

A Randomized Controlled Trial of Acceptance Based Behavior Therapy
And Cognitive Therapy for Test Anxiety: A Pilot Study

Lily A. Brown, Evan M. Forman^{*}, James D. Herbert, Kimberly L. Hoffman, Erica K. Yuen,

Elizabeth M. Goetter

Drexel University

* Correspondence should be directed to Evan M. Forman, Ph.D., Drexel University, 245 N. 15th Street, Mailstop 626, Philadelphia, PA 19102-1192, 215-762-4021; fax: 215-762-8625, evan.forman@drexel.edu; Contact information for Lily A. Brown: Butler Hospital 345 Blackstone Blvd Providence, RI 02906, lab55@drexel.edu, 401-455-6465; Contact information for James D. Herbert: Drexel University 245 N. 15th, Street, MS 988, Philadelphia PA 19102, 215-553-7001, fax: 215-553-7010, email: james.herbert@drexel.edu; Contact information for Kimberly L. Hoffman: klh56@drexel.edu, please refer to Dr. Forman's contact information; Contact information for Erica K. Yuen: eky23@drexel.edu, please refer to Dr. Forman's contact information; Contact information for Elizabeth M. Goetter: emg45@drexel.edu, please refer to Dr. Forman's contact information

* Correspondence should be directed to Evan M. Forman, Ph.D., Drexel University, 245 N. 15th Street, Mailstop 626, Philadelphia, PA 19102-1192, or via email at evan.forman@drexel.edu

Abstract

Many university students suffer from test anxiety that is severe enough to impair performance. Given mixed efficacy results of previous cognitive-behavior therapy (CBT) trials and a theoretically-driven rationale, an acceptance-based behavior therapy (ABBT) approach was compared to traditional CBT (i.e., Beckian cognitive therapy; CT) for the treatment of test anxiety. In this pilot study, 16 university students with test anxiety were randomly assigned to receive either a CT or ABBT two-hour group workshop. The two treatments produced markedly different effects on test performance (measured by exam scores), with those receiving ABBT experiencing improvements in performance, while those receiving CT exhibited reduced performance. In addition, there was a suggestion that ABBT may have been more effective at reducing subjectively experienced test anxiety (i.e., a nonsignificant but medium-sized group by time interaction effect). Implications of these results for the treatment of test anxiety and for theoretical notions related to cognitive change strategies are discussed.

Keywords: Test Anxiety; Cognitive Therapy; Acceptance and Commitment Therapy; Anxiety

Test anxiety involves excessive fear and worry about situations involving formal evaluation of performance, particularly in academic domains. Although most people experience some form of test anxiety, estimates of the prevalence of functionally impairing test anxiety range from 20-35% in studies of college student populations (Naveh-Benjamin, Lavi, McKeachie, & Lin, 1997; Zeidner, 1998). Severe test anxiety can significantly disrupt performance (Rothman, 2004). Consensus has emerged that test anxiety can be divided into two broad dimensions: worry, which is manifested in cognitive concerns and rumination about future performance, and emotionality, reflecting awareness of heightened physiological responses (Cassady & Johnson, 2002; Liebert & Morris, 1967). Worrying in test anxiety is conceptualized as cognitive concern about the possibility of failure, embarrassment, or disappointment and may also include cognitive disturbances such as concentration difficulty, oversensitivity, and memory problems (Huberty & Dick, 2006; Liebert & Morris, 1967; Rothman, 2004; Zeidner, 1998). Emotionality is distinguished by physiological disturbances such as perspiration, nausea, and rapid heartbeat (Huberty & Dick, 2006). Behavioral disturbances such as avoidance of tests, seeking easy tasks, and fidgeting are also components of test anxiety (Huberty & Dick, 2006). There is debate on the origin of test anxiety, with some theorists arguing for a skills deficit explanation (Kirkland & Hollandsworth, 1980) and others promoting a low perceived self-competence explanation. A recent study by Lang and Lang (2010) lends support to the latter claim. Evidence suggests that test anxiety directly impairs performance in test situations, at least high stakes ones (Rothman, 2004; Zatz & Chassin, 1985).

