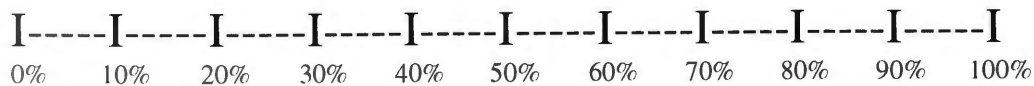
10. You are out on the ocean, deep sea fishing with some friends and it is sunny with few clouds in the sky. Your boat has never had any mechanical problems.

What is the probability that you will be lost at sea?



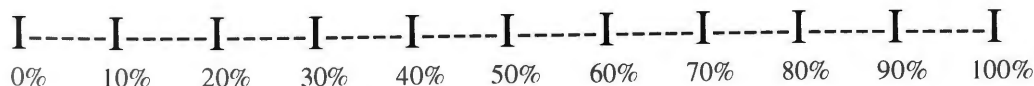
11. You are failing one of your classes and it is already half way through the semester. There are only two tests remaining to pull your grades up to a passing level.

What is the probability that you will fail the class?



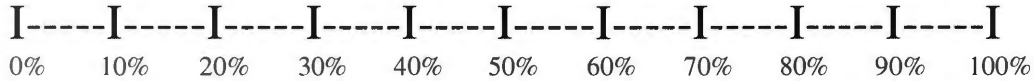
12. During the day, you are walking to your car in a part of town that is familiar to you. Your car is parked in an area that often has others around, but at this time you do not see anyone.

What is the probability that you will be mugged?



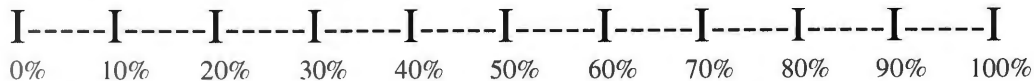
13. It has been raining very hard and windy all day and there has been a flood and tornado advisory reported on the news. Your home is built in a low area with a history of water and wind damage in the past.

What is the probability that your home will avoid sustaining damage form the storm?



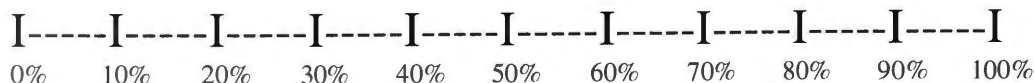
14. You have just graduated from college and taken a job that will move you away from your hometown. This job will take you to a city with a low crime rate and you will be living in a safe part of town.

What is the probability that you will be a crime victim?



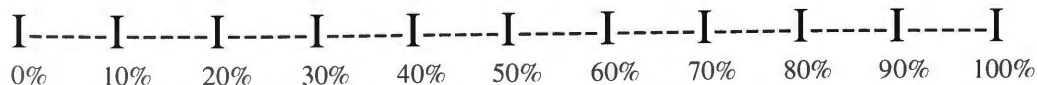
15. You are late for an important meeting across town so you are driving above the speed limit. It starts to rain heavily and the traffic around you is hard to see clearly.

What is the probability that you will be in a car accident?



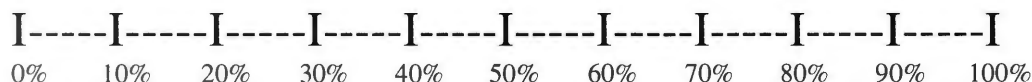
16. Late at night, you are walking to your car in a part of town that is known for a high crime rate. Your car is parked in an area that has very poor lighting.

What is the probability that you will avoid being mugged?



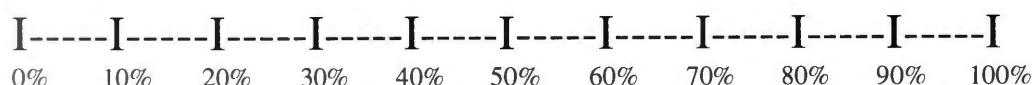
17. You have just graduated from college and taken a job that will move you away from your hometown. This job will take you to a city with a high crime rate and you will be living in an unsafe part of town.

What is the probability that you will avoid becoming a crime victim?



