UCLA
UCLA Electronic Theses and Dissertations

Title
Anxiety and Avoidance: The Relationship, Function, and Measurement

Permalink
https://escholarship.org/uc/item/9q13f1rs

Author
Castriotta, Natalie Nicole

Publication Date
2013

Peer reviewed|Thesis/dissertation

eScholarship.org Powered by the California Digital Library
University of California

UNIVERSITY OF CALIFORNIA

Los Angeles

Anxiety and Avoidance: The Relationship, Function, and Measurement

A dissertation submitted in partial satisfaction of the

requirements for the degree Doctor of Philosophy

in Psychology

by

Natalie Nicole Castriotta

2013

ABSTRACT OF THE DISSERTATION

Anxiety and Avoidance: The Relationship, Function, and Measurement

by

Natalie Nicole Castriotta

Doctor of Philosophy in Psychology

University of California, Los Angeles, 2013

Professor Michelle G. Craske, Chair

Study 1 aimed to differentiate fear and avoidance as separate predictors of treatment outcome and examine whether avoidance behavior is a stronger predictor of treatment outcome and future relapse than fear level. Participants were treatment seeking adults (N=75) who met diagnostic criteria for social anxiety disorder (SAD) using the Anxiety Disorders Inventory Schedule-IV (ADIS). Eligible participants were randomly assigned to one of two treatment groups to complete 12 weeks of manualized Cognitive Behavioral Therapy (CBT) or Acceptance and Commitment Therapy (ACT) treatment. Fear, avoidance, and clinical severity ratings (CSR) were measured via the ADIS and participant self-report using the Mood and Anxiety Symptom Questionnaire at pre and post-treatment and six month follow-up. Results indicate that pre-treatment avoidance level predicted post-treatment fear level over and above pre-treatment fear level, but pre-treatment fear level did not predict post-treatment avoidance Level. Pre-treatment avoidance level significantly predicted post-treatment CSR and MASQ scores, over and above

pre-treatment fear levels. Post-treatment avoidance level significantly predicted CSR and MASQ scores at six-month follow-up, over and above post-treatment fear levels. These results suggest that fear and avoidance are separate predictors of outcome, that avoidance may predict changes in fear, and avoidance may be a stronger and more stable predictor of treatment outcome and future functioning than fear level.

Study 2 aimed to create a new objective and ecologically valid measure of behavioral avoidance that recreates the approach-avoidance conflict that anxious individuals face when confronted with feared stimuli that incorporates risk and reward. Participants were recruited from an undergraduate student sample based on their level of Blood Injection Injury (BII) Phobia related symptoms using the Blood Injection Symptom Scale and placed into Low and High Anxiety groups. The Behavioral Avoidance and Reward Sensitivity Task (BARST) consisted of six levels and asked participants to choose to view one of two groups of BII related images, where one set was more difficult but yielded a higher reward. Each level increased in difficulty and incentive and measured participants' willingness to approach feared stimuli in exchange for reward. The results indicated that the high and low anxiety groups differed as a function of the difficulty level and the reward incentive associated with the images. Reward incentive was also found to be a more consistent predictor of the decision to approach feared stimuli than anxiety level. The results indicate that in general, anxious individuals become more risk averse and less sensitive to reward as difficulty level increases as compared to non-anxious individuals. Also, anxious individuals vary in both their sensitivity to reward and their willingness to approach fear provoking stimuli in exchange for reward.

The dissertation of Natalie Nicole Castriotta is approved.

Bruce Chorpita

John Piacentini

Steven Reise

Michelle G. Craske, Committee Chair

University of California, Los Angeles

2013

TABLE OF CONTENTS

Acknowledgements vi
Curriculum Vitae vii

I. General Introduction 1

A. Theories of Avoidance 1

B. The Role of Risk Avoidance and Decision Making 14

C. The Relationship Between Anxiety and Fear & Avoidance in Treatment 20

D. Measurement of Avoidance 26

II. Study 1- Moving Beyond Fear: The Role of Avoidance Behavior in Predicting Treatment Outcome for Social Anxiety Disorder 32

A. Introduction 33

B. Method 38

C. Results 45

D. Discussion 49

E. Tables and Figures 55

III. Study 2- The Role of Decision Making in Anxiety and Avoidance Behavior: A New Objective Measure of Avoidance 58

A. Introduction 59

B. Method 63

C. Results 70

D. Discussion 73

E. Tables and Figures 80

IV. General Discussion 84

V. Appendix- Self-Report Measures 90

VI. References 109

Acknowledgements

Data from Study 1 was collected using funding from grant number 5R21 MH081299 from the National Institute of Mental Health.

Curriculum Vitae

Education

2011	C.Phil.	University of California, Los Angeles Clinical Psychology Minor: Quantitative Psychology Advisor : Michelle G. Craske, Ph.D.
2008	M.A.	University of California, Los Angeles Clinical Psychology
2005	B.A.	University of California, Berkeley *Summa cum Laude, Phi Beta Kappa* Psychology Major: *Highest Honors*

Honors and Awards

2008	National Science Foundation Fellowship, University of California, Los Angeles
2008	Graduate Summer Research Mentorship Fellowship, University of California, Los Angeles
2008	Graduate Research Mentorship Fellowship, University of California, Los Angeles
2007	Eugene Cota-Robles Fellowship, University of California, Los Angeles (Two years of Graduate Division support for an entering PhD student showing great promise for a future academic career and research)
2007	University Fellowship, University of California, Los Angeles (One year of departmental support for entering PhD student who shows great promise)
2006	Anxiety Special Interest Group Student Poster Award, Association For Behavioral and Cognitive Therapies (ABCT) Annual Convention
2005	Graduation with Highest Academic Distinction, University of California, Berkeley
2005	Graduation with Highest Departmental Honors, Psychology, University of California, Berkeley
2005	Phi Beta Kappa, University of California, Berkeley
2005	Warner Brown Memorial Award and Prize, University of California, Berkeley (Best undergraduate research paper in the department of psychology)
2004	Mildred Jordan Sharp Alumni Award and Scholarship, University of California, Berkeley (The Junior/Senior Class woman who best exhibits Berkeley's key principles: Scholarship, Leadership and Spirit)
2004, 2001	Dean's List, University of California, Berkeley

Publications

Castriotta, N., Craske, M.G. (2013). Depression and Comorbidity with Panic Disorder. In O'Hara, M. & Richards, S. (Eds). *The Oxford Handbook of Depression and Comorbidity.* Oxford University Press.

Castriotta, N., Craske, M.G. (2013). A Comment on Panic Disorder Treatment. In ODonohue, W., & Lilienfeld, S.O. (Eds.) *Case Studies in Clinical Psychological Science.* Oxford University Press.

Kirkanski, K., Mortazavi, A., **Castriotta, N.**, Baker, A., Mystkowski, J., Yi, R., Craske, M.G. (2012). Stimulus and Emotion Variability in Exposure Therapy. *Journal of Behavior Therapy and Experimental Psychiatry.*

Wolitzky-Taylor, K.B., **Castriotta, N.,** Lenze, E.J., Stanley, M.A., Craske, M.G. (in press). Rates and Characteristics of Anxiety Disorders Across the Lifespan. *DSM-V Sourcebook.*

Wolitzky-Taylor, K.B., **Castriotta, N.,** Lenze, E.J., Stanley, M.A., Craske, M.G. (2010). Anxiety Disorders in Older Adults- A Comprehensive Review. *Depression and Anxiety, 27 (2),* 190-211

Scholarly Presentations

Castriotta, N., Pittig, A., Craske, M.G. (2012, November). The Role of Decision Making in Anxiety and Avoidance Behavior: A New Objective Measure of Avoidance. Poster Presentation, Association for Behavioral and Cognitive Therapies Conference.

Castriotta, N., Craske, M.G. (2012, April). Avoidance Behavior as a Predictor of Treatment Outcome and Relapse. A paper presented at the Anxiety Disorders Association of America Conference.

Castriotta, N., Davies, C., Craske, M.G. (2010, November). The role of avoidance behavior in cognitive behavioral therapy. Poster Presentation. Association for Behavioral and Cognitive Therapies Conference.

Baker, A.B., **Castriotta, N.,** Craske, M.G. (2010, November). Emotion Variability in Exposure Therapy. Poster Presentation. Association for Behavioral and Cognitive Therapies Conference.

Conway, C., **Castriotta, N.,** Jalbrzikowski, M., Radisavljevic, K., Thompson, E., Williams, K. (2010, June). Gender bias in assessment of borderline personality disorder symptoms: An item response theory analysis. Poster Presentation at the World Congress of Behavioral and Cognitive Therapies Biannual Conference.

Espejo, N., **Castriotta, N.,** Craske, M.G., Mineka, S., Zinbarg, R. (2010, June). Neuroticism and Childhood Adversity in the Risk for Childhood Depression. Poster Presentation at Anxiety Disorders Association of America Annual Conference.

Castriotta, N.; Nazarian, M.; Craske, M.G.; Mineka, S. and Zinbarg, R. (2007, Spring). Co-Occurrence of eating disorders with anxiety disorders, mood disorders, and alcohol abuse and dependence. Article printed in Association for Behavioral and Cognitive Therapies Anxiety Special Interest Group Quarterly.

Epstein, A.M., Dickson, D., Glenn, D., **Castriotta, N.,** Craske, M.G., Mineka, S., Zinbarg, R. Griffith. J. (2007). Risk Factors Predicting Lifetime and Future Alcohol Use Disorders in Male and Female Adolescents. Poster presentation, Research Society on Alcoholism.

Castriotta, N.; Nazarian, M.; Craske, M.G.; Mineka, S. and Zinbarg, R. (2006, May). Co-Occurrence of eating disorders with anxiety disorders, mood disorders, and alcohol abuse and dependence. Poster presentation, Association for Psychological Science 18th Annual Convention.

Castriotta, N.; Nazarian, M.; Craske, M.G.; Mineka, S. and Zinbarg, R. (2006, November). Chronology of onset of anxiety and mood disorders among adolescents with eating disorders. Poster presentation, 40th

Annual Association for Behavioral and Cognitive Therapies Convention.

Throughout the day, individuals are faced with endless numbers of potentially risky situations that may elicit anxiety and distress and require them to make decisions about how they will behave. The decisions that they make hold the possibility for both positive and negative outcomes and force them to decide whether to engage in activities or avoid them. The decision to speak up in a company meeting may result in receiving positive feedback on one's ideas and a potential promotion, but also may result in rejection by one's colleagues and embarrassment. The decision to ride a public bus may result in a quick and inexpensive ride to one's destination, or may lead to infection from the germs of many strangers.

Current theoretical perspectives assume that healthy functioning is characterized by a balance between risk taking and harm avoidance (Lejuez et al., 2002, 2003). When this balance is disrupted in favor of overly risky behavior with low levels of harm avoidance, the consequences may lead to physical, social, and psychological dysfunction such as substance abuse and gambling (Campbell, Stout, & Finn, 2004). However, the reverse, low levels of risk-taking and high levels of harm avoidance, can be equally dysfunctional and may lead to similarly negative consequences, such as various anxiety disorders, interpersonal difficulties, and depression (Barlow, 2002).

Researchers and clinicians have long theorized that avoidance of feared stimuli and environments contributes greatly to the development and maintenance of fear, anxiety, and anxiety disorders. Conditioning theory posits that fear persists because avoidance of a conditioned stimulus (CS) prevents the extinction that occurs through repeated non-reinforced exposures (e.g. Mowrer, 1939, 1960). Cognitive theories suggest that avoidance inhibits the gathering of evidence against catastrophic misappraisals, further reinforcing the avoidance behavior as a means of keeping safe (e.g., Clark, 1986, 1988). Cognitive models also theorize

that over-prediction of fear results in avoidance, further preventing the collection of disconfirmatory evidence (e.g., Rachman, 1994, Rachman & Lopatka, 1986).

In treatment settings, avoidance has long been recognized as a form of impairment, but also an obstacle in the path to anxiety reduction (Barlow, 2002). Exposure-based treatments offer empirical support for the relationship between avoidance and anxiety reduction as these treatments expose individuals to the feared stimuli they have previously avoided and have been repeatedly shown to effectively reduce fear and anxiety (e.g. Barlow 2002, Craske & Mystkowski, 2006). However, while there are many theories supporting a strong relationship between avoidance and anxiety, they each purport different underlying mechanisms responsible for the development and maintenance of the relationship. There have also been very few studies that specifically examine the role of avoidance behavior in treatment. Specifically, how the degree of exhibited avoidance behavior before and during treatment affects the course and outcome of treatment and how residual avoidance after treatment affects relapse. One possible explanation for the small number of studies on this topic may be a lack of valid and reliable tools for measuring the construct of avoidance behavior.

Theories of Avoidance

Conditioning Theories

The two-factor theory of fear and avoidance (Mowrer, 1960) was the dominant model that informed the development of behavioral treatments for fear and anxiety. The theory originated in animal research and attempted to explain avoidance learning through classical and instrumental conditioning models. Many of the first experiments followed a particular structure where an animal was first shown a warning stimulus, such as a light or tone, followed by an aversive stimulus, such as a shock. In later trials, the animal is given the option to avoid the

aversive stimulus by completing an “avoidance behavior”, such as pressing a lever, or running across the cage. Completion of the avoidance behavior cancels the aversive stimulus and also terminates the warning stimulus, and thus the animal learns the benefits of the avoidance behavior.

Avoidance learning was initially believed to be a variant of instrumental learning because both types of learning were thought to occur as a result of positive reinforcement. In typical instrumental conditioning experiments the reward for an animal performing a learned behavior, such as pressing a lever, is something desirable, such as food. Theorists believed that in avoidance learning, the reward for performing an avoidance behavior is the omission of shock. This explanation raised a significant question though, how could the non-occurrence of an event serve as a reinforcer? Mowrer (1947) proposed a solution with the development of the Two-Factor Theory, which posits that there are two separate processes occurring during avoidance learning. The first is Pavlovian conditioning of fear to the warning stimulus, which serves as a conditioned stimulus (CS). Second, instrumental conditioning occurs when animals learn that they will be rewarded if they perform the avoidance behavior given by the experimenter. However, unlike instrumental learning theorists, Mowrer did not believe that the reinforcement comes from the omission of shock, but from the termination of, or escape from, the warning stimulus, leading to a reduction of the fear aroused by the warning stimulus. Thus, the individual does not directly learn that the avoidance behavior prevents the occurrence of the US, but rather learns that performing the behavior allows them to escape the CS.

The Two-Factor Theory became the dominant explanation of avoidance learning to which all other theories should be judged. It also directed many researchers and clinicians to the importance of Pavlovian and instrumental conditioning in avoidance learning and has aided in

the development of highly effective treatments for anxiety disorders (e.g. Barlow, 2002). However, critics have long pointed to the inability of the theory to explain several important features of avoidance (for a review, see Herrnstein, 1969). The first is that avoidance responses can still be learned even when their performance has no effect on the duration of the CS and only affects the future occurrence of the US (Bolles, Stokes, & Younger, 1966; Rachman, Craske, Tallman, & Solyom, 1986); which suggests that performance of the avoidance behavior is not contingent on escape from the CS. The second is that the CS elicits less anxiety after the avoidance response is learned and performed (Herrnstein, 1969; Rachman, 1977), which is problematic for the two-factor theory because the theory first relies on initial anxiety in the presence of the CS to motivate responding and second, subsequent anxiety reduction after the termination of the CS to reinforce responding.

The ground-breaking and highly influential Rescorla-Wagner model (Rescorla &Wagner, 1972; Wagner & Rescorla, 1972) lent a better understanding to the conditions in which learning occurs by arguing that learning is based on the discrepancy between what is expected during a given event and what actually occurs in that event. For example, if shock were to occur on a trial when it was not expected, the result is fear and excitatory learning. If shock is expected on a trial and it does not occur, the result is a feeling of safety and inhibitory learning. The relevance of this model to avoidance learning lies in its explanation of conditioned inhibition. For inhibitory learning to take place, a neutral stimulus, such as a light, is paired with a shock, which establishes the light as an excitor of fear. Then on what is called an intermixed trial, the light is paired with a second neutral stimulus, such as a tone, but the shock does not occur. According to the model, on these intermixed or compounded trials, the prediction of the shock by the light is

violated, leading to a negative discrepancy between the expectation and the outcome, and thus causing the tone to become a signal for inhibition.

Avoidance learning follows a very similar pattern. In events where the avoidance response is not made, the CS is followed by the US. In events where the CS is paired with the avoidance behavior, the US does not occur. Thus, the avoidance behavior becomes the conditioned inhibitor, or safety signal. Further investigation of this similar pattern between Pavlovian conditioned inhibitors and avoidance behavior has shown that when previously neutral stimuli are yoked to avoidance behavior, the neutral stimulus can acquire the capacity to inhibit fear (Starr & Mineka, 1977; Morris, 1975).

The similarities between Pavlovian conditioned inhibition and avoidance behavior led to the formation of the safety signal theory of avoidance (Bolles, 1970; Gray, 1987; Weisman & Litner, 1972). This model is a modification of the two-factor theory that proposes that feedback received from avoidance responses acquires inhibitory or safety signal properties and thus, avoidance behavior is rewarded by the associated safety properties, as opposed to being rewarded by fear reduction. The feedback from avoidance responses might be tactile stimulation or changes in contextual cues, such as the tactile sensation a mouse feels when they press a lever, or the change in contextual cues experienced by an individual who brings a companion to a party instead of going alone. This feedback acquires safety properties and can become a signal for safety and thus may serve as a source of positive reinforcement for avoidance responding.

The primary advantage of this theory over the two-factor theory is that it is able to account for reduction of fear even without termination of the CS because termination of the CS is not necessary for reward. Second, it also accounts for the decline in fear that is observed during avoidance learning because avoidance responding signals the feedback stimuli (safety signals)

that have acquired safety properties and the safety properties actively inhibit fear. Third, it can explain the preservation of fear to the CS despite many trials without the US through a phenomenon of "protection from extinction" (Lovibond, 2006).

Despite the safety signal model's improvements over the two-factor theory, it is criticized (Seligman and Johnston, 1973) for failing to account for the effectiveness of response prevention in extinguishing avoidance behavior (Baum, 1970). This is because the safety signal theory cannot explain why response prevention would undermine the learned reinforcing properties of the feedback stimuli or the relationship between the avoidance response and reinforcement because neither the response nor the feedback stimuli are present during response prevention. In contrast, the Rescorla Wagner model (1972) explains protection from extinction as a result of the lack of discrepancy between what is predicted and what occurs. On trials where the avoidance behavior is performed, the feedback stimuli counteract the CS, leading to the prediction of no outcome, which is exactly what occurs, so no new learning takes place and there is no extinction. This theory is also capable of explaining the effectiveness of response prevention at producing extinction because if the avoidance behavior is prevented, the CS becomes excitatory again, fear returns, and a discrepancy occurs between what is expected (US) and what occurs (no US), so extinction occurs.

As a contrast to the safety signal theory, Seligman and Johnston (1973) proposed a conditioning theory with a relatively more cognitive element in an attempt to account for some of the criticisms of the two-factor theory. Their approach hypothesized that individuals learn the outcome associated with responding and the outcome associated with not responding and make a decision on how to behave based on the comparison of the two potential expected outcomes. The

cognitive element lies in the suggestion that individuals form cognitive representations of future conditional events and use the representations to regulate their behavioral responding.

Human Associative Learning

Historically, conditioning theories have been tested using animal models because of the belief that animal research represents "fundamental" conditioning processes that have been preserved across evolution and thus, are also present in humans. This assumption has been supported by research that has shown that many parallels exist between animal and human conditioning (Lovibond, 2006). Conditioning theories have typically remained separate from cognitive theories because of beliefs about their differing modes of transmission. Conditioning is seen as the formation of associations that regulate the transmission of activation in a mechanistic manner, whereas cognition is believed to acquire, store, and operate on symbolic or propositional representations of the environment. Thus, it has been widely accepted that there are two systems operating in humans when they are exposed to associative relationships. One is an automatic, mechanistic, and reflexive conditioning system, and one is an effortful, representational, and strategic cognitive system (Lovibond, 2006).

However, laboratory research has had difficulty finding evidence to support the existence of two completely separate systems. There seems to be substantial correspondence between conditioned learning and self-reported expectancy of the US (Lovibond & Shanks, 2002), and explicit attempts to overload the cognitive system have worked to prevent conscious learning, but have also prevented differential conditioned responding (Lovibond, 2003). Some have theorized that these results suggest that learning derived from conditioning is encoded in a propositional form so that it can be integrated with knowledge from symbolic learning, and that the elicitation of behavior is dependent on the outcome of the higher order propositional analysis

rather than lower level cognitive processes (Lovibond, 2006). Similar findings have been found with regard to instrumental conditioning (e.g. Brewer, 1974) and implicit learning (e.g. Shanks & St. John, 1994). These findings make it difficult to support the traditional view that conditioning is solely automatic, unconscious and separate from higher order cognition.

Conditioning and Cognition

While conditioning and cognition were once believed to be separate processes, conditioning being entirely reflexive and mechanistic, and cognition being entirely reflective, the two began to merge with the birth of the cognitive revolution. Theorists such as Rescorla and Wagner (1972) established the concept that conditioning requires the acquisition of information, a cognitive process, through research displaying that conditioned responses (CRs) are elicited when a CS predicts a US, and that CRs are inhibited when the CS predicts that the US is unlikely to occur. More contemporary theorists postulate that this process is driven by the CS activating a memory representation for the US and this memory then creates an expectation regarding whether the US will occur or not (see Kirsch, Lynn, Vigorito, & Miller, 2004, for a review).

These expectancies may be implicit, or automatic, or they may be explicit, or conscious, and debate exists on whether explicit expectancies are necessary for conditioning to occur. Support for the view that they are not necessary is found in work on conditioning to a CS that is not consciously perceived or the relationship between the CS and US in unknown, such as the case with certain evolutionarily "prepared" stimuli (Ohman & Mineka, 2001). Support for the view that explicit expectancies are necessary is found through studies showing that simply informing someone of a relationship between a CS and a US is sufficient to elicit a CR (previously known as informational transmission), and that the strength of the CR varies as a function of the information known about the intensity of the US (Kirsch et al., 2004).

Cognitive Theories

Cognitive models of anxiety emphasize that anxious individuals engage in cognitive thought processes that involve irrational or excessive threat appraisal which result in the exaggerated beliefs about the probability or associated distress of potential negative outcomes (e.g. Beck & Emery, 1985; Clark, 1986).

Rachman (1994) theorizes that over-prediction of fear and negative outcomes results in avoidance. He distinguishes between two types of over-prediction, over-prediction of the amount of fear that one expects to experience, and over-prediction of the probability that an aversive/fearful event will occur within a defined period. Rachman cites previous studies that show that anxiety is often associated with an over-prediction of the likelihood of negative outcomes, such as Butler and Mathews's (1983) report that anxious patients significantly overestimated the probability of experiencing aversive events relative to non-anxious controls, as well as Chambless's (1985) similar findings among agoraphobic patients, and Carr's (1974) claim that obsessional patients overestimate the probability of unfavorable outcomes (see also Rachman & Hodgson, 1980).

To test whether anxiety is associated with an over-prediction of fear, Rachman and Lopatka (1986a-d) use an experimental design where participants are asked to predict peak fear scores prior to exposure to the feared stimulus and then report the peak fear actually experienced. They found that fearful participants tend to over-predict how much fear they will experience and that their predictions became more accurate with practice. They also found that fear predictions correct themselves. Meaning, they decrease after an over-prediction, increase after an under-prediction, and remain unchanged after a correct prediction. Last, they found that reports of actual fear tend to decrease with exposure, regardless of the initial fear prediction. Rachman

believes that over-prediction can occur after an unexpected event, such as an unexpected panic attack or unexpected social embarrassment, and this over-prediction can become pervasive in some individuals as a result of avoidance of exposure to the feared stimulus. That is, by avoiding exposure to the feared stimulus, they do not have the opportunity to correct their over-prediction, so the over-prediction, and thus fear, remain. If they do expose themselves, they have the opportunity to correct their prediction based on their actual fear level during exposure. This is thought to be one of the mechanisms responsible for the effectiveness of exposure based treatments for anxiety disorders.

