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Chapter I: Review of the Literature

Test anxiety is an unpleasant state characterized by psychological, physiological, or behavioral components, which individuals experience before or during a test. Test-anxious individuals typically worry about their performance, especially focusing on possible negative outcomes such as failure (Sieber, O'Neil, & Tobias, 1977). They may also suffer from specific cognitive impairments such as difficulty concentrating or remembering information. Emotionally, students may exhibit physical manifestations of test anxiety including sweating, increased heart rate, and nausea or other somatic issues (Huberty & Dick, 2006; Zeidner, 1998). Furthermore, test anxiety may lead to behavioral problems including avoidance of tests, replacing difficult tasks with easier tasks, and squirming or biting one's nails (Huberty & Dick, 2006). According to studies that measured the prevalence of test anxiety among college undergraduates in 1997 and 1998, approximately 20 – 35 % of college undergraduates experience test anxiety (Naveh-Benjamin, Lavi, McKeachie, & Lin, 1997; Zeidner, 1998).

Because test anxiety is a common problem among students and may prompt students’ distorted cognitions, emotional volatility, unpleasant behaviors, and reduce academic performance, several researchers have studied potential components of test anxiety and possible treatments.

Theories of Test Anxiety on Worry and Emotionality

Liebert and Morris (1967) proposed that test anxiety has two main features – worry and emotionality. Worry consists of cognitive concerns such as lacking confidence or rumination about poor performance. Emotionality involves an increase in physiological arousal within the sympathetic nervous system, which may manifest as a person experiencing an increased heart rate and sweaty palms. In one of the first studies on test anxiety, Liebert and Morris investigated two relationships. First, they studied the relationship between worry and performance
expectancy. Second, they examined the relationship between emotionality and performance expectancy. They defined worry and emotionality according to the definitions above. Performance expectancy was defined as how individuals predict they will perform on a college exam.

Liebert and Morris (1967) hypothesized that there would be an inverse relationship between worry and performance expectancy. In other words, as worry increases, performance expectancy decreases (i.e., individuals predict poorer performance on a college exam) and vice versa. They also hypothesized that the relationship between emotionality and performance expectancy is mediated by individuals’ level of certainty about their performance. More specifically, it was predicted that emotionality would be the greatest when individuals are least certain about their performance, which was defined as a performance expectancy near 0.5. College undergraduate students were categorized into high, medium, and low performance expectancy groups based upon their reported subjective probability of whether they would do as well on an examination as they anticipated. Just before starting the examination, the participants also completed a questionnaire rating five worry items and five emotionality items on a 5-point Likert scale about their current mental and emotional states. As predicted, Liebert and Morris found that worry and performance expectancy were inversely correlated. However, they did not find a correlation between emotionality and performance expectancy. In addition, the level of certainty about test performance did not vary across high and low performance expectancy groups; therefore, it was ruled out as a mediating variable between emotionality and performance expectancy. It is possible that the level of certainty about test performance did not influence a potential relationship between emotionality and performance expectancy because students’ stress levels served as a mediating variable. This seminal study suggests that further research is needed
on the roles of emotionality, performance expectancy, and the degree of certainty students have about their anticipated test performance on their levels of test anxiety.

**Theories of Test Anxiety on Cognitive Tasks and Performance**

Because worry may be an important component of test anxiety, other researchers have investigated how individuals' levels and amounts of worry impact their test performance. Sarason (1988) suggested that worry interferes with persons' cognitive functions and depletes some of the resources, especially within working memory, needed for the test. Then, the students cannot employ the amount of working memory and attention necessary for the test items. Ultimately, this may lead to poorer test performance.

**Processing Efficiency Theory.** Eysenck and Calvo's (1992) research supported Sarason's (1988) hypothesis. They proposed the processing efficiency theory. This theory states that increased levels of worry initiate decreases in individuals' temporary available storage capacities in their working memories. In turn, these individuals allot less processing ability to tasks, such as tests. Subsequently, these initial effects of worry lead to compensatory increases in the effort people need to devote to the task at hand and other behaviors intended to enhance their performance. In addition, the authors differentiate between processing efficiency, the focus of their theory, as opposed to performance effectiveness. The latter, performance effectiveness, is the quality of individuals' overall performances; whereas, processing efficiency is individuals' performance effectiveness divided by the effort they utilized to perform the task at hand. The processing efficiency equation between performance effectiveness and effort expended shows that processing efficiency decreases as more effort and resources are used to perform at a particular level. Eysenck and Calvo argue that people must employ more effort and resources to perform at a particular level when they are experiencing worry; thus, people suffer from reduced
processing efficiency. However, this does not necessarily affect their performance effectiveness, or overall performance. For example, a test may be more difficult and require more effort for worried, test-anxious individuals (i.e., people with reduced processing efficiency) to attain a satisfactory score, but they may be able to eventually increase their effort and use different strategies to perform sufficiently overall (i.e., the people have the same level of effectiveness).

**Attentional Control Theory.** Eysenck, Derakshan, Santos, and Calvo (2007) improved upon Eysenck and Calvo’s (1992) processing efficiency theory with a new theory known as the attentional control theory. According to this theory, anxiety causes individuals to shift their attention to threatening stimuli, thereby decreasing the attention they are able to devote to the task at hand. Threatening stimuli may be either internal or external. For test-anxious students, internal threatening stimuli may often take the form of worrisome thoughts. External threatening stimuli may be unexpected, environmental distracters such as a power outage in the classroom during a test.

The attentional control theory assumes that anxiety interferes with individuals’ inhibition and shifting, which then causes them to devote attention to threatening stimuli instead of the task at hand. Inhibition and shifting are two functions of the central executive system or the area of the brain that regulates cognitive processes. The central executive organizes incoming information and allows individuals to either focus on a task or move from one task to another task (Lambert & Kinsley, 2011). Inhibition is the ability to prevent incoming, unrelated stimuli from disrupting individuals’ focus on the task at hand. Shifting is the ability to move from one task to another task, or group of tasks, which is contingent upon the difficulty and attentional demands required for the task(s).
Lee (1999) substantiated both the processing efficiency theory and the attentional control theory. The author found that among 119 college undergraduates enrolled in an educational psychology course, those with higher test anxiety performed worse on a verbal-analogies task than their low-anxious counterparts. Highly anxious students displayed decreased information processing abilities, which were likely due to a shift in focus toward task-irrelevant information thereby resulting in a reduced working memory capacity.

Because of the effects of test anxiety on working memory (Sarason, 1988), the processing efficiency theory (Eysenck & Calvo, 1992), and the attentional control theory (Eysenck, Derakshan, Santos, & Calvo, 2007), the present study will examine exploratory analyses on the relationships between test anxiety and two major cognitive variables (i.e., processing speed and working memory). First, the investigator will administer the letter comparison task (Salthouse & Babcock, 1991). This measure of processing speed will be used to ascertain whether test anxiety, which may produce a deficiency in inhibition and shifting tasks, is related to processing speed among the sample. Second, the investigator will administer the listening span task (Salthouse & Babcock, 1991). This measure of working memory will be utilized to determine whether test anxiety is correlated with working memory among the study sample. The Measures section in Chapter III describes these tasks in greater detail.

**Theory of Test Anxiety as a Type of Trait Anxiety**

Eysenck (1992) provided an alternative mechanism by which test anxiety may originate in students. According to Eysenck, people who are experiencing high test anxiety are actually experiencing increased levels of trait anxiety. Trait anxiety is defined as a consistent pattern of responding in an anxious manner due to the expectation that threatening situations will arise. In the case of a test, students perceive the testing situation as a threat. Instead of devoting all of
their cognitive resources to the test, they direct their attention toward their threatening surroundings. Acting upon their heightened trait anxiety renders the students more vulnerable to distraction and interference, thus perpetuating test anxiety and potentially influencing their test performance.

Self-Evaluations and Evaluations By Others Influencing Test Anxiety

In addition to trait anxiety influencing test anxiety, individuals’ self-evaluations and perceptions about how others may evaluate their academic performance may also impact their level of test anxiety. Hagtvet, Ye, Man, Pal, and Sharma (2010) conducted a study of over 3,000 individuals divided among 18 samples of mainly ninth graders, including individuals from a broad range of countries such as the Czech Republic, the United States, and India. The age of participants in each sample varied, but all of the participants ranged from 13 years old to 21 years old.

The purpose of their study was two-fold – to investigate the different categories that influence individuals’ worrisome thoughts and to determine whether a general factor exists within the participants’ set of worrisome thoughts. In order to achieve the first aim, participants completed a Failure Outcome Expectancies Inventory. A “failure outcome expectancy” was defined as the belief that a specific act would lead to the outcome of failure on an important exam. Participants rated several statements according to how accurately the statements defined them on a 4-point rating scale. Each statement began with “I am afraid of lower grades on an important exam” and ended with a different combination of a referent category (i.e., self, parents, teachers, siblings or classmates) and a concern category (i.e., study effort, ability, blame, self-esteem, future success, or controllability). For instance, a statement that combined the self-referent category and concern about study effort category was, “I am afraid of lower grades on
an important exam because this can reveal that I did not study or prepare hard enough for the exam.” Then, the researchers addressed the second aim of their study by examining each sample with the inclusion of a general factor. The purpose of the g-factor analysis was to ascertain whether the self and other-referent categories were actually components of a single construct of worry cognitions instead of separate categories. If they were components of a single construct, this would support Eysenck’s (1992) theory that test anxiety is simply one component of overall trait anxiety.

Results from the study showed that other-referent cognitions were typically more important, or accounted for a larger percentage of the variance of worry cognitions on an exam, than self-referent cognitions. Other-referent cognitions refer to situations in which the students feel like an external person (e.g., a parent, teacher, or sibling) will judge their academic performance negatively. Even when a general factor was added to control for all of the referent categories, the other-referent categories still accounted for a large portion of the variance in worry cognitions. Therefore, both self and other-referent worries appear to influence test anxiety independent of general worry, but thoughts of failure perceived to be generated by others about the students appear to be more salient to test anxious students. Future research is necessary to determine how self and other-referent worries are related to each other and what variables influence self and other-referent worries. One important caveat of this study was that the researchers used ninth graders for the study population, rather than college undergraduates as proposed in the current study. It is possible that the authors found significant variance within participants’ other-referent worries because the participants’ senses of self and others are actively developing during their teenage years. Even though the results of this study may not generalize to a college population, this study is important for the proposed study from a conceptual
standpoint. Both self-referenced cognitions and other-referenced cognitions appear to play a critical role in worrisome thoughts, which, in turn, influence individuals' levels test anxiety. In an effort to reduce individuals' levels of test anxiety, it will be crucial to understand and address the potential factors that may be influencing their test anxiety.

Zeidner’s (1998) Theory of Test Anxiety

Zeidner (1998) proposed another model concerning individuals’ personal evaluations with regard to test anxiety, which incorporates three components including the students’ perception of the test, self-perceptions, and views of the test-taking situation. Zeidner based his theory on Kurt Lewin’s (1951) equation or heuristic, which was an important advancement in the field of social psychology. Lewin’s equation suggested that both individuals themselves and their current situations need to be considered in order to accurately depict their behavior instead of solely relying upon their past histories or personality traits to account for their behavior. Within the domain of test anxiety, this theory emphasizes that individuals’ perceptions of the current testing situation should be assessed, above and beyond their self-perceptions or previous test performances, when considering individuals’ overall test anxiety.

Bonaccio and Reeve (2010) applied Zeidner’s (1998) broad theory of test anxiety to a novel study. They identified several variables within each of the three superordinate categories of individuals’ perceptions of the test, perceptions of themselves, and perceptions of the test-taking situation that appear to influence test anxiety (see Figure 1).
Figure 1. Model of the Three-factor Theory

Perceptions of the Test

Perceptions of the Self

Test Anxiety

Perceptions of the Test-Taking Situation

Figure 1. Model of the three-factor theory in which the arrows designate that these three components contribute to one’s test anxiety.

Using data from two samples of college undergraduates who were asked to reflect upon recent high test-anxiety situations, the investigators identified seven categories of perceptions that may lead to test anxiety. The first sample of 67 participants took part in a qualitative study. They were asked to think of a recent academic test situation in which they were highly anxious and respond to an open-ended prompt inquiring about the factors that contributed to their test anxiety. The researchers compiled the students’ responses and created a list of possible factors that may lead to test anxiety.

The second sample in Bonaccio and Reeve’s (2010) study was also asked to think about a recent academic test situation in which they were highly anxious. However, the participants provided quantitative data, instead of qualitative data, which was collected from the first sample. The second sample rated 22 statements, based upon the perceived sources of anxiety provided by the first sample, according to how accurately each statement reflected what that person thought or felt during the test-anxious situation on a 1 (not at all) to 5 (extremely) rating scale. In
addition, the second sample completed questionnaire items regarding their worry and tension as measured by the Reactions to Test Questionnaire (Sarason, 1984).

Based upon the data collected from both samples, the authors suggested several subcategories of perceptions that may lead to test anxiety within students’ perceptions of the test, their self-perceptions, and their perceptions of the test-taking situation. First, students’ perceptions of the test included test uncertainty (i.e., uncertain of the test format, no prior experience with the specified format, uncertain of test content, and lack of control), test difficulty (i.e., breadth of test content and complexity of test content), and instrumentality of test results (i.e., whether the test was an important determinant of the course grade or students’ grade-point averages, had a direct impact on the students’ progression in the program, or a direct impact on the students’ ability to be hired for particular jobs). Second, their self-perceptions were perceived low self-efficacy, temporary deficit, and trait-linked perceptions. Perceived low self-efficacy was defined as prior poor performance in the content area (i.e., not doing well in a course previously that is within the same subject area), lack of preparation for the test, and lack of ability on the test. A temporary deficit was defined as a physical or mental illness or exhaustion that may lead to reduced test performance. Trait-linked perceptions included whether the students endorsed generalized anxiety about tests, whether their striving for high achievement increased their levels of anxiety, whether their competitiveness increased their levels of anxiety, and a perceived lack of control over their performance on the test. Finally, their view of the test-taking situation was considered to be situational uncertainty (i.e., potential last minute obstacles to the test or an unexpected change in format), fear of disappointing others, or anxiety or level of test difficulty concerns due to comparing themselves to individuals who had already taken the test.
Results showed that students’ most important source of perceived test anxiety was their perceptions of the test, especially the perceived level of test difficulty and perceived instrumentality or how the test would impact their final course grade or future. However, the data also indicated that perceived low self-efficacy and anxiety proneness, which are both included in self-perceptions, were the two subcategories that most strongly and uniquely predicted test anxiety. Therefore, students’ reported perceptions may not accurately reflect the true sources that account for the most variance in their levels of test anxiety. By contrast, the students rated self-efficacy as the least important source of anxiety, albeit a source that still contributed to test anxiety.

There are several potential reasons that these divergent findings may have been discovered in Bonaccio and Reeve’s (2010) study. For instance, there is a tendency for students to respond in socially desirable ways, self-report is not always an accurate indicator of students’ personal thoughts and feelings, and students often account for potential poor performance through external factors (e.g., the test) instead of internal factors (e.g., students’ lack of ability; Miller, 1976). Furthermore, students are interested in preserving their own self-worth by attributing positive characteristics to themselves (Miller, 1976). Bonaccio and Reeve’s study is limited by the significantly larger number of Caucasian students in the sample as compared to students of other races. Therefore, more research is necessary regarding potential differences in perceived sources of test anxiety across race as well as gender. However, Bonaccio and Reeve’s study is important because it emphasizes that there may be several precursors to test anxiety, especially within major categories, with perceptions of the test and self-perceptions being perhaps the most salient factors to test takers.
Theory for the Present Study

Given the literature that has been referenced, the prevailing theories suggest that test anxiety is a multifaceted construct. On a broad level, both worry cognitions and emotions appear to influence individuals' levels of test anxiety (Liebert & Morris, 1967). However, several other variables may also affect people's test anxiety such as their levels of trait anxiety (Eysenck, 1992); their perceptions of the test, self-perceptions, and perceptions of the test-taking situation (Zeidner, 1998); and individuals' perception of how others may view them based upon their test performance (Hagtvet et al., 2010). Test anxiety theories also suggest that an increased level of test anxiety reduces the amount of processing ability individuals are able to devote to a test (Eysenck & Calvo, 1992) and may cause students to divert their attention to threatening internal or external stimuli instead (Eysenck et al., 2007).

The present study will operate under the assumption that Zeidner's (1998) three main variables account for individuals' test anxiety as they grapple with this emotional and cognitive experience. The study will utilize his theory of test anxiety, which from this point forward will be referred to as the "three-factor theory," purporting that test anxiety is composed of individuals' perceptions of the test, their self-perceptions, and their perceptions of the test-taking situation. The three-factor theory seems to be the most parsimonious, and the most comprehensive theory, especially when the subcategories researched by Bonaccio and Reeve (2010) are taken into consideration. Their subcategories of perceptions that may lead to test anxiety, within the three-factor theory, were listed previously. Because Hagtvet et al.'s (2010) study suggested that another important factor of test anxiety is individuals' perceptions of how others may view them based upon their test performance, the present study will also address this
factor. The fear of disappointing others is a subcategory within the students' perceptions of the test-taking situation.

The study will target the three factors of test anxiety by using the following Dialectical Behavior Therapy (DBT; Linehan, 1987) skills: One-Mindfully, Participate, Non-judgmentally, Observe, and Cope Ahead. One-Mindfully and Participate will target students' perceptions of the test. Non-Judgmentally and Observe will target students' self-perceptions. Finally, Cope Ahead will target students' perceptions of the test-taking situation (see Figure 2).

The skills will be described in detail in Chapter III, but they are briefly outlined here. One-Mindfully, Participate, Non-judgmentally, and Observe are some of the skills included in the Mindfulness skills. In general, Mindfulness skills are designed to help individuals focus their attention in a centered and direct manner to the present moment. The DBT mindfulness skills of One-Mindfully and Participate will target the students' perceptions of the test by emphasizing that the students should focus their attention on the test, become fully engaged in the experience, and practice accepting the aspects of the test that they cannot change. Non-judgmentally and Observe will address students' perceptions of themselves by educating the students about techniques to use in order to stay focused in the present moment and not on self-judgments.

Cope ahead is a skill that is intended to help individuals regulate their emotions by encouraging them to rehearse effectively coping with an emotional situation beforehand so they are able to handle it with greater ease when it occurs. This skill will direct students to engage in imaginal practice of the test-taking situation, which can lead to repeated exposure of the feared situation and mastery of these fears. This skill will help students manage their perceptions of the test-taking situation by accepting inevitable uncertainties of the test-taking situation, dealing with
emotional concerns about potentially disappointing people who are important to the students, and deescalating their own anxiety about the test.

**Figure 2.** DBT Skills for Factors of Test Anxiety

![Diagram showing the relationship between different skills and test anxiety]

*Figure 2.* DBT Skills that correspond with each factor in the three-factor theory for test anxiety.