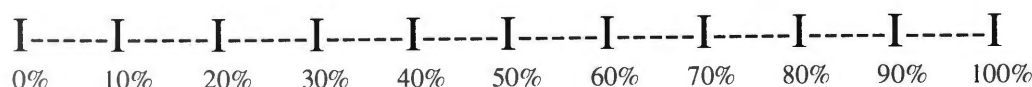
18. It has been a sunny day with very few clouds in the sky. You live in a home that has never had a history of water or wind damage from a storm.

What is the probability that your home will sustain damage from the storm?



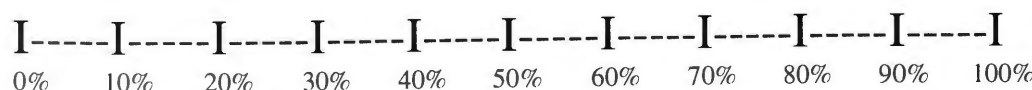
19. You are passing one of your classes but it is early in the semester. There are several more tests remaining for your grade to change.

What is the probability that you will pass the class?



20. You are in a large auditorium with very few other people watching a movie. At the end of the movie, people begin to move toward the exits.

What is the probability that you will avoid being injured trying to leave the auditorium?





## APPENDIX E

### Follow-up

## Follow-up

Participant Number \_\_\_\_\_  
FU

Date \_\_\_\_\_

**Directions:** Please read the following paragraphs and imagine yourself in that situation. Then, rate the probability that the event listed will happen to you on the following scale, given the situation that you read. You may use any numeric value between 0% and 100%.

I-----I-----I-----I-----I-----I-----I-----I-----I-----I  
0%      10%      20%      30%      40%      50%      60%      70%      80%      90%      100%

0% = The outcome has no chance of occurring.

50% = The outcome has an equal chance of occurring or not occurring.

100% = The outcome will definitely occur.

Please make only a line to indicate your rating of the probability that the event will occur, given the situation that was presented. You may draw your line at any point on the scale provided. **DO NOT WRITE A NUMBER**

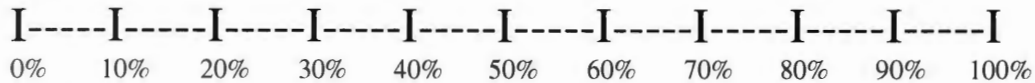
Example: Your car's engine has not been running very well over the last month and it has been very hard to start at times, but you have been unable to take it to a mechanic to have it checked.

What is the probability that your car will break down today?

I-----I-----I-----I-----I-----I-----I-----I-----I-----I  
0%      10%      20%      30%      40%      50%      60%      70%      80%      90%      100%

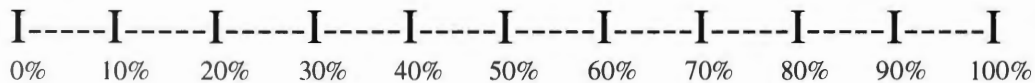
1. You are driving to a meeting across town, but you don't expect to be late. The weather is fine and traffic is average.

What is the probability that you will avoid being in a car accident?



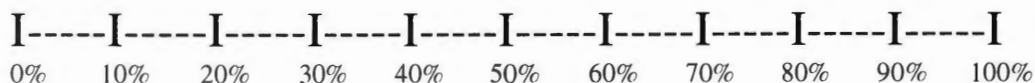
2. You are riding a bicycle down a large hill when you realize that the brakes of the bike are not working and a sharp turn is just ahead.

What is the probability that you will wreck the bicycle?



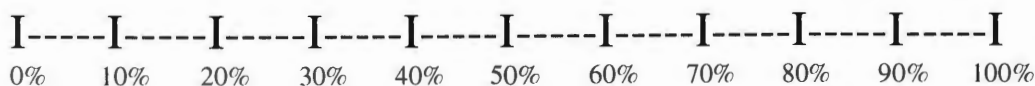
3. During the day, you are driving on a highway that has few other cars. You know that one of your tires has a slow air leak, but you checked the air pressure in the morning.

What is the probability that you will be stranded on the highway?