More recently, cognitive researchers have become interested in a mechanism that shares many features with avoidance learning. Salkovskis, Wells, and colleagues (e.g. Salkovskis, Clark, & Gender, 1996; Wells et al., 1995) began studying the concept of "within situation safety behaviors" as a means to explain resistance to exposure therapy in panic disorder and social phobia. They explain that during exposure, patients carry out subtle safety behaviors (e.g. holding onto a person, or staying silent in a conversation) that are meant to avert their predicted harmful outcomes (e.g. fainting in the case of panic, or social ridicule in the case of social phobia). The result is that these behaviors block the disconfirmation of unrealistic beliefs, or over-predictions of fear, because the absence of the feared outcome is attributed to the safety behaviors, not to the fact that it was an unrealistic belief. The safety behaviors theory shares many similarities with the safety signal model of avoidance derived from animal research, in which safety information protects danger cues from extinction (Wagner & Rescorla, 1972). Clinical researchers have separated their theory from the safety signal model, however, by explaining that their model involves a reasoning process based on consciously accessible propositional beliefs about danger. Here, again, we see hypotheses related to the two differing

modes of transmission of avoidance behavior, the unconscious, automatic and reflexive theories of how avoidance behavior is learned and carried out, contrasted with the more conscious, reflective, and voluntary theories. The cognitive theory of safety behaviors also has many parallels with the propositional view of associative learning in that it posits that behavior is ultimately guided by higher order, propositional analysis.

Conditioning and Cognitive Theories Combine

The integration of cognition into conditioning theories paved the way for cognitive theories to combine with learning theories in the understanding and treatment of anxiety. Substantial evidence suggests significant biases in the expectancies of anxious individuals, including over-attention to negative stimuli, over-estimation of the likelihood of negative events, and catastrophizing the meaning of negative events (see Davey, 2006). These biases in expectancies may lead to maladaptive assumptions and beliefs, which contribute to the perception of the degree of threat associated with the US and the perceived likelihood of the occurrence of the US. These biased beliefs also lead to stronger conditioning of the CR. Correction of expectancy biases can be integrated into exposure therapy through the learning of cognitive skills for decreasing the estimation of the likelihood of risk and decreasing the perceived intensity of the negative outcome, which in turn enhance the extinction of the CR.

While the debate rages on regarding the necessity of explicit appraisals or not, cognitive appraisal theory (Kirsch et al., 2004) focuses solely on the content of cognitions and appraisals at the explicit level. According to this theory, instrumental and classical conditioning are likely contributors to the development of explicit appraisals, such as the person who is abused (a natural US) who develops beliefs that people are dangerous, but it is these beliefs that influence subsequent learning by influencing expectancies for the US and its consequences.

An Integrated Expectancy Theory

Lovibond and Shanks (2002) have proposed an integrative expectancy theory of human avoidance learning that incorporates recent developments from animal conditioning, human conditioning, and clinical psychology, while accounting for many of the limitations of previous theories. The essential components of this theory are that Pavlovian conditioning of fear is based on learning the relationship between the CS and an aversive outcome. Presentation of the CS elicits an expectancy of the aversive outcome and that expectancy produces anxiety or fear. Instrumental learning of the avoidance response is dependent on learning the relationship between the response and the non-occurrence of the expected aversive outcome. Whether the individual performs the avoidance behavior or not is based on their comparison of the incentives of responding or not responding. Both types of learning are represented as propositional knowledge that is conscious and capable of being reported by the individual. It is further theorized that avoidance interacts with anxiety through the mediating process of the expectancy of the aversive outcome, or in other words, anxiety elevates expectancy and expectancy determines the presence of avoidance behavior.

This model incorporates Mowrer's (1947) distinction between Pavlovian and instrumental conditioning, and follows Seligman and Johnson's account of the comparison process involved in instrumental conditioning. It is also similar to the safety signal model in its emphasis on inhibitory learning; however, the integrated expectancy model posits that the non-occurrence of the expected aversive event is associated with a central cognitive representation of the avoidance behavior, rather than with feedback stimuli from the response. This theory can explain the reduction of anxiety after the avoidance response is learned because the expectancy

of the aversive outcome has been inhibited as a result of the available avoidance behavior. It also accounts for the preservation of avoidance even after the aversive outcome has been discontinued because the expected outcome of not responding is never tested. It also accounts for the effectiveness of response prevention in extinguishing avoidance responding because the absence of the expected negative outcome does not occur, which directly disconfirms the previous expectation and thus changes the expectation. Last, the expectancy model predicts complete return of fear as soon as avoidance responding is made unavailable because the expectation is that the negative outcome will occur. This theory attributes the modulation of anxiety to the decision to make the avoidance response or not, rather than to an indirect Pavlovian process based on response feedback.

The ability of this theory to account for all of these phenomena have been supported by laboratory research using a paradigm developed by Lovibond and Shanks (2002) that tests expectancies related to avoidable and unavoidable shocks. They found that the expectancy of shock, as well as electro-dermal responding, declines over repeated avoidable trials, and that avoidance responding, when used as a source of safety, can protect a feared CS from extinction because the CS retains its expectancy of shock when avoidance responding is not prevented. This demonstration that an avoidance response can interfere with the extinction of fear to a Pavlovian CS is directly in line with the process proposed by Salkovskis and colleagues (e.g. Salkovskis et al. 1996) when safety behaviors are performed during exposure therapy because the feared outcome is not expected when the safety behavior is performed.

Of all the theories of avoidance, the expectancy model appears to be the model that is subject to the least number of limitations in terms of the phenomena that it can explain. It also integrates the most salient aspects of each of the aforementioned theories into a comprehensive

package that is well supported by empirical data. The combination of these factors makes a strong argument that this theory of avoidance learning and behavior is the strongest to date. One of the largest deviations of this model from previous conditioning models, but not from human associative and cognitive models that integrate conditioning theory, is the emphasis on higher order, propositional analysis. This theory posits that individuals engage in a decision process about whether to engage in avoidance behavior or not based on their expected outcomes for each behavior. This decision process occurs at the conscious level and incorporates strategic and reflective cognitive processing as opposed to relying solely on automatic and reflexive processing. If this theory holds true, and individuals are constantly making decisions based on their expectancies, it raises the question of where their expectancies come from and how they can become unrealistic, leading to the formation of anxiety disorders.

The Role of Risk Avoidance and Decision Making

While conditioning, cognitive and expectancy based theories have long speculated that anxious individuals avoid specific threat-related stimuli, such as the avoidance of social interaction in individuals with social anxiety disorder (Barlow, 2002) and avoidance of dirty objects by individuals with contamination related fears (Tsao & McKay, 2004), research is only just beginning to explore whether anxious individuals possess a more generalized and pervasive tendency to avoid risk. At the same time that clinical research is beginning to evaluate risk taking, judgment and decision making literature, that was once purely cognitive based, has begun to evaluate the role of affect (for a review see Lerner & Keltner, 2000).

Judgment and decision making researchers first began incorporating affect by splitting it into two valences, positive-affect traits and negative-affect traits, and comparing them (DeSteno,

Petty, Wegener, & Rucker, 2000; Lerner & Keltner, 2000). For example, one of the earliest studies found that participants who were induced to feel negative-affect were more pessimistic in their prediction of the chance of death than participants who were induced to feel positive affect (Johnson & Tversky, 1983). Follow up research continued to find consistent results suggesting that the presence of either a negative or a positive mood increases the frequency of estimates of events that are similarly valenced, meaning that those who are more likely to experience positive mood will predict a higher likelihood of the occurrence of positive events, whereas those who are more likely to experience negative mood will predict a higher likelihood of negative events (e.g. Bower, 1991; Kavanagh & Bower, 1985; Mayer, Gaschke, Braverman, & Evans, 1992; Mayer & Hanson, 1995). These findings may explain why anxious individuals over-predict the likelihood of negative events (Rachman, 1994) and why they are driven by expectancies that approach behavior will result in more negative outcomes than avoidance behavior (Lovibond & Shanks, 2002).

In the decision making literature, Lerner and Keltner (2001) took a deviation from this typical path by examining how specific emotions, fear, anger and happiness, can influence judgments and appraisals that were considered normatively unrelated to their present mood. They developed a theory of an appraisal-tendency framework which postulates that emotion-specific appraisal processes are linked to the manner in which individuals make judgments and how they choose to behave when faced with choices. This theory is based on two assumptions. First, that emotions trigger changes in cognition, physiology and behavior that persist even after the triggering event has passed, and that these processes guide behavior and cognitions in goal-directed ways (e.g. Gasper & Clore, 1998). Second, they assume that emotions are related to specific appraisals and that these appraisals represent the meaning of the event to that individual

and therefore determine how the emotion will influence their social judgment (Lazarus, 1991; Ohman, 1993; Clore, & Collins, 1988; Roseman, 1984; Scherer, 1999; Smith & Ellsworth, 1985; Weiner, Graham, & Chandler, 1982). These well researched assumptions led them to hypothesize that specific emotions activate an individual's predisposition to appraise future events in line with the central appraisal dimensions that are triggered by the emotions that they feel most frequently. They call this process an "appraisal tendency."

In testing their theory, they found that when comparing dispositionally fearful, angry and happy individuals, the groups differed in their overall pattern of judgment and choice (Lerner & Keltner, 2001). Fearful individuals consistently made relatively pessimistic judgments and choices, whereas both happy and angry individuals consistently made relatively optimistic judgments and choices. This study provided some of the first evidence on how specific emotions affect judgment and appraisal, and more specifically showed that appraisal tendencies mediate emotion and judgment outcomes. They also found that fear and anger only played a role in mediating judgments that were ambiguous or low in terms of certainty or control, suggesting that fearful and angry individuals default to fearful and angry appraisals when faced with ambiguous stimuli or uncertainty.

Clinical studies of anxiety also show that appraisal may play an important role in the maintenance of anxiety disorders as well as the relationship between anxiety and risk avoidance (McNally, 2001; Rachman, 1988; Trower & Gilbert, 1989). Negative expectancies have been associated with social anxiety disorder, specific phobias, and generalized anxiety disorder (e.g., Barlow, 2002; Butler & Mathews, 1983; 1987; Sloan & Telch, 2002; Telch, Brouillard, Telch, Agras, & Taylor, 1989). These individuals have a tendency to overestimate the likelihood that their feared event will occur as well as overestimate the amount of distress that they will feel if it

does occur. Also, anxious individuals possess a lack of perceived control or the degree to which they judge events to be controllable (Chorpita & Barlow, 2008; Chorpita, Brown, & Barlow, 1998; Cloitre, Heimberg, Liebowitz, & Gitow, 1992; Sanderson, Rapee, & Barlow, 1989). This lack of perceived control may be related to the findings of Lerner and Keltner (2001) that fearful individuals revert to fearful appraisals when they judge situations to be uncertain and uncontrollable.

Maner and Schmidt (2006) use the appraisal tendency theory as well as the clinical literature on lack of perceived control in anxious individuals to hypothesize that anxious individuals possess global appraisal biases that cause them to behave in a risk avoidant manner in all areas of their life. Their study deviated from previous research in three ways. First, they hypothesized that high levels of trait anxiety would be associated with relatively negative appraisals of risk and relatively low levels of willingness to engage in risky behavior. Second, they hypothesized that the relationship between anxiety and risk avoidance would be mediated by negative risk appraisals. Third, they conducted analyses to rule out depression as a contributor to the first two hypotheses. Their findings confirm their hypotheses, suggesting that anxiety is related to pervasive forms of risk-avoidant decision-making, with anxious individuals showing a relatively low willingness to engage in risky decision-making across a range of behavioral contexts. These findings remained significant after controlling for depression, indicating that this is a phenomenon that is unique to anxiety. A limitation of this study is that the findings were based completely on self-report data, which may be influenced by responder biases or lack of personal insight.

While these findings that anxious individuals are risk avoidant in general may be true, they may also be leaving an important piece of the puzzle out, the process of making the final

appraisal. Do anxious individuals only see the potential negative consequences related to potentially risky situations, or do they also see the potential rewards? Is it that they only see the negative consequences and they never consider the rewards, or is it that they see both negative and positive consequences, but the potential risks outweigh the potential rewards? Is this process the same for all anxious individuals or does it differ between individuals?

This question of whether all anxious individuals are forming judgments and making decisions in the same way was raised by Kashdan, Elhai, and Breen (2007). They specifically examined approach-avoidance tendencies in socially anxious students for heterogeneity in the types of choices made. They argued that one of the defining factors of social anxiety disorder is an approach-avoidance conflict where socially anxious individuals want to make friends, form bonds and make good impressions, yet they also want to avoid embarrassment and other negative social consequences (Clark & Wells, 1995; Gilbert, 2001; Kashdan, 2007; Rapee & Heimberg, 1997). This fear of negative evaluation is what leads socially anxious individuals to avoid or escape social interactions. However, preliminary evidence has suggested that regardless of anxiety level, not all socially anxious individuals behave in a behaviorally inhibited manner, with some groups of individuals actually displaying disinhibited and impulsive responses (Kashdan, Collins, & Elhai, 2006).

In their study, Kashdan, Elhai, and Breen (2007) found that social anxious individuals displayed greater overall threat appraisals for every type of social and risk-taking behavior when compared to non-anxious individuals. However, overall appraisals of risky behavior were not based entirely on threat alone, as many socially anxious individuals reported approach-avoidance conflicts because they believed that many of the risky behaviors could also satisfy their curiosity and advance their social status. It seems that concerns about potential negative outcomes related

to risky behaviors are co-mingling with the recognition that these same risky behaviors possess reward incentives. The significance of these findings is that anxious individuals are frequently experiencing conflict in their decision of whether to approach or avoid situations, yet avoidance is winning. Another significant finding from this study is that anxious individuals differ in their levels of avoidance behavior, suggesting that regardless of fear levels, some avoid more than others and that variability in avoidance level can lead to different outcomes.

Overall, the burgeoning risk taking and decision making literature is suggesting that biases in anxious individuals' appraisal tendencies may be leading them to appraise stimuli or situations as risky or dangerous, even when those appraisals are unrealistic, because their appraisals are influenced by their mood or disposition, even when the stimuli are unrelated to their mood. This tendency to over-appraise risk may be influencing anxious individuals' decisions to engage in avoidance behavior in an attempt to avoid risk, even when risk is not a realistic outcome. It also seems that this tendency to over-appraise is occurring in a broad variety of situations, not just in relation to the most feared stimuli, suggesting that anxious individuals may possess a propensity to avoid risk in general. The tendency to default to fearful-appraising is also most likely to occur when stimuli or situations are uncertain or ambiguous, which may be related to previously mentioned theories that anxious individuals are more fearful of stimuli that they cannot predict or control.

The literature also suggests that when confronted with a risk situation or a feared stimulus, anxious individuals do not solely see the risks, they also see the potential rewards associated with not avoiding, which presents them with a conflict. However, somehow the rewards associated with avoidance often outweigh the rewards associated with approach and therefore the individual makes the decision to avoid. This literature is highly in line with the

expectancy model of avoidance in that an individual's appraisal tendency may determine their expectancy of certain outcomes related to approach and avoidance, and those expectancies then determine how they weigh the potential rewards and punishments in their decision making process.

The Relationship between Fear and Avoidance and the Role of Avoidance in Treatment

Fear and Avoidance

In their review of the relationship between panic and avoidance, Craske and Barlow (1988) ask the question, why does agoraphobic avoidance develop differently across individuals and why do some individuals with panic disorder never develop agoraphobia at all? One common explanation is that avoidance behavior increases as a function of greater severity or more chronic psychopathology related to panic disorder (e.g. Klein, 1980), and thus panic related anxiety is what drives avoidance (Klerman, 1986). Another view, evidenced in their review, is that behavioral avoidance is just one of many response characteristics to panic. They also show that the development of avoidance is dependent on specific individual characteristics, and different combinations of these characteristics account for individual differences in avoidance. These individual characteristics include: instrumental conditioning or reduction of anxiety from escape avoidance, social demand and secondary gain, safety signals, and heightened anticipation of the probability of panic.

Panic disorder treatment studies have shown a large desynchrony in the relationship between fear and avoidance levels at post-treatment (e.g. Michelson, Mavissakalian, & Marchione, 1985; Arnow, Taylor, Agras, & Telch, 1985; Chambless, Goldstein, Gallagher, & Bright, 1986), with change occurring in either fear or avoidance, but not necessarily in both. One

explanation for this desynchrony is that the expectancy for the amount of fear that will be experienced in relation to the feared stimulus may be different than and separate from the expectancy for the likelihood of the occurrence of the feared stimulus (Kirsch, 1985). Thus, the expectancy for the former may drive fear level, while the expectancy for the latter two drives avoidance level. These two expectancies may commonly overlap, as individuals may expect that a feared stimulus is likely to occur and that they will experience a great deal of fear and negative consequences when it does, which undoubtedly lead to theories that fear drives avoidance. However, they may also not overlap, as is the case if individuals expect that they will experience a great deal of fear, but do not expect that the feared stimulus is likely to occur.

As discussed earlier, Rachman (1994) also theorizes that the over-prediction of fear and negative outcomes, which could also be called biased expectancies, results in both increased fear and avoidance behavior, however his theory argues that fear and avoidance operate in a cyclical, as opposed to a separate, fashion. Rachman states that these over-predictions lead to avoidance behavior and that the avoidance of the feared stimuli maintains the over-predictions because the individual is not receiving the opportunity to adjust their over-predictions. Individuals who do not avoid are able to correct their predictions based on their actual fear level or the actual likelihood of the feared outcome occurring, but those who do avoid never experience an actual fear level and never test the likelihood of the feared outcome, and thus predictions remain the same and fear level remains the same.

Avoidance and Treatment

The existence of a relationship between fear and avoidance has been demonstrated in a large body of research examining the effectiveness of exposure-based treatment for anxiety disorders; however the precise nature of this relationship in treatment remains unclear. Studies

have shown that exposing individuals to the feared stimulus they have previously avoided is very effective in reducing both reported fear as well as future avoidance behavior (e.g. Barlow 2002, Craske & Mystkowski, 2006), suggesting that exposure is a mechanism of change for both fear and avoidance. Laboratory based studies have also found a relationship between avoidance behavior and fear levels within exposure situations, however, these studies show that avoidance responding is the mechanism that protects fear responses from extinction (Lovibond et al., 2009), suggesting that avoidance maintains fear and exposure decreases avoidance, which decreases fear.

This cyclical relationship where avoidance maintains fear may aid in the explanation of individual differences in both treatment success rates and relapse rates after treatment. If there is continued avoidance behavior after treatment, there will not be opportunities for the correction of over-predictions or for the creation of realistic expectancies. Thus, it may be theorized that avoidance level after treatment, more so than fear level after treatment, may be the best predictor of later relapse. If exposure or approach behavior is the means through which predictions or expectancies change, then fear level is dependent on avoidance level.

Summary of Theories

In sum, a large body of research points to the existence of a relationship between anxiety and avoidance behavior, yet they differ in the proposed mechanisms responsible for this relationship. Conditioning theories propose that fear persists because avoidance of a CS prevents the extinction that occurs through repeated non-reinforced exposures. More specifically, the two-factor theory (Mowrer, 1960) proposes that after individuals become conditioned to fear a CS through its pairing with a US, avoidance responses are reinforced because their performance terminates the fear-evoking CS. Thus, individuals do not learn that the avoidance response

prevents the US; they merely learn to escape the CS. Limitations of this theory in explaining the persistence of avoidance when there is no termination of the CS lead to the formation of several other conditioning theories. The Rescorla–Wagner (1972) model posits that learning depends on the discrepancy between what is expected and what actually occurs on a given learning occasion. In addition, their model introduces the concept of conditioned inhibition, which suggests that avoidance responding is the instrumental equivalent to a Pavlovian safety signal, or a signal for the nonoccurrence of an otherwise expected negative outcome. The safety signal model of avoidance (Bolles, 1970; Gray, 1987; Weisman & Litner, 1972) was created as a modification of the two-factor theory that proposes that feedback received from avoidance responses acquires inhibitory or safety signal properties and thus, avoidance behavior is rewarded by the associated safety properties, as opposed to being rewarded by fear reduction. Seligman and Johnston (1973) presented a more cognitively influenced conditioning theory, which argues that individuals learn the outcome of avoidance responding and of not responding and make a decision whether to respond or withhold responding on the basis of a comparison between the two expected outcomes.

Cognitive models of anxiety emphasize that anxious individuals engage in cognitive thought processes that involve irrational or excessive threat appraisal which result in the exaggerated beliefs about the probability or associated distress of potential negative outcomes (e.g. Beck & Emery, 1985; Clark, 1986). Rachman (1994) theorizes that over-prediction of the amount of fear that one expects to experience and over-prediction of the probability that an aversive/fearful event will occur within a defined period results in avoidance. He further hypothesizes that avoidance maintains the over-predictions of fear because the individual does not have the opportunity to correct their over-predictions. Salkovskis, Wells, and colleagues (e.g.

Salkovskis, Clark, & Gender, 1996; Wells et al., 1995) developed the safety behaviors theory that explains that during exposure, patients carry out subtle safety behaviors that are meant to avert their predicted harmful outcomes. The performance of these behaviors results in the blocking of the disconfirmation of unrealistic beliefs, or over-predictions of fear, because the absence of the feared outcome is attributed to the safety behaviors.

While initially conditioning models were believed to measure automatic and reflexive learning and cognitive models were believed to measure conscious and reflective processes, later research has found that there is a great deal of overlap between these two processes. The integrated expectancy model (Lovibond & Shanks, 2002) combines conditioning and cognitive based theories to account for the overlap. Their theory predicts that first, the CS elicits an expectancy of an aversive outcome and that expectancy produces anxiety or fear. Second, the learning of the avoidance response is dependent on its performance predicting the non-occurrence of the expected aversive outcome. On future trials, whether the individual performs the avoidance behavior or not is based on their conscious and reflective comparison of the incentives of avoidance responding or not responding.

The roles of conscious choice and reflective comparison in the expectancy model highlight the importance of understanding the decision making process being used by anxious individuals when they decide to avoid or not. Lerner and Keltner's (2001) appraisal tendency theory hypothesizes that specific emotions elicit specific types of appraisals and that the frequent experience of an emotion can create a predisposition to appraise future events in line with the appraisal style of that emotion. Thus, if individuals frequently feel anxious, this frequent experience will cause them to develop an anxious appraisal style and they will be more likely to appraise situations through an anxious lens, even if they do not feel anxious in those situations.

These appraisals then influence individuals' judgments and decisions regarding how to behave in these situations. They found that this is particularly true when the outcome of the situation is uncertain.

Maner and Schmidt (2006) found that anxious individuals have a tendency to avoid risk in general, not just in relation to their feared stimuli, suggesting that there is a bias in their appraisal of risk, which would be in accordance with Lerner and Keltner's model. Yet this finding raises the question of whether anxious individuals can only see the risk surrounding approach behavior or if they can also see the potential benefits. Kashdan, Elhai, and Breen (2007) found that socially anxious individuals reported a conflict when deciding whether to approach or avoid because they do see the potential risks and benefits in both behaviors, suggesting that somehow the benefits associated with avoidance are outweighing the benefits associated with approach.

Finally, research examining the relationship between fear levels and avoidance levels in treatment have found that there is often desynchrony between the two (see Craske & Barlow, 1988), suggesting that they may be guided by separate processes. One theory is that fear and avoidance are controlled by separate expectancy processes, one that predicts the amount of fear that will be experienced and one that predicts the likelihood of negative outcomes (Kirsch, 1985) and therefore treatment may create changes in one expectancy and not another. Another theory is that over-predictions of negative outcomes lead to avoidance behavior, but that avoidance behavior maintains the over-predictions, and fear levels, because the avoidance is blocking the opportunity to correct the biased predictions. Both theories point to the importance of measuring fear and avoidance separately and using both as separate indicators of treatment outcome.

Measurement of Avoidance

The measurement of avoidance typically begins with the question of whether one is interested in the implicit or explicit expression of avoidance. Information-processing models emphasize the necessity of distinguishing between strategic, voluntary modes of responding to threat and more automatically initiated modes of responding to threat (Beck & Clark, 1997; Fazio & Towles-Schwen, 1999; Strack & Deutsch, 2004). Beck and Clark (1997) theorized that when a disorder specific negative stimulus is identified, a threat processing template is automatically activated, which guides automatically initiated responses. However, when sufficient resources, such as time, are available, this automatic stage is argued to be followed by a slower, effortful, secondary processing of the threat information. The secondary elaboration of threat information would provide the opportunity to respond with more controlled fear behaviors that are more strategic, reflectively initiated, and voluntarily controlled. This is also evidenced by neurobiological research showing the presence of separate pathways for initial, lower order and slower, higher order processing of stimulus information (e.g., LeDoux, 1995).