**Interventions for Test Anxiety**

Researchers have employed a wide variety of treatments for test anxiety. For example, they have used cognitive therapy, relaxation techniques, and study-skills training (Ergene, 2003). The researchers’ conceptualization of test anxiety often determines which treatment they deem appropriate for a particular study sample.

**Meta-analyses of Several Test Anxiety Interventions.** Ergene (2003) conducted a meta-analysis of 56 studies, ranging from 1973 to 1998, with a total of 2,482 participants. The mean age of participants was 18.86 years old with a range of 10 years old to 32 years old. The majority of the participants were attending a college or university. The purpose of the meta-analysis was to examine the effectiveness of several treatment programs aimed at reducing test anxiety. Specifically, Ergene examined interventions for test anxiety, characteristics of the
participants, and aspects of the study designs. He wanted to ascertain whether any of these variables influenced the effectiveness of the intervention in reducing test anxiety.

Ergene (2003) found that the most beneficial interventions were cognitive and skill-focused combined, behavioral and skill-focused combined, and behavioral alone. Cognitive, behavioral, and cognitive behavioral approaches are designed to alleviate symptoms of test anxiety by altering individuals' thoughts, behaviors, or both. As a result, people are able to perform better or feel more comfortable in a testing situation. The skills-deficit approach utilizes skills training, on the other hand, which is based upon a learning deficit paradigm. According to this paradigm, people with test anxiety do not have the requisite study skills or test-taking skills necessary for preparing and taking tests. Thus, when these individuals learn study skills or test-taking skills, their test anxiety will decrease. More generally, Ergene noted that test anxiety interventions documented in the literature have been divided into four major categories: behavioral approaches, cognitive approaches (e.g., Beck, Emery, & Greenberg, 1996; Jones & Petruuzzi, 1995), cognitive-behavioral approaches (e.g., Kondo & Gifu, 1997; Sud & Prabha, 1996), and skill-deficit approaches (e.g., Onwuegbuzie & Daley, 1996; Sanghvi, 1995)

Ergene (2003) conducted a two-hour seminar for his graduate students on how to code the studies used in his meta-analysis according to his coding manual, which was not included in the published article. Then, he supervised three graduate students while they coded the studies according to the following categorical variables: intervention approach or type of therapy (behavioral, cognitive, cognitive-behavioral, skill-focused, behavioral and skill-focused combined, cognitive and skill-focused combined, cognitive and behavioral and skill-focused combined, or other techniques); type of intervention technique within the type of therapy (systematic desensitization, relaxation training, anxiety management training, hypnotherapy,
other behavioral techniques, rational-emotive therapy, cognitive restructuring, other cognitive
behavioral techniques, cognitive-behavioral modification, stress-inoculation training, other cognitive-
behavioral techniques, study-skills training, other skill focused interventions, behavioral and
skill-focused approaches combined, cognitive and skill-focused approaches combined, cognitive
behavioral and skill-focused combined, or other interventions); intervention modality (group,
individual, or both); time in therapy in minutes (0-60, 61-200, 201-350, 351-500, 501-650, or
651 or above); education level of participants (primary school, middle school, high school, or
college and university); and publication status (published or unpublished).

The author found many significant results, the most important of which are described
below. The overall effect size of the meta-analysis was 0.65 meaning that studied interventions
for test anxiety were generally effective. According to Cohen’s (1977) criteria on effect size, an
effect size of 0.65 is medium to large. Stated in another way, the average person who
participated in a treatment for test anxiety would have less test anxiety than 74% of the people
who did not participate in a treatment. The effect sizes for the most beneficial intervention
approaches, or types of therapy, were based upon Hunter and Schmidt’s (1990) formulas on
effect size differences instead of Cohen’s (1988) standard. According to Hunter and Schmidt’s
method of adjusting the effect size to account for measurement error by dividing the effect size
by the square root of the dependent variable’s reliability coefficient, a greater effect size
difference indicated that the treatment was more beneficial to participants. The effect size
differences among the most impactful types of therapy were 1.22 for cognitive and skill-focused
combined, 1.10 for behavioral and skill-focused combined, and 0.80 for behavioral alone.
Ergene (2003) noted that the type of intervention technique, within each of the larger categories
of types of therapy, showed that cognitive restructuring had the greatest effect size difference,
followed closely by behavioral and skill-focused approaches combined and cognitive and skill-focused approaches combined. Skills training by itself, either study-skills or test-taking skills, only produced a small effect size difference. These latter results further support that the effectiveness of cognitive or behavioral interventions can be enhanced when combined with skills training interventions. Interventions that utilized both individual and group modalities, as opposed to simply one or the other, had the most positive impact upon participants. In addition, participants who spent 201-350 min in treatment had the largest effect size differences as compared to participants who spent more or less than 201-350 min in treatment. Moderate effect size differences were found for college and university students. Finally, no difference was found in effect sizes when comparing published studies to unpublished studies among the 56 studies. Due to the latter finding based upon the wide range of studies included in his meta-analysis, Ergene concluded that there does not seem to be a publication bias in the literature on test anxiety as a whole.

Ergene’s (2003) meta-analysis provided many robust conclusions yet he also emphasized numerous limitations and areas needed for future research on test anxiety. Based upon the meta-analysis, a combined treatment program may be the most promising option for individuals who suffer from test anxiety. Skills training (i.e., study-skills or test-taking skills), developing self-awareness about one’s own thoughts and behaviors regarding testing situations, and learning how to focus one’s attention on the test may be important features of a combined treatment program. Furthermore, a combined treatment program may be even more effective if it incorporates both individual and group modalities and is administered over a relatively brief period of time. Ergene cautioned his readers that significantly more research on test anxiety is necessary. Researchers have used small sample sizes, a wide variety of research settings and
conditions that are difficult to compare to each another, and they have not collected sufficient data on the characteristics of the participants in test anxiety interventions. Another important drawback of Ergene’s study is that he did not include acceptance-based therapy approaches in his meta-analysis.

Hembree (1988) also conducted a meta-analysis on test anxiety interventions, but he used approximately 10 times as many studies as Ergene (2003). The purpose of his meta-analysis was more theoretical as he investigated the nature, effects, and interventions of test anxiety. The meta-analysis contained 562 studies, from 1950 through 1986, utilizing individuals enrolled in kindergarten through graduate school. Three hundred sixty studies involved college undergraduate participants. Hembree documented a myriad of significant results. Because the present study utilizes college undergraduates, the results of the meta-analysis specifically pertaining to college undergraduate participants will be reported here.

Based on 627 test-anxious college students, who completed the subscales of the California Psychological Inventory (Gough, 1987) and were included in Hembree’s (1988) meta-analysis, high test-anxious college undergraduates had a lower sense of well-being, reduced level of self-acceptance, decreased self-control, lower acceptance of responsibility, reduced capacity for status (i.e., individual characteristics that enable one to achieve a higher status and success), decreased tolerance, and reduced intellectual efficiency as compared to low test-anxious college undergraduates. In addition, Hembree reported more generally that high test-anxious college students who experience difficulties encoding information prior to a test and reproducing it in a testing situation are more likely to be influenced by external sources that could increase their anxiety and are more vulnerable to experience anxiety in other areas of their lives. Regarding treatments for high test-anxious students, the meta-analysis showed that cognitive-behavioral
treatments (i.e., cognitive modification, attentional training, insight therapy, anxiety management training, and stress inoculation) and all behavioral therapies (e.g., systematic desensitization) decreased test anxiety if provided in either individual or group settings. Hembree’s meta-analysis also revealed that study-skills training alone did not decrease test anxiety. Furthermore, Hembree found that behavioral or cognitive-behavioral interventions decreased test anxiety among high test-anxious college undergraduates.

**Cognitive Therapy and Cognitive-Behavioral Therapy.** Data from the previous meta-analyses indicated that cognitive therapy, behavioral therapy, Cognitive-Behavioral Therapy, or any of these therapies combined with study-skills training were effective treatments for test anxiety (Ergene, 2003; Hembree, 1988). Seminal individual studies have been conducted as well, which utilized either Cognitive Therapy or Cognitive-Behavioral Therapy in order to reduce test anxiety.

Prior to reviewing the literature on these specific treatments, it is important to understand the definitions of both Cognitive Therapy (herein abbreviated as CT) and Cognitive-Behavioral Therapy or Behavioral Therapy (herein abbreviated as CBT). CT was developed by Beck (1976) and is based upon the principle that a therapist can access an individual’s emotions by first addressing the person’s thoughts. The therapist’s role is to challenge and help clients alter their negative, unhelpful, or distorted self-views. This process reduces individuals’ psychological distress and enables them to feel more positive. CBT is an extension of CT because it emphasizes the association between individuals’ thoughts, feelings, and behaviors. If a therapist is able to help individuals change their maladaptive thought patterns and feelings then they will, in turn, most likely change their self-destructive behaviors. Ultimately, the goal of CBT is to help individuals act in ways that correspond to more adaptive, positive thoughts and feelings.
CBT is a goal-directed therapy focused on solving clients’ problems and increasing their coping skills (NAMI, 2012).

In an influential study in 2009, Dundas, Anderssen, Wormnes, and Hauge investigated how 32 test-anxious students, primarily between 20 and 25 years old, used a CBT intervention to reduce their test anxiety. The students participated in a 7-hour CBT intervention divided across three group sessions. During the intervention, a therapist educated the participants about the unwanted effects of negative self-statements, such as anxiety. Participants were instructed to practice substituting positive self-statements for negative self-statements and took part in a relaxation exercise regarding a testing situation. The authors found that a large number of the participants used the skills they had learned in the CBT intervention to their advantage during their next exam. More specifically, the participants found judgment errors in their negative self-statements, broadened their potential views of reality, and looked to others for confirmation of reality. These strategies appeared to help students when their anxiety arousal levels were not excessively high. In addition, students reported that they did not always believe that their positive self-statements were realistic. In some cases, they relayed that using positive self-statements did not alleviate their test anxiety. Two of the main limitations of this study were that only four of the total participants were men and that the CBT intervention used in the study was not explained in a comprehensive manner. However, the study emphasized that positive self-statements included in a CBT treatment must be believable and acceptable to test-anxious students in order to effectively help them reduce their test anxiety.

Orbach, Lindsay, and Grey (2007) studied a CBT intervention for test anxiety as well, but the participants in the study accessed the treatment via the Internet. Participants were randomly assigned to receive a CBT intervention or no intervention. The authors analyzed data
from 30 participants in the CBT group and 28 participants in the control group from an original sample of 47 students and 43 students in each group, respectively. The CBT treatment consisted of six modules that focused on an explanation of test anxiety, applying rational thinking to testing situations, managing one’s stress, and proficiently studying for tests. The control group also received an explanation of test anxiety but worked on “brain puzzles” throughout the intervention instead. Both groups underwent a progressive relaxation exercise following their respective modules. According to the Test Anxiety Inventory (Spielberger et al., 1980) and the Anxiety Hierarchy Questionnaire (Orbach, 2002), which are self-report measures of overall test anxiety and anxiety in a test-taking situation, the participants in the CBT group showed significantly less test anxiety than those in the control group. The study has large implications and may be a promising form of CBT delivery because of the ease and widespread use of the Internet, the ability of individuals to progress through the treatment at their own pace, and the anonymous nature of this data collection medium. However, more studies with greater sample sizes and more standardized CBT treatments are necessary in order to confirm these results.

By contrast, Nelson and Knight (2010) chose a different approach for investigating the potential effects of CT or CBT interventions on test anxiety. They specifically studied one component of a CT or a CBT treatment, which may elucidate the potential effects of a full CT or CBT treatment. The researchers conducted a study employing a “positive thought task,” in which they asked some of the 118 introductory psychology students to write about successful personal experiences as compared to a “control task” wherein other students wrote about their morning routines. The underlying theory of their study was that the positive thought task would prompt more positive feelings, less negative feelings, greater optimism, and reduced test anxiety about an upcoming pop quiz. Nelson and Knight confirmed their hypothesis and documented
that the group who participated in the positive thought task also showed increased confidence in their future ability to cope with stressors.

**Combinations of CBT and Other Therapies.** Other published studies in the literature report on intervention programs that combine several aspects of CT and CBT as well as other self-help strategies to reduce test anxiety. For instance, Damer and Melendres (2011) designed a 4-week treatment called “Tackling Test Anxiety” for college undergraduates suffering from test anxiety. College campus staff members typically co-led the group every week for 75 min per session. The treatment included issues such as how to change one’s negative thoughts, study skills, study habits, self-care, time-management, mindfulness, relaxation and breathing exercises, and practice dealing with distractions. They found that among 17 college undergraduates who completed the intervention, their self-reported levels of test anxiety significantly decreased, as measured by the TAI (Spielberger et al., 1980). Furthermore, they believed they had developed a new perspective on test anxiety and could cope with their problems more effectively.

Likewise, Sapp (1996) utilized an assortment of therapies for test anxiety in his study. He compared Cognitive-Behavioral Hypnosis (i.e., participants receive suggestions on how to relax in testing situations and practice substituting illogical thoughts with positive statements about the self), Relaxation Therapy (i.e., progressive muscle relaxation and in later sessions, thinking about how the person felt when relaxed), and Supportive Counseling (i.e., providing a comfortable environment in which the student can devise personalized ways of managing his or her test anxiety). Trained, advanced-standing graduate students administered the treatments individually to each participant for approximately one hour each week over the course of eight weeks. In addition, the treatments were compared across the domains of test anxiety with regard to the participants’ level of worry, test anxiety with regard to how emotional or physically
aroused the participants became, and grade point averages before and after the treatment. A total of 45 undergraduate and 45 graduate students were randomized to each treatment. Sapp discovered that Supportive Counseling was the most effective treatment for reducing worry and emotionality test anxieties and increasing GPAs among college undergraduates; whereas, Relaxation Therapy was the most effective treatment across all of these domains for graduate students. The study revealed that level of education seems to be a mediating variable for the test anxiety intervention. As such, it may be beneficial to incorporate Supportive Counseling strategies in the present study’s intervention for college undergraduates.

Dundas, Wormnes, and Hauge (2009) expanded upon Sapp’s (1996) study emphasizing that students often adapt test anxiety interventions to suit their needs. In a qualitative study assessing how students responded to and revised a CBT intervention, in addition to a self-hypnosis treatment in half of the participants, the authors concluded that the 36 students studied used three central coping strategies to reduce their test anxiety. They were self-hypnosis (i.e., visualizing themselves in a state of complete relaxation and rehearsing positive self-statements), using positive self-statements to bolster their confidence and challenging their irrational thoughts, and creating their own strategies such as accepting the limitations of the testing situation and acknowledging that their anxiety is a real feeling. The first two strategies followed from the intervention directly, but the third strategy was unique to the individual students. Surprisingly, almost 70% of the sample utilized their own coping strategies that were not explicitly outlined or practiced in the intervention. The results of this study suggest that students may use their own self-protective methods to control their test anxiety, which should be documented in the follow-up procedures post intervention. More globally, this finding may affect therapeutic interventions for test anxiety when a therapist and client are devising strategies
for combating the client’s test anxiety. It may also highlight the importance of students developing personalized plans in order to reduce their test anxiety.

There appears to be a wide array of literature on cognitive, behavior, and cognitive-behavioral therapy interventions for test anxiety that have suggested that these methods work well (Ergene, 2003; Hembree, 1988; Orbach, Lindsay, & Grey, 2007). Introducing skills training, such as study-skills training, may also increase the effectiveness of these interventions. However, only a few studies on other treatment modalities, such as acceptance strategies, have been conducted (Brown et al., 2011). For example, Zettle (2003) was the only study as of 2012 that compared Acceptance and Commitment Therapy (Eifert & Forsyth, 2005) and systematic desensitization. In addition, the only study as of 2012 comparing CT and Acceptance-Based Behavior Therapy is detailed below (Brown et al., 2011).

**Cognitive Therapy vs. Acceptance-Based Behavior Therapy.** According to Brown et al. (2011), it is unknown whether cognitive therapy or Acceptance-Based Behavior Therapy (i.e., ABBT or a therapy that focuses on an individual accepting his or her thoughts) is most beneficial for students suffering from test anxiety. As a result, they conducted a study comparing these two treatments.

The CT intervention used in the study was based mainly upon Beck, Emery, and Greenberg’s (1985) theory of CT used for treating anxiety disorders and phobias. The major premise of this type of therapy, as originally conceptualized by Beck (1987), is that thoughts, feelings, and behaviors are related in such a way that one’s thoughts influence his or her feelings and behaviors. So, if one engages in unrealistic or irrational thinking, this may prompt the individual to have maladaptive feelings and behaviors. CT intended to reduce test anxiety focuses on recognizing and reformulating irrational thoughts, such as an immense fear of failure,
in order to help the individual change his or her feelings and behaviors that may follow these thoughts. The participants in this group engaged in several exercises including keeping a record of their thoughts before the final exam, relaxation techniques, and an in-group simulation of a mock exam. They were assigned homework exercises based upon what they learned in the therapy session and encouraged to complete it before the final exam in their psychology course.

The ABBT intervention used in Brown et al.’s (2011) study, by contrast, incorporated principles from Acceptance and Commitment Therapy (ACT; Hayes, Strosahl, & Wilson, 1999), Mindfulness-based Stress Reduction (MBSR; Kabat-Zinn, 1990), and Dialectical Behavior Therapy (DBT; Linehan, 1993a). ACT encourages individuals to participate in behaviors that are meaningful to them and aligned with their core values. This way of living helps the person move toward accepting their troubling thoughts and feelings instead of trying to change, quell, or become entangled with them (Hayes et al., 1999). MBSR purports that an individual should adopt a nonjudgmental stance when engaging with his or her thoughts, feelings, and sensations. Meditating, focusing one’s attention, and trying to live in the moment are specific techniques used in this type of therapy (Kabat-Zinn, 1990). For the purpose of the study, participants in the ABBT intervention completed multiple psycho-educational, in-group exercises stressing the futility of trying to control one’s thoughts and anxiety. They learned how to “gently refocus,” a technique also used in MBSR and DBT, their thoughts and feelings while studying or taking the exam. Finally, they also engaged in the same mock examination exercise that the CT group completed and had homework exercises to complete before their final exam as well.

Prior to the administration of CT and ABBT interventions, the authors used an abbreviated form of the Test Anxiety Inventory (TAI; Spielberger et al., 1980), the TAI-5 (Taylor & Deane, 2002) as a screening tool to measure students’ levels of test anxiety. Sixteen
individuals, who scored in the elevated range (i.e., one standard deviation above the mean) for test anxiety and were enrolled in psychology courses, qualified for the study. The participants completed preliminary surveys and questionnaires and were randomly assigned to an ABBT or a CT group. Then, they took their midterm exam in one of their psychology courses. Before completing their final exam in the same course, they participated in a 2-hour group therapy treatment. The researchers collected post-treatment data online within 48 hours of the participants completing their final exams.