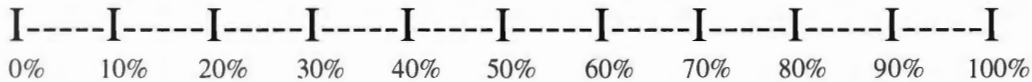
4. You are in a large auditorium with hundreds of people watching a movie. You have a faint smell of smoke when an alarm goes off and people begin running to the exits.

What is the probability that you will be injured trying to leave the auditorium?



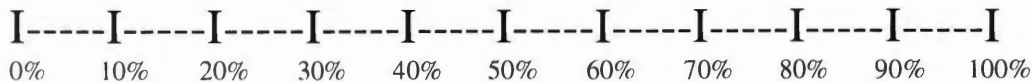
5. You have a job that you enjoy but the company is having financial problems and will lay off several employees in the near future.

What is the probability that you will lose your job?



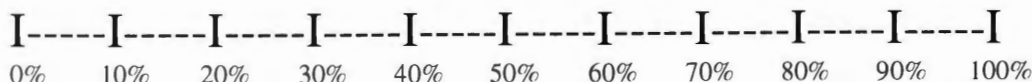
6. You are out on the ocean, deep sea fishing with some friends when a large storm begins to roll in. You try to start the engine, but mechanical problems prevent the engine from starting.

What is the probability that you will get home safe?



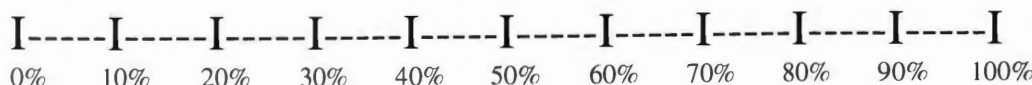
7. You have a job that you enjoy and the company is financially having no problems. There is little risk that the company will lay off any employees in the new future.

What is the probability that you will keep your job?



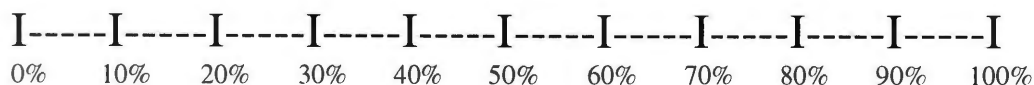
8. Late at night, you are driving on a highway that is totally deserted. One of your tires blows out and you pull off the road to check for damage.

What is the probability that you will avoid being stranded on the highway?



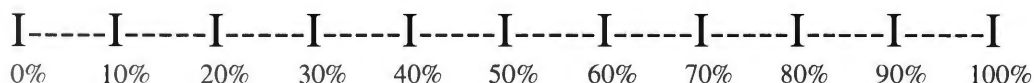
9. You are riding a bicycle on a relatively flat road with no other cars or bicycles in sight. The brakes of your bike are working just fine.

What is the probability that you will avoid wrecking the bicycle?



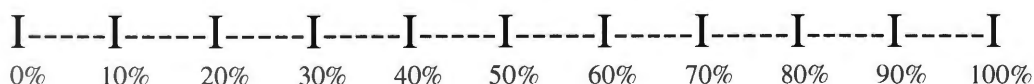
10. You are out on the ocean, deep sea fishing with some friends and it is sunny with few clouds in the sky. Your boat has never had any mechanical problems.

What is the probability that you will be lost at sea?



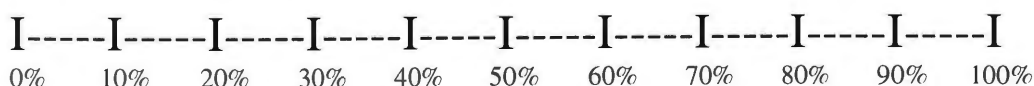
11. You are failing one of your classes and it is already half way through the semester. There are only two tests remaining to pull your grades up to a passing level.

What is the probability that you will fail the class?



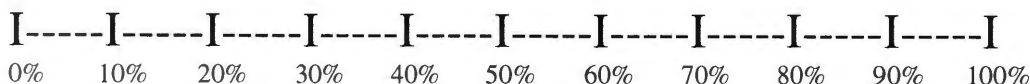
12. During the day, you are walking to your car in a part of town that is familiar to you. Your car is parked in an area that often has others around, but at this time you do not see anyone.