Treatments for Test Anxiety

Cognitive therapy. Standard Beckian CBT, known as cognitive therapy (CT), is based on the so-called cognitive model, which links cognitions, emotions, and behaviors such that cognitions shape behaviors and emotions, and unrealistic cognitions can lead to inappropriate emotions and behaviors (Beck, 1987). CT aims to reduce test anxiety by identifying and restructuring biased or maladaptive cognitions such as those about the inevitability and exaggerated consequences of failure (Beck, 1991; Beck, Emery, & Greenberg, 1985; Huberty & Dick, 2006). In addition, CT programs for test anxiety typically include relaxation techniques such as deep breathing and guided imagery. Several studies have indicated that interventions based on CT principles produce a reduction in test anxiety (Dendato & Diener, 1986; Goldfried, Linehan, & Smith, 1978; Himle, Thyer, Papsdorf, & Caldwell, 1984; McCordick, Kaplan, Smith, & Finn, 1981; Meichenbaum, 1971). However, meta-analyses suggest that the full CT package for test anxiety was no better (Hembree, 1988) or was less effective (Ergene, 2003) than behavioral-only treatments. Therefore, it is not clear whether the cognitive components of CT are specifically efficacious.

Moreover, almost none of the studies examining CT principles have used measurements that can capture changes in real world performance. Many studies examining CT's effects on test anxiety rely on analogue measures of performance, such as tests of general reasoning (Orbach, Lindsay, & Grey, 2007), speed tests with numbers (Finger & Galassi, 1977), or problem solving tasks (McCordick, et al., 1981); none of these studies revealed benefits to CT over behavioral-only (e.g. modeling, exposure) or control treatment conditions on performance measures. Furthermore, these tasks may not be reflective of real-world performance on examinations. Whereas Dendato and Diener (1986) did report that a relaxation/cognitive

therapy condition improved exam performance, utilization of cognitive coping statements has been associated with *worse* performance (Zatz & Chassin, 1985). CT has shown limited, if any, positive effects on real-world test *performance* (D'Alelio & Murray, 1981; Dendato & Diener, 1986; McCordick, et al., 1981), arguably the most important outcome variable.

Acceptance-based behavior therapy. Newer forms of CBT provide an alternative to interventions that focus on cognitive reappraisal. Acceptance-based behavior therapies (ABBTs) are relatively new and promising treatment models that emphasize the psychological acceptance of distressing thoughts and feelings rather than efforts to control or eliminate them (Herbert, Forman, & England, 2009). Some of these therapies are based on a philosophy of functional contextualism, that seeks to understand behavior and emotions based on a person's learning history (Hayes, Luoma, Bond, Masuda, & Lillis, 2006). Acceptance and commitment therapy (ACT; Hayes, Strosahl, & Wilson, 1999), a prominent model of ABBT, has shown promising results in the treatment of anxiety and depressive symptoms (Forman, Herbert, Moitra, Yeomans, & Geller, 2007), social anxiety (Dalrymple & Herbert, 2007) and psychosis (Gaudio & Herbert, 2006), among other problems. Studies have reported an advantage of ACT over traditional CBT in treating chronic pain (McCracken, Vowles, & Gauntlett-Gilbert, 2007), eating pathology (Juarascio, Forman, & Herbert, 2010), and mixed mood-anxiety-interpersonal problems (Lappalainen, et al., 2007). A review by Hayes, Luoma, Bond, Masuda, and Lillis (2006) notes that research into this therapy is still in the early stages but the results thus far are encouraging. Rather than targeting symptom reduction as the main outcome, ACT primarily focuses on helping clients to engage in behaviors that are consistent with chosen

values by enhancing the ability to “accept” rather than change, suppress, or otherwise directly engage disturbing thoughts, feelings, and sensations (Eifert & Forsyth, 2005).