Results showed that all of the participants experienced an overall decrease in test anxiety, as measured by the TAI from pre-intervention to post-intervention. Participants also seemed to understand the two interventions equally well. However, ABBT appeared to be better for increasing exam scores. Students who participated in ABBT achieved higher scores from their midterm exam to their final exam as compared to students who participated in CT. In addition, ABBT participants reported feeling less test anxiety from their midterm exam to their final exam even though this reduction was not statistically significant.

Limitations of this study provide important data for future researchers to consider when designing novel studies. The study had a small sample size, did not collect data on how many participants completed their homework or other information including hours spent studying, and post-treatment measurements of anxiety were subject to biased memories. However, this was the only study as of 2011 that had compared CT and ABBT for the treatment of test anxiety.

Much of the research on test anxiety theories and interventions for this problem suggest a need for further research. For example, studies have utilized small sample sizes, poor control conditions, and methods that are not described comprehensively in the study or administered in a standardized manner across participants. The present study will address some of these issues.
Summary and Need for the Present Study

The literature indicates that individual or group CBT treatments and behavioral therapies (Hembree, 1988; Orbach, Lindsay, & Grey, 2007); cognitive therapy (Brown et al., 2011); cognitive restructuring, behavioral and skill-focused approaches combined, cognitive and skill-focused approaches combined (Ergene, 2003); and ABBT (Brown et al., 2011) are effective treatments for test anxiety. These interventions target a wide range of potential variables that seem to influence college undergraduates’ test anxiety including their levels of trait anxiety (Eysenck, 1992); their perceptions of the test, self-perceptions, and perceptions of the test-taking situation (Zeidner, 1998); and their perception of how others may view them based upon their test performance (Hagtvet et al., 2010).

The processing efficiency theory (Eysenck & Calvo, 1992) and the attentional control theory (Eysenck, Derakshan, Santos, & Calvo, 2007) are important for the present study because they clarify the potential mechanisms affected by test anxiety, which would then influence the type of intervention that would be appropriate for test-anxious college undergraduates. The processing efficiency theory suggested that test-anxious students have reduced storage capacities in their working memories. The attentional control theory emphasized that individuals’ impaired functions of inhibition and shifting, as well as directing attentional resources to distractors instead of the test, may account for increased test anxiety (Eysenck et al., 2007). Due to the higher distractibility of high test-anxious individuals, an intervention may be beneficial if it incorporates strategies to quell internal and external distractors present in a testing situation.

DBT skills training is a promising treatment for test anxiety among college undergraduates for several reasons. First, it is a brief intervention, which will only require approximately two hours of the students’ time. In Brown et al.’s (2011) study, they highlighted
the advantage of a 1 session treatment noting that it is much more likely that college
undergraduates will be able to fit the intervention into their wide variety, and occasionally
uncertain, array of courses and activities. Second, the treatment is a comprehensive combination
treatment, which addresses each theoretical component of test anxiety with a corresponding DBT
skill. Therefore, it will be more likely to reduce individuals’ test anxiety. Finally, the treatment
will teach students how to focus their attention on the test, instead of the external, distracting
variables that tend to increase test anxiety.

Furthermore, the present study may help college undergraduates reduce their test anxiety
by teaching participants the skill of being mindful of a successful personal experience (Nelson &
Knight, 2010), formulating realistic positive self-statements (Dundas, Anderssen, Wormnes, &
Hauge, 2009), and creating a comfortable environment in which students can develop
personalized ways of managing their test anxiety (Sapp, 1996).

The present study is an important contribution to the literature because a study applying
specific DBT skills to reduce test anxiety among college undergraduates has not been conducted.
This will extend the sparse literature on acceptance-based treatments for test anxiety.
Chapter II: Rationale and Hypotheses

Individuals who are afflicted by test anxiety usually experience uncomfortable psychological, physical, and behavioral symptoms before or during a test. Possible psychological symptoms include persistent worry about poor performance on a test (Sieber, O'Neil, & Tobias, 1977), decreased cognitive resources devoted to the test (Eysenck & Calvo, 1992), and unrealistic thoughts about oneself and the testing situation (Bonaccio & Reeve, 2010). Physical problems may manifest as increased heart rate, sweating, or shortness of breath. Lastly, behavioral issues may arise such as biting one’s nails or avoiding tests (Huberty & Dick, 2006; Zeidner, 1998).

A plethora of researchers have investigated potential treatments for the unpleasant symptoms of test anxiety. They have concluded that Cognitive Behavioral Therapy, Behavioral Therapy, and Cognitive Therapy seem to be effective for symptom reduction (Ergene, 2003; Hembree, 1988; Orbach et al., 2007). In addition, skills training, recollection of successful personal experiences (Nelson & Knight, 2010), positive self-talk (Dundas et al., 2009), and enabling students to create their own methods and routines for managing their test anxiety (Sapp, 1996) have also led to beneficial outcomes.

Because approximately 20-35 percent of college undergraduates experience test anxiety (Naveh-Benjamin et al., 1997; Zeidner, 1998), there appears to be a critical need for an effective treatment intervention. An abbreviated, DBT skill-focused therapy based upon skills within DBT, developed by Marsha Linehan (1993a, b), may be a beneficial treatment option. The intervention would use the skills of One-Mindfully, Participate, Non-judgmentally, Observe, and Cope Ahead to reduce students' test anxiety generated by the students' perceptions of the test, self-perceptions, and perceptions of the test-taking situation. In general, DBT incorporates
acceptance and techniques to help an individual change his or her harmful or undesirable behavior. The therapy was originally designed as an outpatient program to treat chronically parasuicidal women (Linehan, 1987) but has since been applied to individuals with other disorders, primarily Borderline Personality Disorder (Linehan 1993a, b). However, there have been no empirical reports of DBT skills being used to treat individuals with test anxiety.

Given the referenced literature and limitations of previous studies, the present study will test the following hypotheses:

1. When comparing participants receiving brief DBT to participants in a control group, the individuals in brief DBT will have greater improvement of test scores (as measured between scores on an early exam and a later exam in a psychology course).

2. When comparing participants receiving brief DBT to participants in a control group, the individuals in brief DBT will have greater reductions in test anxiety as measured by the Test Anxiety Inventory (TAI; Spielberger et al., 1980).

3. When comparing participants receiving brief DBT to participants in a control group, the individuals in brief DBT will have greater reductions in state anxiety as measured by the State Trait Anxiety Inventory: S-Anxiety scale (STAI; Spielberger et al., 1983).

4. When comparing participants receiving brief DBT to participants in a control group, the individuals in brief DBT will have greater reductions in trait anxiety as measured by the State Trait Anxiety Inventory: T-Anxiety scale (STAI; Spielberger et al., 1983).

For exploratory purposes, the investigator will examine several other variables. Namely, the investigator will examine the impact of brief DBT, as compared to no brief DBT treatment, on mindfulness and acceptance. It is expected that individuals in the brief DBT group will have greater increases in both mindfulness and acceptance as compared to their control group.
counterparts. Mindfulness will be measured by the Kentucky Inventory of Mindfulness Skills (KIMS; Baer, Smith, & Allen, 2004), and acceptance will be measured by the Acceptance and Action Questionnaire-II (AAQ-II; Bond et al., 2011). In addition, the investigator will explore potential relationships among anxiety and two cognitive parameters: first, processing speed and second, working memory. The Letter Comparison Task (Salthouse & Babcock, 1991) and the Listening Span Task (Salthouse & Babcock, 1991), respectively, will measure these cognitive variables. It is expected that students who have higher anxiety levels on each of the TAI (Spielberger et al., 1980), STAI: S-Anxiety scale (Spielberger et al., 1983), and the STAI: T-Anxiety scale (Spielberger et al., 1983) will exhibit reduced processing speed as well as decreased working memory capacity.
Chapter III: Method

Participants

Participants for the study will include 28 college undergraduates enrolled in psychology courses at Xavier University – a mid-sized, Catholic University in the Midwest. They will be recruited from Xavier University’s Department of Psychology college undergraduate participant pool. The study will prescreen students because not all students will meet inclusion criteria for the study. If a college undergraduate qualifies for the study, the investigator will obtain his or her verbal consent for participation over the phone.

The following are inclusion and exclusion criteria of participants to the study:

Inclusion Criteria:

1. The participant is a college undergraduate enrolled at Xavier University in a psychology course with at least two exams remaining in the course. One exam must be scheduled for after his or her participation in the study’s intervention.

2. The participant has been deemed a high-test-anxious student according to his or her score on the TAI-5, which is at or above 51.26 for males and at or above 48.27 for females.

3. The participant provides written informed consent.

4. The participant agrees not to participate in another DBT treatment while enrolled in the study.

5. The participant does not initiate new anxiety treatment during the course of the study. If new treatment such as an anti-anxiety medication is necessary, the participant will be asked to withdraw from the study.

Exclusion Criterion:

1. The participant is currently enrolled in DBT.
In order to be included in the study, a participant must meet criteria for high test anxiety on the Test Anxiety Inventory-5 (TAI-5; Taylor & Deane, 2002). High test-anxious students will be comprised of individuals who score one standard deviation or more above the means, which are different for males and females, established by the authors of the measure. This technique for separating high test-anxious students from low test-anxious students will be utilized because it has been used in the test anxiety intervention research when such a division is necessary (Sud & Prabha, 1996). The normative data for the means and standard deviations from Taylor and Deane's study on the development of the TAI-5 (2002) indicates that female college undergraduates must score at or above 48.27 ($M = 34.88; SD = 13.39$) and male college undergraduates must score at or above 51.26 ($M = 36.58; SD = 14.68$). The total TAI-5 scores will be calculated by multiplying the individual's TAI-5 score by four in order to obtain a score that is comparable to the full TAI, which is a measure with 20 items (Spielberger et al., 1980). Then, the high test-anxious students who give consent to participate further will be randomly assigned, via a random numbers table, to receive either a brief DBT treatment or participate in an activities group. The activities group will serve as a comparison group. Individuals in the activities group will complete brain puzzles and other activities for the same amount of time (i.e., two hours) that the brief DBT treatment is administered to the treatment group.

Demographic information for all participants will be collected in a survey format on age, sex, race, ethnicity, year in school, whether the person is participating in therapy for anxiety, and whether the person is currently taking a medication to treat anxiety. If the participant is involved in therapy for the treatment of anxiety, he or she will be asked to describe the therapy. If the participant is taking medications to treat anxiety, he or she will be asked to list the medications. Demographic data will be obtained in order to ensure that inclusion criteria have been met and to
collect basic information about the study sample. Demographic information will be analyzed collectively and provide the study investigator with information regarding how the study sample may generalize to other college undergraduate populations struggling with test anxiety. See Appendix A for the Demographics Worksheet.

A power analysis was conducted using the G*Power 3.1.4 program (Faul, Erdfelder, Buchner, & Lang, 2009). This method of power analysis was used to determine the number of participants needed for the study in order to detect a significant effect if one, in fact, truly exists. Based on Brown et al.’s (2011) pilot study, a large effect size is expected, however the study will be more conservatively powered to detect a medium effect. A mixed model analysis of variance (MMANOVA) that includes a within and a between subjects factor was utilized for the main analysis. Using a MMANOVA, the study requires 28 participants in total, with 14 individuals per group (i.e., brief DBT treatment group and no treatment group), to obtain a 0.8 power in order to detect a medium effect size of 0.25 with an alpha level of .05. As a precaution against drop out and incomplete assessments, it will be necessary to enroll as many as 50 participants, with 25 participants per group, to ensure a sufficient sample size is collected for statistical analysis. Participants will be recruited for the study until at least 14 individuals per group, and up to 25 individuals per group, have completed the baseline assessments and the follow-up assessments.

**Measures**

The measures detailed below will be used for the investigation of the research hypotheses (i.e., TAI-5, TAI, and STAI) and for exploratory purposes (KIMS, AAQ-II, letter comparison task, listening span task, and the Perceived Sources of Test Anxiety). These measures are
specific to the study outcomes and will be measured at pre-treatment and post-treatment assessment points as per the Procedure (see Appendix B for reference information on measures).

**Test Anxiety Inventory-5 (TAI-5).** The Test Anxiety Inventory-5 (Taylor & Deane, 2002) consists of five items from the full, 20-item Test Anxiety Inventory (Spielberger et al., 1980). It is a self-report measure of test anxious individuals’ physical symptoms, thoughts, and feelings about taking tests. The measure consists of two items from the Emotionality subscale (pertaining to feelings) of the TAI, two items from the Worry subscale (pertaining to thoughts) of the TAI, and one neutral item that is not included in either subscale. For each item, the individual responds with a severity endorsement on a four-step Likert scale from 1 (*almost never*) to 4 (*almost always*). The overall score is calculated by summing the individual item scores so the range for the TAI-5 is 5 to 20. However, this score is often prorated, by multiplying the total score by 4, in order to obtain a score that is comparable to the full TAI form with a range from 20 to 80.

Taylor and Deane (2002) utilized a sample of over 300 psychology college undergraduates in order to create an abbreviated form of the TAI when situations merited a brief (i.e., less than a few minutes) evaluation of test anxiety. They opted for their unique, five-item form for the following three reasons: it was the most similar to the TAI with items assessing both emotionality and worry; it had mean scores that were not significantly different from the TAI; and it showed sufficient reliability and validity when compared to the TAI. The internal consistency of the TAI-5, as measured by Cronbach’s alpha (1951), is good with $r = .87$. Test-retest reliabilities were not calculated in the study. Using concurrent validity studies, the authors reported that the TAI-5 seems to accurately measure test anxiety. It is most highly correlated (i.e., $r = .66$) with the short form State Scale (STAI-6; Marteau & Bekker, 1992) for a
hypothetical test situation of the State Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, & Lushene, 1970). Furthermore, the correlations of the TAI-5 with the STAI-T (Trait Scale of the STAI), STAI-6 normal classroom situation, and the STAI-6 prior to an actual test situation were not statistically different from the correlations of the full TAI with these same measures.

The TAI-5 had three main limitations. First, the self-report format presupposes that test-takers will be honest about their symptoms, which is not always the case. Second, a 5-item measure may not fully capture the intricacies of someone’s test anxiety. Third, test-retest reliabilities were not calculated for the measure. Overall, the psychometric properties and concurrent validity of the TAI-5 indicate that it is a respectable, brief measure of test anxiety. It is sufficient for pre-screening individuals, via the phone, for the study. High-test-anxious individuals (i.e., 48.27 or greater for female college undergraduates and 51.26 or greater for male college undergraduates) will qualify for participation in the study.

**Test Anxiety Inventory (TAI).** Spielberger et al. (1980) created The Test Anxiety Inventory. This measure is a 20-item self-report questionnaire in which participants endorse different symptoms of test anxiety that they may experience before, during, and after an exam. For instance, two items are “While taking examinations I have an uneasy, upset feeling” and “Thoughts of doing poorly interfere with my concentration on tests.” The participant rates each item on a four-step Likert scale choosing from one of the following options: 1 (*almost never*), 2 (*sometimes*), 3 (*often*), or 4 (*almost always*). A summation of all item scores, including a reverse score of item 1, is known as the total score. It ranges from 20 to 80. The total score provides an indication of how vulnerable the individual is to experiencing test anxiety in examination situations with higher scores indicative of greater anxiety. The TAI also includes emotionality and worry subscales, which specifically address Spielberger et al.’s (1980) two major domains of
test anxiety. The emotionality subscale captures participants' feelings or their symptoms of autonomic arousal. The worry subscale, on the other hand, includes items that focus on participants' cognitive concerns, such as rumination or negative thoughts that reduce concentration on an exam. Each subscale consists of eight items, scored from 1 to 4, so the total score for each subscale ranges from 8 to 32.

Normative samples for the TAI included primarily college undergraduates and high school students. The authors found that most college undergraduates were able to complete the inventory in 8 to 10min. When an examiner administers the inventory, he or she should always refer to it as the "Test Attitude Inventory," which is written at the top of the test form (Spielberger et al., 1980).

Spielberger et al. (1980) reported adequate to good test-retest and internal-consistency reliabilities for the TAI and its subscales. When the TAI was administered to 159 college undergraduates at baseline and again at three weeks, the test-retest reliability coefficient was .80. However, the authors note that the test-retest reliability coefficients may decrease if greater periods of time elapse between the baseline TAI and the follow-up TAI. This may be due to students' varying levels of anxiety contingent upon particular life circumstances. Internal-consistency reliability coefficients, as measured by Cronbach's (1951) alpha, were high for males and females ranging from .92 to .95. For the emotionality and worry subscales, median internal consistencies were sufficient at .88 and .90, respectively.

Results from Spielberger et al.'s (1980) validity studies indicated that the TAI is a valid measure of test anxiety. The authors conceptualized test anxiety as a personality trait dependent upon a specific situation. The TAI shows good evidence of concurrent validity because it is highly correlated with other rigorous measures of test anxiety, such as the Test Anxiety Scale
(TAS; Sarason, 1978) at .82. In addition, the TAI subscales of worry and emotionality are satisfactorily correlated with the Worry and Emotionality Questionnaire subscales (WEQ; Liebert & Morris, 1967) at .73 for WEQ-Worry and .77 for WEQ-Emotionality. Finally, the TAI was somewhat positively correlated with the State-Trait Anxiety Inventory (Spielberger, Gorsuch, & Lushene, 1970) at .67 for the S-Anxiety scale and .54 for the T-Anxiety scale revealing that the TAI cannot be explicitly categorized as either a state or trait anxiety assessment.

**State-Trait Anxiety Inventory (STAI).** The State-Trait Anxiety Inventory (Spielberger, Gorsuch, & Lushene, 1970) is a self-report measure intended to assess how anxious college undergraduates feel at the present moment (i.e., state anxiety) and also how prone they are to experience anxiety in general (i.e., trait anxiety). The original version of this measure was known as “Form X,” but major revisions began in 1979 in order to develop a more accurate measure of anxiety and improve the inventory’s psychometric properties. Thus, Spielberger, Gorsuch, Lushene, Vagg and Jacobs (1983) created “Form Y,” which was supplemented by a testing manual and scoring guide as well. Form Y will be used in this study, and the psychometric properties described in this section refer to Form Y. However, Spielberger et al. (1983) emphasized that Form X and Form Y are highly correlated so some of the reliability and validity assessments conducted for Form X were simply reproduced in the manual for Form Y instead of repeated on a new sample of individuals.