What is the probability that you will be mugged?



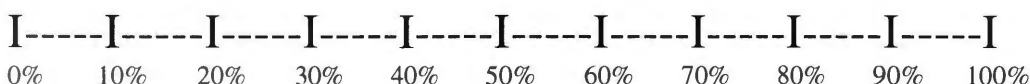
13. It has been raining very hard and windy all day and there has been a flood and tornado advisory reported on the news. Your home is built in a low area with a history of water and wind damage in the past.

What is the probability that your home will avoid sustaining damage form the storm?



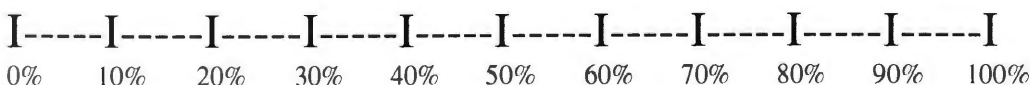
14. You have just graduated from college and taken a job that will move you away from your hometown. This job will take you to a city with a low crime rate and you will be living in a safe part of town.

What is the probability that you will be a crime victim?



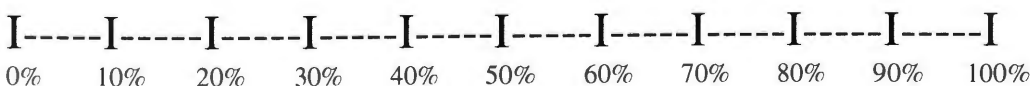
15. You are late for an important meeting across town so you are driving above the speed limit. It starts to rain heavily and the traffic around you is hard to see clearly.

What is the probability that you will be in a car accident?



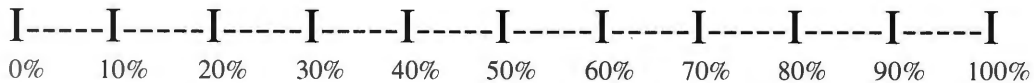
16. Late at night, you are walking to your car in a part of town that is known for a high crime rate. Your car is parked in an area that has very poor lighting.

What is the probability that you will avoid being mugged?



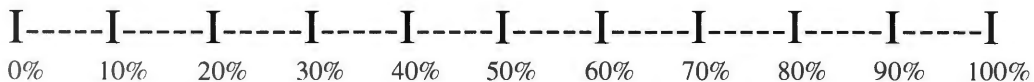
17. You have just graduated from college and taken a job that will move you away from your hometown. This job will take you to a city with a high crime rate and you will be living in an unsafe part of town.

What is the probability that you will avoid becoming a crime victim?



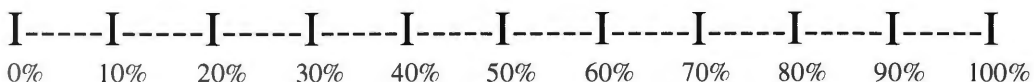
18. It has been a sunny day with very few clouds in the sky. You live in a home that has never had a history of water or wind damage from a storm.

What is the probability that your home will sustain damage from the storm?



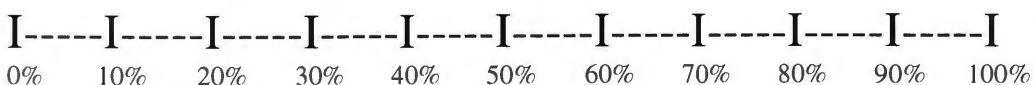
19. You are passing one of your classes but it is early in the semester. There are several more tests remaining for your grade to change.

What is the probability that you will pass the class?



20. You are in a large auditorium with very few other people watching a movie. At the end of the movie, people begin to move toward the exits.

What is the probability that you will avoid being injured trying to leave the auditorium?



## APPENDIX F

### Debias



## Debias

Participant Number \_\_\_\_\_  
Deb

Directions: Please read the following paragraphs and imagine yourself in that situation. Then, generate two possible ways in which the situation may end in a **POSITIVE** outcome. Give enough detail to your situational outcome to clearly explain how the event will end. Your two alternative outcomes for the situation should all be different and **POSITIVE** in some way.