The differences between theories of implicit, automatic avoidance responding and theories of explicit, voluntary avoidance responding warrant the use of different types of measurement to study each specific process. Implicit avoidance, such as escape behavior, is typically measured by automatic fear-relevant associations, such as measuring reaction time or eye movements when viewing feared stimuli, whereas explicit avoidance has typically been measured using behavioral approach tasks or self-report measures that allow more time for reflection, introspection and choice. Measures that allow time for voluntary choices may thus be based on both automatically activated information as well as more reflective, secondary considerations (Fazio & Olson, 2003). Huijding and de Jong (2005) specifically explored

whether different measures are better suited for different types of avoidance and found that measures of automatic reaction are better at testing implicit avoidance and self-report measures are better at testing explicit avoidance.

While both implicit and explicit processes are theorized to play an important role in the production of avoidance behavior in anxious individuals, the strategic and thoughtful judgment and decision-making process that have been theorized to underlie voluntary avoidance behaviors are most likely best measured with measures that allow time and room for strategic and reflective choices to be made. Historically, this type of avoidance has most commonly been measured in two ways, self-report measures and behavioral avoidance or approach tasks.

Self-Report Measures

Self-report measures of avoidance, such as the Mobility Inventory for Agoraphobia (Chambless, 1985), the Marks and Mathews Fear Questionnaire (1979), and the Social Interaction Anxiety Scale and the Social Phobia Scale (Heimberg, Mueller, Holt, & Hope, 1992) are the quickest and most direct means of measuring avoidance behavior, and for that reason they are widely used. However, the inherent limitation of self-report measures is that they can only measure an individual's subjective experience and awareness of their own avoidance behavior, and not all elements of fear are accessible to introspection (Foa & Kozak, 1986). Anxious individuals also over-predict the amount of fear they will experience and the likelihood of negative consequences when faced with feared stimuli, so their self-reported fear and avoidance behavior may also be inaccurate (Rachman, 1994). Therefore, self-report measures may yield biased information that is influenced by many factors such as lack of awareness and insight, demand characteristics of the scale, and social desirability. These limitations press the importance of not relying solely on self-report data. When possible, objective behavioral

measures that are not subject to these biases should be used either in place of self-report or in conjunction with self-report as a means of validating the data.

Behavioral Measures

While self-report measures are the simplest to administer, objective behavioral data are typically the most accurate and free of bias. Historically, the most common objective measure of avoidance has been the behavioral avoidance task (BAT). The first BAT was reported by Lang and Lazovik (1963) and was used as an overt measure of behavioral anxiety that was indirect and involved quantification of participants' escape and avoidance behavior related to feared stimuli. In the first use of the paradigm, snake-phobic participants were asked to approach, touch, and handle a live snake prior to treatment and then again after treatment. The dependent variable was their minimum distance in feet from the animal, or their degree of interaction with it (e.g. touch, hold). This paradigm has continued to grow in popularity because of the relative simplicity of assessing fears under controlled conditions that it affords (Bernstein & Paul, 1971).

The BAT design has become more sophisticated over time and has expanded its outcome variables to include duration of exposure to a feared stimulus (Miller & Bernstein, 1972), latency data such as the amount of time from the start of the test to the time when contact with the object is first made (Borkovec, 1972), as well as tests of anxiety related to more complex stimuli, including claustrophobia (Miller & Bernstein, 1972), agoraphobia (Everaerd, Rijken, & Emmelkamp, 1973), obsessive-compulsive rituals (Rachman, Hodgson, & Marks, 1971) and fear of heights (Ritter, 1970). Furthermore, the BAT has been shown to have substantial inter-rater reliability (e.g. r =.099, Borkovec, 1972). The stability of the BAT on untreated participants has been variable, partly as a function of the time between testing. Reliability coefficients range from

0.63 in the original Lang and Lazovik's (1963) study to 0.95 in later work (Borkovec & Craighead, 1971).

Over the past few decades, the BAT has continued to grow in popularity and has been used to study all types of anxiety disorders and fearful stimuli. It has gained such universal appeal and recognition that it is no longer even cited as a particular author's paradigm, but instead is recognized as a reliable and valid instrument without any citing of reliability and validity statistics. While the BAT has been extremely useful in the quantification of avoidant and escape behavior, it has a fundamental limitation that decreases its ability to accurately capture how participants avoid in their real lives. The task encourages the participant to slowly approach and touch the feared stimulus or to remain in a feared context for as long as possible. The limitation is that the participants do not have the reward incentives to approach the feared stimulus in the laboratory that they have in the real world.

As was discussed earlier, anxious individuals are constantly faced with the conflict and the decision to approach or avoid their feared stimuli and they typically recognize the potential rewards and punishments of both approach and avoidance (Rapee & Heimberg, 1997). It can be assumed that the rewards associated with approach behavior in the real world are not always present in the laboratory. The individual with a fear of public speaking typically understands that while giving a speech in the work place may be associated with risks, it may also be associated with rewards, such as a possible promotion. However, the willingness to give a speech in the laboratory does not usually afford external rewards, and thus the motivation to push oneself to approach is lacking. The lack of motivation to perform approach behaviors on laboratory tasks is an indicator that the tasks may not provide an externally valid representation of how an anxious individual makes decisions regarding how to behave in the real world. A more valid measure of

behavioral avoidance and approach would need to incorporate reward incentives to mimic the decision process that anxious individuals are faced with every time they encounter their feared stimulus. The balance of potential rewards and punishments must lead the individual to be faced with a conflict where a thoughtful comparison of the choices is made.

Several laboratory tasks that were recently created to test automatic and implicit avoidance responses may offer some direction to the study of explicit, strategic avoidance responses. One example is the Approach-Avoidance Task, introduced by Rinck and Becker (2007), where participants are shown pleasant and fearful stimuli and are given a joystick that allows them to control whether they zoom in on a picture or zoom out on a picture. Based on the theory that approach and avoidance are basic responses associated with the primary motive systems of the brain that underlie complex emotional responding (Lang et al., 1997), they theorized that participants' automatic responses when confronted with a fear evoking stimulus would be to push it away, or zoom out, and when confronted with a pleasant stimulus would be to bring it closer to them, or zoom in, which is what they found. This finding was replicated with both spider phobic individuals (Rinck & Becker, 2007) and socially phobic individuals (Heuer, Rinck, & Becker, 2007) by adapting the task to include disorder specific feared stimuli (i.e. spider images for spider phobia, and angry faces for social phobia).

While this task was created to measure automatic responses, some of the basic components of the task may also be useful in measuring explicit and strategic avoidance, if the timing of the task is slowed down and a voluntary choice component is added. In particular, showing a fearful individual images of their feared stimulus that are zooming, or becoming larger on the screen, in order to mimic approach towards the feared stimulus may be an effective means of simulating the approach behavior measured on a BAT, but using a more easily

administered, computerized task. If the images were shown at a slower rate and the participant was given choice as to whether or not to "approach" the feared images, and if reward incentives were given for approaching and not avoiding feared stimuli, the task would mimic the conflict and decision-making process that anxious individuals face when deciding to approach or avoid feared situations in their daily lives.

Moving Beyond Fear: The Role of Avoidance Behavior in Predicting Treatment Outcome for Social Anxiety Disorder

Researchers and clinicians have long theorized that avoidance of feared stimuli contributes greatly to the development and maintenance of fear, anxiety, and anxiety disorders. However, there has been little agreement regarding the precise mechanisms underlying the relationship between fear and avoidance behavior, or how the nature and degree of fear and avoidance behavior contribute to the course and outcome of anxiety treatment.

The prevailing models of exposure therapy for anxiety disorders have emphasized fear reduction as the critical agent of change responsible for treatment success. Exposure therapy paradigms have been greatly influenced by the tenants of the emotional processing theory (Foa & Kozak, 1986; Foa & McNally, 1996), which states that high levels of initial fear activation upon exposure followed by within and between session habituation of fear, are the critical indices of corrective learning throughout exposure therapy. The practical application of this theory is to repeat exposure to a feared stimulus the number of times and the length of time necessary for fear to subside. As a result, many treatment studies have used the level of fear reduction achieved as a primary measure of treatment outcome.

However, the evidence indicates that the degree by which fear reduces within and between exposure trials does not predict therapeutic outcomes, as measured by fear and avoidance levels at follow-up testing (Craske, Kircanski, Zelikowski, Mystkowski, Chowdhury, & Baker, 2008; Craske, Liao, Brown, & Vervliet, 2012). Furthermore, analog research has shown that maintaining high and variable levels of fear within and between exposure trials does not lessen outcomes (Baker, Mystkowski, Culver, Yi, Mortazavi, & Craske, 2010; Culver, Stoyanova, & Craske, 2011; Kircanski et al., 2012), suggesting that fear reduction may not be the primary agent of change.

Anxiety treatment literature has paid little attention to the role of avoidance behavior in

determining treatment outcome, yet there are a number of theories that propose that avoidance is the key mechanism through which fear is maintained. Conditioning theories propose that fear persists because avoidance of a conditioned stimulus (CS) prevents the extinction that naturally occurs following repeated non-reinforced exposures. The Rescorla–Wagner (1972) model posits that learning depends on the discrepancy between what is expected to occur and what actually occurs on a given learning occasion. For example, if a feared outcome were to occur on a trial when it was not expected, the result is fear and excitatory learning. If a feared outcome is expected on a trial and it does not occur, the result is a feeling of safety and inhibitory learning. Similarly, when a behavior is performed to avoid a feared stimulus, and the feared outcome does not occur, the result is a feeling of safety and inhibitory learning. The avoidance behavior then becomes the instrumental equivalent to a Pavlovian safety signal, or a conditioned signal for the nonoccurrence of an otherwise expected negative outcome. For example, if an individual sits by themselves at a social event and they do not experience the expected and feared outcome of social ridicule, sitting alone can become conditioned to feel safe.

It is now thought that this inhibitory, or safety, learning is a central agent in the process of fear extinction (Bouton, 1993; Miller et al., 1988; Wagner, 1981). Within a Pavlovian conditioning approach, the inhibitory learning model posits that during fear extinction, the original excitatory association between the feared/conditioned stimulus (CS) and the feared outcome (Unconditioned Stimulus (US)) learned during fear conditioning is not erased. Rather, the original excitatory association is left intact while a new, secondary, inhibitory association between the CS and US is created through exposure to trials where the CS is present but the expected US does not occur. The non-occurrence of the US violates the expected relationship between the CS and US and this violation creates inhibitory learning (e.g., Bouton & King, 1983;

Bouton, 1993). Thus, after successful fear extinction, the CS possesses two competing meanings; its original excitatory meaning (CS predicts US) and an additional inhibitory meaning (CS predicts no US).

Recent theories of exposure therapy that draw from the fear extinction literature have pointed to the creation and strengthening of inhibitory learning associations as the essential mechanism of change that occurs through exposure (Craske et al., 2008, 2012). The inhibitory learning models of exposure therapy view avoidance behavior as a safety signal that interferes with this essential mechanism. Avoidance prevents exposure to the CS, and subsequently prevents learning that there is a discrepancy between what is expected to occur upon exposure to the CS (the US) and what actually occurs (no US). Thus, avoidance blocks the formation of new, inhibitory associations between the CS and US. Instead, an inhibitory, or safe, association forms between the CS and the avoidance behavior, which increases the likelihood of future avoidance responding in the presence of the CS, and protects the excitatory, fear inducing association from extinction.

If exposure treatment limits avoidance behavior, greater inhibitory learning between the CS and US is more likely to occur, yet both the excitatory and inhibitory associations between the CS and US will still remain intact. Thus, individuals must continue to strengthen the new inhibitory association through continued exposure to the feared stimulus to maintain its dominance over the excitatory association. Without continued exposure to the feared stimulus in varied contexts, the older, more practiced excitatory association may resurge as the dominant association, and there may be a return of fear. Therefore, this theory predicts that the presence of avoidance behavior during exposure therapy blocks initial inhibitory learning, which blocks fear reduction. Additionally, even if inhibitory learning occurs and fear declines during treatment, the

presence of avoidance behavior after treatment could lead to a reinstatement of the original excitatory associations and ultimately, a return of fear.

From a cognitive theoretical perspective, avoidance is believed to impede the correction of errors in threat prediction and thereby maintain fear. Rachman (1994) labels this process as "over-prediction," and theorizes that over-prediction of the amount of fear that one expects to experience, as well as over-prediction of the probability that an aversive/fearful outcome will occur within a defined period, results in avoidance. He further hypothesizes that avoiding exposure to the feared stimulus prevents the experience of actual fear levels as well as actual rates of occurrence of the feared outcome. Thus, avoidance prevents the correction of the over-predictions, and subsequently is responsible for maintaining the fear associated with the stimulus (Rachman, 1994, Rachman & Lopatka, 1986). This process of correcting over-prediction through hypothesis testing is thought to be one of the mechanisms responsible for the effectiveness of exposure based treatments for anxiety disorders.

Combining conditioning and cognitive theories, the integrated expectancy theory (Lovibond & Shanks, 2002) predicts that the CS elicits an expectancy of an aversive outcome (US), and that expectancy produces anxiety or fear. Subsequently, an avoidance response is learned if its performance predicts the non-occurrence of the expected aversive outcome. On future trials, whether the individual performs the avoidance behavior or not is based on their conscious and reflective comparison of the incentives of avoidance versus non-avoidance. Avoidance responding, when used as a source of safety, can protect the fear associated with the CS from extinction because avoidance maintains the expectancy that the CS is associated with an aversive outcome.

In sum, these theories point to the role of avoidance behavior in maintaining fear because

the occurrence of an avoidance response prevents inhibitory learning and the correction of over-predictions and unrealistic expectancies regarding the probability of threat and fear. These theories also state that blocking the avoidance response is necessary to cultivate inhibitory learning and correct over-predictions/biased expectancies. That is, avoidance must be blocked before fear can be reduced.

A recent treatment study of cognitive behavioral therapy (CBT) for social anxiety disorder (SAD) examined session by session fear and avoidance levels and found that during the first eight weeks of treatment, avoidance level predicted subsequent fear levels above and beyond previous fear levels, but fear level did not predict subsequent avoidance level above and beyond previous avoidance levels (Aderka, McLean, Huppert, Davidson, & Foa, 2013). Additionally, they found that in the last six sessions, fear and avoidance predicted one another. These results suggest that changes in avoidance sparked the cycle of change involved in treatment of SAD, and that the cycle maintained itself later through the reciprocal relationship between fear and avoidance. They also suggest that early in treatment, avoidance is a better predictor of future fear than past fear, and that fear is not a strong predictor of future avoidance.

Collectively, this research suggests that changes in avoidance levels precede changes in fear levels, that avoidance may be a better predictor of future fear levels than past fear levels, and that the maintenance of avoidance reductions may be the most stable predictor of sustained fear extinction. Thus, this research would also suggest that pre-treatment avoidance levels may be a better predictor of change throughout treatment than pre-treatment fear levels because the ability to reduce avoidance early in treatment will drive the success of the treatment. Similarly, the level of residual avoidance at post-treatment may be a better predictor of the maintenance of treatment gains, continued change, or relapse after treatment than post-treatment fear level.

Present Study

The first aim is to differentiate fear and avoidance as two separate predictors of behavioral treatment outcome for anxiety disorders and to test whether pre-treatment avoidance level predicts post-treatment fear level above and beyond pre-treatment fear level. The second aim is to examine whether pre-treatment avoidance level predicts post-treatment functioning above and beyond pre-treatment fear level. The third aim is to examine whether post-treatment avoidance level predicts functioning at six month follow up above and beyond post-treatment fear level. This study will focus specifically on the role of fear and avoidance within exposure based treatments for SAD, one of the most common anxiety disorders, with lifetime prevalence rates of 16.6% (Kessler, Chiu, Demler, Merikangas, & Walters, 2005), in order to decrease heterogeneity in this first comparison study.

Method

Participants

Study participants were English speaking individuals 18-60 years of age. Participants were a treatment seeking sample that came to the Anxiety Disorders Research Center at the University of California, Los Angeles (UCLA) to participate in a 12-week randomized clinical trial examining the efficacy of Cognitive Behavioral Therapy (CBT) versus Acceptance and Commitment Therapy (ACT) for the treatment of SAD. The study was advertised using local flyers, Craig's list online listings and newspaper advertisements. Participants met DSM-IV-TR (APA, 2000) criteria for a diagnosis of SAD, generalized (n=74, ACT=34, CBT=40). Participants were 57% male with an average age of 27.8 years old and an average education level of 15.7 years. The sample was ethnically diverse with 49.1% Caucasian, 21.7% Asian, 13.2%

Latino, 2.8% African-American, 2.8% Middle-Eastern, and 10.5% Other.

Participants were either medication-free or stabilized for a minimum length of time (1 month for benzodiazepines and beta blockers, 3 months for SSRIs/SNRIs and heterocyclics). Also, they were psychotherapy-free or stabilized on alternative psychotherapies (other than cognitive or behavioral therapies) that were not focused on their anxiety disorder for at least 6 months. Exclusion criteria were active suicidal ideation; severe depression (clinical severity rating > 6, see below); history of bipolar disorder, psychosis, mental retardation or organic brain damage; substance abuse or dependence within the last 6 months; and respiratory, cardiovascular, pulmonary, neurological, muscular-skeletal diseases or pregnancy. As our study included neuroimaging (results reported elsewhere), additional exclusion criteria were left handedness, metal implants, and claustrophobia.

Diagnostic Assessment

ADIS-IV. Diagnoses were ascertained with the Anxiety Disorders Interview Schedule-IV (ADIS-IV) (Brown, DiNardo, &Barlow, 1994), which diagnoses anxiety disorders, mood disorders, somatoform disorders, and substance disorders, screens for psychoses, and includes a brief medical history. For each disorder, clinical ratings of severity of symptoms, distress and disablement were made by group consensus on a 0 to 8 scale (CSR scale; 0= none, 8= extreme). Diagnoses of social anxiety disorder assigned a rating of "4" or higher served as the cutoff for study eligibility (see Craske, DeCola, Sachs, & Pontillo, 2003; Arch, Eifert, Davies, Vilardaga, Rose, & Craske, 2012). The ADIS-IV was re-administered at post-treatment (Post) and six-month follow-up (FU) to assess changes in diagnostic ratings.

ADIS-IV principal anxiety disorder diagnoses evidence good to excellent inter-rater reliability, with kappas ranging from .67 to .86 (mean kappa= .78) (Brown, DiNardo, Lehman, &

Campbell, 2001). Doctoral students in clinical psychology or bachelor level research assistants served as interviewers after completing 15-20 hours of training and demonstrating adequate diagnostic reliability on 3 consecutive interviews. All interviews were audio-recorded and a subset were randomly selected (n=22) for blind rating by a second interviewer. Inter-rater reliability on the principal diagnosis (n=22) was 100%, and on dimensional CSR ratings for SAD (n=10) was ICC = 1.00 (100% agreement).

Treatment

Experimental design. After completing baseline eligibility and diagnostic assessments (Pre), in addition to a questionnaire battery, eligible participants were randomly assigned to either the CBT or ACT condition. Participants were re-assessed using the same measures immediately after treatment (Post) and at six months after Pre (FU). Participants were stratified by age and gender in CBT and ACT to ensure equal distribution across groups.

Treatment Procedures Common to both Conditions. Participants in the CBT and ACT groups received twelve weekly, 1-hour, individual therapy sessions based on detailed treatment manuals.[1] ACT and CBT were matched on number of sessions devoted to exposure but differed in framing of the intent of exposure. Following the 12 sessions, therapists conducted follow-up booster phone calls (20-35 mins) once per month for 6 months to reinforce progress consistent with the assigned therapy condition. See (Craske et al., under review) for additional details of therapist training, randomization, and treatment.

Cognitive Behavioral Therapy (CBT). CBT for SAD was derived largely from standard CBT models (e.g. Hope, Heimberg, Juster, & Turk, 2004). This particular CBT has been effective for individuals with social anxiety disorder within larger primary care (Craske et al.,

[1] See author for a copy of the CBT treatment manual; the ACT manual is published (Eifert & Forsyth, 2005).

2011) and clinic samples (Arch et al., 2012). Session 1 focused on assessment, self-monitoring, and psychoeducation. Sessions 2-4 emphasized cognitive restructuring errors of overestimation and catastrophizing regarding negative evaluation, combined with hypothesis testing, self-monitoring, and breathing retraining. Exposure to feared social cues (including in-vivo, imaginal, and interoceptive exposure combined with in-vivo exposure) was introduced in Session 5, and emphasized strongly in Sessions 6-11. Session 12 focused on relapse prevention.

Acceptance and Commitment Therapy (ACT). ACT for anxiety disorders followed a manual by Eifert and Forsyth (2005).[2] Session 1 focused on psychoeducation, experiential exercises and discussion of acceptance and valued action. Sessions 2-3 explored creative hopelessness, or whether previous efforts to control anxiety had "worked" and how such efforts had led to the reduction of valued life activities, and encouraged acceptance. Sessions 4 and 5 emphasized mindfulness, acceptance and cognitive defusion, or the process of experiencing anxiety-related language (e.g., thoughts, self-talk, etc.) as part of the broader, ongoing stream of present experience rather than getting stuck in responding to its literal meaning. Sessions 6-11 continued to hone acceptance, mindfulness, and defusion, and added values exploration and clarification with the goal of increasing willingness to pursue valued life activities. Behavioral exposures, including interoceptive, in-vivo, and imaginal, were used to practice making room for, mindfully observing, and accepting anxiety and to practice engaging in valued activities while experiencing anxiety. Session 12 reviewed what worked and how to continue moving forward.

Measures

Predictive Variables

[2] Creative hopeless was moved from session 1 to session 2

ADIS-IV Fear and Avoidance Ratings. The ADIS-IV interviewers (Brown, DiNardo, & Barlow, 1994) rated levels of fear and avoidance in relation to a list of specific situations and stimuli associated with SAD. Ratings were made on a scale of 0-8 (0= no fear or avoidance, 8= highest level of fear or avoidance). Cronbach's αs = .88 (Pre) and .93 (Post).

Overall fear level at pre-treatment (Fear-Pre) was calculated by taking the average fear rating across all situations that were avoided with a score of four and above. Overall avoidance level at pre-treatment (Avoidance-Pre) was calculated by summing the total number of situations avoided with a score of four or above. The four and above cut-off was used because these scores were considered "clinically significant." The same fear and avoidance variables were created for ratings made at post-treatment (Fear-Post, Avoidance-Post).

Avoidance variables were calculated using the total number of situations avoided over a clinically significant cut-off so that they captured the range of situations avoided at a moderate to severe level. Fear variables were calculated using the average fear level experienced in all situations avoided over a clinically significant cut-off so that they captured the intensity of the fear experienced in the situations avoided. Using the total number of situations feared over a clinically significant cut-off would have neglected the intensity level of the fear experienced and likely would have inflated the overall fear score because of the difficulty in disentangling the overlapping fear experienced in each commonly co-occurring situation. Several other options were considered for how to calculate the fear and avoidance variables.

The first option considered was to create the avoidance variable by summing the ratings of all situations avoided and creating the fear variable by averaging the fear ratings for those situations. This option was problematic because a participant with low avoidance scores on many situations may have a higher overall avoidance score than someone with very high avoidance

scores on just a few situations. A participant with limited but frequent avoidance may be experiencing more avoidance overall than a participant with varied but infrequent avoidance.

The second option considered was to create the avoidance variable by summing the ratings for the three situations with highest avoidance ratings and creating the fear variable by averaging the fear ratings for those situations. This option was problematic because individuals with high avoidance scores on a few situations would score higher on overall avoidance than individuals with moderate avoidance scores on many situations. It is currently unclear whether more frequent or more generalized avoidance is more severe.

Ultimately, the decision to use the total situations avoided with a score of four and above, and the average of the feared situations with an avoidance rating of four and above was deemed the best option. This set of calculations eliminated the problems with the other two considerations because there is not an issue of many low scores or a few high scores inflating the overall score. This method of calculation is simply a count of the number of situations avoided at a clinical level.