The STAI includes two scales known as the State-Anxiety (i.e., S-Anxiety) and Trait-Anxiety (i.e., T-Anxiety) scales. These scales were formerly known as A-State and A-Trait scales, respectively, in Form X. Depending on how threatening a person perceives a testing situation to be and based on his or her past experiences, it is probable that those with higher trait
anxiety scale scores will also have higher state anxiety scale scores (Spielberger, Gorsuch, & Lushene, 1970). The S-Anxiety scale consists of 20 questions about how the individual feels “right now” pertaining to his or her worries, nervousness, uneasiness, and physical tension. For instance, “I feel tense,” “I am relaxed,” or “I feel frightened.” Respondents are asked to evaluate the intensity of their feelings for each item given the following options: 1 (not at all), 2 (somewhat), 3 (moderately so), and 4 (very much so). Likewise, the T-Anxiety scale also has 20 items with four response options per item. However, the T-Anxiety scale comprises questions about the individual’s personal attributions that he or she believes remain stable over time. For example, “I lack self-confidence” or “I worry too much over something that really doesn’t matter.” Respondents are asked to evaluate the frequency of their anxiety feelings choosing one of these responses: 1 (almost never), 2 (sometimes), 3 (often), and 4 (almost always). When administering the STAI, the investigator will give the S-Anxiety scale first and then the T-Anxiety scale because the scales were presented in this order when Spielberger et al. (1980) standardized the test. Spielberger et al. (1983) explained their rationale for this decision stating that the S-Anxiety scale is purposely subject to the conditions under which it is given, which could be biased by the emotions brought to the surface if the T-Anxiety scale were administered first. For each scale, an individual can score a minimum of 20 to a maximum of 80. When calculating the scores for each scale, certain items are reverse scored to account for whether a high rating on the item denoted low or high anxiety. Higher scores on either scale indicate greater levels of present anxiety or general anxiety for the S-Anxiety scale and T-Anxiety scale, respectively. An individual has a total score for each scale because the scores are never combined.
The STAI has good evidence of reliability. Among samples of college students, high school students, working adults, and military recruits the Cronbach (1951) alpha reliability coefficients for each scale were sufficiently high with the S-Anxiety scale ranging from .86 to .95 and the T-Anxiety scale ranging from .89 to .91. In addition, based upon different time intervals and experimental conditions, test-retest correlations for college students on the T-Anxiety scale were relatively high ranging from .73 to .86. By contrast, test-retest correlations for the S-Anxiety scale were generally low ranging from .16 to .54. The latter is consistent with the assumption that the S-Anxiety scale measures anxiety at a given point in time, which was different across varied experimental conditions.

Regarding the STAI's validity, which was based on the A-Trait Scale of STAI Form X, the trait anxiety scale evidences concurrent validity with other measures of trait anxiety such as The Institute for Personality and Ability Testing Anxiety Scale (Cattell & Scheier, 1963), with a correlation of .75 for college females and .76 for college males, and the Taylor Manifest Anxiety Scale (Taylor, 1953) with a correlation of .80 for college females and .79 for college males. These values are relatively high and were calculated specifically among college undergraduates, which is of note because this is the population that will be utilized in this study. A study of the S-Anxiety scale shows that it seems to have good construct validity. Spielberger, Gorsuch, and Lushene (1970) made this determination because individuals consistently rated their state anxiety significantly higher when imaging their anxiety just before a final exam as opposed to a normal condition that was not in anticipation of a final exam.

Despite sufficient reliability and validity estimates, the STAI is not without limitations. Most notably, the assessment was created in 1970 with a revision in 1980, and the authors utilized a normative sample of students at that time. It is possible that college undergraduates
today may exhibit different levels of state and trait anxiety due to different environmental influences. Also, most of the items have face validity as assessing anxiety, so students may under or over-report their anxiety symptoms as they may discover the purpose of the measure. One way to ensure students respond honestly and to protect against the latter concern is for the investigator to consistently refer to the inventory as the “Self-Evaluation Questionnaire,” which is printed on the form (Spielberger et al., 1983).

**Kentucky Inventory of Mindfulness Skills (KIMS).** The Kentucky Inventory of Mindfulness Skills (Baer, Smith, & Allen, 2004) is a 39-item self-report measure, which focuses on four core areas of mindfulness. The core areas are observing, describing, acting with awareness, and accepting (or allowing) without judgment. These areas are also referred to as the KIMS Scales. Observing is defined as paying attention to or taking notice of internal and external stimuli (Linehan, 1993b). Describing is simply assigning a word label to the observation, such as “sadness” (Goldstein, 2002; Linehan, 1993b; Segal, Williams, & Teasdale, 2002). When describing, it is important to do so in a nonjudgmental manner. Acting with awareness means directing one’s attention to the present activity and only focusing on that particular activity (Hanh, 1976). Finally, accepting (or allowing) without judgment is when the person attends to the current moment without a judgmental attitude. This skill is also utilized in observing and describing. Individuals respond to each item according to a 5-point Likert scale ranging from 1 (almost never) to 5 (almost always). A number of items pertain to the mindfulness skill being assessed and are scored as the number the individual assigns to the item. However, other items are worded to describe a lack of a mindfulness skill and, as such, those items are reverse scored. Four total scores (i.e., a total for each skill) are obtained by summing
the items in each category. The total scores ultimately suggest how much of a particular mindfulness skill an individual uses in his or her every day life.

The results from reliability and validity studies on the KIMS suggest that it is both a relatively consistent and valid measure. Estimates of internal consistency or reliability for each of the four skills were good ranging from .76 to .91. Test-retest reliabilities showed similarly adequate results, ranging from .65 to .86 across the four mindfulness categories. Finally, even though mindfulness is in the infancy stages of being defined and measured (Baer, Smith, & Allen, 2004), construct validity studies in a college undergraduate sample revealed that the KIMS seems to measure the four factors that it intends to measure in individuals. A study comparing the well-known NEO Five Factor Inventory (NEO-FFI; Costa & McCrae, 1992) and the KIMS suggested some noteworthy comparisons between personality traits and the KIMS’ mindfulness scales. Neuroticism, which is typically used to describe individuals with negative affect and higher anxiety, was negatively correlated with describing, acting with awareness, and accepting (or allowing) without judgment. This finding is important because it is possible that neuroticism characteristics need to be minimized in order to fully embrace or practice mindfulness skills. Extraversion was positively correlated with the skill of describing, which seems reasonable because describing requires talking and social skills. Also, openness was moderately positively correlated with observing. This correlation implies that individuals who are more open are more likely to pay attention to their experiences but also refrain from judging their experiences. Overall, these important reliability and validity findings serve as a solid foundation for more extensive studies on the KIMS and other mindfulness measures.

The KIMS has three distinct advantages over other mindfulness assessments. First, the measure is designed so that individuals are able to understand the measure even if they have not
had experience with mindfulness or meditation. Second, the KIMS evaluates an individual’s propensity to be mindful in every-day life, as opposed to a particular context, so the measure is more easily generalized. Third, the measure is multi-dimensional or designed to assess many different aspects of mindfulness. Despite these strengths, the KIMS is also limited by the four skills chosen to capture the broad construct of mindfulness. Also, research has documented that mindfulness is still a developing psychological concept so it remains unclear exactly how it should be defined and measured. (Baer, Smith, & Allen, 2004).

**Acceptance and Action Questionnaire-II (AAQ-II).** The Acceptance and Action Questionnaire-II (Bond et al., 2011) assesses how individuals interact with their thoughts and feelings. In particular, the questionnaire focuses on people’s avoidance of and how rigidly they connect with their thoughts and feelings. The latter is known as psychological flexibility. In order to assess these variables, the questionnaire includes items like “I’m afraid of my feelings” or “Worries get in the way of my success.”

The AAQ-II consists of 10 items. An individual responds to each statement on a 7-point Likert scale ranging from 1 (*never true*) to 7 (*always true*). Higher scores on the measure indicate greater psychological flexibility (or more acceptance). Due to the wording of the items, seven items are reverse scored so that higher scores still reflect greater psychological flexibility. Finally, a total score is calculated ranging from 10 to 70.

The AAQ-II has adequate reliability and validity. Cronbach’s alpha coefficient (1951) for the questionnaire is .84, with a range of .78 to .88, which is sufficient. Test-retest reliability was .81 and .79 when the questionnaire was given to a large sample at the three months’ and 12 months’ time points of a study. Regarding the measure’s validity, it appears to measure the same construct as its previous form with $r = .97$. In addition, validity studies show that higher levels
of psychological inflexibility on the AAQ-II are positively correlated with the following symptoms assessed by other psychological measures: depression, anxiety, stress, and poorer mental health outcomes. However, more research is necessary to determine appropriate studies for the AAQ-II and the implications of individuals’ scores on this questionnaire.

**Letter Comparison Task.** This paper-and-pencil task, created by Salthouse and Babcock (1991), measures individuals’ processing speed or how efficiently they can finish a simple task that requires automatic thought processes, attention, and concentration. The examinees’ task is to decide as quickly as possible whether two strings of letters (i.e., members of a letter pair) in the same row are the “same” or “different.” The participants write an “S” if the letters are the same or a “D” if the letters are different on the horizontal line located between the members of the letter pair. Each letter string is comprised of a random series of consonants including three, six, or nine letters. When the members of the letter pairs differ, they differ by only one letter, which is randomized to occur at the beginning, middle, or end of a letter string. Participants are given 20s to complete the first set of 21 letter pairs and another 20s to complete the second set of 21 letter pairs. Approximately half of the letter pairs are different. The examiner gives examinees one point for each correctly identified letter pair made during each 20s period. Then, a z score is calculated in order to evaluate individuals’ processing speed.

While formal validity studies have not been conducted on the letter comparison task, it has been used in several studies as a measure of processing speed (e.g., Bowles & Salthouse, 2008; Brown & Park, 2002; Levitt, Fugelsang, & Crossley, 2006; Park et al., 1996; Salthouse & Babcock, 1991; Zwahr et al., 1999). This suggests that cognition researchers believe that it measures what it claims to measure – processing speed. However, the task does have empirical evidence of high test-retest reliability with $r = .94$ (Salthouse & Babcock, 1991). Even though
more studies need to be conducted on the task’s validity and reliability, the task is easy to
administer, tolerable to most examinees, and a practical assessment for processing speed.

**Listening Span Task.** Salthouse and Babcock (1991) developed the listening span task,
which is a measure of working memory. First, a sentence or sentences are read aloud to the
examinees. Then, they must choose the correct answer to questions about the orally presented
sentence or sentences while concurrently remembering the last word of each sentence (i.e., target
words). Each sentence is between 6 and 10 words long and should be read at a normal rate of
speech. The corresponding comprehension questions always have three answer choices.
Examinees mark their answers on a response sheet and are required to choose only one of the
three potential answers for each sentence. Salthouse and Babcock (1991) tried to create basic
comprehension questions for each sentence often pertaining to who, what, where, or when. In
addition, the target words never appear in the questions or answer choices. The target words are
never greater than two syllables, never appear more than once, and are familiar enough to be
found in a children’s dictionary. After examinees have completed a specific number of
sentences (i.e., ranging from one to eight sentences), which are presented in three trials per
number of sentences (e.g., three trials for groups of two sentences), and their corresponding
questions, they are told to turn their response sheets over and write the target words in the order
they were presented to them.

The instructions for the task note that examinees should focus on answering the content
questions correctly instead of only concentrating on recalling the target words. In order for the
target word recall responses to be scored, examinees must answer the content questions
correctly. If this is the case, listening span scores are recorded as the highest number of correct
responses to items on at least two of the three trials of a particular sequence length. A z score is calculated for the listening span task in order to evaluate participants’ working memories.

When Salthouse and Babcock (1991) calculated a correlation between the typical number of responses that participants remembered correctly on trials containing even numbers of items and the typical number of responses that participants remembered correctly on trials containing odd numbers of items, they found that the listening span task had evidence of good split-half reliability with $r = .86$. Regarding the validity of the listening span task, the authors reported that there is a .68 correlation between the listening span task and the computation span task (Salthouse & Babcock, 1991), both of which are purported to measure the same construct of working memory. The listening span task has been used as a measure of working memory in many studies including Levitt et al., 2006; Salthouse and Babcock, 1991; and Zwahr et al., 1999.

**Perceived Sources of Test Anxiety.** As described in the literature review, Bonaccio and Reeve (2010) obtained qualitative data from a sample of college undergraduates in which they asked them to recall a test for which they were highly anxious and explain all of the reasons why they were anxious about the test. Then, the authors created a list of 22 statements regarding the college undergraduates’ perceived sources of test anxiety. The statements include a wide range of possible reasons for test anxiety and are grouped into the following three major categories: perceptions of the test, perceptions of the self (i.e., the test-taker), and perceptions of the test-taking situation. Each statement on the perceived sources of test anxiety begins with the item stem “I felt anxious about taking this test because...” and is followed by a statement such as “we were not given any information on what information may be covered on the exam.” A participant responds from 1 (not at all) to 5 (extremely) based upon how accurately the statement
reflects the participant’s perceived source of test anxiety for that particular test. An individual score for each item is reported, but item scores are not summed to obtain a total score.

Because the list of statements was originally based upon qualitative data and only later did the researchers apply a quantitative scale to each statement, the researchers used the data to indicate the relative importance of different perceived sources of test anxiety. A comparison of the mean score for each item showed which statements reflected the most salient sources of perceived test anxiety. The list of statements is not a scale or test and therefore has not been subjected to tests of reliability and validity. This measure will be collected for exploratory purposes.

Manipulation check. During the follow-up assessments, participants will complete a feedback form based off of Brown et al.'s (2011) pilot study on test anxiety. The manipulation check will assess the how well participants comprehended the material, how helpful the intervention was, and how they used the information they had learned during the intervention. The form will specifically invite participants to provide feedback on what they learned about managing their test anxiety. Furthermore, the form will help the study team determine if the participants seemed to understand and use the skills taught during the intervention. See Appendix C for the Comprehension, Credibility, and Usefulness Checks form. In addition, the form includes a section on the following other important information: the course that included both exams, the dates of each exam, the length of studying for each exam, the type of studying completed for each exam, and the format of each exam. This information will be reported qualitatively in order to provide details about additional, uncontrolled variables that may influence the treatment outcomes such as test scores and level of test anxiety.
Procedure

IRB approval will be sought from the Xavier University IRB. After approval to begin the study, data collection will commence.

Details about the study will be posted on the participant pool bulletin board in a brief handout. The handout will invite individuals with test anxiety to participate in the study. It will include a short description of the study, the time necessary and basic requirements for adequate study completion, information about how to complete pre-screening over the phone, and the study investigator’s contact information. Potential study participants will call study staff for pre-screening.

The pre-screening process via the phone will begin with a verbal informed consent process. Participants who consent will be asked to respond to the five items on the TAI-5 (i.e., a brief measure of test anxiety), the questions included on the demographics worksheet (see Appendix A), and ensuring that candidates fulfill inclusion criteria and do not satisfy the exclusion criterion (see the “Participants” section in Chapter III for inclusion and exclusion criteria). College undergraduates will qualify for the study if they meet these criteria and obtain a high test anxiety score on the TAI-5, which is defined by 48.27 or greater for female college undergraduates and 51.26 or greater for male college undergraduates. The investigator will inform participants if they qualified for further participation in the study in this initial phone conversation.

While on the phone, the investigator will also explain that an informed consent document that describes the study and its risks (e.g., any potential mental pain prompted by recalling anxiety-provoking conditions or information about the participants’ perceptions of themselves, tests, or test-taking situations) will be given to participants at the first meeting. The investigator
will remain on the line with a participant who has qualified for the study in order to schedule a
time for the participant to come in for consent and pre-treatment assessments. Both the
investigator and the participant will agree upon the specified time to meet and complete these
procedures prior to the participant's first exam. Depending upon the number of individuals who
qualify for the study, pre-treatment assessments will likely be conducted in a group. The college
undergraduates who qualify and participate in the study will receive three hours of course credit
in their psychology course. The college undergraduates who do not qualify for the study (i.e.,
are not high test-anxious students) will receive 15 min of credit in their psychology course.
Figure 3. Procedure Flow Chart

Figure 3. Flow chart of Procedure for individuals who did not qualify and the study groups.
After randomization to either the brief DBT intervention group or the activities group, the letter comparison task and the listening span task will be administered in individual breakout sessions because these measures require the investigator to interact with and time the participant on certain activities. Then, the participants will complete the remaining pre-assessment measures: TAI, STAI, KIMS, and AAQ-II. These assessments will be counterbalanced so that each participant has an equal chance of receiving either the TAI, STAI, KIMS, or AAQ-II measure first and the remaining measures in a random order. Counterbalancing the measures will ensure that if responses on one assessment bias responses on the following assessment, the effect will be negated across the sample.

Individuals enrolled in the brief DBT treatment will attend 1, 2-hour session modeled from Linehan’s outpatient DBT treatment (1993a, b) prior to taking a later exam in the same psychology course. At this time, participants will also report their score on their first exams to the investigator. Participants will be asked to bring the exam to the session so the investigator can verify the score. In the event that participants are not able to bring their exams to the study meeting, they will be asked to bring an email from the course professor verifying their exam score. If neither of these requirements is met, students will tell the investigator their exam scores.

The brief DBT intervention will focus on the skills of One Mindfully, Participate, Non-Judgmentally, Observe, and Cope Ahead. At the beginning of the brief DBT treatment session, participants will be oriented to the treatment. The investigator will explain that three main sources contribute to test anxiety – students’ perceptions of the test, perceptions of themselves, and their perceptions of the test-taking situation (Zeidner, 1998). The investigator will ask students to offer potential examples in each of these categories, and the investigator will also
provide examples from the literature on test anxiety. In addition, the sample will be informed that the brief DBT treatment is designed to reduce their levels of test anxiety through acceptance based techniques by applying specific DBT skills to address different aspects of test anxiety. The sample will be asked to introduce themselves, and the investigator will also introduce herself to the group. After the introductions, participants will communicate one goal they have for the treatment session. Throughout the session, students will be asked to participate and provide feedback about their personal experiences. Activities and handouts will be taken from Linehan’s DBT manual (1993b), but the investigator will follow the general outline below:

I. Mindfulness: provide an explanation of this concept, different states of mindfulness, and examples. As discussed in Chapter I, individuals with higher test anxiety often experience both internal and external distracters during a testing situation, which may result in an inability to focus on the test (Eysenck et al., 2007). Mindfulness specifically addresses this issue because students are taught how to attend to the present moment instead of paying attention to or thinking about other distracting internal or external stimuli.

A. Mindfulness is attending to the present moment and focusing on particular aspects of that moment.

a. Reasonable mind is the part of a person’s mind that is logical or rational, which helps the person organize, plan, and evaluate aspects of his or her world in a logical manner.

b. Emotion mind is the part of a person’s mind that relies upon emotions to steer his or her thinking and behavior.
c. Wise mind is an integration of reasonable mind and emotion mind in order to become fully aware of oneself.

d. In general, mindfulness skills enable a person to balance reasonable mind and emotion mind in order to attain a state of wise mind.