Example: Your car's engine has not been running very well over the last month and it has been very hard to start at times, but you have been unable to take it to a mechanic to have it checked.

Generate three different **POSITIVE** ways in which this situation may end.

(1) \_\_\_\_\_

(2) \_\_\_\_\_

(3) \_\_\_\_\_

1. It has been raining very hard and windy all day and there has been a flood and tornado advisory reported on the news. Your home is built in a low area with a history of water and wind damage in the past.

Generate three different POSITIVE ways in which this situation may end.

- (1) \_\_\_\_\_
- (2) \_\_\_\_\_
- (3) \_\_\_\_\_

2. You have just graduated from college and taken a job that will move you away from your home. This job will take you to a city with a high crime rate and you will be living in an unsafe part of the town.

Generate three different POSITIVE ways in which this situation may end.

- (1) \_\_\_\_\_
- (2) \_\_\_\_\_
- (3) \_\_\_\_\_

3. You are riding a bicycle down a large hill when you realize that the breaks of the bike are not working and a sharp turn is just ahead.

Generate three different POSITIVE ways in which this situation may end.

- (1) \_\_\_\_\_
- (2) \_\_\_\_\_
- (3) \_\_\_\_\_

4. You are in a large auditorium with hundreds of people watching a movie. You have a faint smell of smoke when an alarm goes off and people begin running to the exits.

Generate three different POSITIVE ways in which this situation may end.

- (1) \_\_\_\_\_
- (2) \_\_\_\_\_
- (3) \_\_\_\_\_

5. Late at night, you are driving on a highway that is totally deserted. One of your tires blows out and you pull off the road to check for damage.

Generate three different POSITIVE ways in which this situation may end.

- (1) \_\_\_\_\_
- (2) \_\_\_\_\_
- (3) \_\_\_\_\_

6. You have a job that you enjoy but the company is having financial problems and will lay off several employees in the near future.

Generate three different POSITIVE ways in which this situation may end.

- (1) \_\_\_\_\_
- (2) \_\_\_\_\_
- (3) \_\_\_\_\_

7. You are failing one of your classes and it is already half way through the semester. There are only two tests remaining to pull your grade up to passing level.

Generate three different POSITIVE ways in which this situation may end.

- (1) \_\_\_\_\_
- (2) \_\_\_\_\_
- (3) \_\_\_\_\_

8. Late at night, you are walking to your car in a part of town that is known for a high crime rate. Your car is parked in an area that has very poor lighting.

Generate three different POSITIVE ways in which this situation may end.

- (1) \_\_\_\_\_
- (2) \_\_\_\_\_
- (3) \_\_\_\_\_

9. You are late for an important meeting across town so you are driving above the speed limit. It starts to rain heavily and the traffic around you is hard to see clearly.

Generate three different POSITIVE ways in which this situation may end.

- (1) \_\_\_\_\_
- (2) \_\_\_\_\_
- (3) \_\_\_\_\_

10. You are driving to a meeting across town, but you don't expect to be late.  
The weather is fine and traffic is average.

Generate three different POSITIVE ways in which this situation may end.

(1) \_\_\_\_\_

(2) \_\_\_\_\_

(3) \_\_\_\_\_

## APPENDIX G

### Control

## Control

Participant Number \_\_\_\_\_  
Cont

**Directions:** Please read the following paragraphs and imagine yourself in that situation. Then, please indicate the nouns and verbs within the paragraphs by writing the words in the spaces provided below. There may be more or less of the parts of speech present within the paragraphs in comparison to spaces provided. However, you need to only indicate a total of three nouns and verbs in the spaces provided.

Example: Your car's engine has not been running very well over the last month and it has been very hard to start at times, but you have been unable to take it to a mechanic to have it checked.

Please indicate the nouns and verbs within the paragraph above by writing the words in the spaces provided below.