Outcome Variables

ADIS-IV CSR Ratings. Dependent variables were CSR ratings for SAD at post-treatment (CSR-Post) and six-month-follow-up (CSR-FU). Pre-treatment CSR ratings (CSR-Pre) were used as a covariate.

Mood and Anxiety Symptom Questionnaire (MASQ). Participants completed the General Distress Mixed, General Distress Anxiety, General Distress Depression, Anxious Arousal, and Anhedonic Depression subscales of the Mood and Anxiety Symptom Questionnaire (Watson & Clark, 1991) at pre- and post-treatment and six-month follow-up. The MASQ reliably produces a three-factor structure, with factors representing General Distress, Anxious Arousal, and

Anhedonic Depression (Watson, Clark, et al., 1995). Dependent variables were MASQ scores on the General Distress Anxiety Subscale and Total Scale at post-treatment (MASQ Anxiety-Post, MASQ Total-Post) and six-month-follow-up (MASQ Anxiety-FU, MASQ Total-FU). Pre-treatment MASQ scores on the General Anxiety Subscale and Total Scale (MASQ Anxiety-Pre, MASQ Total-Pre) were used as a covariates. The MASQ was chosen over the use of a social anxiety measure because symptoms related specifically to social anxiety were already captured using the SAD CSR. Using the MASQ allowed for the capture of more general distress and negative affect associated with SAD as well as other forms of anxiety and depression that commonly co-occur with SAD.

Data Analysis Plan

Only participants who completed the full 12 weeks of treatment and their post-treatment assessment were included in the following analyses (n=62). To examine the first study aim of whether pre-treatment avoidance level predicts post-treatment fear level, above and beyond pre-treatment fear level, a general linear model (GLM) was first used to assess whether Treatment Group interacted with pre-treatment avoidance in predicting post-treatment fear. If no interaction effects were present, participants were collapsed into one group and a hierarchical multiple regression model was used. The dependent variable was post-treatment fear level (Fear-Post). The first step entered the pre-treatment fear variable (Fear-Pre). The second step entered the pre-treatment avoidance level (Avoidance-Pre).

To examine the second study aim of whether pre-treatment avoidance level predicts treatment outcome scores at post-treatment, above and beyond pre-treatment fear level, a GLM was first used to assess whether Treatment Group interacted with pre-treatment fear and avoidance levels in predicting treatment outcome scores at post-treatment. If no interaction

effects were present, participants were collapsed into one group and a hierarchical multiple regression model was used. The dependent variables were treatment outcome scores at post-treatment (CSR-Post, MASQ Anxiety-Post, MASQ Total-Post). The first step entered the baseline measure of the outcome variable being tested (CSR-Pre, MASQ Anxiety- Pre, or MASQ Total-Pre) to control for pre-treatment variability. The second step entered the pre-treatment fear variable (Fear-Pre). The third step entered the pre-treatment avoidance variable (Avoidance-Pre).

Only participants who completed the full 12 weeks of treatment, their post-treatment assessment, and their FU assessment were included in the following analyses (n=31). To examine the third study aim of whether post-treatment avoidance level predicts treatment outcome scores at six-month-follow-up, above and beyond post-treatment fear level, a GLM was first used to assess whether Treatment Group interacted with post-treatment fear and avoidance levels in predicting treatment outcome scores at six-month follow-up. If no interaction effects were present, participants were collapsed into one group and a hierarchical multiple regression model was used. The dependent variables were treatment outcome scores at six-month-follow-up (CSR-FU, MASQ Anxiety-FU, or MASQ Total-FU). The first step entered the post-treatment measure of the outcome variable being tested (CSR-Post, MASQ Anxiety-Post, or MASQ Total-Post) to control for post-treatment variability. The second step entered the post-treatment fear variable (Fear-Post). The third step entered the post-treatment avoidance variable (Avoidance-Post).

Results

Table 1 presents the correlation matrix of all independent and dependent variables, as

well as means and standard deviations.

Aim #1: Does pre-treatment avoidance level predict post-treatment fear level?

The first aim addressed whether pre-treatment avoidance levels predict post-treatment fear levels, over and above pre-treatment fear levels.

In GLM analyses, Treatment Group did not interact with Avoidance-Pre, $F(1, 81) = 1.36$, $p = .26$, or Fear-Pre, $F(1, 81) = 1.43$, $p = .24$, in predicting Fear-Post. Thus, participants from both treatment groups were collapsed into one group.

In hierarchical regression analyses, higher Avoidance-Pre predicted higher Fear-Post, $R^{2\ Change} = .02$, standardized $\beta = .22$, $p = .04$. This effect was found over and above Fear-Pre, which was also a significant predictor of Fear-Post, standardized $\beta = .63$, $p < .00$.

In hierarchical regression analyses, higher Fear-Pre did not significantly predict Avoidance-Post, $R^{2\ Change} = .01$, standardized $\beta = .19$, $p =$ ns, over and above Avoidance-Pre. Avoidance-Pre was a significant predictor of Avoidance-Post, standardized $\beta = .57$, $p < .00$.

Aim #2: Does pre-treatment avoidance level predict post-treatment outcome?

The second aim addressed whether pre-treatment avoidance levels predict post-treatment symptoms and functioning, as measured by post-treatment CSR ratings and MASQ scores, over and above pre-treatment fear levels.

CSR Ratings. In GLM analyses, no significant interaction was found between Treatment Group and Avoidance-Pre, $F(1, 32) = .11$, $p = .75$, or Fear-Pre, $F(1, 32) = .03$, $p = .86$, in predicting CSR-Post, thus the participants from both treatment groups were collapsed into one group.

In hierarchical regression analyses, higher Avoidance-Pre predicted higher CSR-Post, $R^{2\ Change} = .07$, standardized $\beta = .31$, $p = .03$, after controlling for CSR-Pre. This effect was found

over and above Fear-Pre, which in and of itself was not a significant predictor of CSR-Post, $R^{2\ Change} = .01$, standardized $\beta = -.07$, p= ns. Figure 1 presents the regression line for Avoidance-Pre predicting CSR-Post, adjusted to account for the variance explained by CSR-Pre and Fear-Pre. When Avoidance-Pre was removed from the hierarchical regression, Fear-Pre remained a non-significant predictor of CSR-Post, $R^{2\ Change} = .01$, standardized $\beta = .11$, p= ns.

MASQ Anxiety. In GLM analyses, no significant interaction was found between Treatment Group and Avoidance-Pre, $F(1,32) = .27$, p= .61, or Fear-Pre, $F(1,32) = .34$, p= .57, in predicting MASQ Anxiety-Post, thus the participants from both treatment groups were collapsed into one group.

In hierarchical regression analyses, higher Avoidance-Pre predicted higher MASQ Anxiety-Post, $R^{2\ Change} = .25$, standardized $\beta = .53$, p= .04, after controlling for MASQ Anxiety-Pre. This effect was found over and above Fear-Pre, which in and of itself was not a significant predictor of MASQ Anxiety-Post, $R^{2\ Change} = .30$, standardized $\beta = .38$, p= .14. When Avoidance-Pre was removed from the hierarchical regression, Fear-Pre remained a non-significant predictor of MASQ Anxiety-Post, $R^{2\ Change} = .26$, standardized $\beta = .55$, p= .08.

MASQ Total. In GLM analyses, no significant interaction was found between Treatment Group and Avoidance-Pre, $F(1,32) = .10$, p= .76, or Fear-Pre, $F(1,32) = .13$, p= .72, in predicting MASQ Total-Post, thus the participants from both treatment groups were collapsed into one group.

In hierarchical regression analyses, higher Avoidance-Pre did not significantly predict higher MASQ Total-Post, $R^{2\ Change} = .16$, standardized $\beta = 5.0$, p= .06, after controlling for MASQ Total-Pre and Fear-Pre. Fear-Pre was a significant predictor of MASQ Total-Post, $R^{2\ Change} = .01$, standardized $\beta = 12.0$, p= .02.

Aim #3: Does post-treatment avoidance level predict treatment outcome at six-month-follow-up?

The third aim addressed whether post-treatment avoidance levels predict treatment functioning at six month follow up, as measured by six month follow up CSR ratings and MASQ scores, over and above post-treatment fear levels.

CSR Ratings. In GLM analyses, no significant interaction was found between Treatment Group and Avoidance-Post, $F(1, 23) = 1.28$, $p = .27$, or Fear-Post, $F(1, 23) = .01$, $p = .93$, in predicting CSR-FU, thus the participants from both treatment groups were collapsed into one group.

In hierarchical regression analyses, higher Avoidance-Post predicted higher CSR-FU, $R^{2\ Change} = .12$, standardized $\beta = .60$, $p = .03$, after controlling for CSR-Post. This effect was found over and above Fear-Post, which in and of itself was not a significant predictor of CSR-FU, $R^{2\ Change} = .01$, standardized $\beta = -.18$, p= ns. Figure 2 presents the regression line for Avoidance-Post predicting CSR-FU, adjusted to account for the variance explained by CSR-Post and Fear-Post. When Avoidance-Post was removed from the hierarchical regression, Fear-Post remained a non-significant predictor of CSR-FU, $R^{2\ Change} = .01$, standardized $\beta = .09$, p= ns.

MASQ Anxiety. In GLM analyses, no significant interaction was found between Treatment Group and Avoidance-Post, $F(1,23) = .01$, $p = .95$, or Fear-Post, $F(1,23) = .05$, $p = .84$, in predicting MASQ Anxiety-FU, thus the participants from both treatment groups were collapsed into one group.

In hierarchical regression analyses, higher Avoidance-Post predicted higher MASQ Anxiety-FU, $R^{2\ Change} = .05$, standardized $\beta = .32$, $p = .04$, after controlling for MASQ Anxiety-Post. This effect was found over and above Fear-Post, which in and of itself was not a significant predictor of MASQ Anxiety-FU, $R^{2\ Change} = .20$, standardized $\beta = .18$, p= ns.

MASQ Total. In GLM analyses, no significant interaction was found between Treatment Group and Avoidance-Post, $F(1,23) = .12$, $p = .74$, or Fear-Post, $F(1,23) = .01$, $p = .94$, in predicting MASQ Anxiety-FU, thus the participants from both treatment groups were collapsed into one group.

In hierarchical regression analyses, higher Avoidance-Post predicted higher MASQ Total-FU, $R^{2\ Change} = .01$, standardized $\beta = .14$, $p < .00$, after controlling for MASQ Total-Post. This effect was found over and above Fear-Post, which was also a significant predictor of MASQ Total-FU, $R^{2\ Change} = .06$, standardized $\beta = .13$, $p = .01$.

Discussion

The present study differentiated fear and avoidance as two separate predictors of outcome in a randomized clinical trial of two different exposure-based treatments for social anxiety disorder (SAD). The study further examined the contributions of each variable in predicting future fear and avoidance levels, SAD diagnostic severity, and anxiety and mood disorder related distress at post-treatment and six months post-treatment. Finally, the study investigated whether fear and avoidance levels predicted the above treatment outcome variables differently across CBT and ACT treatment models.

The results confirmed the first hypothesis that the level of avoidance behavior at pre-treatment predicts fear level at post-treatment, over and above fear level at pre-treatment. Conversely, and as hypothesized, the level of fear at pre-treatment was not a significant predictor of the level of avoidance at post-treatment. The results also confirmed the second hypothesis that the level of avoidance behavior at pre-treatment is a stronger predictor of both diagnostic severity and general distress related to anxiety symptoms at post-treatment than pre-treatment

fear level. Fear level was not found to be a significant predictor of either post-treatment outcome variable in the larger model, nor was fear a significant predictor when avoidance level was removed from the model. Pre-treatment avoidance level did not significantly predict scores of general distress related to anxiety and mood disorder symptoms above and beyond fear level at post-treatment, however, avoidance came very close to reaching significance, indicating the start of a strong trend.

The results also confirmed the third hypothesis that the level of residual avoidance behavior at post-treatment is a stronger predictor of both diagnostic severity and general distress related to anxiety symptoms at six month follow up than the level of residual fear at post-treatment. Post-treatment avoidance level significantly accounted for a large proportion, 12%, of the variance in diagnostic severity at six month follow-up, which was particularly meaningful as it was not only above and beyond the variance accounted for by post-treatment fear level, but also above and beyond post-treatment diagnostic severity. Fear level was not found to be a significant predictor of outcome at follow-up in the larger model, nor was fear a significant predictor when avoidance level was removed from the model. Additionally, post-treatment avoidance level significantly predicted scores of general distress related to mood and anxiety symptoms at six month follow-up. This effect was found above and beyond the effect of fear level, which was also a significant predictor.

Finally, the results indicated that treatment condition did not significantly interact with pre-treatment fear and avoidance levels in predicting post-treatment diagnostic severity, general distress due to anxiety symptoms, or general distress due to anxiety and mood disorder symptoms. Nor did treatment condition significantly interact with post-treatment fear and avoidance levels in predicting diagnostic severity, general distress due to anxiety symptoms, or

general distress due to anxiety and mood disorder symptoms at six month follow-up. The lack of interaction between the two treatment conditions and the predictor variables indicates that fear and avoidance levels predicted the outcome variables similarly across both the CBT and ACT treatment conditions.

These findings suggest that avoidance level and fear level are separate predictors of SAD diagnostic severity, general distress related to anxiety symptoms, and general distress related to anxiety and mood disorder symptoms. Of the two, avoidance was also the only significant predictor of diagnostic severity and general distress due to anxiety symptoms after treatment and six months after treatment. Additionally, the predictive power of avoidance was similar in both the CBT and ACT treatment conditions. These findings suggest that across exposure based treatments, avoidance is a stronger and more stable predictor of diagnostic severity and symptom related distress than fear. The finding that fear and avoidance are differential predictors of outcome is particularly surprising given their high correlation, which attests to the importance of their unique variance. The high correlation yet differential predictive power may be explained by the finding that avoidance level predicted future fear level over and above past fear level, but fear level did not predict future avoidance level, suggesting a relationship where avoidance is a critical agent in the maintenance and change of fear.

These results are in line with the fear extinction literature and inhibitory learning theories that state that avoidance behavior must be reduced before an individual can be conditioned to learn new inhibitory associations between the CS and US (Rescorla & Wagner, 1972, Craske, Liao, Brown, & Vervliet, 2012). According to these models, exposure therapy creates new inhibitory, safe associations with a feared stimulus that compete with older, excitatory associations that produce fear. For fear to reduce, the new inhibitory associations must become

stronger than the more engrained excitatory associations. Thus, this model would support the finding that high levels of pre-treatment avoidance predict post-treatment diagnostic severity and distress better than pre-treatment fear, as high pre-treatment avoidance may lead to avoidance of or the use of safety signals during exposure trials and thus may prevent the learning and strengthening of new inhibitory associations between the feared stimulus and feared outcome.

If inhibitory learning occurs during exposure therapy, the inhibitory association must be continuously strengthened through sustained prevention of avoidance responding in order to remain dominant over the excitatory fear association. Thus, inhibitory learning theories would particularly support our finding that residual avoidance level at post-treatment was a better predictor of functioning at six month follow-up than residual fear level because if avoidance behavior remains high or rises again after treatment, the excitatory fear association may regain dominance and fear is likely to resurge. Also, even if exposure creates inhibitory learning in the contexts where the exposure took place, this learning must be maintained and reinforced in wider and more varied contexts outside of treatment in order for the new inhibitory association to generalize to new contexts and compete with more engrained excitatory associations.

These results are also in line with Rachman's Over-prediction model (1994) and the Integrated Expectancy Theory (Lovibond & Shanks, 2002) as they would predict that the level of avoidance present before treatment would determine the individual's willingness to engage in exposure exercises throughout treatment. The range and extent of exposures completed would determine the range and extent of actual experiences with the feared stimulus that could be used to recalculate predictions/expectancies regarding the probability of negative outcomes. Thus, these theories would support our finding that pre-treatment avoidance level predicted post-treatment diagnostic severity and anxiety related distress as they predict that high pre-treatment

avoidance would block these recalculations from occurring, which would lead to the maintenance of fear and other anxiety symptoms. These theories would also predict that if avoidance level is high after treatment and the individual is not continuing to expose themselves regularly outside of treatment, their predictions/expectancies regarding the feared outcome may not generalize beyond the exposure therapy context and thus, fear and anxiety may remain in other contexts.

The findings of this study have significant implications for the treatment of SAD and potentially other anxiety disorders. First, the results indicate that anxiety treatment studies should assess fear and avoidance separately as individual predictors and markers of treatment outcome. Future studies may consider emphasizing changes in avoidance level over changes in fear level in their calculation of treatment success rates. Second, as the avoidance variable in our study included both the degree of avoidance behavior and the range of avoided situations, the findings imply that treatment should focus on reducing avoidance behavior across a variety of domains. Third, our finding that pre-treatment avoidance predicted post-treatment fear over and above pre-treatment fear may support Aderka and colleagues' (2013) finding that early in treatment, avoidance predicted future fear better than past fear but fear did not predict future avoidance better than past avoidance. Therefore, it may be advisable to target avoidance early in treatment as it may be the strongest predictor of both future fear and avoidance. This indication is consistent with studies of SAD treatment that have found that targeting avoidance early, as well as targeting subtle avoidance, can lead to increased effect sizes (Rapee, Gaston, & Abott, 2009). Fourth, this study may contribute to a growing body of literature that proposes that decreases in fear level (i.e. habituation) in and between sessions are not necessary before moving on to increasingly difficult exposure tasks. Finally, this study may support third wave behavioral

therapies that emphasize approaching feared stimuli to increase quality of life, even if it means tolerating or accepting the continued presence of fear and anxiety.

Several limitations of this study should be noted and improved upon in future research. First, this study only examined fear and avoidance as predictors of SAD. Future studies should reassess these variables as predictors of outcome in all anxiety disorders to judge whether the relationship between these variables and treatment outcome is specific to SAD or whether they represent a relationship that is shared across all forms of anxiety and all types of feared stimuli. Second, there is currently a lack of reliable measures that are designed and validated to assess avoidance behavior as a variable separate from fear across anxiety disorders. This study improvised by calculating fear and avoidance scores from a larger diagnostic instrument, but future studies should create self-report and behavioral measures that are designed specifically for disentangling the variance associated with these often co-mingled variables. Third, this study only measured overt avoidance behavior. Measures should be created that include the assessment of more covert forms of avoidance behavior, the use of safety signals, and the presence of safety behaviors. The roles of fear and avoidance in predicting treatment outcome should be reassessed using these more valid measures. Fourth and finally, while this study measured the level of avoidance behavior as a predictor of outcome, future studies should also assess changes in the level of avoidance behavior throughout treatment as a predictor of outcome.

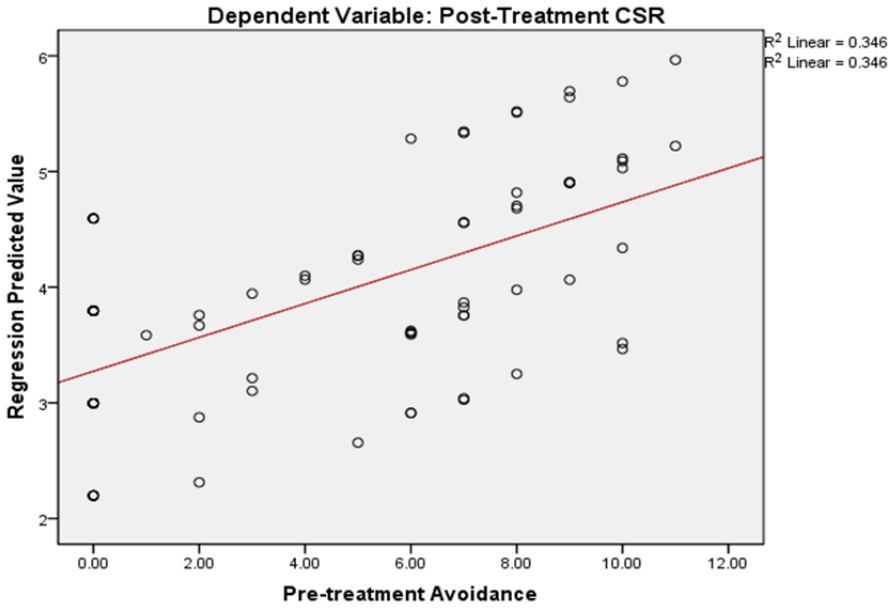
Table 1

Correlation Matrix Between All Variables

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Fear-Pre	-												
2. Fear-Post	.81**	-											
3. Avoid-Pre	.83**	.75**	-										
4. Avoid-Post	.67**	.81**	.74**	-									
5. CSR-Pre	.14	.13	.10	.20	-								
6. CSR-Post	.23	.59**	.32*	.75**	.52**	-							
7. CSR-FU	.22	.41*	.20	.67**	.21	.61**	-						
8. MASQ Anxiety -Pre	-.07	-.12	-.02	-.01	.41**	.14	.15	-					
9. MASQ Anxiety-Post	.22	.32*	.27	.30*	.16	.16	.43*	.67**	-				
10. MASQ Anxiety-FU	.19	.37	.15	.14	.26	.30	.44*	.74**	.49**	-			
11. MASQ Total-Pre	-.13	-.08	-.04	.04	.55**	.38**	.22	.83**	.67**	.67**	-		
12. MASQ Total-Post	.17	.43**	.27	.49**	.14	.36*	.52**	.45**	.82**	.49**	.63**	-	
13. MASQ Total-FU	.12	.36	.11	.18	.20	.39*	.50**	.59**	.58**	.87**	.70**	.47**	-
M	3.8	3.0	4.4	3.5	5.5	4.1	3.2	28.1	22.7	21.7	234.8	202.7	197.8
SD	2.9	2.7	3.8	3.8	1.0	1.6	1.8	8.0	7.5	6.3	45.5	46.8	35.7

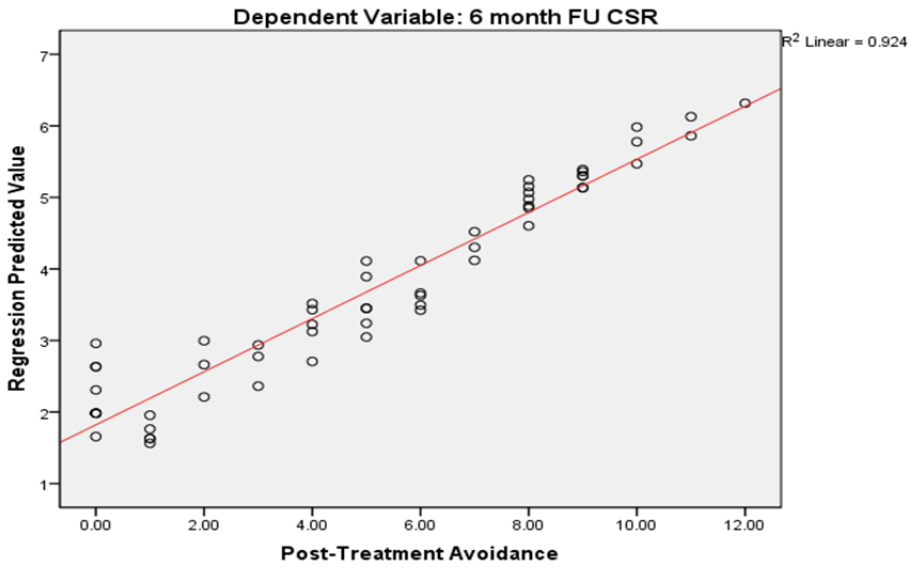
Note. Pre= Pre-treatment, Post= Post-treatment, CSR= Clinical Severity Rating, MASQ= Mood and Anxiety Symptom Questionnaire, MASQ Anxiety= MASQ General Anxiety Subscale, MASQ Total= MASQ Total Scale

Figure 1



Note. Figure depicts the hierarchical regression line for Avoidance-Pre predicting CSR-Post, adjusted to account for the variance explained by CSR-Pre and Fear-Pre.

Figure 2



Note. Figure depicts the hierarchical regression line for Avoidance-Post predicting CSR-FU, adjusted to account for the variance explained by CSR-Post and Fear-Post.