Similarly, mindfulness-based stress reduction (MBSR; Kabat-Zinn, 1990) and mindfulness-based cognitive therapy (MBCT; Segal, Williams, & Teasdale, 2002) aim to teach participants to approach internal experiences such as emotions, sensations, and cognitions from a nonjudgmental perspective through existential exercises. An important feature of both of these therapies is teaching patients, both through concentrative meditation and through mindful living, to recognize their thoughts as thoughts in the moment of having them, which is referred to as “defusion” in the ACT literature (Baer, 2003; Hayes, et al., 1999; Segal, et al., 2002). MBSR has shown promising findings in the areas of stress reduction, anxiety, and negative affect (Shapiro, Brown, & Biegel, 2007) and MBCT has shown successful results in the areas of prevention of depression relapse (Teasdale, et al., 2000). A meta-analytic review of mindfulness studies combining MBSR and MBCT revealed that medium effect sizes are typical of these studies and large effect sizes have also been found (Baer, 2003). Dialectical Behavior Therapy (DBT; Linehan, 1993) is another model of CBT that includes mindfulness and acceptance components in an effort to bring patients into the current moment while simultaneously looking ahead to behavioral change (Welch, Rizvi, & Dimidjian, 2006). DBT has shown to be effective in the treatment borderline personality disorder (Linehan, Armstrong, Suarez, Allmond, & Heard, 1991), substance use disorders in individuals with borderline personality disorder (Harned, et al., 2008), and binge eating disorder (Telch, Agras, & Linehan, 2001) among other problems. A review of current randomized controlled trials for DBT further demonstrated its efficacy (Lynch, Trost, Salsman, & Linehan, 2007).

Attention training is a key component of traditional mindfulness techniques. Martin (1997) described mindfulness as a means to “free up attention” because once one can observe thoughts without judgment, one is free to attend to other processes. The technique of concentrative meditation is used to continuously refocus one's mental capacities on a specific predetermined point of attention (Jha, Krompinger, & Baime, 2007; Martin, 1997). This idea of refocusing on important stimuli while recognizing that other unimportant stimuli will enter consciousness could be particularly useful for anxious students in a testing situation. Many test anxious students are constantly flooded with a number of trivial and potentially distracting thoughts, but must continue to attend to other stimuli in order to perform to ability.

Whereas cognitive restructuring has been demonstrated to reduce test anxiety (Goldfried, et al., 1978), it is likely taxing to devote time and resources to evaluating and challenging thoughts in timed, high stakes situations such as tests. In contrast, acceptance-based approaches emphasize experiential acceptance. Rather than expending resources to engage with thoughts (or feelings and sensations), the individual can devote maximum effort to focus on the task at hand. Moreover, several acceptance-based approaches (e.g., MBSR, DBT) have adapted mindful focusing techniques that train individuals to direct focus on a particular stimulus (often one's breath) in part by “nonjudgmentally” noticing each occurrence of lapsed focus and immediately following it with a “gentle” redirection of attention. In this case, “nonjudgmental” implies a lack of distracting and draining entanglement with the fact that distraction occurred, and “gentle” incorporates the notion of accepting that we have only a limited and imperfect degree of control over attention. Research has suggested that an acceptance-based approach to unwanted thoughts and feelings may be most beneficial when

used in response to thoughts and feelings that the individual experiences as highly distressing and that he or she either struggles to eliminate or avoid (Forman, Hoffman, et al., 2007). Given the above, we hypothesize that acceptance-based strategies may be especially well-suited for application to test anxious individuals because testing situations inherently involve the combination of high stakes, anxious thoughts and feelings, distractibility, and the need for attentional focus. To the extent that cognitive and affective anxiety responses are both inevitable and difficult to control in high-stakes contexts, an acceptance-based strategy may have an advantage over a symptom-focused strategy such as CT in the treatment of test anxiety.

In the only study of an ABBT for test anxiety to date, Zettle (2003) compared ACT and systematic desensitization (SD). The interventions produced equivalent reductions in state test anxiety, but the SD group was more effective at reducing trait anxiety (Zettle, 2003). However, the SD intervention assigned weekly relaxation exercises for homework, whereas the ACT intervention did not systematically assign homework or stress the importance of practicing behavioral techniques, which is a crucial component of the model. Therefore, it is necessary to re-examine ABBT as a treatment method for test anxiety, utilizing all the essential components that have made ABBT successful in other treatment areas. The purpose of this pilot study is to explore the feasibility, acceptability, and preliminary effectiveness of an ABBT intervention for test anxiety relative to an established model of CBT (i.e., CT).

Given the mixed evidence for the effectiveness of CT in test anxiety research and the theoretical notions of acceptance-based approaches highlighted above, it was hypothesized that that the ABBT intervention would be more effective than a CT intervention at improving

test performance (measured by midterm and final examination scores) and reducing test anxiety. The hypothesis was tentative, given the results of the Zettle (2003) study and the limited research in the area of ABBT for test anxiety.