Nouns

(1) \_\_\_\_\_

(2) \_\_\_\_\_

(3) \_\_\_\_\_

Verbs

(1) \_\_\_\_\_

(2) \_\_\_\_\_

(3) \_\_\_\_\_

1. It has been raining very hard and windy all day and there has been a flood and tornado advisory reported on the news. Your home is built in a low area with a history of water and wind damage in the past.

Please indicate the nouns and verbs within the paragraph above by writing the words in the spaces provided below.

Nouns

(1) \_\_\_\_\_

(2) \_\_\_\_\_

(3) \_\_\_\_\_

Verbs

(1) \_\_\_\_\_

(2) \_\_\_\_\_

(3) \_\_\_\_\_

- 2) You have just graduated from college and taken a job that will move you away from your home. This job will take you to a city with a high crime rate and you will be living in an unsafe part of the town.

Please indicate the nouns and verbs within the paragraph above by writing the words in the spaces provided below.

Nouns

(1) \_\_\_\_\_

(2) \_\_\_\_\_

(3) \_\_\_\_\_

Verbs

(1) \_\_\_\_\_

(2) \_\_\_\_\_

(3) \_\_\_\_\_

- 3) You are riding a bicycle down a large hill when you realize that the brakes of the bike are not working and a sharp turn is just ahead.

Please indicate the nouns and verbs within the paragraph above by writing the words in the spaces provided below.

Nouns

(1) \_\_\_\_\_

(2) \_\_\_\_\_

(3) \_\_\_\_\_

Verbs

(1) \_\_\_\_\_

(2) \_\_\_\_\_

(3) \_\_\_\_\_



4. You are in a large auditorium with hundreds of people watching a movie. You have a faint smell of smoke when an alarm goes off and people begin running to the exits.

Please indicate the nouns and verbs within the paragraph above by writing the words in the spaces provided below.

Nouns

(1) \_\_\_\_\_

(2) \_\_\_\_\_

(3) \_\_\_\_\_

Verbs

(1) \_\_\_\_\_

(2) \_\_\_\_\_

(3) \_\_\_\_\_

5. Late at night, you are driving on a highway that is totally deserted. One of your tires blows out and you pull off the road to check for damage.

Please indicate the nouns and verbs within the paragraph above by writing the words in the spaces provided below.

Nouns

(1) \_\_\_\_\_

(2) \_\_\_\_\_

(3) \_\_\_\_\_

Verbs

(1) \_\_\_\_\_

(2) \_\_\_\_\_

(3) \_\_\_\_\_

6. You have a job that you enjoy but the company is having financial problems and will lay off several employees in the near future.

Please indicate the nouns and verbs within the paragraph above by writing the words in the spaces provided below.

Nouns

(1) \_\_\_\_\_

(2) \_\_\_\_\_

(3) \_\_\_\_\_

Verbs

(1) \_\_\_\_\_

(2) \_\_\_\_\_

(3) \_\_\_\_\_

7. You are out on the ocean, deep sea fishing with some friends when a large storm begins to roll in. You try to start the engine, but mechanical problems prevent the engine from starting.

Please indicate the nouns and verbs within the paragraph above by writing the words in the spaces provided below.

Nouns

(1) \_\_\_\_\_

(2) \_\_\_\_\_

(3) \_\_\_\_\_

Verbs

(1) \_\_\_\_\_

(2) \_\_\_\_\_

(3) \_\_\_\_\_

8. You are failing one of your classes and it is already half way through the semester. There are only two tests remaining to pull your grade up to passing level.

Please indicate the nouns and verbs within the paragraph above by writing the words in the spaces provided below.

Nouns

(1) \_\_\_\_\_

(2) \_\_\_\_\_

(3) \_\_\_\_\_

Verbs

(1) \_\_\_\_\_

(2) \_\_\_\_\_

(3) \_\_\_\_\_

9. Late at night, you are walking to your car in a part of town that is known for a high crime rate. Your car is parked in an area that has very poor lighting.

Please indicate the nouns and verbs within the paragraph above by writing the words in the spaces provided below.