The Role of Decision Making in Anxiety and Avoidance Behavior:

A New Objective Measure of Avoidance

Researchers and clinicians have long theorized that avoidance of feared stimuli contributes greatly to the development and maintenance of fear, anxiety, and anxiety disorders. Conditioning theory posits that fear persists because avoidance of a conditioned stimulus prevents the extinction that occurs through repeated non-reinforced exposures (e.g. Mowrer, 1939). Cognitive theories suggest that avoidance inhibits the individual from gathering evidence against catastrophic misappraisals, further reinforcing the avoidance behavior as a means of keeping the individual safe (e.g. Clark, 1986, Rachman, 1994). Support for the relationship between avoidance and anxiety comes from exposure-based treatments for anxiety disorders that have repeatedly been found to be effective in reducing fear and anxiety (e.g. Barlow 2002, Craske & Mystkowski, 2006). Additionally, laboratory studies have shown that avoidant responding protects fear from extinction (e.g. Lovibond et al., 2002). Yet, despite numerous theories that propose that avoidance behavior is a critical mechanism through which fear is maintained, little attention has been given to the role of avoidance behavior in determining treatment outcome. The scarcity of such research may be due in part to the lack of externally valid and objective measures of avoidance behavior.

Self-report measures (i.e. Chambless, 1985; Marks & Mathews, 1979; Heimberg, Mueller, Holt, & Hope, 1992) are the quickest and most direct means of measuring avoidance behavior and thus, are widely used. However, the inherent limitation of self-report measures is that they only measure an individual's subjective experience and awareness of their own avoidance behavior, and not all elements of fear are accessible to introspection (Foa & Kozak, 1986). Such self-report scales are also biased by retrospective estimation biases (Craske & Tsao, 1999) such that scores may not concord with actual behavioral avoidance as measured in in vivo situations.

Historically, the most commonly used objective measure of avoidance has been the behavioral avoidance task (BAT) (Lang and Lazovik, 1963), which measures the duration of exposure to the feared stimulus and latency of time before contact with the feared stimulus is first made. However, the BAT may lack external validity because participants are asked to approach feared stimuli without being offered a reward or incentive. In daily living, when individuals are faced with feared stimuli, the decision to approach or avoid is often influenced by both negative and positive outcomes associated with each decision (e.g., Rapee & Heimberg, 1997).

Kashdan, Elhai, and Breen (2007) found that socially anxious individuals weigh the potential risks and benefits of approaching feared situations, but often overestimate the risks and underestimate the benefits, leading to more frequent decisions to avoid. They also found that regardless of the level of fear experienced, some participants felt the benefits outweighed the risks and chose to approach the feared situation. These participants experienced better long term outcomes, suggesting that sensitivity to reward incentives in exchange for approach behavior may be an important indicator of long term functioning. Thus, for a behavioral measure of avoidance to hold external validity and represent the same approach-avoidance conflict experienced in daily living, it should incorporate a reward incentive for approach behavior. The task should balance potential risks and rewards to create a conflict where a thoughtful comparison of the choices must be made.

An objective behavioral task should also mimic the circumstances under which anxious individuals make decisions. Lerner and Keltner's (2000) appraisal tendency theory posits that individuals appraise all situations based on the emotions that they most commonly feel. If an individual commonly feels fear, then the experience of fear will continue to affect future

appraisals, judgments, and decisions for an extended period of time. Empirical studies found that fear plays a particularly strong role in guiding judgments when certainty regarding the outcome of the judgment is low or the situation is ambiguous, suggesting that fearful individuals are more likely to default to fearful appraisals when faced with ambiguous stimuli or uncertain outcomes (Lerner & Keltner, 2001). Thus, a task aimed at measuring the mechanisms responsible for the outward display of avoidance behavior should measure this decision making process under conditions where the stimuli are ambiguous and the outcomes are uncertain.

Consistent with the appraisal tendency theory, Maner and Schmidt (2006) found that trait anxiety is related to pervasive forms of risk-avoidant decision-making, with trait anxious individuals showing a relatively low willingness to engage in risky decision-making across a range of behavioral contexts. Additionally, they found that the relationship between trait anxiety and general risk avoidance was mediated by negative risk appraisals, suggesting that general risk avoidance may result from commonly experiencing the emotion of fear and the influence of fear on appraisals and behavioral decisions. However, this study found no correlation between trait anxiety and perceptions of positive outcomes related to risk taking, suggesting that trait anxious individuals experience higher negative risk appraisals and similar positive risk appraisals compared to non-anxious individuals. Paired with the findings that anxious individuals weigh the relative risks and benefits when deciding to approach or avoid feared stimuli (Kashdan, Elhai, & Breen, 2007), a behavioral avoidance task that aims to differentiate anxious individuals in the severity of their avoidance should also measure a participant's willingness to take risks in the presence of reward.

Avoidance behavior is typically measured in two distinct forms. Information-processing models emphasize the necessity of distinguishing between explicit, or strategic and voluntary

modes of responding to threat and implicit, or more automatically initiated, modes of responding to threat (Beck & Clark, 1997; Fazio & Towles-Schwen, 1999; Strack & Deutsch, 2004). Explicit avoidance is typically measured using the BAT or self-report measures that allow more time for reflection, introspection, and choice. In contrast, implicit avoidance, such as escape behavior, is typically measured by automatic fear-relevant associations, such as reaction time or eye movements when viewing feared stimuli. A task that aims to measure how anxious individuals make strategic decisions to approach or avoid feared stimuli should measure explicit avoidance to capture the voluntary and strategic process of choice. Once a voluntary choice is made to approach feared stimuli, anxious individuals may still reflexively escape the situation, thus a task aimed at measuring automatic and involuntary decision making processes after a decision to approach has occurred should also measure implicit avoidance.

There is currently no behavioral measure of both explicit and implicit avoidance, however; previously validated avoidance measures may be modified to measure both. The Approach-Avoidance Task (Rinck & Becker, 2007) is a measure of implicit avoidance where participants are shown pleasant and fearful images and are given a joystick that allows them to control whether they zoom in or out on an image. The creators theorized and found that participants' automatic responses when confronted with a fear evoking image was to push it away, and when confronted with a pleasant image was to bring it closer to them. This finding was replicated with both spider phobic individuals (Rinck & Becker, 2007) and socially phobic individuals (Heuer, Rinck, & Becker, 2007) by adapting the task to include disorder specific feared stimuli.

If the Approach-Avoidance task was modified such that a reward incentive was given for approaching and not avoiding feared stimuli and participants were given enough time to weigh

the risks and rewards and make a voluntary and strategic choice to approach or avoid the feared images, the task could match the conflict and decision-making process that anxious individuals face when deciding to approach or avoid feared situations in their daily lives. If the task was additionally modified to allow participants to escape from feared images, even after making the strategic choice to approach them, the task could potentially match the escape behavior that frequently occurs when faced with feared stimuli (e.g. Barlow, 2002).

Present Study

The aim of the present study was to create an objective measure of anxiety- related avoidance behavior that tests both explicit and implicit avoidance through the measurement of decision-making processes and willingness to take risks in exchange for rewards. The task was tested in individuals with blood-injection-injury (BII) phobia and utilized disorder specific feared stimuli in this first study. We hypothesized that anxious individuals would differ from non-anxious individuals in the choices they made to approach and avoid BII related stimuli as a function of both the difficulty level and the reward incentive for approaching. We further hypothesized that anxious individuals would weigh the risks and rewards similarly to non-anxious individuals when the threat level of the feared stimulus was low, but would become more sensitive to risk and less sensitive to reward as the threat level increased.

Method

Participants

Participants (n=85) were recruited from introductory psychology courses at the University of California, Los Angeles based on their level of anxiety related to blood, injury, and injection (BII), assessed using the Blood-Injection Symptom Scale (BISS) (Page, Bennet, Carter,

Smith, & Woodmore, 1997), a 17-item self-report scale that measures anxiety, tension, and faintness related to blood and injections (α = .86). Participants were selected randomly if their scores fell in either the top or bottom quartiles of the distribution of scores. Participants in the top quartile were assigned to the High Anxiety Group (n=38). Participants in the bottom quartile were assigned to the Low Anxiety Group (n=47). Sample demographics were 68.5% female with an average age of 19.86 years old. The sample was ethnically diverse with 46.8 Asian%, 23.7% Caucasian, 14.2% Latino, 2.6% Middle-Eastern, 1.8% African-American, and 10.9% Other.

Participants were excluded if they endorsed any of the following: under 20/20 or non-corrected vision, non-English speaking, current pregnancy, or a score of 21 or higher on the Beck Depression Inventory- Second Edition (BDI-II) (Beck, Steer, & Brown, 1996). These participants were excluded to control for difficulties they may have had with completing the tasks that are not related to anxiety, and to protect them from risks associated with tasks that may be exceedingly stressful. Four participants (n=1 Low Anxiety Group, n=3 High Anxiety Group) were excluded from all analyses because they scored a 21 or higher on the BDI-II.

Materials

Behavioral Avoidance and Reward Sensitivity Task

Apparatus and Procedure. Participants were seated in a chair in front of a desktop computer. An experimenter explained that they were being asked to participate in a game where they will view groups of blood, injection, and injury related images in exchange for points. The images were taken from internet stock photos and rated for valence and arousal levels (see description of *Stimuli* below for more detail). Participants were told that there are six "Levels" in the game, and that each Level increased in difficulty but also increased in potential points earned.

At the start of Level 1, they could choose to view either the "Easy" or "Hard" set of images. The "Easy Set" contained blood and injection images that have been rated as mild on scales of valence and arousal. The "Hard Set" contained blood and injection images that have been rated slightly higher on valence and arousal than the images in the Easy set. Each set contained eight images and each image was displayed for 5000 ms. Participants earned 100 points for choosing the Easy Set and 200 points for choosing the Hard Set. The experimenter explained that the goal of the game is to earn the highest number of points possible, and that earning higher scores by not avoiding, taking risks, and choosing to view the more difficult images has been associated with greater success in overcoming anxiety, as well overall greater quality of life in many areas. Evidence for this statement comes from research on exposure based therapies for anxiety disorders, which have found that exposure to feared stimuli can lead to reductions in future rates of anxiety and avoidance behavior (e.g., Norton & Price, 2007).

During the image presentation within each Level, participants could stop the presentation of images by hitting the space bar, which sent them to a blank screen for the rest of the time left in that Level. However, by hitting the space bar they forfeited all points earned during that Level.

The same procedure repeated for Levels 2-6. The images in the Easy Set remained the same throughout all Levels and the points earned by choosing the Easy Set remained the same in each Level (100 pts). The images in the Hard Set increased in valence and arousal ratings with each Level and the points earned for choosing the Hard Set increased by 100 points with each Level. A bar at the top of the screen recorded the number of points the participant had earned throughout the task. The bar also contained a marker indicating the highest possible score and the highest points earned thus far by a previous participant. The bar served as a visual marker of current success and potential success, which was intended to serve as a motivator to earn more

points throughout the game. The task took approximately 10 minutes to complete.

Scoring. The dependent variables for this task were explicit and implicit avoidance. Explicit avoidance variables were measured categorically and dummy coded to indicate participant response, or whether they chose the Hard (1) or Easy (0) Set of images. Explicit avoidance was measured independently at each Level of the task (i.e., Level 1 Choice, Level 2 Choice, Level 3 Choice, Level 4 Choice, Level 5 Choice, Level 6 Choice). Total Choice scores for the full task were measured by summing the number of Levels where a Hard Set was chosen (i.e., Total Choice). Implicit avoidance variables were measured independently for each Level of the task through a categorical variable signifying whether or not the participant engaged in escape behavior by hitting the spacebar (No=0, Yes=1) (i.e., Level 1 Escape, Level 2 Escape, Level 3 Escape, Level 4 Escape, Level 5 Escape, Level 6 Escape). Sensitivity to reward incentive was measured for each Level by the total points earned thus far at that Level (i.e., Level 1 Total Points, Level 2 Total Points, Level 3 Total Points, Level 4 Total Points, Level 5 Total Points, Level 6 Total Points). For example: Level 6 Total Points measured the total points earned thus far on the task at the end of Level 5.

Stimuli. The stimuli used in the task depicted images of blood, injury, and injections. A standardized set of blood, injury, and injection images with sufficient variation on ratings of valence and arousal to fit the specifications of each Level of the Behavioral Avoidance and Reward Sensitivity Task (BARST) was not previously available. We created our own database of images by selecting a large pool (n= 90) of stock images found on the internet. Each image was then rated on its valence and its arousal level by UCLA graduate and undergraduate student volunteers (n=48). Valence was rated on a nine point scale (1= very positive, 5= neutral, 9= very negative). All responses were averaged to form an overall valence score for the image. Arousal

was rated on a nine point scale (1= very calm, 5= neutral, 9= very aroused).). All responses were averaged to form an overall arousal score for the image. For each image, the valence and arousal scores were combined to form a total score.

Each Level of the task contained eight images. The total valence and arousal ratings for the images in each set were as follows: Easy Set = 9-10.5; Level 1 Hard Set = 10.5-11.2; Level 2 Hard Set =11.2-13; Level 3 Hard Set = 13.2-15.3; Level 4 Hard Set = 15.5-16.5; Level 5 Hard Set = 16.5-17.1; Level 6 Hard Set = 17.2-17.6.

Self-Report Measures

Blood-Injection Symptom Scale. This is a 17-item self-report scale that measures anxiety, tension, and faintness related to blood and injections. This scale has been found to be highly reliable and valid (Page et al., 1997). This measure was used to screen for participants with both high and low symptom rates of blood-injection-injury phobia. The scale was re-administered at the time of testing to verify scores.

Fear Questionnaire. Participants completed the Blood-Injury-Injection (BII) questions from the Fear Questionnaire (FQ) (Marks & Mathews, 1979). The FQ is a self-report questionnaire designed to measure avoidance behavior associated with (1) agoraphobia, (2) social phobia, and (3) BII phobia. The full scale consists of 15 items (five for each subscale) that ask participants to rate how much they would avoid a list of situations, using a nine-point rating scale (0= no avoidance, 9= extreme avoidance). Participants only completed the 5 items related to BII. The dependent variable was measured by total score on the BII sub-scale (FQ-Total). We assessed the correlation between this previously validated measure of BII- related avoidance and Total Choice scores on the BARST.

Risk-Taking Behaviors Scale (RTBS). The RTBS (Weber, Blais, & Betz, 2002) assesses willingness to engage in risky decision-making. Responses to this scale predict the frequency with which individuals engage in risky decision-making in both naturalistic and laboratory settings (Weber et al., 2002). Items assess risk-taking across several overlapping domains, including: health/safety, recreation, ethics, social interaction, and gambling. Participants respond by indicating the likelihood that they would engage in each behavior, provided the opportunity (1 = very unlikely; 5 = very likely); higher scores reflect greater risk-taking propensity. Scores are calculated by summing responses to all items (RTBS-Total). We assessed correlations between self-report of risk taking and Total Choice scores on our new behavioral measure of risk taking.

Risk Taking Behaviors Scale- Risk Perception and Expected Benefit Sub-Scales. These are sub-scales of the RBTS described above. The Risk Perception sub-scale asks participants how risky they think each of the situations listed on the RBTS is on a scale from 1-5 (1= Not at all Risky, 5= Extremely Risky). The Expected Benefit sub-scale asks participants to rate the benefits they would obtain by engaging in each situation listed on the RBTS on a scale from 1-5 (1= No benefits at all, 5= Great benefits). Scores are calculated by summing all responses (Risk Perception-Total, Expected Benefit-Total). We assessed correlations between self-report of risk perception and expected benefit and Total Choice scores on our new behavioral measure of risk taking.

Beck Depression Inventory Second Edition (BDI-II). The BDI-II (Beck, Brown, & Steer, 1996) is a 21-item measure that assesses the existence and severity of symptoms of depression, as outlined in the DSM-IV, which has been shown to possess strong reliability and validity. The version of the questionnaire given to participants omitted one item that inquires about suicidal ideation because of the lack of clinical care available if a participant were to endorse suicidal

ideation. We assessed the correlation between depression related symptoms and Total Choice scores on the BARST.

Experimental Procedure

The experiment was conducted in one session, lasting approximately 45 minutes. Participants arrived in the laboratory, completed informed consent, and were given the opportunity to ask questions about the experiment. The experiment began with the BARST followed by the self-report measures. Participants were allowed to ask questions at the end of the experiment and were given course credit for their participation.

Data Analysis Plan

Group Differences

Group differences on explicit avoidance were evaluated using a repeated measures analysis of variance (ANOVA). The between-subjects factor was Group (High Anxiety, Low Anxiety). The within-subjects factor was Choice at each task level (Level 1 Choice, Level 2 Choice, Level 3 Choice, Level 4 Choice, Level 5 Choice, Level 6 Choice). Although the use of a repeated measures ANOVA with a dichotomous dependent variable violates the assumption of a normal distribution of scores, this model was deemed appropriate because of the exploratory nature of the analyses and the lack of generalization of the scores to the general population.

Group differences on implicit avoidance were completed using a chi^2 tests of Escape scores at each level of the task.

Reward Incentive

To examine whether sensitivity to reward incentive predicts response probability, separate binary logistic regression analyses were run for each Level except Level 1. The dependent variable was the choice made between the Hard and Easy Sets on the respective Level

(i.e. Level 2 Choice, Level 3 Choice, Level 4 Choice, Level 5 Choice, Level 6 Choice). The independent variables were reward sensitivity exhibited thus far on the task (i.e. Level 1 Total Points, Level 2 Total Points, Level 3 Total Points, Level 4 Total Points, Level 5 Total Points), Group (i.e. High Anxiety, Low Anxiety) and the interaction between reward sensitivity and Group (i.e. Level 5 Total Points X Group). A Forward: LR Method was used. For example, to examine whether sensitivity to reward incentive predicted Choice on Level 6, the dependent variable was Level 6 Choice, the independent variables were Level 5 Total Points, Group, and Level 5 Total Points X Group.

Results

Group Differences

Figure 1 depicts the proportion of Hard Set choices made in each Level by the High and Low Anxiety groups.

Explicit Avoidance. A 2 (Group) x 3 (Task Level) repeated measures ANOVA was conducted for explicit avoidance scores. Mauchly's test indicated that the assumption of sphericity had been violated, and therefore degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity. There was a significant interaction between Group and Level, $F(1, 3.86) = 2.82$, $p = .025$, $\eta^2 = .034$, indicating that the difference between Groups on Choice varied depending on Level. Tests of within subject contrasts showed that the interaction between Group and Levels most closely fits a linear model, $F(1, 3.86) = 6.36$, $p = .014$, $\eta^2 = .074$.

A significant main effect was found for Group, $F(1,79) = 5.53$, $p = .021$, $\eta^2 = .065$, indicating that across all Levels, the High and Low Anxiety Groups differed on Choice of which set of images they viewed. A significant main effect was found for Level, $F(1, 3.86) = 7.34$, $p <$

.000, η^2= .085, indicating that across both groups, participant Choice of which set of images to view differed between Levels. Tests of within subject contrasts show that the relationship between Levels most closely fits a quadratic model, F (1, 3.86) = 19.85, p < .000, η^2= .201. There was also a significant cubic, F (1, 3.86) = 6.57, p =. 012, η^2= .077, and linear, F (1, 3.86) = 4.20, p =. 044, η^2= .050, relationship between Levels.

Follow up tests of simple effects show that there is a significant simple effect of Group at Level 4, β= .22, *SE*= .07, p= .002, and Level 6, β= .27, *SE*= .09, p= .004, indicating that on these Levels, the High Anxiety Group chose to view the Hard Set of images less frequently. The simple effect of Group at Level 5 was not significant, β= .17, *SE*= .09, p= .068, but indicated a strong trend. There was no significant simple effect of Group at Level 1, β= -.02, *SE*= .10, p= .847, Level 2, β= .06, *SE*= .05, p= .217, or Level 3, β= .06, *SE*= .06, p= .267, indicating that on these Levels, the High and Low Anxiety Groups made similar choices between the Hard and Easy Sets of images.

Implicit Avoidance. Too few participants (n= 3) chose to use the Escape option during the task and thus the data were not analyzed statistically.

Does Incentive Change Response Probability

Figure 2 depicts the relationship between sensitivity to reward incentive and Choice made on the next Level of the task. Specifically, separate graphs for each Level of the task depict the percentage of individuals who chose the Hard and Easy Sets of images, based on the number of points they had earned thus far in the task.

In binary logistic regression analyses, Level 1 Reward Sensitivity (i.e. Level 1 Total Points), Group, and the reward sensitivity on Level 1 X Group Interaction were not significant predictors of Choice on Level 2.

Reward sensitivity at Level 2 (i.e. Level 2 Total Points) was a significant predictor of Choice at Level 3, β = .020, *SE*= *.008,* Exp(β)= 1.021, p=.007, 95% CI= 1.005-1.036, such that for every 100 point increase in Level 2 Total Points, the log odds of choosing the Hard Set of images in Level 3 increased by a factor of 2. Group (p= .20) and the Level 2 Reward Sensitivity X Group Interaction (p= .34) were removed from the equation because they did not improve the fit of the model.

Group was a significant predictor of Choice at Level 4, β= *2.42, SE*= 1.10, p=.027, Exp(β) = 11.25, 95% CI= 1.31-96.362, such that being in the Low Anxiety Group increased the log odds of choosing the Hard Set of images in Level 4 by a factor of 2.42. Level 3 Reward Sensitivity (i.e. Level 3 Total Points) was not a significant predictor of Choice at Level 4, β= .005, *SE*= .003, Exp(β)= 1.005, p=.062, 95% CI= 1.000-1.010, but was included in the equation because it improved the fit of the model. The Level 4 Reward Sensitivity X Group Interaction (p= .30) was removed from the equation because it did not improve the fit of the model.

Level 4 Reward Sensitivity (i.e. Level 4 Total Points) was a significant predictor of Choice on Level 5, β = .003, *SE*= .001, Exp(β)= 1.003, p=.044, 95% CI= 1.000-1.005, such that for every 100 point increase in Level 4 Total Points, the log odds of choosing the Hard Set of images in Level 5 increased by a factor of .33. Group (p= .41) and the Level 4 Reward Sensitivity X Group Interaction (p= .33) were removed from the equation because they did not improve the fit of the model.

Level 5 Reward Sensitivity (i.e. Level 5 Total Points) was a significant predictor of Choice on Level 6, β= .003, *SE*= .001, Exp(β)= 1.003, p= .004, 95% CI= 1.001-1.005. such that for every 100 point increase in Level 5 Total Points, the log odds of choosing the Hard Set of images in Level 6 increased by a factor of .3. The Level 5 Reward Sensitivity X Group

interaction was a significant predictor of Choice on Level 6, β = .001, *SE*= .000, Exp(β)= 1.001, p=.034, 95% CI= 1.000-1.001, such that the predictive power of Level 5 Total Points varied depending on whether one was in the High or Low Anxiety Group. Group (p= .06) was removed from the equation because it did not improve the fit of the model.

In sum, reward sensitivity at Levels 1, 3, 4, and 5 significantly predicted the choice made between the Hard and Easy Sets of images at Levels 2, 4, 5, and 6, respectively. Group was a significant predictor of Choice on Level 3, but not for other Levels. The interaction between reward sensitivity at Level 5 and Group significantly predicted choices made on Level 6. Thus, for most Levels, sensitivity to reward incentive was a significant predictor of the Choice made between the Hard and Easy Sets of images, over and above the effect of Group.

Correlations

Fear Questionnaire. Total Choice scores were significantly correlated with FQ-Total scores, r= .25, p= .02, indicating a significant overlap in the avoidance behavior content assessed by the present task and the FQ.

Risk Taking Behaviors Scale. Total Choice scores were not significantly correlated with RTBS-Total scores, r= .16 p= .15. Total Choice scores were not significantly correlated with Risk Perception-Total scores, r= -.19, p= .10. Total Choice scores were not significantly correlated with Expected Benefit-Total, r= .16, p= .15.

Beck Depression Inventory-II. Total Choice scores were not significantly correlated with BDI-Total scores, r= -.16, p= .15.