Methods

Participants

Participants ($n=16$) were recruited from psychology courses at a large urban university via in-class announcements. Participants were distributed across 5 different courses with a difference of no more than two participants between the ACT and CT group for each course. All participants scored high on a screening measure of test anxiety, as described below, and were in courses that had at least two major exams. Ethnicities of participants included White (43.7%), Asian/Pacific Islander (25%), Black (6.2%), Caribbean/Haitian (6.2%), Latino (6.2%), and multiracial/other (12.5%). The mean age of participants was 20.2 years ($SD=1.9$) and 68.8% were female.

Measures

All key measures were administered at pre-intervention (an average of 3.4 weeks across interventions) with the ABBT group averaging less time ($M=2.7$ weeks) compared to the CT group ($M=4.0$ weeks) between the intervention and the final examination ($t(14)=5.155, p<.01$). All measures were administered again within 48 hours of administration of the final examination.

Test Anxiety Inventory-5 (TAI-5; Taylor & Deane, 2002). The TAI-5 is a shortened version of the Test Anxiety Inventory (described below) that was used to screen participants for their level of test anxiety. Only those participants who scored one standard deviation above the

mean were invited to participate in the study. Taylor and Deane (2002) report good internal consistency ($r=.87$) and concurrent validity with the full TAI ($r=.53$).

Test Anxiety Inventory (TAI; Spielberger, 1980). The TAI is a 20-item measure that asks participants to rate their level of test anxiety on a 1 (almost never) to 4 (almost always) Likert scale. The TAI has an emotionality (TAI-E) and worry (TAI-W) subscale. The TAI is one of the most frequently used measures for test anxiety (Chapell, et al., 2005) and has been found to have good test-retest reliability ($r=.80$; Spielberger, 1980).

State Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, & Lushene, 1970). The STAI has both State and Trait subscales, each of which contain 20 questions to which individuals must respond on a 1 (not at all) to 4 (very much so) scale. The STAI has been found to have good test-retest reliability and high construct validity (Spielberger, et al., 1970).

Philadelphia Mindfulness Scale (PHLMS; Cardaciotto, 2005) The PHLMS is a 20-item measure. Individuals rate their level of awareness and acceptance of various thoughts and feelings on a Likert Scale from 1 (Never) to 5 (Very Often). The PHLMS has been reported to be both valid and reliable and includes an awareness subscale (PHLMS-Awareness) and an acceptance subscale (PHLMS-Acceptance; Cardaciotto, 2005).

Acceptance and Action Questionnaire (AAQ; Hayes, et al., 2004) The AAQ-II includes 10 items that measure one's acceptance of negative thoughts and feelings. Individuals rate each statement on a Likert Scale from 1=never true and 7=always true. The AAQ is reported to be both reliable and valid in previous research (Bond & Bunce, 2003).

Drexel Defusion Scale (DDS; Zebell, Yeomans, Forman, & Moitra, 2006) The DDS is a 10-item measure that rates one's ability to defuse from distressing thoughts and feelings. The

participants rate their ability to defuse in various situations on a Likert scale from 0 (Not at all) to 5 (Very much). Good ($r=0.85$) internal consistency has been previously reported (Zebell, et al., 2006).

Comprehension, credibility and utilization checks. Participants were also asked to complete a comprehension check at the end of the treatment session as a manipulation check and to measure if they understood the material. The comprehension check was open-ended in format and required participants to “write a brief summary (2-3 sentences) of what you learned about how to cope with your test anxiety.” Responses were coded on a 1 to 3 scale where 1 (low comprehension) was no clear strategies of the intervention are discussed, 2 (moderate comprehension) was at least one concept/strategy of the respective intervention is indicated, and 3 (high comprehension) where two or more strategies of the respective intervention were indicated. Participants were also asked to complete a credibility rating by responding on a 7-point Likert scale (0 = not at all helpful, 6 =extremely helpful) to the question, “How helpful do you think the strategies you learned today will be in coping with your test anxiety?” Following the second examination, participants were asked “Which of the strategies specifically did you use to help you cope with your anxiety during the examination?” This qualitative measure was based on whether or not a participant utilized at least one skill consistent with the respective intervention during the final examination (e.g. cognitive restructuring or deep breathing in the CT intervention and defusion or acceptance in the ABBT intervention). Both the qualitative measures were coded by two blind raters, and inter-rater reliability was excellent (Kappa/intra-class correlations = .88 for comprehension and 1.00 for utilization, probably due to the simplicity of the coding).