Nouns

(1) \_\_\_\_\_

(2) \_\_\_\_\_

(3) \_\_\_\_\_

Verbs

(1) \_\_\_\_\_

(2) \_\_\_\_\_

(3) \_\_\_\_\_

10. You are late for an important meeting across town so you are driving above the speed limit. It starts to rain heavily and the traffic around you is hard to see clearly.

Please indicate the nouns and verbs within the paragraph above by writing the words in the spaces provided below.

Nouns

(1) \_\_\_\_\_

(2) \_\_\_\_\_

(3) \_\_\_\_\_

Verbs

(1) \_\_\_\_\_

(2) \_\_\_\_\_

(3) \_\_\_\_\_

## APPENDIX H

### Consent to Participate in Research

## Title: The Debiasing of Pessimistic Judgments in the Clinically Anxious

Investigators: Bret Bentz, Ph.D. (940) 898-2318

You are being asked to participate in a research study of Assistant Professor Bret Bentz, Ph.D., Texas Woman's University. The purpose of this research is to investigate the judgments among individuals with differing levels of anxiety. Specifically, this study will examine the different ways in which individuals make judgments about the likelihood of future events.

Both patients and students are potential participants in this study. The procedures for the experiment will be exactly the same for both groups except for the initial recruitment of participants, the location of the experiment, and the possibility of earning extra-credit for students. For the study procedures, you will be asked to complete several questionnaires. First, you will be asked to complete an inventory that is specifically constructed to assess your level of anxiety. Next, you will be asked to read a series of situations and make probability judgments as to the likelihood of future events. You will then be randomly assigned to one of two interventions in which you will then be randomly assigned to one of two interventions in which you will be asked to complete another questionnaire depending upon your random assignment. After completion of the intervention, you will again read situations and make probability judgments just as was done previously. Finally, exactly one week later you will be asked to read situations and make probability judgments for a third time as a follow-up component to the study. Your maximum total time commitment for the study is estimated to be approximately 90 minutes.

One possible risk to you as result of your participation in this study is the loss of confidentiality. Confidentiality will be protected to the extent that it is allowed by law. Participant numbers rather than names will be used on all study information. The consent forms and questionnaires will be used on all study information. The consent forms and questionnaires will be stored separately in the office of Bret Bentz, Ph.D. in a locked filing cabinet. It is anticipated that the results of the study will be used for research publishing. However, no names or identifying information will be used in any publication.

Participant's Initials

Another possible risk is the loss of time. However, the procedures of the study will be tailored to your schedule. An additional possible risk as a result of your participation is discomfort due to fatigue. The procedures of the study will be kept to no more than 90 minutes in duration and breaks will be allowed at any time. You may withdraw from the study at any time. Frustration may be a risk of the study due to the experimental stimuli. Breaks may be taken as needed or you may withdraw from the study.

A possible negative impact on the care that you receive at your facility is a risk of this study. All participant and study information will be kept confidential and separate from the facility. A potential risk is stigmatization. Again, study and participant information will be kept confidential to minimize this risk. Embarrassment is a potential risk of this study. Participants will be separated and their participation kept confidential. Finally, coercion is a potential risk of the study. Participants will be informed that their participation is completely voluntary and will in no way influence their treatment at the practice or grade in their class.

#### Participation and Benefits

Your involvement in this research is completely voluntary, and you may discontinue your participation in the study at any time without penalty. As a benefit for participating in this research, you will receive extra credit or research credit as determined by the instructor of your class. Another benefit to your participation is the timely and scientific feedback that you can receive as to the results of the study.

The researchers will try to prevent any problem that could happen because of this research. You should let the researchers know at once if there is a problem and they will help you. However, Texas Woman's University does not provide medical services or financial assistance for injuries that might happen because you are taking part in this research.

You will be given a copy of this signed and dated consent form to keep. If you have any questions about the research study you should ask the researchers; their phone numbers are at the top of this form. If you have any questions about your rights as a participant in this research or the way this study has been conducted, you may contact Texas Woman's University Office of Research and Sponsored Programs at 940-898-3378 or via e-mail at [IRB@twu.edu](mailto:IRB@twu.edu)

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Participant's Initials

---

Signature of Participant

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Date

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Printed Name of Participant

Please indicate an email address or phone number where you can be contacted. This will be used by the advisor of the project **ONLY** if there is a need to verify that you actually participated in the study or to clarify any problems with assigning course credit for participation.