Discussion

The present study tested a new objective measure of anxiety-related avoidance behavior

that was designed to increase ecological validity over existing measures of behavioral avoidance. The Behavioral Avoidance and Reward Sensitivity Task (BARST) was designed to more closely match the approach-avoidance conflict and decision making process that anxious individuals face in their daily lives when they are forced to weigh the expected risks and benefits of approaching or avoiding their feared stimuli. The task was broken into six levels that steadily increased in difficulty, as a function of valence and arousal levels of the stimuli presented, and also steadily increased in the potential reward for approach. The design also attempted to match the uncertainty that anxious individuals face when making decisions to approach or avoid by asking participants to choose between a familiar, easy set of images and an unknown, hard set of images where the degree of difficulty was left ambiguous. The task aimed to measure differences between anxious and non-anxious individuals in how they make decisions to approach and avoid feared stimuli, as well as how threat level of the feared stimulus, reward incentive for approaching, and uncertainty of outcomes affected the decision making process.

The results showed a significant interaction between the high and low anxiety groups and the different levels of the task in predicting the choices participants made to approach or avoid the hard images. This finding confirmed the hypothesis that the high and low anxious participants differed on their decisions to approach or avoid the hard images depending on the difficulty level of the images and the associated reward incentive for approaching. Tests of simple effects of each group of participants within each level of the task showed that at the start of the task, when uncertainty of the content of the images was highest and reward incentive for approaching was lowest, the high and low anxious participants both approached the more difficult images at a moderate rate. This may indicate that with high uncertainty and low reward, both groups were risk averse. As uncertainty regarding the content of the images began to

decrease, and the difficulty level and reward incentive increased, both groups became more willing to take risks in exchange for the higher reward incentive and chose to view the hard images at higher rates. This finding suggests that when difficulty level is low to moderate, reward incentive influences approach behavior regardless of anxiety level.

In the second half of the task, as the difficulty level and the reward incentive associated with the hard sets of images increased exponentially, the high and low anxious participants began to deviate in their choices. The low anxious participants began to approach the hard images at higher rates while the high anxious group began to avoid the hard images at higher rates, indicating that the low anxious participants remained sensitive to the reward and willing to approach the hard images while the high anxious participants became less sensitive to the reward and more risk averse. At the end of the task, when both threat level and reward incentive were at the highest possible level, the low anxious participants became slightly more risk averse, choosing to avoid the hard images and forgo the large reward at slightly higher rates, while the high anxious participants became even more risk averse and significantly increased their avoidance of the hard images and their disregard for the large rewards. This shift in pattern in the latter half of the task indicates that as difficulty level and reward incentive increase, highly anxious individuals become less sensitive to reward incentive and more risk averse, leading to greater avoidance behavior. In contrast, low anxious individuals continue to weigh the rewards more heavily than the risks, leading to more frequent choices to approach.

Additionally, the main effects of the group analyses showed that the high and low anxiety groups differed in their overall rates of approach and avoidance on the task. Regardless of the difficulty level of the images, the participants with high levels of BII related anxiety chose to approach the fear inducing images in exchange for a higher reward less frequently than

participants with low anxiety. The results also confirmed the assumption that for both high and low anxious participants, decisions to approach or avoid feared stimuli varied depending on the associated difficulty level and the reward incentive.

Contrary to the prediction from appraisal tendency theory (Lerner & Keltner, 2001), the high and low anxiety groups did not differ in their choices at the start of task when uncertainty regarding the content of the hard images was highest. The results indicate that both groups made fewer hard choices under the most uncertain conditions, which could be explained by a number of factors. One hypothesis is that both groups may have experienced some state anxiety at the start of the experiment because of the evaluative nature of the task, which may have triggered anxious appraisals for a majority of individuals. Another hypothesis is that when faced with higher reward, anxious individuals may approach feared stimuli despite the ambiguity of outcome. Once anxious individuals viewed the threatening stimuli at various levels and became more familiar with the content, they appeared to make their future decisions based on their past experience regarding the difficulty level, which may indicate that they were using past experience in their decision making strategies more than future uncertainty.

The results also indicated that reward incentive was a significant predictor of choice on almost every level of the task, over and above anxiety level. Specifically, at each level of the task, the previous points earned predicted the choice made to approach or avoid the hard images. Anxiety level was not a significant predictor of choice to approach or avoid at any level except one. These findings may suggest that while there is an overall significant difference between high and low anxious individuals on approach-avoidance choices, it is the previous rate of willingness to approach in exchange for reward that best predicts future choices of whether to approach or avoid feared stimuli. This may imply that despite anxiety level, individuals that are

sensitive to reward incentive are more willing to approach their fear provoking stimuli than individuals who are less sensitive to reward.

These results are in line with Kashdan, Elhai, and Breen's (2007) findings that anxious individuals weigh the risks and benefits of approaching feared stimuli and vary in their willingness to take risks in exchange for reward. These findings also concord with previous evidence that past levels of clinician-rated avoidance behavior predicted future levels of avoidance behavior, whereas past clinician-rated fear levels did not (Castriotta & Craske, in prep). Both of these studies found that despite fear level, anxious individuals who avoided feared stimuli less often had better long term outcomes. Thus, accurately differentiating anxious individuals on their avoidance levels may be a useful indicator of future functioning, and measuring change in avoidance level and reward sensitivity throughout anxiety treatment may be a useful indicator of treatment progress. The BARST may serve as an externally valid tool in identifying these differences between anxious individuals, as well as measuring changes in approach and avoidance behavior.

The task was not a successful measure of implicit avoidance as too few participants chose to escape from viewing the sets of images they selected. One potential explanation is that the task was not sufficiently difficult to elicit implicit avoidance behavior. Another is that the most avoidant individuals, who were most likely to display escape behavior, either did not choose to participate in the study, or did not risk choosing the hard sets of images and only viewed the easy set. The easy set was fairly low on threat level and may be unlikely to elicit an escape response. A third explanation may be that the consequence of escaping was so high that it inhibited participants from displaying the behavior.

Analyses indicated that there was a significant correlation between the BARST and the

Blood Injection Injury (BII) Scale of the Fear Questionnaire (FQ) (Marks & Matthews, 1979), demonstrating that the BARST and the FQ are both related to the same construct of BII related avoidance behavior. However, the relatively small correlation highlights the discordance between the self-report measure and the more objective and behavioral index, suggesting that the two measures differ in their assessment. In light of many studies which demonstrate that anxiety related self-report measures are subject to responder biases (e.g. Craske & Tsao, 1999; Foa & Kozak, 1986), the small correlation may indicate that the FQ was limited in its assessment of avoidance as it asks the participant to predict their future behavior without reference to the context of risk and reward in which the decision will be made. The BARST overcomes this limitation by measuring objective rates of avoidance within specific contexts which can be changed and manipulated to match individuals' presenting problems. These results further reveal the limitations of self-report measures in assessing in vivo behavior and highlights the fact that true validation of this behavioral measure requires comparison to actual behavior in the context of feared situations.

The BARST was not correlated with the Risk Taking Behavior Scale (RTBS), the Risk Perception sub-scale, or the Expected Benefit sub-scale, which may indicate that the BARST is not related to general risk taking behavior, general risk perception, or general perceptions of expected benefit related to risk taking, and instead is only related to BII associated risk taking behavior. These two measures may also not have been correlated because of the variation in their context. The RTBS and its subscales may be subject to the same responder biases as other self-report measures and it also asks participants to estimate their self-reported risk taking behavior and risk related perceptions within hypothetical situations that participants may have never been faced with. Thus RTBS scores may differ greatly from measures of in vivo risk taking behavior

because in the behavioral measure the individual is forced to weigh the risks and rewards in the moment. It is also possible that individuals with BII phobia differ from trait anxious individuals in the generality of their anxiety, and thus differ in general risk-taking behaviors and perceptions.

Additionally, the BARST was not correlated with the Beck Depression Inventory-II (BDI-II) (Beck, Brown, & Steer, 1996), and thus the avoidance behavior measured by the present task was not found to be related to the depression. The present task was correlated with the Blood Injection Symptom Scale (BISS) (Page et al., 1997), indicating that the avoidance behavior measured by present task is specifically related to the construct of BII related anxiety, as intended.

As this was a pilot study, there were a number of limitations and many areas where future research could expand upon the findings. First, this study only measured avoidance behavior within BII related anxiety. However the task was designed to be used with any anxiety disorder and any type of feared stimuli. Future studies should create different versions of the task that include stimuli relevant to different feared stimuli. Second, this study was conducted on an analog sample. Future studies should attempt to validate the measure using a treatment seeking, clinical sample, which may show more robust effects.

In sum, the present task aimed to validate a new objective behavioral measure of avoidance behavior that more closely resembles the approach-avoidance conflict and decision making process that anxious individuals experience when confronted with feared stimuli. The task demonstrated significant differences between low and high anxious individuals on avoidance behavior. The task also demonstrated that the difference between these groups varies as a function of threat level and reward incentive.

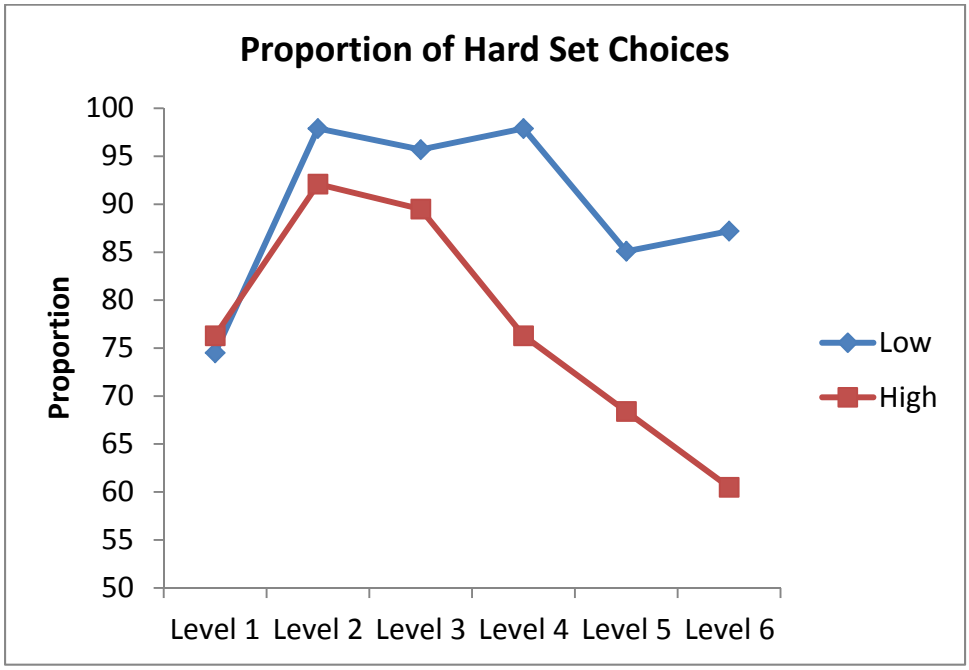
Table 1

Proportions (SDs) of Hard Set Choices by Group and Level

	Low Anxiety Group	High Anxiety Group	Effect Size *d*
Level 1	.75 (.44)	.76 (.43)	-.02
Level 2	.98 (.15)	.92 (.27)	.27
Level 3	.96 (.20)	.89 (.31)	.27
Level 4	.98 (.15)	.76 (.43)	.68
Level 5	.85 (.36)	.68 (.47)	.41
Level 6	.87 (.34)	.61 (.50)	.61

Note. Effect size *d* reflects the effect of Group at each Level of the task.

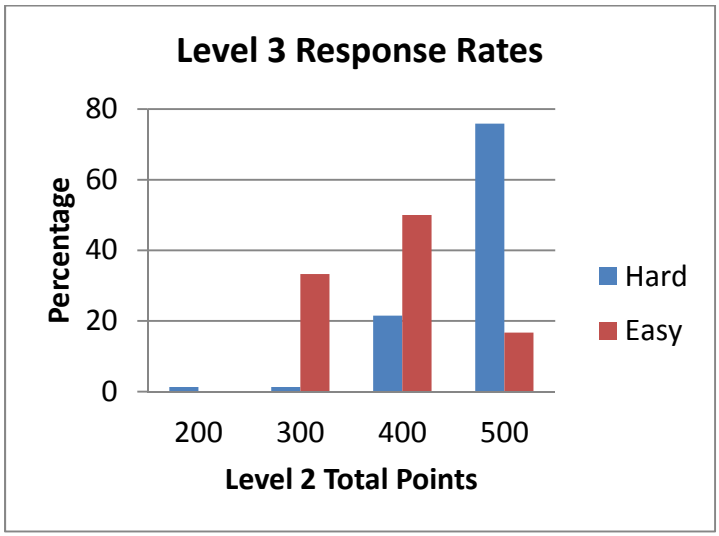
Figure 1

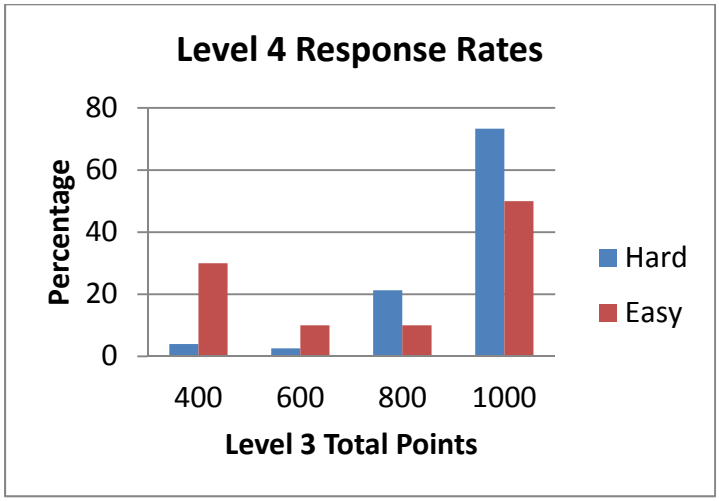


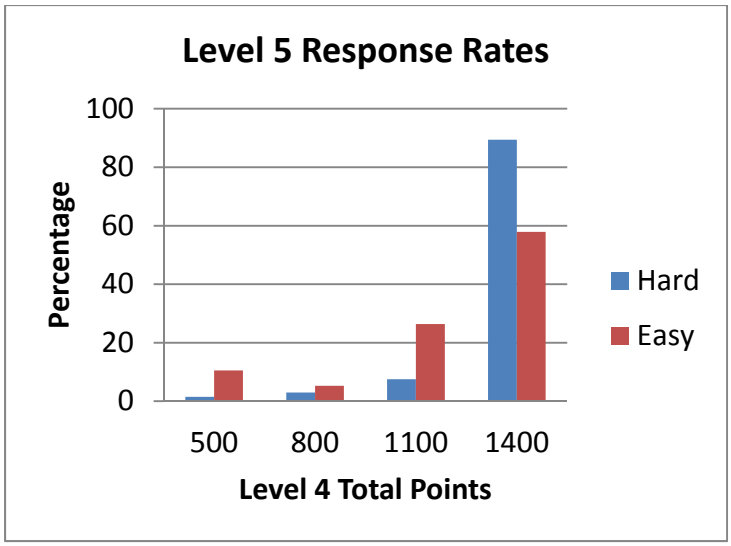
Note. Figure depicts the proportion of Hard Set choices made in each Level by the High and Low Anxiety groups.

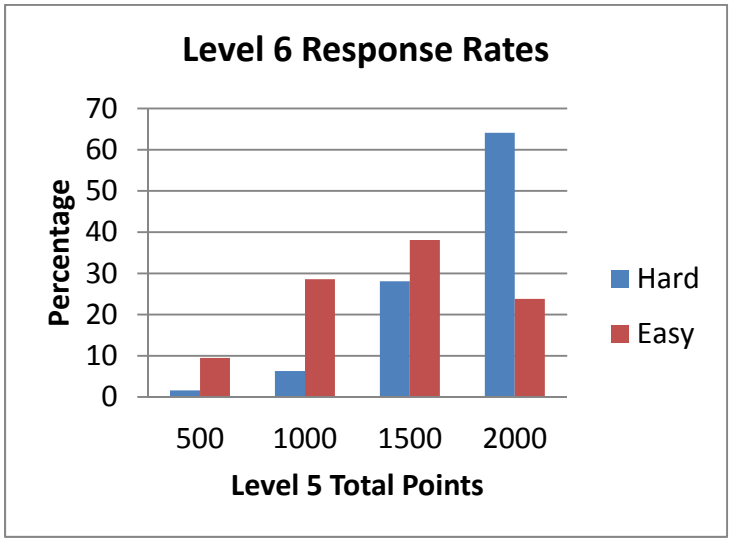
Figure 2


Level 2 Response Rates
80
60
40
20
0
Percentage
100
200
Level 1 Total Points
Hard
Easy


Level 3 Response Rates
80
60
40
20
0
Percentage
200
300
400
500
Level 2 Total Points
Hard
Easy


Level 4 Response Rates
80
60
40
20
0
Percentage
400
600
800
1000
Level 3 Total Points
Hard
Easy





Note. Figure depicts the relationship between the percentage of individuals who chose the Hard and Easy Sets of images for each Level of the task, and the number of points they had earned in the game up until that Level.

General Discussion

The present studies extend our understanding of the relationship between anxiety and avoidance behavior in several ways. First, Study 1 responded to a discordance in the treatment literature between prevailing models of exposure therapy for anxiety disorders which emphasize fear reduction as the critical agent of change and a growing body of research that indicates that fear reduction within and between exposure trials is not predictive of therapeutic outcomes (Craske, Kircanski, Zelikowski, Mystkowski, Chowdhury, & Baker, 2008; Craske, Liao, Brown, & Vervliet, 2012). Based on numerous theories that propose that avoidance behavior is a key mechanism through which fear is maintained (e.g. Lovibond & Shanks, 2002; Rachman, 1994), and a lack of previous research on the role of avoidance as an independent predictor of outcome, Study 1 distinguished fear and avoidance as two separate processes involved in the maintenance of fear and anxiety and examined the role of each in predicting anxiety treatment outcome.

Study 1 expanded upon laboratory based experiments that have found that avoidance responding is the mechanism that protects fear responses from extinction (Lovibond et al., 2009) by examining the role of avoidance behavior in predicting future fear levels as well as future anxiety disorder diagnostic severity and symptom related distress in a randomized clinical trial of two widely used behavioral therapies, Cognitive Behavioral Therapy (CBT) and Acceptance and Commitment Therapy (ACT). The results indicated that avoidance level at pre-treatment significantly predicted fear level at post-treatment, over and above fear level at pre-treatment. Conversely, pre-treatment fear level did not predict post-treatment avoidance level, suggesting that avoidance level is a critical agent in the maintenance and change of fear level and fear level is not an agent in the maintenance or change in avoidance levels.

Study 1 also found that avoidance level at pre-treatment was a significant predictor of social anxiety disorder (SAD) diagnostic severity as well as general anxiety related symptom distress at post-treatment, over and above pre-treatment fear level. Further, pre-treatment fear level was not a significant predictor of any post-treatment outcomes. Additionally, residual avoidance behavior at post-treatment was a significant predictor of SAD diagnostic severity, general anxiety related symptom distress, and general mood and anxiety related symptom distress six months after treatment ended. Again, post-treatment fear level was not found to a be a significant predictor of any treatment outcome measures at six month follow up except general mood and anxiety related symptom distress. These findings indicate that when fear and avoidance are separated as distinct processes, avoidance is a stronger and more stable predictor of diagnostic severity and symptom related distress than fear. Finally, there was no significant interaction between treatment condition and fear and avoidance in predicting outcome, demonstrating that the role of avoidance behavior in predicting treatment outcome is the same in both CBT and ACT treatment models.

These findings have great implications for the treatment of SAD and potentially other anxiety disorders as they suggest that change in avoidance behavior should be emphasized over change in fear as a marker of treatment success. In addition, avoidance behavior should be targeted early in treatment, regardless of fear level, as it is potentially the strongest predictor of future fear levels and outcome. Thus, reducing avoidance level early in treatment may aid in the reduction of future fear, avoidance, symptom severity, and symptom related distress. A significant limitation of this study is that at the time of its design, there was a lack of valid measures of avoidance behavior designed to assess avoidance as a distinct variable separate from fear. Further there was a lack of valid behavioral measures of avoidance that objectively assessed

avoidance in vivo. Study 1 was forced to improvise by calculating separate fear and avoidance scores from a larger clinician rated diagnostic interview. Clinician ratings were deemed preferable to the use of self-report measures because they were less subject to the responder biases often associated with self-report (e.g. Craske & Tsao, 1999), however these ratings remain less objective than an in vivo behavioral measure of avoidance. Given the findings that avoidance behavior plays a significant role in predicting treatment outcome and the indications that treatment studies should more frequently assess avoidance behavior as a marker of outcome, more ecologically valid measures of avoidance will be needed to validly assess changes that occur in treatment.

Study 2 responded to the lack of ecologically valid behavioral measures of avoidance by creating a new objective behavioral measure that more closely matches anxious individuals experience when making decisions to approach or avoid feared stimuli in their daily lives. Research has shown that when faced with a feared situation, anxious individuals experience an approach-avoidance conflict where they weigh the risks and benefits associated with both behaviors before making a decision of how to proceed (Kashdan, Elhai, & Breen, 2007). However, research has also shown that anxious individuals often weigh the potential risks more heavily than the rewards, leading to greater avoidance (Kashdan, Elhai, & Breen, 2007; Rapee, & Heimberg, 1997). Thus the new task attempted to match this approach avoidance conflict to both create a more naturalistic in vivo environment in which to measure avoidance behavior and to more closely measure the decision making process.

The design and testing of this new task also expanded upon our understanding of ecologically valid measurement of avoidance behavior by creating an in vivo fear inducing situation that more closely matches both exposure trials and real life experiences by not only

measuring the degree of avoidance but also measuring the context where the approach-avoidance conflict takes place. The study also expands upon our previous knowledge of the role of reward sensitivity and risk aversion in the decision making processes used by anxious individuals when they choose to approach or avoid.

Study 2 created the Behavioral Avoidance and Reward Sensitivity Task (BARST) and found in a sample of individuals with and without blood injection injury (BII) phobia that when faced with a decision to approach or avoid fear provoking stimuli, uncertainty and reward incentive play a significant role in the decision making process for both groups of individuals. Specifically, when uncertainty regarding the outcome of approaching fear inducing images was high, both groups were moderately risk averse and made very similar decisions to approach and avoid. When the threat level of the fear provoking images was low to moderate, and there was a reward incentive associated with approaching, both groups were sensitive to reward incentive and approached the images at similarly high rates. However, anxious and non-anxious individuals made significantly different decisions once the threat level became high. When both the threat level and reward incentive associated with approaching the fear provoking images was high, the low anxious individuals became even more sensitive to the reward incentive and approached at higher rates, while the high anxious individuals became more risk averse and less sensitive to the reward incentive and began avoiding the images at high rates.

These findings indicated that when threat level is low or moderate, anxious individuals use a similar decision making process as non-anxious individuals when deciding to approach or avoid fear provoking stimuli. Both groups of individuals are sensitive to reward incentives and are willing to approach. However, when threat level becomes high, anxious individuals disregard

the potential reward incentives and weigh the associated risks higher than the associated benefits, leading to a decision to avoid.

Study 2 also found that sensitivity to reward incentive was a stronger predictor of the decision to approach or avoid than anxiety level. Specifically, the degree to which an individual was sensitive to the reward incentives on early levels of the task was a better predictor of their decision to approach or avoid on later levels of the task than their anxiety level. When reward incentive was added to the model, anxiety level was no longer found to be a significant predictor of the decision to approach on almost every level of the task. This indicates that anxious individuals vary in both their sensitivity to reward and their willingness to approach fear provoking stimuli in exchange for reward.

The findings from this study have significant implications for the measurement of avoidance and treatment outcome. They indicate that anxious individuals differ in their rates of approach and avoidance, their sensitivity to reward, and the decision making process they use when weighing the risks and benefits associated with approach and avoidance. Overall, anxious individuals become more risk averse and less reward sensitive as threat level increases, yet there is individual variation within anxious individuals regarding reward sensitivity and approach behavior, and thus, potentially increasing reward sensitivity could decrease avoidance behavior and improve treatment outcomes.

Combined with the findings from Study 1 that avoidance behavior is potentially the best predictor of outcome at post-treatment and six month follow up, the BARST should be used by future treatment outcome studies to more accurately assess the level of avoidance behavior, reward sensitivity, and willingness to take risks at the start of treatment as a means of predicting who will experience favorable outcomes at post-treatment. Treatment studies should also use the

BARST to measure changes in individuals' avoidance behavior throughout treatment to monitor treatment progress. Finally, the BARST should be used to measure residual avoidance behavior at post-treatment to assess the level of treatment success as well as to predict whether an individual is likely to continue to make gains after treatment or is likely to experience a relapse of symptoms.