Performance measures. We collected a measure of participants' performance on two classroom-based tests, one occurring before the intervention and one after. In order to ensure accuracy, these scores were collected from both the participants and their instructors, and cross-checked.

Procedure

Participants were randomly assigned to receive either the ABBT intervention or the CT intervention, both of which were administered in a single two-hour group session. Participants were randomized to groups by choosing numbered slots in an online database that had been previously randomized to either ABBT or CT. All participants completed pre-treatment measures in person. All interventions occurred between administration of the mid-term and final examination. Emails were sent to the students at the time of their second examination requesting completion of the post-treatment online survey within 48 hours of the examination.

Components common to both interventions. Both interventions were delivered by one advanced graduate student (there were a total of three group leaders) with a second student acting as an assistant, and the group leader followed a manual for each intervention. There was an average of 3.25 participants in each intervention administration. The group leaders were all members of a research group that specializes in the study of traditional cognitive therapies as well as acceptance based therapies in their application to various anxiety and mood disorders. One of the group leaders (who administered interventions for both groups) was involved in the development of the study, and thus this person was not blind to the study hypotheses. The interventions were designed to be brief in order to gather preliminary justification for the implementation of a more intensive intervention in future studies. An

advantage of such brief interventions is that they fit well with the sometimes unpredictable and varied schedules of university students. The beginning of each intervention provided psychoeducation about anxiety (e.g., anxiety is adaptive when humans are in a situation with actual threat, but sometimes persists when benign situations are incorrectly interpreted as involving imminent harm). Test anxiety was defined as including both anxious thoughts and feelings, and participants were taught that both of these features interact to produce the overall experience of anxiety in a testing situation.

Each intervention included extensive experiential exercises. The number and duration of experiential exercises were equivalent across interventions, but (as described further below) the objective of the exercises was dependent upon the respective intervention. In one experiential exercise that was delivered to both groups, participants completed a mock examination and received the following instructions:

“We’re going to have you complete a shortened mock exam, and we would like for you to pretend that this is the real testing situation and that you just walked in to take the exam. Try to imagine sitting in the chair in front of the computer assigned to you. Imagine how the room feels and what the lighting will be like. Think of all the hard work that you’ve put into preparing for this exam. Now we’re going to pass the exam out. While you’re taking the exam we would like you to just notice the thoughts that are coming up for you.”

Another in-group exercise that was given to both groups required participants to imagine that “this is the night before the exam, and you have been spending all day studying.

You are just about to be done studying for the examination, but have one more paragraph to read.” We then provided all participants with a paragraph from a psychology journal and had a confederate verbalize some of the previously identified anxious thoughts while the participants were reading the paragraph. The participants were asked to use the strategies they had been taught in each respective intervention to help them cope with the verbalized thoughts. The final in-group exercise included another mock examination with similar material where the participants were asked to practice using the strategies from each intervention.

Following the interventions, participants were provided with a written summary of the strategies and homework assignments for practicing the techniques. The summary and the homework were reviewed in group to ensure that the participants understood their assignments. In order to address the aforementioned limitation in Zettle (2003), we made the homework identical in terms of the frequency and duration for each group. The specifics for the homework in each group will be described below.

CT intervention

Introduction. The CT intervention borrowed heavily from Beck, Emery, and Greenberg (1985)’s description of CT for anxiety disorders and phobias (Beck, et al., 1985). The intervention began by a discussion of treatment goals, which were the reduction of test anxiety, including anticipatory, studying, and test-taking anxiety. We then introduced the cognitive model to the participants, and elaborated the model as an explanation for test anxiety. In the case of test anxiety, the presentation of a test evokes anxious thoughts (“I’m going to fail”) and physical sensations (e.g. palms sweating, heart racing, psychomotor agitation) that in turn reinforces an interpretation of the test as threatening.