II. Two types of mindfulness skills

A. Mindfulness “what” skills: Observe and Participate
   a. These skills are applied one at a time.

B. Mindfulness “how” skills: Non-Judgmentally and One Mindfully
   a. These skills can all be used at the same time.

III. Five Skills: Observe, Participate, Non-Judgmentally, One-Mindfully, and Cope Ahead – describe and discuss each of the five skills above according to the manual and provide examples and handouts of the skills.

A. Observe is paying attention to an experience without judging or labeling it. The group will practice observing with exercises such as experiencing one’s hand on a cool surface or focusing on one’s stomach then shoulders. The investigator will inform the participants that observing emphasizes becoming in touch with one’s personal experiences, instead of observing himself or herself from an outside perspective.

B. Participate is fully engaging in an activity as if the person has become one with the activity. The investigator will describe the skill and ask for examples from participants of this skill. For instance, an example of participating would be a talented musician becoming one with his or her instrument and the experience of playing it, instead of worrying about things outside of this activity.
C. Non-Judgmentally is not judging, or not labeling, things when a person is practicing the mindfulness “what” skills. The investigator will explain the skill and engage with the participants about examples of acting non-judgmentally, how it is different from facts or consequences, and how judgment is related to responsibility. Furthermore, the participants will learn about the importance of accepting and acknowledging situations.

D. One-Mindfully is attending to one thing in the moment. The investigator will discuss the difference between one-mindfully and multi-tasking. The group will practice letting go of distractions and reminding themselves about participating in an activity and only that single activity. Finally, the investigator and the participants will formulate ideas about the beneficial effects of incorporating this skill into one’s daily life.

E. Cope Ahead helps the individual prepare for an emotionally provocative situation by rehearsing the situation ahead of time. The investigator and the students will brainstorm examples of anxieties in testing situations. Then, the group will discuss ways to alleviate these anxieties in the testing situation and practice rehearsing successfully coping with the testing situation in their minds.

F. The investigator will summarize the skills and how participants can practice them before their upcoming exam and how to apply them to their upcoming exam experience.

   a. The investigator will provide students with simple homework sheets (i.e., DBT Skills Diary Card) in which they will be asked to document when they used each skill prior to their second exam. Each row of the sheet will list a
particular skill (e.g., Observe) and a brief definition and examples of how to use this skill (e.g., observe your back gently resting against your chair and focus on not judging this experience). On the same row, the days of the week will be listed so the student can record which days he or she practiced specific skills. The diary card will include several weeks to accommodate for students whose exams are several weeks after the intervention. The diary card will also have a “Test Day Anxiety Record” wherein the student records his or her subjective anxiety level (i.e., low, medium, or high) before, during, and after the exam. Students will be asked to turn in their diary card to the investigator at Meeting 3. See Appendix D for the DBT Skills Diary Card and Test Day Anxiety Record.

By contrast, individuals in the activities group will not attend the brief DBT intervention. However, like the brief DBT group, they will also report their scores on their first and second exams at Study Meeting 2 and Study Meeting 3, respectively. As modeled after Orbach, Lindsay, and Grey’s (2007) study comparing Internet-based CBT to an Internet-based activities control group, the activities group in this study will complete a series of brain puzzles and other activities for the same amount of time as the brief DBT intervention group. The investigator will inform the students in this group that completing brain puzzles may improve their attention and shift their attention away from worrying about their exams and test anxiety in general.

The investigator will ask the students to complete several language, mathematical, and logic “brain puzzles” on www.brainbashers.com. Different categories of puzzles will be completed in 30min increments. During the first, 30min period, students will choose language activities from the “Daily Puzzles” category such as word searches, word twists using 4-by-4 and
5-by-5 square letter grids, and Sudoku puzzles. During the second, 30min period, students will choose any games with numbers or games that utilize mathematical skills. For instance, 1 to 100 (i.e., clicking the numbers from 1 to 100 arranged randomly in a grid as quickly as possible), Think of a Number (i.e., thinking of a number between 1 and 63 and seeing if the computer can guess it from a series of clues) or logic puzzles with numbers. During the third, 30min period, students will choose memory or attention games such as concentration (i.e., matching card pairs), face memory (i.e., reconstructing faces from memory), or memory (i.e., memorizing and reconstructing strings of letters and numbers). Finally, during the last, 30min period, students will choose any games under "Fun Stuff" including games about U.S. state geography, playing cards, or optical illusions. After each 30min period during the activities group session, one student will be drawn from a hat and receive a prize such as candy, a Xavier University apparel item or accessory, or school supplies. All students will receive a small prize upon completion of the 2-hour activities group for their participation.

After meeting with either the experimental (i.e., brief DBT group) or control group (i.e., Activities group), participants will schedule a follow-up appointment with the experimenter within two to three weeks, depending upon when their next exam is scheduled. Finally, after completion of their second exam, all of the participants will complete follow-up procedures by returning for a final, 45min session. At this time, the participants will report their score on their second exam and bring it to the meeting. Then, the participants will complete the letter comparison task, listening span task, and the following five questionnaires: TAI, STAI, KIMS, AAQ-II, and the Perceived Sources of Test Anxiety all of which will be given in a random order to the participants. The manipulation check will be given at this time as well (see "Manipulation
Check” under Measures for the description of this assessment) along with a debrief statement and the opportunity for participants to ask questions.
Chapter IV: Proposed Analyses

Because the investigator is using a study design that includes a between-subjects variable (i.e., condition) and within-subjects variable (i.e., time), a two-way, mixed-model analysis of variance (mixed-model ANOVA) will be used to assess the efficacy of the brief DBT test anxiety intervention. The mixed-model ANOVA will evaluate whether there are significant differences on participants’ exam scores, test anxiety, state anxiety, trait anxiety, acceptance, and mindfulness between pre-treatment and post-treatment in both the treatment group and the control group. In addition, the mixed-model ANOVA will test for significant differences within each group from pre-treatment assessments (Study Meeting 1) to post-treatment assessments (Study Meeting 3). Overall, the mixed-model ANOVA will examine the relationship that occurs between the study condition and time.

A mixed-model ANOVA will be conducted to test the first hypothesis that individuals receiving brief DBT will have greater improvement of test scores, between their first and second exams, than their control group counterparts. The study condition (i.e., brief DBT versus control) will be the independent between subjects variable, time will be the within-subjects variable, and the participants’ exam scores will be the dependent variable.

A mixed-model ANOVA will be used to test the second hypothesis that individuals receiving brief DBT will have greater reductions in test anxiety levels as compared to the control group. The study condition (i.e., brief DBT versus control) will be the independent between subjects variable, time will be the within-subjects variable, and the participants’ TAI scores will be the dependent variable.

A mixed-model ANOVA will be used to test the third hypothesis that individuals receiving brief DBT will have greater reductions in state anxiety levels as compared to the
control group. The study condition (i.e., brief DBT versus control) will be the independent between subjects variable, time will be the within-subjects variable, and the participants’ STAI-S-Anxiety scale scores will be the dependent variable.

A mixed-model ANOVA will be used to test the fourth hypothesis that individuals receiving brief DBT will have greater reductions in trait anxiety levels as compared to the control group. The study condition (i.e., brief DBT versus control) will be the independent between subjects variable, time will be the within-subjects variable, and the participants’ STAI-T-Anxiety scale scores will be the dependent variable.

In addition, mixed-model ANOVAs will also be conducted for the following exploratory analyses:

1. When comparing participants receiving brief DBT to participants in a control group, the individuals in the brief DBT group will show greater increases in mindfulness levels. The study condition (i.e., brief DBT versus control) will be the independent between subjects variable, time will be the within-subjects variable, and the participants’ KIMS score will be the dependent variable.

2. When comparing participants receiving brief DBT to participants in a control group, the individuals in the brief DBT group will show greater increases in acceptance levels. The study condition (i.e., brief DBT versus control) will be the independent between subjects variable, time will be the within-subjects variable, and the participants’ AAQ-II score will be the dependent variable.

In addition, correlations will be conducted for the following exploratory analyses examining the relationships between anxiety and cognitive parameters. In each scenario, the independent variable will be the participant’s score on an anxiety measure (i.e., score on TAI,
score on STAI: S-Anxiety scale, or score on STAI: T-Anxiety scale) and the dependent variable will be the participant’s score on a cognitive measure (i.e., score on the Letter Comparison Task or score on the Listening Span Task). All of the subsequent correlations will be run on pretreatment data only:

1. A correlation will exist in the negative direction between participants’ pretreatment scores on the TAI and the letter comparison task, a measure of processing speed. In other words, as a participant’s symptoms of anxiety before, during, and after exams increases, his or her processing speed will decrease.

2. A correlation will exist in the negative direction between participants’ pretreatment scores on the STAI: S-Anxiety scale and the letter comparison task, a measure of processing speed. In other words, as a participant’s symptoms of present anxiety increase, his or her processing speed will decrease.

3. A correlation will exist in the negative direction between participants’ pretreatment scores on the STAI: T-Anxiety scale and the letter comparison task, a measure of processing speed. In other words, as a participant’s symptoms of general anxiety increase, his or her processing speed will decrease.

4. A correlation will exist in the negative direction between participants’ pretreatment scores on the TAI and the listening span task, a measure of working memory. In other words, as a participant’s symptoms of anxiety before, during, and after exams increases, his or her working memory capacity will decrease.

5. A correlation will exist in the negative direction between participants’ pretreatment scores on the STAI: S-Anxiety scale and the listening span task, a
measure of working memory. In other words, as a participant’s symptoms of present anxiety increase, his or her working memory capacity will decrease.

6. A correlation will exist in the negative direction between participants’ pretreatment scores on the STAI: T-Anxiety scale and the listening span task, a measure of working memory. In other words, as a participant’s symptoms of general anxiety increase, his or her working memory capacity will decrease.

An alpha level of .05 will be used to signify statistical significance of the mixed-model ANOVAs and correlations.

Limitations

Some limitations should be considered when drawing conclusions from this study. First, regarding generalizability, it is not possible to obtain a sample that perfectly reflects the characteristics of all of the individuals with test anxiety in the college undergraduate population. The sample is limited by specific demographic characteristics, geographical region, and students enrolled in psychology courses. Second, the study was designed to assess the effectiveness of a brief DBT intervention provided to participants in 1, 2-hour session, which may be too short of an amount of time to produce a noticeable effect. Nonetheless, showing the effectiveness of a brief intervention may increase the accessibility of treatment to students. Third, the study allows students to participate in the study treatment for anxiety and continue pre-existing treatment with anti-anxiety medications and therapy during the study. The study will report, however, on the percentage of individuals who indicate that they are participating in psychotherapy, psychotropic, or both treatments for their anxiety. Yet, this may be a confound because, at the end of the study, it will still remain somewhat unknown whether a participant’s test anxiety symptoms, exam scores, and other outcome variables improved or declined as a result of the
brief DBT treatment or these other therapeutic modalities (i.e., therapy, medication(s), or both). Fourth, some of the post-treatment assessments require the participants to recall their anxiety levels before, during, and after their second exam. Some participants may have difficulty recalling this information accurately. Fifth, the study incorporates several self-report assessments relying on participants to honestly report their symptoms and feelings. This assessment format requires a moderate amount of insight and self-reflection, which may not be inherent to all participants. In addition, self-reports are subject to the participants’ own cognitive biases, self-presentation concerns, and different motivations. Finally, the study would benefit from replication utilizing a larger sample size in order to confirm the study’s results.

Despite the aforementioned limitations, this study may provide a significant contribution to the literature on the uses of DBT and viable treatments for test anxiety, which will ultimately benefit students plagued by test anxiety. Should this intervention be shown to be effective, colleges and universities may consider offering a brief DBT intervention for test anxious college undergraduates.
References


impairment, and Alzheimer's disease. *Psychological Medicine, 33*, 1039-1050. doi: 10.1017/S0033291703008031


Methods, 41, 1149-1160. doi: 10.3758/BRM.41.4.1149


Appendix A

Demographics Worksheet

Please complete the following demographic information on this page and then continue with the study activities.

Age: ____________

Sex: ____________________________

Race: _____ American Indian or Alaska Native
       _____ Asian
       _____ Biracial
       _____ Black or African American
       _____ Native Hawaiian or Other Pacific Islander
       _____ White

______________________________ Other (please specify)
______________________________ Prefer not to respond

Ethnicity: _____ Hispanic or Latino
           _____ Not Hispanic or Latino

Year in School: ____________________________

Currently participating in therapy for anxiety: YES or NO

Describe: __________________________________

__________________________________________

__________________________________________

Currently taking a medication to treat anxiety: YES or NO

List medications: ____________________________

__________________________________________

__________________________________________

Inclusion Criteria: (continued on next page)
1. The participant is a college undergraduate enrolled at Xavier University in a psychology course with at least two exams remaining in the course. One exam must be scheduled for after his or her participation in the intervention.

YES  NO

2. The participant has been deemed a high-test-anxious student according to his or her score on the TAI-5, which is at or above 51.26 for males and at or above 48.27 for females.

YES  NO

3. The participant provides written informed consent.

YES  NO

4. The participant agrees not to participate in another DBT treatment while enrolled in the study.

YES  NO

5. The participant agrees to complete the study in its entirety in order to be awarded three hours of participation in his or her psychology course.

YES  NO

6. The participant does not initiate new anxiety treatment during the course of the study. If new treatment is necessary, the participant will be asked to withdraw from the study.

YES  NO

Exclusion Criterion:

1. The participant is currently enrolled in DBT.

YES  NO
Appendix B

Information on Measures

Test Anxiety Inventory-5

The Test Anxiety Inventory-5 (TAI-5) is protected by copyright so it is not reproduced in this document. This measure can be found in the following article: Taylor, J., & Deane, F.P. (2002). Development of a short form of the Test Anxiety Inventory (TAI). *The Journal of General Psychology, 129*, 127-136.

Test Anxiety Inventory

The Test Anxiety Inventory (TAI) is protected by copyright so it is not reproduced in this document. This measure is available through http://www.mindgarden.org or in the following manual: Spielberger, C. D., Gonzalez, H. P., Taylor, C. J., Anton, E. D., Algaze, B., Ross, G. R., & Westberry, L. G. (1980). *Manual for the Test Anxiety Inventory ("Test Attitude Inventory")*. Redwood City, CA: Consulting Psychologists Press.

State-Trait Anxiety Inventory


Kentucky Inventory of Mindfulness Skills

The Kentucky Inventory of Mindfulness Skills (KIMS) is protected by copyright so it is not reproduced in this document. This measure can be found in the following article: Baer, R. A.,

Acceptance and Action Questionnaire—II

The Acceptance and Action Questionnaire—II (AAQ-II) is protected by copyright so it is not reproduced in this document. This measure can be found in the following article: Bond, F. W., Hayes, S. C., Baer, R. A., Carpenter, K. M., Guenole, N., Orcutt, H. K., Waltz, T., & Zettle, R. D. (2011). Preliminary psychometric properties of the Acceptance and Action Questionnaire - II: A revised measure of psychological flexibility and experiential avoidance. *Behavior Therapy, 42*, 676-688.

Letter Comparison Task

The Letter Comparison Task is protected by copyright so it is not reproduced in this document. This measure is used and explained in multiple publications including Bowles & Salthouse, 2008; Brown & Park, 2002; Levitt et al., 2006; Park et al., 1996; Salthouse & Babcock, 1991; and Zwahr et al., 1999. It is available from T.A. Salthouse.

Listening Span Task

The Listening Span Task is protected by copyright so it is not reproduced in this document. This measure is used and explained in multiple publications including Levitt et al., 2006; Salthouse & Babcock, 1991; and Zwahr et al., 1999. It is available from T.A. Salthouse.

Perceived Sources of Test Anxiety

The items that comprise the perceived sources of test anxiety list is protected by copyright so it is not reproduced in this document. These items can be found in the following article: Bonaccio, S., & Reeve, C. L. (2010). The nature and relative importance of students' perceptions of the sources of test anxiety. *Learning and Individual Differences, 20*, 617-625. doi: 10.1016/j.lindif.2010.09.007
Appendix C

Comprehension, Credibility, and Usefulness Checks

Write a brief summary (2-3 sentences) of what you learned about how to cope with your test anxiety.

________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________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Other Important Information:

- For the purposes of this study, what *course* did you take both of your exams in?

- What were the *dates* of your exams?
  - First Exam: __________________________
  - Second Exam: __________________________

- Approximately *how long* did you study for each examination? *Circle one.*
  - First Exam: 0 minutes, 30 minutes, 60 minutes, 90 minutes, 120 minutes, 150 minutes, 180 minutes, 210 minutes, 240 minutes, or more than 240 minutes.
  - Second Exam: 0 minutes, 30 minutes, 60 minutes, 90 minutes, 120 minutes, 150 minutes, 180 minutes, 210 minutes, 240 minutes, or more than 240 minutes.

- What *type* of studying did you do for each examination? *Circle all that apply.*
  - First Exam: read or re-read textbook or assigned readings, flashcards, used or created a study guide, reviewed notes/handouts/quizzes, answered practice questions or completed practice quizzes/tests, or studied with a partner or in a group.
  - Second Exam: read or re-read textbook or assigned readings, flashcards, used or created a study guide, reviewed notes/handouts/quizzes, answered practice questions or completed practice quizzes/tests, or studied with a partner or in a group.