Future research should also extend the findings of these two studies by examining the relationship between anxiety and avoidance behavior across all anxiety disorders. The findings from Study 1 should be replicated to examine whether the role of avoidance behavior in predicting treatment outcome is similar across other anxiety disorders in addition to SAD. Future research should also produce and test new versions of the BARST task that are specific to each anxiety disorder and contain disorder specific fear provoking stimuli. These new versions should be used to examine whether the BARST is an ecologically valid measure of avoidance in all anxiety disorders and if the approach-avoidance conflict is met with the same decision making process across all anxiety disorders.

Self-Report Measures

Mood and Anxiety Symptom Questionnaire (MASQ)

Below is a list of feelings, sensations, and experiences that people sometimes have. Read each item and then circle the appropriate choice on the scale next to that item. Use the choice that best describes how much you have felt or experienced things this way DURING THE PAST WEEK, INCLUDING TODAY.

Not at all	**A little Bit**	**Moderately**	**Quite A Bit**	**Extremely**
1	**2**	**3**	**4**	**5**

1. Felt cheerful…….....	1	2	3	4	5
2. Felt afraid……..	1	2	3	4	5
3. Startled easily……	1	2	3	4	5
4. Felt confused……	1	2	3	4	5
5. Slept very well…….	1	2	3	4	5
6. Felt sad…….	1	2	3	4	5
7. Felt very alert……...	1	2	3	4	5
8. Felt discouraged……...	1	2	3	4	5
9. Felt nauseous……	1	2	3	4	5
10. Felt like crying……...	1	2	3	4	5
11. Felt successful……	1	2	3	4	5
12. Had diarrhea……..	1	2	3	4	5
13. Felt worthless……	1	2	3	4	5
14. Felt really happy……..	1	2	3	4	5
15. Felt nervous…….	1	2	3	4	5
16. Felt depressed……..	1	2	3	4	5
17. Felt irritable…….	1	2	3	4	5
18. Felt optimistic……..	1	2	3	4	5

	Not at all 1	A little Bit 2	Moderately 3	Quite A Bit 4	Extremely 5
19. Felt faint……..	1	2	3	4	5
20. Felt uneasy……..	1	2	3	4	5
21. Felt really bored……..	1	2	3	4	5
22. Felt hopeless……	1	2	3	4	5
23. Felt like I was having a lot of fun……	1	2	3	4	5
24. Blamed myself for a lot of things……	1	2	3	4	5
25. Felt numbness or tingling in my body….	1	2	3	4	5
26. Felt withdrawn from other people……...	1	2	3	4	5
27. Seemed to move quickly and easily……	1	2	3	4	5
28. Was afraid I was going to lose control…	1	2	3	4	5
29. Felt dissatisfied with everything…….	1	2	3	4	5
30. Looked forward to things with enjoyment.....	1	2	3	4	5
31. Had trouble remembering things…….	1	2	3	4	5
32. Felt like I didn't need much sleep……	1	2	3	4	5
33. Felt like nothing was very enjoyable……	1	2	3	4	5
34. Felt like something awful was going to happen…….	1	2	3	4	5
35. Felt like I had accomplished a lot…….	1	2	3	4	5
36. Felt like I had a lot of interesting things to do……..	1	2	3	4	5
37. Did not have much of an appetite…….	1	2	3	4	5
38. Felt like being with other people……..	1	2	3	4	5

	Not at all 1	A little Bit 2	Moderately 3	Quite A Bit 4		Extremely 5
39. Felt like it took extra effort to get started……..	1	2	3	4	5	
40. Felt like I had a lot to look forward to...	1	2	3	4	5	
41. Thoughts and ideas came to me very easily……..	1	2	3	4	5	
42. Felt pessimistic about the future……	1	2	3	4	5	
43. Felt like I could do everything I needed to……	1	2	3	4	5	
44. Felt like there wasn't anything interesting or fun to do……	1	2	3	4	5	
45. Had pain in my chest…….	1	2	3	4	5	
46. Felt really talkative……	1	2	3	4	5	
47. Felt like a failure……	1	2	3	4	5	
48. Had hot or cold spells……	1	2	3	4	5	
49. Was proud of myself…….	1	2	3	4	5	
50. Felt very restless……	1	2	3	4	5	
51. Had trouble falling asleep……..	1	2	3	4	5	
52. Felt dizzy or lightheaded……	1	2	3	4	5	
53. Felt unattractive…….	1	2	3	4	5	
54. Felt very clearheaded…….	1	2	3	4	5	
55. Was short of breath……	1	2	3	4	5	
56. Felt sluggish or tired……..	1	2	3	4	5	
57. Hands were shaky……..	1	2	3	4	5	

	Not at all 1	A little Bit 2	Moderately 3	Quite A Bit 4	Extremely 5
58. Felt really “up” or lively…….	1	2	3	4	5
59. Was unable to relax……	1	2	3	4	5
60. Felt like being by myself……	1	2	3	4	5
61. Felt like I was choking……...	1	2	3	4	5
62. Was able to laugh easily…….	1	2	3	4	5
63. Had an upset stomach…….	1	2	3	4	5
64. Felt inferior to others……..	1	2	3	4	5
65. Had a lump in my throat…….	1	2	3	4	5
66. Felt really slowed down……..	1	2	3	4	5
67. Had a very dry mouth…….	1	2	3	4	5
68. Felt very confident about myself……	1	2	3	4	5
69. Muscles twitched or trembled……	1	2	3	4	5
70. Had trouble making decisions……	1	2	3	4	5
71. Felt like I was going crazy…….	1	2	3	4	5
72. Felt like I had a lot of energy…….	1	2	3	4	5
73. Was afraid I was going to die……	1	2	3	4	5
74. Was disappointed in myself……..	1	2	3	4	5
75. Heart was racing or pounding……...	1	2	3	4	5
76. Had trouble concentrating……..	1	2	3	4	5
77. Felt tense or “high-strung”……	1	2	3	4	5
78. Felt hope about the future……..	1	2	3	4	5

	Not at all 1	A little Bit 2	Moderately 3	Quite A Bit 4	Extremely 5
79. Was trembling or shaking……...	1	2	3	4	5
80. Had trouble paying attention……...	1	2	3	4	5
81. Muscles were tense or sore……..	1	2	3	4	5
82. Felt keyed up, “on edge”…….	1	2	3	4	5
83. Had trouble staying asleep……...	1	2	3	4	5
84. Worried a lot about things……	1	2	3	4	5
85. Had to urinate frequently…….	1	2	3	4	5
86. Felt really good about myself……..	1	2	3	4	5
87. Had trouble swallowing……...	1	2	3	4	5
88. Hands were cold or sweaty……..	1	2	3	4	5
89. Thought about death or suicide……	1	2	3	4	5
90. Got tired or fatigued easily……..	1	2	3	4	5

FEAR QUESTIONNAIRE (FQ)

Choose a number from the scale below to show how much you would avoid each of the situations listed below because of fear or other unpleasant feelings. Then write the number you choose in the space provided.

Would Not Avoid It		Slightly Avoid It		Definitely Avoid It		Markedly Avoid it		Always Avoid It
0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**

**	Main phobia you want treated (Describe in your own words):	_____
1	Avoidance rating for this phobia	_____
2	Injections or minor surgery	_____
3	Eating or drinking with other people	_____
4	Hospitals	_____
5	Traveling alone by bus or coach	_____
6	Walking alone in busy streets	_____
7	Being watched or stared at	_____
8	Going into crowded shops	_____
9	Talking to people in authority	_____
10	Sight of blood	_____
11	Being criticized	_____
12	Going alone far from home	_____
13	Thought of injury or illness	_____
14	Speaking or acting to an audience	_____
15	Large open spaces	_____
16	Going to the dentist	_____
17	Other situations (describe): _____	_____

Now choose a number from the scale below to show how much you are troubled by each problem listed, and write the number in the space provided.

Hardly At All		Slightly Troublesome		Definitely Troublesome		Very Troublesome		Very Severely Troublesome
0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**

18 Feeling miserable or depressed _____

19 Feeling irritable or angry _____

20 Feeling tense or panicky _____

21 Upsetting thoughts coming into your mind _____

22 Feeling you or your surroundings are strange or unreal _____

23 Other feelings (describe): _____ _____

CIRCLE ONE. How would you rate the present state of your phobic symptoms on the scale below?

No Phobias Present		Slightly Disturbing /Not Really Disturbing		Definitely Disturbing /Disabling		Markedly Disturbing /Disabling		Very Severely Disturbing /Disabling
0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**

DOSPERT
Domain-Specific Risk Taking
© Elke U. Weber, 2003
Updated version of Weber, Blais, Betz (2002), *Journal of Behavioral Decision Making*

Risk Taking Scale

For each of the following statements, please indicate the **likelihood** that you would engage in the described activity or behavior, if you were to find yourself in that situation.

For each of the following statements, please indicate your **likelihood** of engaging in each activity or behavior. Provide a rating from **1 to 5**, using the following scale:

1	2	3	4	5
Very unlikely	Unlikely	Not sure	Likely	Very likely

Provide a rating from "Extremely Unlikely" to "Extremely Likely," using the following scale:

1- Extremely Unlikely
2- Moderately Unlikely
3- Somewhat Unlikely
4- Not Sure
5- Somewhat Likely
6- Moderately Likely
7- Extremely Likely

1. Admitting that your tastes are different from those of a friend. _____
2. Going camping in the wilderness. _____
3. Betting a day's income at the horse races. _____
4. Swimming far out from shore on an unguarded lake or ocean. _____
5. Investing 10% of your annual income in a moderate growth mutual fund. _____
6. Drinking heavily at a social function. _____
7. Taking some questionable deductions on your income tax return. _____
8. Disagreeing with an authority figure on a major issue. _____
9. Betting a day's income at a high-stake poker game. _____
10. Having an affair with a married man/woman. _____
11. Passing off somebody else's work as your own. _____
12. Going on vacation to a third-world country. _____

13. Arguing with a friend who has a different opinion on an issue. _____
14. Going down a ski run that is beyond your ability. _____
15. Investing 5% of your annual income in a very speculative stock. _____
16. Approaching your boss for a raise. _____
17. Going whitewater rafting at high water in the spring. _____
18. Betting a day's income on the outcome of a sporting event (e.g., baseball, soccer, or football). _____
19. Investing 5% of your annual income in a dependable and conservative stock. _____
20. Engaging in unprotected sex. _____
21. Revealing a friend's secret to someone else.
22. Driving a car without wearing a seat belt. _____
23. Investing 10% of your annual income in a new business venture. _____
24. Taking a weekend sky diving class. _____
25. Riding a motorcycle without a helmet. _____
26. Gambling a week's income at a casino. _____
27. Choosing a career that you truly enjoy over a more prestigious one. _____
28. Downloading proprietary software from the Internet. _____
29. Reporting a neighbor or friend for some illegal activity. _____
30. Speaking your mind about an unpopular issue in a meeting at work. _____
31. Sunbathing without sunscreen. _____
32. Bungee-jumping off a tall bridge. _____
33. Piloting a small plane. _____
34. Walking home alone at night in an unsafe area of town. _____
35. Eating high cholesterol foods. _____
36. Driving while taking medication that may make you drowsy. _____
37. Moving to a city far away from your extended family. _____
38. Starting a new career in your mid-thirties. _____
39. Leaving your young children alone at home while running an errand. _____
40. Not returning a wallet you found that contains $200. _____

Risk Perception Scale

People often see some risk in situations that contain uncertainty about what the outcome or consequences will be and for which there is the possibility of negative consequences. However, riskiness is a very personal and intuitive notion, and we are interested in **your gut level assessment of how risky** each situation or behavior is.

For each of the following statements, please indicate **how risky you perceive** each situation. Provide a rating from **1 to 5**, using the following scale:

1	2	3	4	5
Not at all risky		Moderately risky		Extremely risky

For each of the following statements, please indicate how risky **you** perceive each situation. Provide a rating from "Extremely Unlikely" to "Extremely Likely," using the following scale:

1- Not at all risky
2- Slightly Risky
3- Somewhat Risky
4- Moderately Risky
5- Risky
6- Very Risky
7- Extremely Risky

1. Admitting that your tastes are different from those of a friend. _____
2. Going camping in the wilderness. _____
3. Betting a day's income at the horse races. _____
4. Swimming far out from shore on an unguarded lake or ocean. _____
5. Investing 10% of your annual income in a moderate growth mutual fund. _____
6. Drinking heavily at a social function. _____
7. Taking some questionable deductions on your income tax return. _____
8. Disagreeing with an authority figure on a major issue. _____
9. Betting a day's income at a high-stake poker game. _____
10. Having an affair with a married man/woman. _____
11. Passing off somebody else's work as your own. _____
12. Going on vacation to a third-world country. _____
13. Arguing with a friend who has a different opinion on an issue. _____
14. Going down a ski run that is beyond your ability. _____
15. Investing 5% of your annual income in a very speculative stock. _____

16. Approaching your boss for a raise. _____

17. Going whitewater rafting at high water in the spring. _____

18. Betting a day's income on the outcome of a sporting event
(e.g., baseball, soccer, or football). _____

19. Investing 5% of your annual income in a dependable and conservative stock._____

20. Engaging in unprotected sex. _____

21. Revealing a friend's secret to someone else. _____

22. Driving a car without wearing a seat belt. _____

23. Investing 10% of your annual income in a new business venture. _____

24. Taking a weekend sky diving class. _____

25. Riding a motorcycle without a helmet. _____

26. Gambling a week's income at a casino. _____

27. Choosing a career that you truly enjoy over a more prestigious one. _____

28. Downloading proprietary software from the Internet. _____

29. Reporting a neighbor or friend for some illegal activity. _____

30. Speaking your mind about an unpopular issue in a meeting at work. _____

31. Sunbathing without sunscreen. _____

32. Bungee-jumping off a tall bridge. _____

33. Piloting a small plane. _____

34. Walking home alone at night in an unsafe area of town. _____

35. Eating high cholesterol foods. _____

36. Driving while taking medication that may make you drowsy. _____

37. Moving to a city far away from your extended family. _____

38. Starting a new career in your mid-thirties. _____

39. Leaving your young children alone at home while running an errand. _____

40. Not returning a wallet you found that contains $200. _____

Expected Benefits Scale

For each of the following statements, please indicate **the benefits** you would obtain from each situation. Provide a rating from **1 to 5**, using the following scale:

1	2	3	4	5
No benefits at all		Moderate benefits		Great benefits

1. Admitting that your tastes are different from those of a friend. _____
2. Going camping in the wilderness. _____
3. Betting a day's income at the horse races. _____
4. Swimming far out from shore on an unguarded lake or ocean. _____
5. Investing 10% of your annual income in a moderate growth mutual fund. _____
6. Drinking heavily at a social function. _____
7. Taking some questionable deductions on your income tax return. _____
8. Disagreeing with an authority figure on a major issue. _____
9. Betting a day's income at a high-stake poker game. _____
10. Having an affair with a married man/woman. _____
11. Passing off somebody else's work as your own. _____
12. Going on vacation to a third-world country. _____
13. Arguing with a friend who has a different opinion on an issue. _____
14. Going down a ski run that is beyond your ability. _____
15. Investing 5% of your annual income in a very speculative stock. _____
16. Approaching your boss for a raise. _____
17. Going whitewater rafting at high water in the spring. _____
18. Betting a day's income on the outcome of a sporting event (e.g., baseball, soccer, or football). _____
19. Investing 5% of your annual income in a dependable and conservative stock. _____
20. Engaging in unprotected sex. _____
21. Revealing a friend's secret to someone else. _____
22. Driving a car without wearing a seat belt. _____

23. Investing 10% of your annual income in a new business venture. _____
24. Taking a weekend sky diving class. _____
25. Riding a motorcycle without a helmet. _____
26. Gambling a week's income at a casino. _____
27. Choosing a career that you truly enjoy over a more prestigious one. _____
28. Downloading proprietary software from the Internet. _____
29. Reporting a neighbor or friend for some illegal activity. _____
30. Speaking your mind about an unpopular issue in a meeting at work. _____
31. Sunbathing without sunscreen. _____
32. Bungee-jumping off a tall bridge. _____
33. Piloting a small plane. _____
34. Walking home alone at night in an unsafe area of town. _____
35. Eating high cholesterol foods. _____
36. Driving while taking medication that may make you drowsy. _____
37. Moving to a city far away from your extended family. _____
38. Starting a new career in your mid-thirties. _____
39. Leaving your young children alone at home while running an errand. _____
40. Not returning a wallet you found that contains $200. _____

The Blood-Injection Symptom Scale

These questions ask about sensations that you may experience in situations involving blood or injections. For each sensation, circle 'yes' if you noticed the sensation during one of your worst experiences involving blood or injections and circle 'no' if you did not notice the sensation during one of your worst experiences involving blood or injections.

1. Did you have tightness, pain or discomfort in your chest?	Yes/No
2. Were you anxious?	Yes/No
3. Did you have blurred vision?	Yes/No
4. Did you have cold or clammy hands?	Yes/No
5. Were you dizzy or lightheaded?	Yes/No
6. Did you feel faint?	Yes/No
7. Were you fatigued?	Yes/No
8. Did you faint?	Yes/No
9. Did you feel unreal?	Yes/No
10. Did your heart pound?	Yes/No
11. Were you particularly irritable?	Yes/No
12. Did you feel nauseous?	Yes/No
13. Did the room spin?	Yes/No
14. Did you sweat?	Yes/No
15. Did your muscles feel tense, sore, or ache?	Yes/No
16. Did you tremble?	Yes/No
17. Did you have trouble walking?	Yes/No

Beck Depression Inventory (BDI)- II

On this questionnaire are groups of statements. Please read each group of statements carefully. Then pick out the one statement in each group which best describes the way you have been feeling in the **PAST WEEK, INCLUDING TODAY**. Circle the number beside the statement you picked. If several statements in the group seem to apply equally well, circle each one. **Be sure to read all the statements in each group before making your choice.**

1. I do not feel sad 0
   I feel sad 1
   I am sad all the time and I can't snap out of it 2
   I am so sad or unhappy that I can't stand it 3

2. I am not particularly discouraged about the future 0
   I feel discouraged about the future 1
   I feel I have nothing to look forward to 2
   I feel that the future is hopeless and that things cannot improve 3

3. I do not feel like a failure 0
   I feel I have failed more than the average person 1
   As I look back on my life, all I can see is a lot of failures 2
   I feel I am a complete failure as a person 3

4. I get as much satisfaction out of things as I used to 0
   I don't enjoy things the way I used to 1
   I don't get real satisfaction out of anything anymore 2
   I am dissatisfied or bored with everything 3

5. I don't feel particularly guilty 0
   I feel guilty a good part of the time 1
   I feel quite guilty most of the time 2
   I feel guilty all of the time 3

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

7. I don't feel disappointed in myself 0
   I am disappointed in myself 1
   I am disgusted with myself 2
   I hate myself 3

8. I don't feel I am any worse than anybody else 0
   I am critical of myself for my weaknesses or mistakes 1
   I blame myself all the time for my faults 2
   I blame myself for everything bad that happens 3

9. I don't cry any more than usual 0
   I cry more now than I used to 1
   I cry all the time now 2
   I used to be able to cry, but now I can't cry even though I want to 3

10. I am no more irritated now than I ever am 0
    I get annoyed or irritated more easily than I used to 1
    I feel irritated all the time now 2
    I don't get irritated at all by the things that used to irritate me 3

11. I have not lost interest in other people 0
    I am less interested in other people than I used to be 1
    I have lost most of my interest in other people 2
    I have lost all of my interest in other people 3

12. I make decisions about as well as I ever could 0
    I put off making decisions more than I used to 1
    I have greater difficulty in making decisions than before 2

I can't make decisions at all anymore 3

13. I don't feel I look any worse than I used to 0
    I am worried that I am looking old or unattractive 1
    I feel that there are permanent changes in my appearance that make me look unattractive 2
    I believe that I look ugly 3

14. I can work about as well as before 0
    It takes an extra effort to get started at doing something 1
    I have to push myself very hard to do anything 2
    I can't do any work at all 3

15. I can sleep as well as usual 0
    I don't sleep as well as I used to 1
    I wake up 1-2 hours earlier than usual and find it hard to get back to sleep ... 2
    I wake up several hours earlier than I used to and cannot get back to sleep ... 3

16. I don't get more tired than usual 0
    I get tired more easily than I used to 1
    I get tired from doing almost anything 2
    I am too tired to do anything 3

17. My appetite is no worse than usual 0
    My appetite is not as good as it used to be 1
    My appetite is much worse now 2
    I have no appetite at all anymore 3

18. I haven't lost much weight, if any, lately 0
    I have lost more than 5 pounds. 1
    I have lost more than 10 pounds 2
    I have lost more than 15 pounds 3
    *18a **I am purposely trying to lose weight by eating less* YES ..... NO (circle one)

19. I am no more worried about my health than usual 0
    I am worried about physical problems such as aches and pains; or upset stomach; or constipation 1
    I am very worried about physical problems and it's hard to think of much else 2
    I am so worried about my physical problems that I cannot think about anything else 3

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

References

Aderka, I.M., McLean, C.P., Huppert, J.D., Davidson, J.R.T., Foa, E.B. (2013). Fear, Avoidance, And Physiological Symptoms During Cognitive-Behavioral Therapy for Social Anxiety Disorder. *Behaviour Research and Therapy,* doi: 10.1016/j.brat.2013.03.007.

Angst J., Merikangas, K.R., Preisig, M. (1997) Subthreshold syndromes of depression and anxiety in the community. *Journal of Clinical Psychiatry*, *(Suppl. 8),* 6–10.

Arch, J.J., Eifert, G.H., Davies, C., Vilardaga, J.C.P., Rose, R.D., Craske, M.G. (2012). Randomized Clinical Trial of Cognitive Behavioral Therapy (CBT) Versus Acceptance and Commitment Therapy (ACT) for Mixed Anxiety Disorders. *Journal of Consulting and Clinical Psychology, 80(5),* 750-765.

Arnow, B. A., Taylor, C. B., Agras, W. S., & Telch, M. J. (1985). Enhancing agoraphobia treatment outcome by changing couple communication patterns. *Behavior Therapy, 16,* 452-467.

Baker, A., Mystkowski, J., Culver, N., Yi, R., Mortazavi, A., Craske, M.G. (2010). Does habituation matter? Emotional processing theory and exposure therapy for acrophobia. *Behaviour Research and Therapy, 48,* 1139-1143.

Barlow, D. H. (2002). *Anxiety and its disorders: The nature and treatment of anxiety and panic (2nd ed.)*. New York: Guilford Press.

Baum, M. (1970). Extinction of avoidance response through response prevention (flooding). *Psychological Bulletin, 74*, 276–284.

Beck, A. T., & Clark, D. A. (1997). An information processing model of anxiety: Automatic and strategic processes. *Behaviour Research and Therapy, 35,* 49–58.

Beck, A.T., & Emery, G. (1985). *Anxiety disorders and phobias: A cognitive perspective.*

New York: Basic Books.

Beck A.T., Steer R.A., Brown G.K. *Manual for the Beck Depression Inventory–II.* San Antonio, TX: Psychological Corporation; 1996.

Bernstein, D.A., & Nietzel, M.T. (1971). Some comments on therapy analogue research with small animal "phobias." *Journal of Behavior Therapy and Experimental Psychiatry, 2,* 225-237.

Bolles, R.C. (1970). Species-specific defense reactions and avoidance learning. *Psychological Review, 77*, 32–48.

Bolles, R.C., Stokes, L.W., & Younger, M.S. (1966). Does CS termination reinforce avoidance behaviour? *Journal of Comparative and Physiological Psychology, 62,* 201–207.

Borkovec, T.D. (1972). Effects of expectancy on the outcome of systematic desensitization and implosive treatments for analogue anxiety. *Behavior Therapy, 3,* 29-40.

Borkovec, T.D., Craighead, W.E. (1971). The comparison of two methods of assessing fear and avoidance behavior. *Behavior Research and Therapy, 9, 285-291.*

Bouton, M. E. (1993). Context, time, and memory retrieval in the interference paradigms of Pavlovian learning. *Psychological Bulletin, 114,* 80-99.