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- If you would like to see a summary of the results of this study, please provide an address to which this summary should be sent

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## APPENDIX I

### Institutional Review Board (IRB) Materials





**Institutional Review Board**  
Office of Research and Sponsored Programs  
P.O. Box 425619, Denton, TX 76204-5619  
940-898-3378 Fax 940-898-3416  
e-mail: IRB@twu.edu

October 31, 2008

Ms. Stephanie Barfield  
2536 St. Francis  
Dallas, TX 75228

Dear Ms. Barfield:

Re: *Effects of Debiasing on Pessimistic Predictions: A Comparison of Clinically Anxious Inpatients and Non-Anxious College Students*

The above referenced study has been reviewed by the TWU Institutional Review Board (IRB) and was determined to be exempt from further review.

If applicable, agency approval letters must be submitted to the IRB upon receipt PRIOR to any data collection at that agency. Because a signed consent form is not required for exempt studies, the filing of signatures of participants with the TWU IRB is not necessary.

Another review by the IRB is required if your project changes in any way, and the IRB must be notified immediately regarding any adverse events. If you have any questions, feel free to call the TWU Institutional Review Board.

Sincerely,

Dr. David Nichols, Chair  
Institutional Review Board - Denton

cc. Dr. Dan Miller, Department of Psychology & Philosophy  
Dr. Sally D. Stabb, Department of Psychology & Philosophy  
Graduate School



**Institutional Review Board**

Office of Research and Sponsored Programs  
P.O. Box 425619, Denton, TX 76204-5619  
940-898-3378 Fax 940-898-3416  
e-mail: IRB@twu.edu

March 13, 2007

Dr. Bret Bentz  
Department of Psychology & Philosophy

Dear Dr. Bentz:

*Re: The Debiasing of Pessimistic Judgments in the Clinically Anxious*

The request for an extension of your IRB approval for the above referenced study has been reviewed by the TWU Institutional Review Board (IRB) and appears to meet our requirements for the protection of individuals' rights.

If applicable, agency approval letters must be submitted to the IRB upon receipt PRIOR to any data collection at that agency. A copy of all signed consent forms and an annual/final report must be filed with the Institutional Review Board at the completion of the study. A copy of the approved consent form with the IRB approval stamp is enclosed. Please use a copy of this stamped consent form when obtaining consent from your participants.

This extension is valid one year from April 8, 2007. According to regulations from the Department of Health and Human Services, another review by the IRB is required if your project changes in any way. If you have any questions, feel free to call the TWU Institutional Review Board.

Sincerely,

Dr. David Nichols, Chair  
Institutional Review Board - Denton

cc. Dr. Dan Miller, Department of Psychology & Philosophy



**Institutional Review Board**

Office of Research and Sponsored Programs  
P.O. Box 425619, Denton, TX 76204-5619  
940-898-3378 Fax 940-898-3416  
e-mail: IRB@twu.edu

March 14, 2008

Dr. Bret Bentz  
Department of Psychology & Philosophy

Dear Dr. Bentz:

*Re: The Debiasing of Pessimistic Judgments in the Clinically Anxious*

The request for an extension of your IRB approval for the above referenced study has been reviewed by the TWU Institutional Review Board (IRB) and appears to meet our requirements for the protection of individuals' rights.

If applicable, agency approval letters must be submitted to the IRB upon receipt PRIOR to any data collection at that agency. A copy of all signed consent forms and an annual/final report must be filed with the Institutional Review Board at the completion of the study. A copy of the approved consent form with the IRB approval stamp is enclosed. Please use a copy of this stamped consent form when obtaining consent from your participants.

This extension is valid one year from April 8, 2008. According to regulations from the Department of Health and Human Services, another review by the IRB is required if your project changes in any way. If you have any questions, feel free to call the TWU Institutional Review Board.

Sincerely,

Dr. David Nichols, Chair  
Institutional Review Board - Denton

cc. Dr. Dan Miller, Department of Psychology & Philosophy