- What was the *format* of each examination? *Circle all that apply.*
  - First Exam: Multiple choice, short answer, essay, true/false, matching, or other (please specify) __________________________
  - Second Exam: Multiple choice, short answer, essay, true/false, matching, or other (please specify) __________________________

- How *prepared* were you for the last exam? *Circle one from “Not prepared at all” (0) to “Extremely prepared” (10).*

  0--------1--------2--------3--------4--------5--------6--------7--------8--------9--------10

  Not at all  
  Extremely
Appendix D

DBT Skills Diary Card and Test Day Anxiety Record

Date you started this page: ______ / ______ / ______
Circle the days that you practiced each skill:

<table>
<thead>
<tr>
<th>MON</th>
<th>TUE</th>
<th>WED</th>
<th>THUR</th>
<th>FRI</th>
<th>SAT</th>
<th>SUN</th>
<th><strong>Observe</strong> (just notice the experience; e.g., notice what comes through your eyes, ears, and nose; notice your thoughts but do not judge them)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MON</td>
<td>TUE</td>
<td>WED</td>
<td>THUR</td>
<td>FRI</td>
<td>SAT</td>
<td>SUN</td>
<td><strong>Participate</strong> (enter into the experience and act intuitively; e.g., immerse yourself in the conversation when you meet for lunch with a friend; engage fully in your soccer game and use your skills that come naturally to you)</td>
</tr>
<tr>
<td>MON</td>
<td>TUE</td>
<td>WED</td>
<td>THUR</td>
<td>FRI</td>
<td>SAT</td>
<td>SUN</td>
<td><strong>Non-judgmental</strong> (when observing or participating practice not judging the experience as “good” or “bad;”; or let the experience simply be what it is; e.g., when you make a mistake, don’t label it or when you act in a particular way, don’t judge your behavior)</td>
</tr>
<tr>
<td>MON</td>
<td>TUE</td>
<td>WED</td>
<td>THUR</td>
<td>FRI</td>
<td>SAT</td>
<td>SUN</td>
<td><strong>One-mindfully</strong> (be in the present moment; e.g., focus your attention on one activity at a time such as driving, eating, reading, etc.)</td>
</tr>
<tr>
<td>MON</td>
<td>TUE</td>
<td>WED</td>
<td>THUR</td>
<td>FRI</td>
<td>SAT</td>
<td>SUN</td>
<td><strong>Cope ahead</strong> (rehearse an anxiety-provoking situation ahead of time and imagine it running smoothly; e.g., think about taking your test with a relaxed mind and imagine the experience going well.)</td>
</tr>
</tbody>
</table>

Date of your test: ______ / ______ / ______
Rate your anxiety from 0 to 100.

| The Hour Before Test | During Test | The Hour After Test | Test Day | Level of Anxiety (0 – 100) |
Chapter V: Dissertation

Abstract

Test anxiety is an unpleasant state characterized by psychological, physiological, or behavioral components, which individuals experience before or during a test. Test anxiety affects approximately 20 – 35% of college undergraduate students. According to Zeidner’s (1998) theory, test anxiety is composed of individuals’ perceptions of the test, their self-perceptions, and their perceptions of the test-taking situation. This study examined an intervention targeting these three factors of test anxiety by teaching the Dialectical Behavior Therapy (DBT; Linehan, 1987) mindfulness skills of observing and participating, one-mindfully and non-judgmentally, as well as the skill of cope ahead. The intervention was intended to decrease participants’ levels of test anxiety and raise their academic performance across examinations in one of their psychology courses. Participants enrolled in psychology courses in which they had at least two exams remaining were recruited and screened for test anxiety using the Test Anxiety Inventory-5 (TAI-5; Taylor & Deane, 2002). Those participants with high test anxiety (i.e., above the cut score on the TAI-5; n = 48) were randomly assigned to one of two conditions. In the DBT condition (n = 26), participants engaged in a single, two-hour session of skills training in which they were taught the five skills mentioned above. The DBT therapist utilized the principles of the treatment to dialectically balance a focus on change (e.g., changing focus away from anxious thoughts during the test by fully immersing oneself in the test material) with a focus on acceptance (e.g., not judging oneself if anxious thoughts arise during the test). In the control condition (n = 22), participants engaged in a single session of a two-hour group in which they completed a series of brain puzzles and other activities on the computer. Before the first exam and intervention as well as after the intervention and second exam, participants completed measures including the Letter
Comparison Task (Salthouse & Babcock, 1991), the Listening Span Task (Salthouse & Babcock, 1991), the Test Anxiety Inventory (TAI; Spielberger et al., 1980), the State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983), the Kentucky Inventory of Mindfulness Skills (KIMS; Baer, Smith, & Allen, 2004), and the Acceptance and Action-Questionnaire-II (AAQ-II; Bond et al., 2011). After the intervention, participants completed a second exam in their psychology course. Results indicate that individuals in the DBT intervention had greater reductions in levels of test anxiety (as measured by the TAI; Spielberger et al., 1980) and state anxiety (as measured by the STAI; Spielberger et al., 1983) than individuals in the control condition. Further analyses indicated that individuals in the DBT intervention had greater increases in mindfulness (as measured by the KIMS; Baer, Smith, & Allen, 2004) than those in the control group. Individuals in the DBT group had an average of a 2.61 point *increase* in test scores, and individuals in the control group had an average of a 2.04 point *decrease* in test scores. This study provides data supporting that an application of DBT skills training with individuals with test anxiety is promising. Future research should examine if these findings replicate with different samples.
A Randomized Controlled Pilot Trial of a Brief Dialectical Behavior Therapy Skills Training Intervention for Test Anxiety

Approximately 20 – 35% of college undergraduate students suffer from test anxiety (Naveh-Benjamin, Lavi, McKeachie, & Lin, 1997; Zeidner, 1998). This problem often includes psychological, physiological, or behavioral disturbances, which individuals experience before or during a test. Unfortunately, test anxiety can lead to maladaptive thoughts, unwanted emotional states, and decreased academic performance. As such, many researchers have proposed theories on the components of test anxiety and investigated potential treatments.

Theories of Test Anxiety

According to Liebert and Morris (1967), test anxiety consists of two core components—worry and emotionality. Worry includes cognitive issues such as low self-confidence or rumination about poor performance. The authors defined emotionality as physiological arousal, which may be characterized by an increased heart rate and sweaty palms, for instance. Liebert and Morris (1967) investigated the possible relationships between these two components of test anxiety and performance expectancy (i.e., how individuals predict they will perform on a college exam). They found that there was an inverse relationship between worry and performance expectancy so as worry increased, individuals predicted poorer performance on a college exam and vise versa.

Several other researchers have examined the influence of test anxiety on different cognitive outcomes such as working memory and attention. Sarason (1988) hypothesized that worry associated with test anxiety decreases individuals' working memory capacities, which leads to reduced attention and poorer performance on tests. Just as Sarason hypothesized, Eysenck and Calvo's (1992) found that increased levels of worry are correlated with decreased
processing abilities in working memory. As such, individuals typically compensate by allocating more effort to the test. In addition to a reduction in working memory capacities, test anxiety may also interfere with optimal attention allocation (Eysenck, Derakshan, Santos, & Calvo, 2007). Test-anxious individuals shift their attention to threatening internal stimuli (e.g., worrisome thoughts) or external stimuli (e.g., distractions in the testing room) and away from the test. Divided attention may lead to lower information processing abilities and working memory inefficiencies (Lee, 1999).

According to Eysenck (1992), test anxiety may be a sub-category of trait anxiety insofar as individuals with high trait anxiety are predisposed to experiencing higher levels test anxiety. Individuals' self-evaluations and perceptions about how others may evaluate their academic performance may influence their levels of test anxiety as well. Among test-anxious ninth graders, individuals' worries about how important others (e.g., a parent or teacher) would perceive their academic performance was the most important factor contributing to their test anxiety. The authors also found that negative self-evaluations exacerbated test anxiety (Hagtvet, Ye, Man, Pal, & Sharma, 2010).

Zeidner (1998) expanded upon the existing literature on the relationship between self and other perceptions and test anxiety. He created a model that incorporates the following three components of test anxiety: students' perceptions of the test, their self-perceptions, and their views of the test-taking situation. Bonaccio and Reeve (2010) examined perceptions of college undergraduate students, such as those that Zeidner proposed, which may lead to test anxiety. Bonaccio and Reeve concluded that students' greatest source of perceived test anxiety was their perceptions of the test, especially the perceived level of test difficulty and perceived
instrumentality or how the test would impact their final course grade or future. In addition, low self-efficacy (i.e., belief in one's abilities) and anxiety proneness contributed to test anxiety.

The study targeted the three factors of test anxiety by using the following Dialectical Behavior Therapy (DBT; Linehan, 1993a,b) skills: One-Mindfully, Participate, Non-judgmentally, Observe, and Cope Ahead. One-Mindfully and Participate targeted students' perceptions of the test. Non-Judgmentally and Observe targeted students' self-perceptions. Finally, Cope Ahead targeted students' perceptions of the test-taking situation.

One-Mindfully, Participate, Non-judgmentally, and Observe are mindfulness skills intended to help individuals focus their attention in a centered and direct manner to the present moment. One-Mindfully and Participate targeted students' perceptions of the test by emphasizing that the students should focus their attention on the test, become fully engaged in the experience, and practice accepting the aspects of the test that they cannot change. Non-judgmentally and Observe addressed students' perceptions of themselves by educating the students about techniques to use in order to stay focused in the present moment and not on self-judgments. Cope ahead is a skill that is intended to help individuals regulate their emotions by encouraging them to rehearse effectively coping with an emotional situation beforehand so they are able to handle it with greater ease when it occurs. This skill directed students to engage in imaginal practice of the test-taking situation, which can lead to repeated exposure of the feared situation and mastery of these fears. This skill helped students manage their perceptions of the test-taking situation by accepting inevitable uncertainties of the test-taking situation, dealing with emotional concerns about potentially disappointing people who are important to the students, and deescalating their own test anxiety. See Figure 1 for a diagram of DBT skills that correspond with each factor in the three-factor theory for test anxiety.
Interventions for Test Anxiety

There are several empirically supported treatments for test anxiety. For instance, cognitive therapy, relaxation techniques, and study-skills training have been utilized to decrease test anxiety (Ergene, 2003). Meta-analyses, which summarize and integrate the results from multiple studies, provide robust data on the most effective treatments for test anxiety.

Among 56 studies conducted from 1973 to 1998 with 2,482 participants (mean age of 18.86 years old), Ergene (2003) concluded that the most beneficial interventions for test anxiety were cognitive and skill-focused combined interventions, behavioral and skill-focused combined interventions, and behavioral interventions. Cognitive, behavioral, and cognitive behavioral approaches are intended to decrease symptoms of test anxiety by changing individuals’ thoughts, behaviors, or both. Skill-focused interventions teach individuals with test anxiety the necessary study skills and test-taking skills in order to perform well on a test.

Hembree’s (1988) meta-analysis included 562 studies, from 1950 through 1986, utilizing individuals enrolled in kindergarten through graduate school. As compared to low test-anxious college undergraduate students, high test-anxious college undergraduate students (N = 627) had a lower sense of well-being, decreased level of self-acceptance, reduced self-control, lower acceptance of responsibility, reduced capacity for status (i.e., individual characteristics that enable one to achieve a higher status and success), decreased tolerance, and reduced intellectual efficiency. To this end, cognitive-behavioral treatments (i.e., cognitive modification, attentional training, insight therapy, anxiety management training, and stress inoculation) and all behavioral therapies (e.g., systematic desensitization) were used to target these impediments that occurred as a result of test anxiety.
Few studies have been conducted on other treatments for test anxiety such as acceptance-based therapies. Brown et al. (2011) compared cognitive therapy (i.e., CT or a therapy that proposes that irrational thoughts may prompt unwanted feelings and behaviors) to Acceptance-Based Behavior Therapy (i.e., ABBT or a therapy that focuses on an individual's accepting their thoughts) among college undergraduate students. Individuals in the CT group recorded their thoughts before the final exam, participated in relaxation techniques, engaged in a group simulation of a mock exam, and completed homework exercises. Individuals in the ABBT group learned and practiced principles from Acceptance and Commitment Therapy (ACT; Hayes, Strosahl, & Wilson, 1999), Mindfulness-based Stress Reduction (MBSR; Kabat-Zinn, 1990), and Dialectical Behavior Therapy (DBT; Linehan, 1993a). Study results showed a decrease in self-reported test anxiety among both groups, but individuals in the ABBT group showed greater increases in their test scores from a midterm exam to a final exam in a psychology course.

Effective interventions for test anxiety include individual or group CBT treatments and behavioral therapies (Hembree, 1988; Orbach, Lindsay, & Grey, 2007); cognitive therapy (Brown et al., 2011); cognitive restructuring, behavioral and skill-focused approaches combined, cognitive and skill-focused approaches combined (Ergene, 2003); and ABBT (Brown et al., 2011). However, these studies often include small sample sizes, poor control conditions, and vague methodology. Furthermore, few studies have examined acceptance-based treatments for test anxiety. As such, brief DBT skills training is a promising treatment for test anxiety among college undergraduate students due to its short duration, overlap with Zeidner's (1998) theoretical constructs of test anxiety, and emphasis on remaining attentive to the present moment.
**Present Study.** The present study utilized Zeidner’s (1998) theory, which suggests that test anxiety is composed of individuals’ perceptions of the test, their self-perceptions, and their perceptions of the test-taking situation. Given the wide array of literature on test anxiety theories, Zeidner’s theory seems to best capture the variables that are most prominent for individuals experiencing test anxiety.

Four main hypotheses were tested in this study. First, when comparing participants receiving brief DBT to participants in a control group, the individuals in brief DBT will have greater improvement of test scores (as measured between scores on an early exam and a later exam in a psychology course). Second, when comparing participants receiving brief DBT to participants in a control group, the individuals in brief DBT will have greater reductions in test anxiety as measured by the Test Anxiety Inventory (TAI; Spielberger et al., 1980). Third, when comparing participants receiving brief DBT to participants in a control group, the individuals in brief DBT will have greater reductions in state anxiety as measured by the State Trait Anxiety Inventory: S-Anxiety scale (STAI; Spielberger et al., 1983). Fourth, when comparing participants receiving brief DBT to participants in a control group, the individuals in brief DBT will have greater reductions in trait anxiety as measured by the State Trait Anxiety Inventory: T-Anxiety scale (STAI; Spielberger et al., 1983).

For exploratory purposes, the investigator explored several other variables. The investigator examined the impact of brief DBT, as compared to no brief DBT treatment, on mindfulness and acceptance. It was expected that individuals in the brief DBT group would have greater increases in both mindfulness and acceptance as compared to their control group counterparts. Mindfulness was measured by the Kentucky Inventory of Mindfulness Skills (KIMS; Baer, Smith, & Allen, 2004), and acceptance was measured by the Acceptance and
Action Questionnaire-II (AAQ-II; Bond et al., 2011). In addition, the investigator explored potential relationships among anxiety and two cognitive parameters: first, processing speed and second, working memory. The Letter Comparison Task (Salthouse & Babcock, 1991) and the Listening Span Task (Salthouse & Babcock, 1991), respectively, measured these cognitive variables. It was expected that students who had higher anxiety levels on each of the TAI (Spielberger et al., 1980), STAI: S-Anxiety scale (Spielberger et al., 1983), and the STAI: T-Anxiety scale (Spielberger et al., 1983) would exhibit reduced processing speed as well as decreased working memory capacity.

Method

Participants

Participants were recruited from Xavier University’s Department of Psychology college undergraduate student participant pool. Inclusion criteria included 1) the participant is a college undergraduate student enrolled at Xavier University in a psychology course with at least two exams remaining in the course, one of which is scheduled for after his or her participation in the study’s intervention, 2) the participant has been deemed a high-test-anxious student according to his or her score on the TAI-5 (i.e., at or above 51.26 for males and at or above 48.27 for females), 3) the participant provides written informed consent, 4) the participant agrees not to participate in another DBT treatment while enrolled in the study, and 5) the participant does not initiate new anxiety treatment during the course of the study. The exclusion criterion was that the participant is currently enrolled in DBT.

The current study included data from 48 Xavier college undergraduate students. Of the 50 college undergraduate students enrolled in the study, two individuals completed pre-treatment assessments but were lost to follow-up due to a medical condition and vacation, respectively.
Therefore, the final sample included 48 participants (i.e., 26 in the brief DBT group and 22 in the control group) with a mean age of 20.23 ± 4.15 years and a range of 18-47 years. See Table 1 for further descriptive information on study participants.

**Measures**

**Test Anxiety Inventory-5 (TAI-5).** The Test Anxiety Inventory-5 (Taylor & Deane, 2002) is a self-report measure, which includes five items from the 20-item Test Anxiety Inventory (Spielberger et al., 1980). Items assess individuals' physical symptoms, thoughts, and feelings about taking tests. Individuals respond on a four-step Likert scale from 1 (*almost never*) to 4 (*almost always*). The overall score is calculated by summing the individual item scores. Higher scores indicate greater test anxiety. The internal consistency of the TAI-5, as measured by Cronbach’s alpha (1951), is good with $r = .87$. The TAI-5 also shows good evidence of concurrent validity with the Test Anxiety Inventory (Taylor & Deane, 2002).

**Test Anxiety Inventory (TAI).** The Test Anxiety Inventory (Spielberger et al., 1980) is a 20-item self-report questionnaire in which participants respond to items regarding their symptoms of test anxiety experienced before, during, and after an exam. Participants rate items on the following four-step Likert scale: 1 (*almost never*), 2 (*sometimes*), 3 (*often*), or 4 (*almost always*). A summation of all item scores, including a reverse score of item 1, is known as the total score with greater scores signifying higher test anxiety. The measure has sufficient test-retest reliability and internal-consistency reliability at $r = .80$ and .92 to .95, respectively. The TAI shows good evidence of concurrent validity as it is highly correlated with other rigorous measures of test anxiety, such as the Test Anxiety Scale (TAS; Sarason, 1978) at $r = .82$ (Spielberger et al., 1980).
State-Trait Anxiety Inventory (STAI). The State-Trait Anxiety Inventory (Spielberger et al., 1983) is a self-report measure, which assesses how anxious individuals feel at the present moment (i.e., state anxiety) and also how prone they are to experience anxiety in general (i.e., trait anxiety). Thus, the assessment includes two scales known as the State-Anxiety (i.e., S-Anxiety) and Trait-Anxiety (i.e., T-Anxiety) scales. Participants self-report the intensity of their feelings for the 20 state anxiety items from 1 (not at all), 2 (somewhat), 3 (moderately so), to 4 (very much so). Participants endorse the frequency of their anxious feelings for the 20 trait anxiety items from 1 (almost never), 2 (sometimes), 3 (often), to 4 (almost always). A total score for each scale is calculated by summing the items with higher scores on either scale indicating greater levels of present anxiety or general anxiety for the S-Anxiety scale and T-Anxiety scale, respectively. The Cronbach (1951) alpha reliability coefficients for each scale were sufficiently high with the S-Anxiety scale ranging from .86 to .95 and the T-Anxiety scale ranging from .89 to .91. The trait anxiety scale evidences concurrent validity with other measures of trait anxiety such as The Institute for Personality and Ability Testing Anxiety Scale (Cattell & Scheier, 1963), with a correlation of .75 for college females and .76 for college males, and the Taylor Manifest Anxiety Scale (Taylor, 1953) with a correlation of .80 for college females and .79 for college males.

Kentucky Inventory of Mindfulness Skills (KIMS). The Kentucky Inventory of Mindfulness Skills (Baer, Smith, & Allen, 2004) is a 39-item self-report measure, which focuses on four core areas of mindfulness. The core areas comprise the measure's four scales: observing, describing, acting with awareness, and accepting (or allowing) without judgment. Individuals respond to each item according to a 5-point Likert scale ranging from 1 (almost never) to 5 (almost always). Four total scores (i.e., a total for each skill including reversed items) are
obtained by summing the items in each category. The total scores indicate how much of a particular mindfulness skill an individual uses in his or her everyday life. Internal consistency or reliability estimates for each of the four scales was good ranging from .76 to .91. Test-retest reliabilities evidenced similar results, ranging from .65 to .86 across the four mindfulness categories.