Bouton, M. E., & King, D. A. (1983). Contextual control of the extinction of conditioned fear: tests for the associative value of the context. *Journal of Experimental Psychology: Animal Behavior Processes, 9,* 248-265.

Bower, G. H. (1991). Mood congruity of social judgment. In J. Forgas (Ed.), *Emotion and social judgment* (pp. 31-54). Oxford, England: Pergamon Press.

Brewer, W.F. (1974). There is no convincing evidence for operant or classical conditioning in Adult humans. In W.B. Weimer & D.S. Palermo (Eds.), *Cognition and the symbolic*

Processes (pp. 1-42). Hillsdale, NJ: Erlbaum.

Brown, T. A., Di Nardo, P. A., & Barlow, D. H. (1994). *Anxiety disorders interview schedule for DSM-IV*. Albany, NY: Graywind Publications.

Brown, T.A., DiNardo, P.A., Lehman, C.L., & Campbell, L.A. (2001). Reliability of DSM-IV anxiety and mood disorders: implications for the classification of emotional disorders. Journal of Abnormal Psychology, 110, 49-58.

Burkland, Niles, Craske, & Lieberman, in prep.

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

Butler, G., & Mathews, A. (1987). Anticipatory anxiety and risk perception. *Cognitive Research and Therapy, 11,* 551–565.

Campbell, M. C., Stout, J. C., & Finn, P. R. (2004). Reduced autonomic responsiveness to gambling task losses in Huntington's disease. Journal of the International Neuropsychological Society, 10, 239–245.

Carr, A. (1974). Compulsive neurosis: a review of the literature. *Psychological Bulletin, 81,* 311-318.

Cattell, R. B. (1966). *Handbook of multivariate experimental psychology.* Chicago: Rand McNally.

Chambless, D. (1985). Cognitive mechanisms in panic disorder. In Rachman, S. & Maser, J. (Eds.), *Panic: Psychological perspectives.* New Jersey: Erlbaum.

Chambless, D.L., Caputo, G.C., Jasin, S.E., Gracixy, E.J., Williams, C. (1985). The mobility Inventory for agoraphoba. *Behavior Research and Therapy,* 23(1), 35-44.

Chambless, D. L., Goldstein, A. A., Gallagher, R., & Bright, P. (1986). Integrating behavior

therapy and psychotherapy in the treatment of agoraphobia. *Psychotherapy, 23,* 150-159.

Chorpita, B. F., & Barlow, D. H. (1998). The development of anxiety: The role of control in the early environment. *Psychological Bulletin, 124,* 3–21.

Chorpita, B. F., Brown, T. A., & Barlow, D. H. (1998). Perceived control as a mediator of family environment in etiological models of childhood anxiety. *Behavior Therapy, 29,* 457–476.

Cloitre, M., Heimberg, R. G., Liebowitz, R. G., & Gitow, A. (1992). Perceptions of control in panic disorder and social phobia. *Cognitive Therapy and Research, 16,* 569–577.

Clark, D.M. (1986). A cognitive approach to panic disorder. *Behavior Research and Therapy, 24,* 461-470.

Clark, D. M., & Wells, A. (1995). A cognitive model of social phobia. In: R. G. Heimberg, M. R. Liebowitz, D. A. Hope, & F. R. Schneier (Eds.), *Social phobia: Diagnosis, assessment, and treatment* (pp. 69–94). New York: The Guilford Press.

Connor, K.M., Davidson, J.R.T., Churchill, L.E., Sherwood, A., Foa, E., & Weisler, R.H. (2000). Psychometric properties of the Social Phobia Scale (SPIN). *British Journal of Psychiatry, 176,* 379-386.

Craske, M.G., et al. (under review). Randomized controlled trial of cognitive behavioral therapy and acceptance and commitment therapy for social anxiety disorder: outcomes and moderators.

Craske, M.G., Barlow, D.H. (1988). A review of the relationship between panic and avoidance. *Clinical Psychology Review, 8,* 667-685.

Craske, M. G., & Barlow, D. H. (2005). *Mastery of your anxiety and worry: client workbook,* (2nd Ed.). New York, NY: Oxford University Press.

Craske, M. G., DeCola, J. P., Sachs, A. D., & Pontillo, D. C. (2003). Panic control treatment for

agoraphobia. *Journal of Anxiety Disorders, 17,* 321-333.

Craske, M. G., Farchione, T. J., Allen, L. B., Barrios, V., Stoyanova, M., & Rose, R. (2007). Cognitive behavioral therapy for panic disorder and comorbidity: more of the same or less of more? *Behaviour Research and Therapy, 45,* 1095-1109.

Craske, M. G., Kircanski, K., Zelikowski, M., Mystkowski, J., Chowdhury, N., & Baker, A. (2008). Optimizing inhibitory learning during exposure therapy. *Behaviour Research and Therapy, 46,* 5-27.

Craske, M.G., Lang, A.J., Aikins, D.E., & Mystkowski, J.L. (2005). Cognitive behavioral therapy for nocturnal panic. *Behavior Therapy, 36*, 43-54.

Craske, M. G., Liao, B., Brown, L., & Vervliet, B. (2012). Role of inhibition in exposure therapy. *Journal of Experimental Psychopathology, 3*(3), 322-345.

Craske, M.G., Mystkowski, J.L. (2006). Exposure therapy and extinction: clinical studies. In Craske, M.G., Hermans, D., Vansteenwegen, D. (Eds.). *Fear and learning: From basic processes to clinical implications* (pp. 217-233). Washington, DC, US: American Psychological Association.

Craske, M. G., & Tsao, J. C. I. (1999). Self-monitoring with panic and anxiety disorders. *Psychological Assessment, 11*(4), 466-479.

Culver, N. C., Stoyanova, M., & Craske, M. G. (2011). Clinical relevance of retrieval cues for attenuating context renewal of fear. *Journal of Anxiety Disorders, 25,* 284-292.

Davey, G.C.L. (2006). Cognitive mechanisms in fear acquisition and maintenance. In M. G. Craske, D. Hermans, & D. Vansteenwegen (Eds.), *Fear and learning: From basic processes to clinical implications* (pp. 99–116). Washington, DC: American Psychological Association.

DeSteno, D., Petty, R. E., Wegener, D. T., & Rucker, D. D. (2000). Beyond valence in the perception of likelihood: The role of emotion specificity. *Journal of Personality and Social Psychology, 78,* 397-416.

Eifert, G. H., Forsyth, J. P., Arch, J. J., Keller, M., Langer, D., & Espejo, N. (2009). Acceptance and commitment therapy for anxiety disorders: three case studies using a unified treatment protocol. *Cognitive Behavioral Practice, 16,* 368-385.

Everaerd, W., Rijken, H.M., & Emmelkamp, P.M.G. (1973). A comparison of "flooding" and "successive approximation" in the treatment of agoraphobia. *Behavior Research and Therapy, 11,* 105-118.

Fazio, R. H., & Olson, M. A. (2003). Implicit measures in social cognition research: Their meaning and use. *Annual Review of Psychology, 54,* 297–327.

Fazio, R. H., & Towles-Schwen, T. (1999). The MODE model of behavior-attitude processes. In S. Chaiken, & Y. Trope (Eds.), *Dual-process theories in social psychology* (pp. 97–116). New York: Guilford.

Frisch, M. B., Clark, M. P., Rouse, S. V., Rudd, M. D., Paweleck, J., & Greenstone, A. (2005). Predictive and treatment validity of life satisfaction and the Quality of Life Inventory. *Assessment, 12*(66-78).

Foa, E.B., & Kozak, M.J. (1986). Emotional processing of fear: Exposure to corrective information. *Psychological Bulletin, 99,* 20-35.

Foa, E. B., & McNally, R. J. (1986). Sensitivity to feared stimuli in obsessive-compulsives: A dichotic listening analysis. *Cognitive Therapy and Research, 10,* 477-485.

Foa, E., Riggs, D., Dancu, C., & Rothbaum, B. (1993). Reliability and validity of a brief instrument for assessing post-traumatic stress disorder. *Journal of Traumatic Stress, 6,* 459-474.

Gasper, K., & Clore, G. L. (1998). The persistent use of negative affect by anxious individuals to estimate risk. *Journal of Personality and Social Psychology, 74,* 1350-1363.

Gilbert, P. (2001). Evolution and social anxiety: The role of attraction, social competition, and social hierarchies. *Psychiatric Clinics of North America, 24*, 723–751.

Gray, J.A. (1987). *The psychology of fear and stress (2nd Ed.)*. Cambridge, UK: Cambridge University Press.

Heimberg, R.G., Mueller, G.P, Holt, C.A., Hope, D.A., Liebowitz, M.R. (1992). Assessment of anxiety in Social Interaction and Being Observed by Others: The Social Interaction Anxiety Scale and the Social Phobia Scale. *Behavior Therapy, 23, 53-73.*

Herrnstein, R.J. (1969). Method and theory in the study of avoidance. *Psychological Review, 76,* 49–69.

Heuer, K., Rinck, M., Becker, E.S. (2007). Avoidance of emotional facial expressions in social Anxiety: The approach-avoidance task. *Behavior Research and Therapy, 45,* 2990-3001.

Huijding, J., & de Jong, P. J. (2006). Specific predictive power of automatic spider-related affective associations for controllable and uncontrollable fear responses toward spiders. *Behaviour Research and Therapy, 44*, 161–176.

Johnson, E. J., & Tversky, A. (1983). Affect, generalization, and the perception of risk. *Journal of Personality and Social Psychology, 45,* 20-31.

Kashdan, T. B. (2007). Social anxiety spectrum and diminished positive experiences: Theoretical synthesis and meta-analysis. *Clinical Psychology Review, 27*, 348–365.

Kashdan, T. B., Collins, R. L., & Elhai, J. D. (2006). Social anxiety, positive outcome expectancies, and risk-taking behavioral intentions. *Cognitive Therapy and Research, 30*, 749–761.

Kashdan, T.B., Elhai, J.D., Breen, W.E. (2007). Social anxiety and disinhibition: An analysis of curiosity and social rank appraisals, approach–avoidance conflicts, and disruptive risk-taking behavior. *Journal of Anxiety Disorders, 22,* 925-939.

Kavanagh, D. J., & Bower, G. H. (1985). Mood and self-efficacy: Impact of joy and sadness on perceived capabilities. *Cognitive Therapy and Research, 9,* 507-525.

Kessler, R. C., Chiu, W. T., Demler, O., Merikangas, K. R., & Walters, E. E. (2005). Prevalence, severity, and comorbidity of 12-month DSM-IV disorders in the National Comorbidity Survey Replication. *Archives of General Psychiatry, 62,* 617-627.

Kircanski, K., Mortazavi, A., Castriotta, N., Baker, A. S., Mystkowski, J. L., Yi, R., & Craske, M. G. (2012). Challenges to the traditional exposure paradigm: Variability in exposure therapy for contamination fears. *Journal of Behavior Therapy and Experimental Psychiatry, 43*(2), 745-751.

Kirsch. I. (1985). Response expectancy as a determinant of experience and behavior. *American Psychologist, 40,* 1189-1202.

Kirsch, I., Lynn, S.J., Vigorito, M., & Miller, M.M. (2004). The role of cognition in classical and operant conditioning. *Journal of Clinical Psychology, 60(4),* 369-392.

Klein. D. F. (1980). Anxiety reconceptualized. *Comprehensive Psychiatry, 21,* 411-427.

Klerman, G. L. (1986). Current trends in clinical research on panic attacks, agoraphobia, and related anxiety disorders. *Journal of Clinical Psychiatry, 47, 37-39.*

Lang, P. J., Bradley, M. M., & Cuthbert, B. N. (1997). Motivated attention: Affect, activation, and action. In P. J. Lang, R. F. Simons, & M. F. Balaban (Eds.), *Attention and orienting: Sensory and motivational processes* (pp. 97–135). Hillsdale, NY: Erlbaum.

Lang, P.J., & Lazovik, A.D. (1963). Experimental desensitization of a phobia. *Journal of Abnormal and Social Psychology, 66,* 519-525.

Lazarus, R. S. (1991). *Emotion and adaptation.* New York: Oxford University Press.

LeDoux, J. E. (1995). Emotion: Clues from the brain. *Annual Review of Psychology, 46*, 209–235.

Lejuez, C. W., Aklin, W. M., Jones, H. A., Richards, J. B., Strong, D. R., Kahler, C. W., et al. (2003). The balloon analogue risk task (BART) differentiates smokers and nonsmokers. *Experimental and Clinical Psychopharmacology, 11*, 26–33.

Lejuez, C. W., Read, J. P., Kahler, C. W., Richards, J. B., Ramsey, S. E., Stuart, G. L., et al. (2002). Evaluation of a behavioral measure of risk taking: The balloon analogue risk task (BART). *Journal of Experimental Psychology: Applied, 8*, 75–84.

Lerner, J. S., & Keltner, D. (2000). Beyond valence: Toward a model of emotion-specific influences on judgment and choice. *Cognition and Emotion, 14,* 473-493.

Lerner, J. S., & Keltner, D. (2001). Fear, anger, and risk. *Journal of Personality and Social Psychology, 81*, 146–159.

Lovibond, P. F. (2003). Causal beliefs and conditioned responses: Retrospective revaluation induced by experience and by instruction. *Journal of Experimental Psychology: L Learning, Memory, and Cognition, 29*, 97–106.

Lovibond, P. F. (2006). Fear and avoidance: An integrated expectancy model. In M. G. Craske,

D. Hermans, & D. Vansteenwegen (Eds.), *Fear and learning: From basic processes to clinical implications* (pp. 117–132). Washington, DC: American Psychological Association.

Lovibond, P. F., & Shanks, D. R. (2002). The role of awareness in Pavlovian conditioning: Empirical evidence and theoretical implications. *Journal of Experimental Psychology: Animal Behavior Processes, 28,* 3–31.

Marks, I.M., Mathews, A. (1979). Case histories and shorter communications: brief standard Self-rating for phobic patients. *Behavior Research and Therapy, 17,* 263-267.

Maner, J.K., Schmidt, N.B. (2006). The role of risk avoidance in anxiety. *Behavior Therapy, 37,* 181-189.

Mayer, J. D., Gaschke, Y. N., Braverman, D. L., & Evans, T. W. (1992). Mood-congruent judgment is a general effect. *Journal of Personality and Social Psychology, 63,* 119-132.

Mayer, J. D., & Hanson, E. (1995). Mood-congruent judgment over time. *Personality and Social Psychology Bulletin, 21,* 237-244.

McNally, R. J. (2001). On the scientific status of cognitive appraisal models of anxiety disorder. *Behaviour Research and Therapy, 39*, 513–521.

Michelson, L., Mavissakalian, M, & Marchione, K. (1985). Cognitive and behavioral treatments of agoraphobia: Clinical, behavioral and psychophysiological outcomes. *Journal of Consulting and Clinical Psychology, 53,* 913-925.

Miller, B.V., Bernstein, D.A. (1972). Instructional demand in a behavioral avoidance test for claustrophobic fear. *Journal of Abnormal Psychology, 80,* 206-210.

Miller, R. R., & Matzel, L. D. (1988). Contingency and relative associative strength. In S. B. Klein & R. R. Mowrer (Eds.), *Contemporary learning theories:Pavlovian conditioning*

and the status of traditional learning theory (pp. 61-84). Hillsdale, NJ: Lawrence Erlbaum Associates.

Morris, R. G. M. (1975). Preconditioning of reinforcing properties of an exteroceptive feedback stimulus. *Learning and Motivation, 6,* 289–298.

Mowrer, O.H. (1947). On the dual nature of learning: A re-interpretation of "conditioning" and "problem solving." *Harvard Educational Review, 17,* 102-148.

Mowrer, O.H. (1960). *Learning theory and behavior*. New York: Wiley.

Norton, P. J., & Price, E. C. (2007). A meta-analytic review of adult cognitive-behavioral treatment outcome across the anxiety disorders. *Journal of Nervous and Mental Disease, 195*(6), 521-531.

Ohman, A. (1993). Fear and anxiety as emotional phenomena: Clinical phenomenology, evolutionary perspectives, and information-processing mechanisms. In M. Lewis & J. M. Haviland (Eds.), *Handbook of emotions* (pp. 511-536). New York: Guilford.

Ohman, A., Mineka, S. (2001). Fears, phobias, and preparedness: Toward an evolved module of fear and fear learning. *Psychological Review, 108,* 483-522.

Ortony, A., Clore, G. L., & Collins, A. (1988). *The cognitive structure of emotions.* New York: Cambridge University Press.

Rachman, S. (1977). The conditioning theory of fear acquisition: A critical examination. *Behaviour Research and Therapy, 15,* 375–387.

Rachman, S. (1988). Panics and their consequences: A review and prospect. In J. D. Maser (Ed.), *Panic: Psychological perspectives* (pp. 259–303). Hillsdale, NJ: Lawrence Erlbaum.

Rachman, S. (1994). The over-prediction of fear: A review. *Behavior Research and Therapy, 32(7),* 683-690.

Rachman, S., Craske, M., Tallman, K., & Solyom, C. (1986). Does escape behavior strengthen agoraphobic avoidance? *Behavior Therapy, 17,* 366–384.

Rachman, S. & Hodgson R (1980). Obsessions *and compulsions.* New Jersey: Prentice-Hall.

Rachman, S., Hodgson, R., & Marks, I.M. (1971). Treatment of chronic obsessive compulsive neurosis. *Behavior Research and Therapy, 9,* 237-247.

Rachman, S. & Lopatka, C. (1986a). Match and mismatch in the prediction of fear-l. *Behaviour Research and Therapy, 24,* 387-393.

Rachman, S. & Lopatka, C. (1986b). Match and mismatch of fear in Gray's Theory-II. *Behaviour Research and Therapy, 24,* 395-401.

Rachman S. & Lopatka, C. (1986~). Do fears summate?-III. *Behaviour Research and Therapy, 24,* 653-660.

Rachman. S. & Lopatka, C. (1986d). A simple method for determining the functional independence of two or more fears-IV. *Behaviour Research and Therapy, 24,* 661-664.

Rapee, R. M., Gaston, J. E., & Abbott, M. J. (2009). Testing the efficacy of theoretically derived improvements in the treatment of social phobia. *Journal of Consulting and Clinical Psychology, 77*, 317-327.

Rapee, R. M., & Heimberg, R. G. (1997). A cognitive-behavioral model of anxiety in social phobia. *Behaviour Research and Therapy, 35,* 741–756.

Rescorla, R.A., & Wagner, A.R. (1972). A theory of Pavlovian conditioning: Variations in the effectiveness of reinforcement and non-reinforcement. In A. H. Black & W. F. Prokasy (Eds.), *Classical conditioning II: Current research and theory* (pp. 64– 99). New York: Appleton-Century-Crofts.

Rinck, M., Becker, E.S. (2007). Approach and avoidance in fear of spiders. *Journal of Behavior*

Therapy and Experimental Psychiatry, 38, 105-120.

Ritter, B. (1970). The use of contact desensitization, demonstration-plus-participation and demonstration-alone in the treatment of acrophobia. *Behavior Research and Therapy, 7,* 157-164.

Roseman, I. J. (1984). Cognitive determinants of emotion: A structural theory. *Review of Personality and Social Psychology, 5,* 11-36.

Salkovskis, P.M., Clark, D.M., Gelder, M. (1996). Cognition-behaviour links in the persistence of panic. *Behavior Research and Therapy, 34,* 453-458.

Sanderson, W. C., Rapee, R. M., & Barlow, D. H. (1989). The influence of an illusion of control on panic attacks induced via inhalation of 5.5% carbon dioxide-enriched air. *Archives of General Psychiatry, 46,* 157–162.

Scherer, K. R. (1999). Appraisal theory. In T. Dalgleish & M. J. Power (Eds.), *Handbook of cognition and emotion* (pp. 637-663). Chichester, England: Wiley.

Seligman, M., & Johnston, J. (1973). A cognitive theory of avoidance learning. In F. J. McGuigan & D. B. Lumsden (Eds.), *Contemporary approaches to conditioning and learning* (pp. 69–110). Washington, DC: Winston.

Shanks, D.R., St. John, M.F. (1994). Characteristics of dissociable human learning systems. *Behavioral and Brain Sciences, 17,* 367-447.

Shear M.K., Bjelland I., Beesdo K., Gloster A.T., Wittchen H.U. (2007) Supplementary dimensional assessment in anxiety disorders. *International Journal of Methods in Psychiatric Research*, *16*(*Suppl. 1),* S52. DOI: 10.1002/mpr.215.

Sloan, T., & Telch, M. J. (2002). The effects of safety-seeking behavior and guided threat reappraisal on fear reduction during exposure: An experimental investigation. *Behaviour*

Research and Therapy, 40, 235–251.

Smith, C. A., & Ellsworth, P. C. (1985). Patterns of cognitive appraisal in emotion. *Journal of Personality and Social Psychology, 48,* 813-838.

Starr, M.D., Mineka, S. (1977). Determinants of fear over the course of avoidance learning. *Learning and Motivation, 8,* 332-350.

Strack, F., & Deutsch, R. (2004). Reflective and impulsive determinants of social behavior. *Personality and Social Psychology Review, 8*, 220–247.

Telch, M. J., Brouillard, M., Telch, C. F., Agras, W. S., & Taylor, C. B. (1989). Role of cognitive appraisal in panic related avoidance. Behaviour Research and Therapy, 27, 373–383.

Tottenham, N., Tanaka, J.W., Leon, A.C., McCarry, T., Nurse, M., Hare, T.A., Marcus, D.J., Westerlund, A., Casey, B.J., Nelson, C. (2009). The NimStim set of facial expressions: Judgments from untrained research participants. *Psychiatry Research, 168(3*), 242-249

Trower, P., & Gilbert, P. (1989). New theoretical conceptions of social anxiety and social phobia [Special Issue: Social phobia]. *Clinical Psychology Review, 9*, 19–35.

Tsao, S. D., & McKay, D. (2004). Behavioral avoidance tests and disgust in contamination fears: Distinctions from trait anxiety. *Behaviour Research and Therapy, 42,* 207–216.

Wagner, A. R. (1981). SOP: A model of automatic memory processing in animal behavior. In N. E. S. R. R. Miller (Ed.), *Information processing in animals: Memory mechanisms*. Hillsdale, NJ: Erlbaum.

Wagner, A.R., Rescorla, R.A. (1972). Inhibition in Pavlovian conditioning: Application of a theory. In R.A. Boakes & M.S. Halliday (Eds.), *Inhibition and learning* (pp. 301-336). London, England: Academic Press.

Watson, D., & Clark, L. A. (1991). Self-versus peer ratings of specific emotional traits: evidence of convergent and discriminant validity. *Journal of Personality and Social Psychology, 60,* 927-940.

Watson, D., Weber, K., Assenheimer, J. S., Clark, L. A., Strauss, M. E., & McCormick, R. A. (1995). Testing a tripartite model: I. Evaluating the convergent and discriminant validity of anxiety and depression symptom scales. *Journal of Abnormal Psychology, 104,* 3-14.

Weber, E. U., Blais, A., & Betz, N. (2002). A domain-specific risk-attitude scale: Measuring risk perceptions and risk behaviors. *Journal of Behavioral Decision-Making, 15*, 263–290.

Weiner, B., Graham, S., & Chandler, C. (1982). Pity, anger, and guilt: An attributional analysis. *Personality and Social Psychology Bulletin, 8,* 226-232.

Weinstein, N. (1980). Unrealistic optimism about future life events. *Journal of Personality and Social Psychology, 39,* 806–820.

Wells, A., Clark, D.M., Salkovskis, P., Ludgate, J., Hackmann, A., & Gelder, M. (1995). Social Phobia: The role of in-situation safety behaviours in maintaining anxiety and negative Beliefs. *Behavior Therapy, 26,* 153-161.

Weisman, R., & Litner, J.S. (1972). The role of Pavlovian events in avoidance training. In R.A. Boakes & M. S. Halliday (Eds.), *Inhibition and Learning* (pp. 253–270). New York: Academic Press.

Woods, A. M., & Bouton, M. E. (2008). Immediate extinction causes a less durable loss of performance than delayed extinction following either fear or appetitive conditioning. *Learning & Memory, 15*(12), 909-920.