**Acceptance and Action Questionnaire-II (AAQ-II).** The Acceptance and Action Questionnaire-II (Bond et al., 2011) measures how individuals interact with, or their level of flexibility with, their thoughts and feelings. The self-report measure includes 10 items in which individuals respond on a 7-point Likert scale ranging from 1 (*never true*) to 7 (*always true*). A total score is calculated by reverse scoring some items then summing all of the items. Higher scores on the measure indicate more psychological flexibility. The AAQ-II has an alpha of .84, which shows sufficient reliability. Test-retest reliability was strong at 3-month and 12-month time points with coefficients of .81 and .79, respectively.

**Letter Comparison Task.** This assessment is a paper-and-pencil task that measures individuals’ processing speed or how efficiently they can finish a simple task. Individuals must determine as quickly as possible whether two strings of letters (i.e., members of a letter pair) in the same row are the “same” or “different.” Each letter string is comprised of a random series of consonants including three, six, or nine letters. Participants are given 20s to complete the first set of 21 letter pairs and another 20s to complete the second set of 21 letter pairs. One point is given for each correctly identified letter pair made during each 20s period. Then, a z score is calculated in order to evaluate individuals’ processing speed. The task has high test-retest reliability with $r = .94$ but no formal validity studies have been conducted on this task. However, it is a widely used measure (Salthouse & Babcock, 1991).
Listening Span Task. This task, designed to assess working memory, requires individuals to answer questions about information (i.e., the examiner reads one to eight sentences aloud) while simultaneously remembering the last word of each sentence. Individuals must answer content questions correctly in order for the last word recall responses to be scored. Listening span scores are recorded as the highest number of correct responses to items on at least two of the three trials of a particular sequence length. A z score is calculated for the listening span task in order to evaluate individuals’ working memory capacities. The measure shows good split-half reliability with $r = .86$. In addition, it has evidence of validity as the authors reported that there is a .68 correlation between the listening span task and the computation span task, both of which are purported to measure working memory (Salthouse & Babcock, 1991).

Perceived Sources of Test Anxiety. This self-report assessment is a list of 22 statements regarding a sample of college undergraduate students’ perceived sources of test anxiety based on a study conducted by Bonaccio and Reeve (2010). Items assess for sources of anxiety within the greater categories of perceptions of the test, perceptions of the self (i.e., the test-taker), and perceptions of the test-taking situation. Individuals respond from 1 (not at all) to 5 (extremely) based upon how accurately the statement reflects the individual’s perceived source of test anxiety for a particular test. An individual score for each item is reported, but item scores are not summed to obtain a total score.

Manipulation check. During the follow-up assessments, participants completed a qualitative feedback form based on Brown et al.’s (2011) pilot study on test anxiety. The manipulation check assessed how well participants comprehended the material, how helpful the intervention was, and how they used the information they had learned during the intervention. Based on the brief DBT participants’ responses, it was clear that they understood the DBT skills
that they had learned during the intervention and applied them appropriately before, during, and after their second exams. Regarding how helpful the participants viewed the intervention, on a rating scale from 0 (not at all helpful) to 6 (extremely helpful), the brief DBT group had a mean rating of 4.15 (i.e., moderately helpful) with a SD of .84; whereas, the control group had a mean rating of 2.32 (i.e., minimally helpful) with a SD of 1.62. None of the participants failed the manipulation check.

**Procedure**

The Xavier University Institutional Review Board granted study approval (see Appendix B). Using the TAI-5 (Taylor & Deane, 2002), the investigator prescreened potential participants via phone to ascertain whether they had high test anxiety and met inclusion criteria. Demographic information was also obtained from potential participants at this time. If they consented to participate in the study, the investigator arranged a time for pre-treatment assessments to be conducted prior to the participants’ next psychology exam. The following pre-treatment assessments were given to each participant: The Letter Comparison Task (Salthouse & Babcock, 1991), The Listening Span Task (Salthouse & Babcock, 1991), the Test Anxiety Inventory (Spielberger et al., 1980), the State-Trait Anxiety Inventory (Speilberger et al., 1983), the Kentucky Inventory of Mindfulness Skills (Baer, Smith, & Allen, 2004), and the Acceptance and Action Questionnaire – II (Bond et al., 2011). All of the measures were counterbalanced for each participant and given in a random order in order to control for possible order effects. Then, the investigator randomized participants, via a random numbers table, to the brief DBT intervention group or the activities group (i.e., the control group) and soon afterward, conducted pre-treatment assessments. Next, participants attended their assigned 2-hour group after one of their psychology exams and prior to taking a later exam in the same psychology course. On
average, the amount of time between the intervention or control group and participants’ second exam was 21 days. The range of time was from 14 days to 28 days. In the brief DBT intervention, the investigator and a co-therapist taught the participants the skills of One Mindfully, Participate, Non-Judgmentally, Observe, and Cope Ahead. Throughout the intervention, the group therapists encouraged group participation and elaborated on how these skills could be specifically utilized to decrease test anxiety. At the end of the group, the participants were provided with homework sheets to document when they practiced the DBT skills. The activities group, on the other hand, completed brain puzzles and Internet-based activities on www.brainbashers.com based on Orbach, Lindsay, and Grey’s (2007) study comparing Internet-based CBT to an Internet-based activities control group. Based upon the dates of their next psychology exams, participants scheduled an appointment for follow-up assessments within one to two weeks of their second exam. The same assessments given at pre-treatment were given at follow-up in addition to the Perceived Sources of Test Anxiety, a manipulation check, and a debriefing form. If participants had not yet reported their first and second exam scores, they reported them to the investigator at this time. In addition, participants in the brief DBT group turned in their homework sheets.

Results

Results were based upon 48, test-anxious Xavier University college undergraduates. Results are reported for the four primary hypotheses regarding exam scores, test anxiety, state anxiety, and trait anxiety. In addition, results are reported for the exploratory analyses concerning mindfulness, acceptance, and cognitive variables (i.e., processing speed and working memory). Means and standard deviations for the total sample, DBT sample, and control sample at pre-treatment and post-treatment are reported in Table 2.
Exam Scores

A mixed-model Analysis of Variance (ANOVA) was conducted to test the first hypothesis that individuals receiving brief DBT would have greater improvement across their exam scores than their control group counterparts. Individuals in the DBT group had an average of a 2.61 point increase in their test scores, and individuals in the control group had an average of a 2.04 point decrease in their test scores. However, the difference between groups was not statistically significant ($t = 1.43, p > .05$). Although the study was powered to detect a medium to large effect for mixed-model ANOVA analyses, an effect size that was between a small to medium effect size was detected (i.e., Cohen’s $d = 0.42$). Based on the observed effect size, with an alpha of .05 and power set at .80, a researcher would need to collect data from 142 participants (i.e., 71 per group) to be able to detect this effect.

Test Anxiety Levels

A mixed-model ANOVA was used to test the second hypothesis that individuals receiving brief DBT would have greater reductions than the control group in self-reported test anxiety levels, as measured by the TAI (Spielberger et al., 1980). As expected, the brief DBT group had a decrease in self-reported test anxiety. The brief DBT group exhibited a 12.47 point decrease. Whereas, the control group had a 1.36 point decrease in self-reported test anxiety. This difference was statistically significant ($t = 3.77, p < .05$). Furthermore, Cohen’s $d$ suggested a large effect size ($d = -1.11$). See Figure 2 for a graphic depiction of the difference in self-reported test anxiety levels from pre-treatment to post-treatment.

State Anxiety Levels

A mixed-model ANOVA was conducted to test the third hypothesis that individuals receiving brief DBT would have greater reductions in state anxiety levels, as measured by the
STAI: S-Anxiety scale (STAI; Spielberger et al., 1983), as compared to the control group. Results indicated that the brief DBT group had a 4.23 point decrease in self-reported state anxiety levels whereas the control group had a 1.22 point increase in self-reported state anxiety levels. This difference was statistically significant at $t = 2.20, p < .05$). Based on Cohen’s $d$, a medium to large effect size is indicated ($d = -0.65$). See Figure 3 for a graphic depiction of the difference in self-reported state anxiety levels from pre-treatment to post-treatment.

**Trait Anxiety Levels**

A mixed-model ANOVA was employed to test the fourth hypothesis that individuals receiving brief DBT would have greater reductions in trait anxiety levels, as measured by the STAI: T-Anxiety scale (STAI; Spielberger et al., 1983), as compared to the control group. Although the brief DBT group had a 5.54 point decrease in self-reported trait anxiety levels, this reduction was not significant as compared to the 1.59 point decrease in the control group ($t = 1.90, p > .05$). However, this difference approached significance as $p = .06$ and Cohen’s $d = -0.56$, which is a medium effect size. Based on the observed effect size, with an alpha of .05 and power set at .80, a researcher would need to collect data from 82 participants (i.e., 41 per group) to be able to detect this effect.

**Exploratory Analyses**

The exploratory analyses served three purposes. First, the level of four mindfulness skills — observing, describing, acting with awareness, and accepting without judgment (as measured by the KIMS; Baer, Smith, & Allen, 2004) in the brief DBT group was compared to the control group. Second, the level of acceptance (as measured by the AAQ-II; Bond et al., 2011) in the brief DBT group was compared to the control group. Third, correlations of pre-treatment data existed among anxiety (i.e., test, state, and trait anxiety) and specific cognitive areas (i.e.,
processing speed and working memory). Test anxiety was measured by the TAI (Spielberger, 1980). State and trait anxiety were measured by the STAI: S-Anxiety scale and the STAI: T-Anxiety scale, respectively (Spielberger et al., 1983). The Letter Comparison Task (Salthouse & Babcock, 1991) and the Listening Span Task (Salthouse & Babcock, 1991) were used to measure processing speed and working memory, respectively.

It was hypothesized that individuals in the brief DBT group would report greater increases in levels of the mindfulness, as measured by the KIMS (Baer, Smith, & Allen, 2004) in the four skill areas of observing, describing, acting with awareness, and accepting without judgment as compared to their control group counterparts. Regarding the subscale of observing, according to the mixed-model ANOVA, the results showed that there was not a significant difference in the changes in observing levels between the brief DBT group as compared to the control group ($t = .99, p > .05$). Nonetheless, the effect size of this difference was between a small and a medium effect size (Cohen’s $d = 0.29$). Regarding the subscale of describing, according to the mixed-model ANOVA, the results showed that there was not a significant difference in describing levels between the brief DBT group as compared to the control group ($t = .15, p > .05$). Although the difference in the change between groups was not significantly different, the brief DBT group did experience a significant increase in describing levels over time ($t = 2.54, p < .05$). The control group also experienced a significant increase in their scores ($t = 2.13, p < .05$). A less than small effect size was detected for the difference of the change in mindfulness levels of describing between groups (Cohen’s $d = 0.04$). Regarding the subscale of acting with awareness, according to the mixed-model ANOVA, the results showed that there was a significant difference in acting with awareness levels between the brief DBT group as compared to their control group counterparts ($t = 2.21, p < .05$). The brief DBT group showed
an increase in levels of acting with awareness from pre-treatment to post-treatment \((t = 2.63, p < .05)\) whereas the control group did not have a significant change in their acting with awareness scores \((t = .58, p > .05)\). The effect size of this difference was medium to large (Cohen's \(d = 0.65\)). See Figure 4 for a graphic depiction of the difference in self-reported acting with awareness mindfulness levels from pre-treatment to post-treatment. Regarding the subscale of accepting without judgment, according to the mixed-model ANOVA, the results showed that there was not a significant difference in accepting without judgment levels between the brief DBT group as compared to their control group counterparts \((t = 1.52, p > .05)\). While the difference in the change between groups was not significantly different, the brief DBT group did experience a significant increase in accepting without judgment levels over time \((t = 2.14, p < .05)\). The control group did not experience a change in accepting without judgment score \((t = .10, p >.05)\). A small to medium effect size was detected for the difference of the change in mindfulness levels of accepting without judgment between groups (Cohen's \(d = 0.45\)). Based on the observed effect size, with an alpha of .05 and power set at .80, a researcher would need to collect data from 124 participants (i.e., 62 per group) to be able to detect this effect.

It was hypothesized that individuals in the brief DBT group would report greater levels of acceptance as compared to their control group counterparts. However, the results of the mixed model ANOVA indicated that there was not a significant difference in acceptance levels between the brief DBT group and the control group \((t = 1.29, p > .05)\). Although the difference in the change between groups was not significantly different, the brief DBT group did experience a significant increase in acceptance levels over time \((t = 3.41, p < .01)\). The control group did not experience a change in AAQ-II score \((t = 1.38, p > .05)\). A small to medium effect size was detected for the difference of the change in acceptance between groups (i.e., Cohen's \(d = 0.38\)).
Based on the observed effect size, with an alpha of .05 and power set at .80, a researcher would need to collect data from 174 participants (i.e., 87 per group) to be able to detect this effect.

Finally, the relationships among pre-treatment anxiety levels on each of the TAI (Spielberger et al., 1980), STAI: S-Anxiety scale (Spielberger et al., 1983), and the STAI: T-Anxiety scale (Spielberger et al., 1983) and the cognitive variables of processing speed and working memory capacity at pre-treatment were explored. There were significant negative correlations between state anxiety and the second trial of a processing speed measure ($r = -0.23$, $p < .05$), state anxiety and working memory ($r = -0.25$, $p < .05$), and trait anxiety and working memory ($r = -0.26$, $p < .05$). It is probable that there was a significant negative correlation between state anxiety and the second trial of a processing speed measure, as compared to the first trial, because state anxiety likely increased following the first trial. On this task, participants were given 20s to identify whether 21 strings of letter pairs were the same or different. The task was designed so that the majority of participants are not able to complete all of the letter pairs during the allotted time. Overall, these correlations are considered to be between small to medium effect sizes. The relationships tested among the remaining variable combinations were non-significant: 1) test anxiety and working memory, 2) test anxiety and the first trial of a processing speed measure, 3) test anxiety and the second trial of a processing speed measure, 4) state anxiety and the first trial of a processing speed measure, 5) trait anxiety and the first trial of a processing speed measure, and 6) trait anxiety and the second trial of a processing speed measure.

**Discussion**

The purpose of this study was to determine whether a brief DBT skills treatment group, as compared to a control group, would improve college undergraduates’ exam scores and reduce
their test, state, and trait anxiety levels. Zeidner's (1998) theory of test anxiety as comprised of individuals' perceptions of the test, perceptions of themselves, and perceptions of the test-taking situation provided a solid framework for predicting which specific DBT skills may reduce test anxiety. Furthermore, the investigator examined the impact of a brief DBT treatment on mindfulness and acceptance as well as the potential correlations among test anxiety and cognitive variables. Prior research has suggested that cognitive therapy, behavioral therapies, CBT, and CBT in conjunction with skills-training approaches reduce test anxiety (Brown et al., 2011; Ergene, 2003; Hembree, 1988; Orbach, Lindsay, & Gray, 2007). However, less research has been conducted on acceptance-based approaches. The combination of the findings of this study with Brown et al.'s (2011) study suggest that brief acceptance based approaches can be beneficial in reducing test anxiety.

Results confirmed Hypotheses 2 and 3 indicating that individuals in the brief DBT group, as compared to the control group, exhibited a statistically significant reduction in self-reported, test and state anxiety levels. These findings indicate that a brief DBT skills training can reduce test anxiety and state anxiety. This supports a model in which the DBT skills of One-Mindfully and Participate treat Zeidner's (1998) test anxiety component of individuals’ perceptions of the test, the DBT skills of Non-Judgmentally and Observe treat Zeidner’s test anxiety component of individuals’ perceptions of themselves, and the DBT skill of Cope Ahead treats Zeidner’s test anxiety component of individuals’ perceptions of the test-taking situation.

However, Hypotheses 1 and 4 were not confirmed. That is, when individuals in the brief DBT treatment were compared to those in the control group, they neither exhibited a statistically significant improvement in their exam scores from an earlier psychology exam to a later exam nor did they show a statistically significant reduction in trait anxiety levels. Regarding the non-
significant findings from these two hypotheses, the effect sizes are indicative that future research with larger sample sizes may detect significant differences. Further, it may be that a greater number of sessions may increase the impact on these variables. It may also be that for a variable that theoretically has high stability, like trait anxiety, a brief intervention may not be potent enough to impact it.

A few significant findings also emerged from the exploratory analyses. First, the brief DBT group, as compared to their control group counterparts, showed a statistically significant increase in mindfulness levels on the subscale of acting with awareness from pre-treatment to post-treatment. According to Baer, Smith, and Allen (2004), acting with awareness is immersing oneself completely in the activity at hand with undivided attention. The authors indicate that acting with awareness includes the DBT skills of Participate and One-mindfully, both of which were taught to the brief DBT group participants in this study. Second, a negative correlation existed between state anxiety and the second trial of a processing speed. It is possible that the first trial of the processing speed measure increased participants' levels of state anxiety. Future research may examine whether this is an easy, effective way to manipulate state anxiety. Third, a negative correlation was found between state anxiety and working memory. And, fourth, a negative correlation existed between trait anxiety and working memory. These significant results on state and trait anxiety expand upon the findings of Eysenck and Calvo (1992), Lee (1999), and Sarason (1988), which documented that test anxiety is correlated with a decrease in working memory abilities, divided attention, and reduced processing speed. Although the correlations in this study were observed to have small to medium effect sizes, the results suggest that higher levels of state and trait anxiety reduce individuals' cognitive abilities. In addition to potentially impacting performance in testing situations, reduced cognitive abilities may
ultimately influence individuals' functioning in a wide array of areas such as physical, psychological, and interpersonal domains.

A statistically significant difference was not detected for acceptance levels across groups. This finding may be the result of an insufficient sample size required to detect a meaningful effect. Given a small to medium observed effect size, with an alpha of .05 and power set at .80, a researcher would need to collect data from 174 participants (i.e., 87 per group) to be able to detect this effect.

**Limitations and Future Research**

Despite this study being the first to investigate the impact of a brief DBT treatment on the reduction of test anxiety, it is not without limitations. First, the sample size was relatively small (n = 48) and primarily comprised of Caucasian females. Future research should utilize a larger, more diverse sample in order to help detect effects that this study was under-powered to detect as well as expand the generalizability of the treatment beyond college undergraduates enrolled in at least one psychology course. For instance, researchers may examine the treatment among students enrolled in different types of courses, of different educational levels (e.g., high school or graduate school), and of more varied demographic factors. Different testing situations may also be considered such as standardized tests or high school entrance examinations. Second, the primary measure of test anxiety used in the study (i.e., The Test Anxiety Inventory or TAI; Spielberger et al., 1980) was normed on college undergraduates in 1980. The sample of college undergraduates was 55% female. According to the U.S. Department of Education (2009), the collegiate population and environment has changed since 1980. For instance, a greater number of total students and first-generation students have been attending college, students represent more diverse age groups, and the number of females enrolling in college has been increasing at a
faster rate than the number of males enrolling in college. Likewise, the STAI was normed on a sample of college undergraduates in 1983. The normative sample for the STAI was 62% female, and all of the college undergraduates attended the same university in South Florida (Spielberger et al., 1983). The present study was approximately 71% female so it is similar to the normative sample used for the STAI in this domain. Therefore, it is more likely to reflect accurate state and trait anxiety levels. Future research may employ other anxiety measures to examine if the effects found in this study generalize to other anxiety measures. Third, a few study design variables may have altered the results. For instance, participants in the brief DBT group were enrolled in different psychology courses and, thus, used different psychology exams as their exams for the study. Exams varied by difficulty and time given during the semester. Nonetheless, the use of randomization, in theory, should control for these differences between the two conditions.

Future research may collect data while controlling for exam difficulty. Furthermore, individuals in the brief DBT group practiced skills outside of session to varying degrees based upon motivation and the time between the intervention and individuals’ later exams. As such, future research may examine if the level of practice impacts outcome. A final limitation of the study is that the two-hour DBT treatment may have been too brief in order to have a meaningful impact upon variables such as exam score, trait anxiety, and acceptance levels. Future research should consider investigating whether an extended treatment has a greater impact.

Despite the study’s limitations, the randomized controlled pilot trial of a brief DBT treatment suggests that brief DBT is more effective in reducing test and state anxiety among college undergraduates than a control condition. Major strengths of the study include that it is a brief, novel application of DBT treatment and the first to assess the use of a brief DBT skills treatment to decrease test anxiety. The preliminary evidence that a brief DBT treatment reduces
test and state anxiety has powerful implications for the numerous college undergraduates suffering from test anxiety as well as students outside of this population and within different testing contexts.
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the State-Trait Anxiety Inventory*. Palo Alto, CA: Consulting Psychologists Press.

Inventory (TAI). *The Journal of General Psychology, 129*, 127-136. doi:
10.1080/00221300209603133


Table 1

*Descriptive Statistics for Sample*

<table>
<thead>
<tr>
<th>Participant Characteristics (N = 48)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>70.8</td>
</tr>
<tr>
<td>Male</td>
<td>29.2</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>77.1</td>
</tr>
<tr>
<td>African-American</td>
<td>20.8</td>
</tr>
<tr>
<td>Asian</td>
<td>2.1</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
</tr>
<tr>
<td>Hispanic or Latino</td>
<td>4.2</td>
</tr>
<tr>
<td>Not Hispanic or Latino</td>
<td>95.8</td>
</tr>
<tr>
<td><strong>Year in school</strong></td>
<td></td>
</tr>
<tr>
<td>Freshman</td>
<td>25.0</td>
</tr>
<tr>
<td>Sophomore</td>
<td>27.1</td>
</tr>
<tr>
<td>Junior</td>
<td>35.4</td>
</tr>
<tr>
<td>Senior</td>
<td>12.5</td>
</tr>
<tr>
<td><strong>Therapy for Anxiety during study</strong></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>4.2</td>
</tr>
<tr>
<td>No</td>
<td>95.8</td>
</tr>
<tr>
<td><strong>Medication for Anxiety during study</strong></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>0.0</td>
</tr>
<tr>
<td>No</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Table 2

Means and standard deviations of study measures for total sample, DBT sample, and control sample at pre-treatment and post-treatment.

<table>
<thead>
<tr>
<th>Study Variable (Measure)</th>
<th>Pre-treatment Mean (SD)</th>
<th>Post-treatment Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DBT</td>
<td>Control</td>
</tr>
<tr>
<td>Exam Score</td>
<td>79.62 (9.94)</td>
<td>85.86 (10.19)</td>
</tr>
<tr>
<td>Test Anxiety (TAI-5)</td>
<td>62.31 (8.85)</td>
<td>64.91 (5.78)</td>
</tr>
<tr>
<td>Test Anxiety (TAI)</td>
<td>59.35 (8.85)</td>
<td>58.68 (9.08)</td>
</tr>
<tr>
<td>State Anxiety (STAI: S-Anxiety)</td>
<td>44.77 (9.58)</td>
<td>44.23 (8.24)</td>
</tr>
<tr>
<td>Trait Anxiety (STAI: T-Anxiety)</td>
<td>46.00 (9.16)</td>
<td>45.23 (9.83)</td>
</tr>
<tr>
<td>Mindfulness – Observing (KIMS)</td>
<td>34.69 (8.01)</td>
<td>36.18 (6.07)</td>
</tr>
<tr>
<td>Mindfulness – Describing (KIMS)</td>
<td>25.15 (7.99)</td>
<td>25.27 (6.37)</td>
</tr>
<tr>
<td>Mindfulness - Acting with awareness (KIMS)</td>
<td>25.62 (4.85)</td>
<td>28.95 (4.58)</td>
</tr>
<tr>
<td>Mindfulness - Accepting without judgment (KIMS)</td>
<td>29.27 (4.95)</td>
<td>30.86 (4.54)</td>
</tr>
<tr>
<td>Acceptance (AAQ-II)</td>
<td>43.27 (8.30)</td>
<td>42.73 (9.77)</td>
</tr>
<tr>
<td>Processing Speed (Letter Comparison Task – Trial 1)</td>
<td>9.04 (2.54)</td>
<td>7.82 (2.26)</td>
</tr>
<tr>
<td>Processing Speed (Letter Comparison Task – Trial 2)</td>
<td>8.35 (2.47)</td>
<td>8.05 (2.19)</td>
</tr>
<tr>
<td>Working Memory (Listening Span Task)</td>
<td>2.92 (1.60)</td>
<td>3.27 (1.08)</td>
</tr>
</tbody>
</table>
Figure 1. DBT Skills for Factors of Test Anxiety

One-Mindfully and Participate
(Perceptions of the Test)

Non-Judgmentally and Observe
(Perceptions of the Self)

Cope Ahead
(Perceptions of the Test-Taking Situation)

Test Anxiety

Figure 1. DBT Skills that correspond with each factor of the three-factor theory in which the arrows designate that these three components contribute to one’s test anxiety.
Figure 2. Results of MMANOVA for Test Anxiety

Figure 2. Total score on Test Anxiety Inventory (Spielberger et al., 1980) of DBT group and control group at pre-treatment and post-treatment.
Figure 3. Results of MMANOVA for State Anxiety

Figure 3. Total subscale score on S-Anxiety scale of the State-Trait Anxiety Inventory (Spielberger et al., 1983) of DBT group and control group at pre-treatment and post-treatment.
Figure 4. Results of MMANOVA for Acting with Awareness

Figure 4. Total subscale score for Acting with Awareness on the Kentucky Inventory of Mindfulness Skills (Baer, Smith, & Allen, 2004) of DBT group and control group at pre-treatment and post-treatment.
Appendix A

Instruments Used

The Test Anxiety Inventory-5 (TAI-5) is protected by copyright so it is not reproduced in this document. This measure can be found in the following article: Taylor, J., & Deane, F. P. (2002). Development of a short form of the Test Anxiety Inventory (TAI). *The Journal of General Psychology, 129*, 127-136.

The Test Anxiety Inventory (TAI) is protected by copyright so it is not reproduced in this document. This measure is available through http://www.mindgarden.org or in the following manual: Spielberger, C. D., Gonzalez, H. P., Taylor, C. J., Anton, E. D., Algaze, B., Ross, G. R., & Westberry, L. G. (1980). *Manual for the Test Anxiety Inventory (“Test Attitude Inventory”).* Redwood City, CA: Consulting Psychologists Press.


The Kentucky Inventory of Mindfulness Skills (KIMS) is protected by copyright so it is not reproduced in this document. This measure can be found in the following article: Baer, R. A., Smith G. T., & Allen, K. B. (2004). Assessment of mindfulness by self-report: The Kentucky Inventory of Mindfulness Skills. *Assessment, 11*, 191-206. doi: 10.1177/1073191104268029.

The Acceptance and Action Questionnaire-II (AAQ-II) is protected by copyright so it is not reproduced in this document. This measure can be found in the following article: Bond, F. W., Hayes, S. C., Baer, R. A., Carpenter, K. M., Guenole, N., Orcutt, H. K., Waltz, T., & Zettle, R. D. (2011). Preliminary psychometric properties of the Acceptance and Action Questionnaire - II: A revised measure of psychological flexibility and experiential avoidance. *Behavior Therapy, 42*, 676-688.

The Letter Comparison Task is protected by copyright so it is not reproduced in this document. This measure is used and explained in multiple publications including Bowles & Salthouse, 2008; Brown & Park, 2002; Levitt et al., 2006; Park et al., 1996; Salthouse & Babcock, 1991; and Zwahr et al., 1999. It is available from T.A. Salthouse.

The Listening Span Task is protected by copyright so it is not reproduced in this document. This measure is used and explained in multiple publications including Levitt et al., 2006; Salthouse & Babcock, 1991; and Zwahr et al., 1999. It is available from T.A. Salthouse.

The items that comprise the Perceived Sources of Test Anxiety list is protected by copyright so it is not reproduced in this document. These items can be found in the following article: Bonaccio, S., & Reeve, C.L. (2010). The nature and relative importance of students' perceptions of the
Appendix B

Xavier University IRB Letter of Approval

August 7, 2013

Kathryn Jameison  
9225 Spooky Ridge Lane  
Cincinnati, OH 45242

Dear Ms. Jameison:

The IRB has completed the review of your protocol #1299-12, A Brief DBT Intervention for Test Anxiety using expedited review procedures. We appreciate your thorough treatment of the issues raised and your timely response. Your study is approved in the Expedited category under Federal Regulation 45 CFR 46. Approval expires on August 7, 2014. A progress report, available at http://www.xavier.edu/irb/forms.cfm, is due by that date.

Please notice that the statement “THE DATE APPROVAL STAMP ON THIS CONSENT FORM INDICATES THAT THIS PROJECT HAS BEEN REVIEWED AND APPROVED BY XAVIER UNIVERSITY’S INSTITUTIONAL REVIEW BOARD.” has been added to the informed consent. Please make sure to use this copy. Also please confirm with the IRB office the secured location of the informed consents and that they will be stored for three years following the completion of the study.

If you wish to modify your study, including any changes to the approved Informed Consent form, it will be necessary to obtain IRB approval prior to implementing the modification. If any adverse events occur, please notify the IRB immediately. We wish you success with your research!

Sincerely,

Merell E. Mullins, Jr., Ph.D.  
Chair, Institutional Review Board  
Xavier University

MEMsb

cNicholas Salsman, Advisor

Enc. Stamped Informed Consent
Appendix C

Xavier University IRB Letter of Approval Extension

August 5, 2014

Kathryn Jamieson
2205 Park Ave. #3
Cincinnati, OH 45206

Re: Protocol #1299-12, A Brief DBT Intervention for Test Anxiety

Dear Ms. Jamieson

The IRB has received your Progress Report for the above mentioned protocol and understand that you wish to extend your approval for another year. Therefore your above-referenced study has been re-approved in the Expedited category under Federal Guidelines 45CFR46. Your approval expires on August 5, 2015 and a progress Report is due by that date. The form can be found online at www.xavier.edu/irb/forms.

Please note that if you wish to modify your study, it will be necessary to obtain IRB approval prior to implementing the modification. If any adverse events occur, please notify the IRB immediately.

We truly appreciate your efforts and attention to compliance within the spirit of human subject’s protection. We wish you great success with your research.

Sincerely,

Morell E. Mullins, Jr., Ph.D.
Chair, Institutional Review Board
Xavier University

MEM/6b

Enclosure: updated stamped informed consent
Appendix D

Informed Consent

INTRODUCTION:
You are being given the opportunity to volunteer to participate in a project conducted through Xavier University.

PURPOSE:
The purpose of this study is to investigate the relationship between test anxiety and test performance.

SELECTION PROCEDURES:
In general, you were selected to participate in this study because you are an undergraduate student at Xavier University seeking credit for a psychology course. More specifically, you were selected to participate in this study because you qualified as someone who has a high level of test anxiety based upon a prescreening assessment.

INCLUSION AND EXCLUSION CRITERIA:
The following are inclusion and exclusion criteria of students to the study:

Inclusion Criteria:
1. You are an undergraduate enrolled at Xavier University in a psychology course with at least two exams.
2. You have been deemed a high-test-anxious student according to your score on a prescreening assessment for test anxiety.
3. You provide written informed consent.
4. You agree not to participate in a Dialectical Behavior Therapy (DBT) treatment while enrolled in the study.
5. You agree to complete the study in its entirety in order to be awarded three hours of participation in your psychology course.

Exclusion Criteria:
1. You are currently enrolled in DBT.

PROCEDURES:
If you agree to participate in this study, you will be randomly assigned to two hours of either an experimental treatment for test anxiety or a no treatment condition. You will complete three study meetings and several psychological and cognitive assessments. The first meeting will include pre-condition assessments, the second meeting will consist of a two-hour experimental treatment or a two-hour no treatment condition, and the third meeting will include post-condition assessments. You will be asked to take and report the score of an exam in your psychology course prior to Study Meeting 2 as well as take a second exam in the same course between Study Meeting 2 and Study Meeting 3.

ASSOCIATED RISKS:
There is minimal risk involved in participating in this study. In this study you will be asked to answer specific questions about your personal history with test anxiety as well as anxiety in general. If you do not want to continue with the study, know that you do not
have to participate and that you may withdraw from the study at any time. If you feel
distress at any point in time during or after the study counseling services are available
free of charge for full-time Xavier students at the Psychological Services Center (513-
745-3531) and the McGrath Health and Wellness Center (513-745-3022).

ASSOCIATED BENEFITS:
You may be randomly assigned to receive a two-hour experimental treatment, which may
be helpful in reducing test anxiety.

CONFIDENTIALITY:
If you choose to participate in the study you will be prompted to give your name, class
and professor at the end of the study. Gathering this information is solely for purposes of
awarding you credit for your participation. The identifying information that you give will
in no way be linked with your responses to the questionnaires, nor will it be saved on the
same database.

Refusal to participate in this study will have NO EFFECT ON ANY FUTURE
SERVICES you may be entitled to from the University. You are FREE TO WITHDRAW
FROM THE STUDY AT ANY TIME, OR TO NOT PARTICIPATE, WITHOUT
PENALTY.

If you decide to participate in the project, please sign this form. You will be given a copy
of this form to keep.

If you have any questions at any time during the study, you may contact Kathryn
Jameson at jamesonk@xavier.edu or 513-313-4673. You may also contact her
dissertation chair and licensed psychologist, Dr. Nicholas Salsman at 513-745-4289.
Questions about your rights as a research subject should be directed to Xavier
University’s Institutional Review Board at 513-745-2870.

Thank you,
Kathryn Jameson, M.A.

I have been given information about this research study and its risks and benefits and
have had the opportunity to ask questions and to have my questions answered to my
satisfaction. I freely give my consent to participate in this research project.

_____________________________  ____________________________
Signature of Participant                  Date

THE DATE APPROVAL STAMP ON THIS CONSENT FORM INDICATES THAT
THIS PROJECT HAS BEEN REVIEWED AND APPROVED BY XAVIER
UNIVERSITY’S INSTITUTIONAL REVIEW BOARD.

APPROVED
Xavier University
Institutional Review Board
Date: 8/1/13
Appendix E

Debrief

Thank you for your time and participation!

If you feel distress at any point in time during or after the study, counseling services are available free of charge to full-time Xavier students at the Psychological Services Center (513-745-3531) and the McGrath Health and Wellness Center (513-745-3022).

If you have any questions, you may contact Kathryn Jameson at jamesonk@xavier.edu or at 513-313-4673. You may also contact her dissertation chair and licensed psychologist, Dr. Nicholas Salsman, at salsmann@xavier.edu or 513-745-4289. In addition, if you have any questions about your rights as a research participant, please direct them to Xavier University’s Institutional Review Board at 513-745-2870.
Appendix F

Summary

Title: A Randomized Controlled Pilot Trial of a Brief Dialectical Behavior Therapy Skills Training Intervention for Test Anxiety.

Method. Participants included 48 college undergraduates from a mid-sized, private Jesuit university in the Midwest. Participants were recruited through the University’s undergraduate participant pool. The sample consisted of 34 females and 14 males with a mean age of 20.23 years (SD = 4.15). All participants were enrolled in psychology courses in which they had at least two exams remaining and were screened for test anxiety using the Test Anxiety Inventory-5 (TAI-5; Taylor & Deane, 2002). Those participants with high test anxiety (i.e., above the cut score on the TAI-5) were randomly assigned to one of two conditions: a brief DBT treatment group or a control condition. Participants in the brief DBT group attended a two-hour skills training session in which they learned mindfulness and coping skills in order to reduce their test anxiety. Participants in the control group participated in a two-hour session in which they engaged in computer brain puzzles and activities. Several mixed model ANOVAs and correlations were conducted in order to examine four main hypotheses and multiple exploratory hypotheses. The main hypotheses examined whether a brief DBT treatment, as compared to a control condition, improved participants’ exam scores and decreased their levels of test, state, and trait anxiety. Exploratory hypotheses investigated whether a brief DBT treatment, as compared to a control condition, increased participants’ levels of mindfulness and acceptance. In addition, correlations were conducted in order to determine whether any of the following variables: higher levels of test, state, or trait anxiety influenced either of the following cognitive variables: processing speed and working memory.

Findings. The results of mixed-model ANOVAs suggested that individuals in the brief DBT treatment, as compared to their control group counterparts, experienced a reduction in test (t = -3.766, p < .05) and state (t = -2.198, p < .05) anxiety levels from pre-treatment to post-treatment. However, they neither showed a statistically significant improvement in their exam scores (t = 1.43, p > .05) nor a statistically significant decrease in trait anxiety (t = -1.899, p > .05). Nonetheless, the effect sizes for these changes suggest that the study may have been underpowered to detect significant differences in exam scores and trait anxiety. Exploratory analyses revealed that participants in the brief DBT treatment showed a greater increase in levels of mindfulness, namely acting with awareness, as compared to the control group (t = 2.206, p < .05). In addition, higher levels of state anxiety were associated with lower levels of processing speed (r = -0.23, p < .05) and working memory (r = -0.25, p < .05). Higher levels of trait anxiety were associated with reduced working memory abilities (r = -0.26, p < .05). The analyses did not provide evidence for significant differences from pre-treatment to post-treatment regarding acceptance levels between groups (t = 1.288, p > .05) or the other potential correlations between test and trait anxiety and the cognitive variables of processing speed and working memory.

Implications. The study is the first to examine a brief DBT treatment for test anxiety thus contributing to the test anxiety literature in a unique way. As novel applications of DBT continue to increase, this study provides preliminary evidence that a brief DBT skills treatment
reduces test and state anxiety, and increases mindfulness levels, among college undergraduates. Negative correlational findings between state anxiety and processing speed, state anxiety and working memory, and trait anxiety and working memory suggest that it may be useful for future anxiety interventions to specifically target these cognitive variables. The brief, comprehensive DBT treatment utilized in this study may be replicated at other college campuses and among different types of students in diverse educational or occupational settings.