Identification and restructuring of automatic thoughts. We followed the discussion of the cognitive model with strategies for recognizing, recording, evaluating, and restructuring automatic thoughts, a core feature of the cognitive model. Three strategies were provided for identifying and correcting distorted cognitions: eliciting thoughts that may be common for test anxious individuals (to help participants connect specific thoughts to the anxiety they may cause), examining the evidence for (and against) the accuracy and usefulness of thoughts, and identifying the type of cognitive distortion reflected in the thoughts (e.g., overgeneralization, polarized thinking, and catastrophizing). Participants were introduced to a thought record, and with examples of common negative thoughts and physical sensations and ways to focus attention away from them. Participants were encouraged to utilize and review thought records while anticipating and studying for exams.

Relaxation Strategies. Participants were also taught breathing- and muscular-based relaxation strategies that could be utilized both before and during an exam. This exercise was provided with the rationale that one cannot be simultaneously relaxed and anxious. Participants were instructed to take a few deep breaths when they noticed anxious thoughts and sensations overtaking them. Finally, techniques such as positive imagery and memory games were presented as tools to reduce anxiety via distraction from anxiety-provoking anticipatory thoughts that occur leading up to exams.

In-group exercises. When the in group exercises described above (i.e., the mock examinations, the paragraph with study material) were conducted in the CT group, the rationale was that the more practice participants had with these exercises the greater their anxiety could be reduced. When reading the study material in group and when taking the

second mock examination, participants were instructed to restructure anxious thoughts to make them more realistic, thus reducing their anxiety. They were also asked to use the breath task to take a moment to relax if their anxiety became overwhelming while doing either of these exercises.

Homework. The participants were given homework to use the thought record for at least one day before their upcoming examination, to practice identifying thoughts and restructuring them without a thought record for at least one day before the examination, to practice using one distraction technique before the examination, and to use the breath task whenever they noticed they were becoming anxious.

ABBT Intervention

Introduction. The ABBT intervention was based primarily on ACT (Eifert & Forsyth, 2005; Hayes, et al., 1999), but also borrowed clinical strategies from MBSR (Kabat-Zinn, 1990) and DBT (Linehan, 1993). These acceptance-based components were integrated with additional psychoeducational and behavioral components to specifically address test anxiety. The intervention began with a “creative hopelessness” exercise in which participants were encouraged to recognize the futility of various efforts to directly control anxious thoughts and feelings relating to test anxiety (Hayes, et al., 1999). The participants learned to recognize that attempts to control their anxiety may actually contribute to its maintenance or even exacerbation. We provided examples of this by referencing the polygraph metaphor (Hayes, et al., 1999), in which an individual imagines that the only way to prevent being shot in the head by a gun wired to a polygraph machine is for the individual to remain completely calm and free from anxiety. The exercise demonstrates how difficult it is to control internal experiences in

high stakes situations, such as tests. Participants were also given a detailed description of an imaginary chocolate cake and then were asked to not think about the food, demonstrating the paradoxical effects of thought suppression (Hayes, et al., 1999).

The three components of willingness: awareness, defusion, and acceptance. Participants were introduced to the concept of willingness as an alternative to thought control. Willingness was presented as the ability to maintain openness to the experience of distressing thoughts, feeling, images, and sensations. We also asked participants to remember a time when an alarm clock went off early and they felt extremely tired and reluctant to leave their warm bed, but they did anyway in order to achieve something important. We then made the parallel to disliking the experience of anxiety that a test evokes but being willing to experience the anxiety in order to accomplish an important goal that is linked to one or more key personal values. Thus, participants learned that rather than expending energy to suppress or escape from distressing internal experiences, efforts could instead be directed towards accomplishing an important goal (i.e., a good score on an examination).

Willingness was presented as being supported by three components: awareness, defusion, and acceptance. Participants practiced an exercise to increase awareness of their thoughts and feelings by engaging in a short meditation inspired by MBSR and DBT while observing their internal experience. The second component, defusion, was explained as a way to step back and create psychological distance from anxious thoughts and feelings, and it was described using concepts derived from ACT. Participants were provided with a thought defusion record, on which they wrote down a troubling thought or feeling and then decided on a defusion technique to use. The “and/but” exercise from ACT was incorporated into the

intervention to teach participants how to change their perspective on thoughts that limit value-appropriate behaviors (Hayes, et al., 1999). For instance, if a participant has the common thought “I want to study, but I feel anxious,” the participant was taught to replace the word “but” with the word “and” (i.e. “I want to study, and I feel anxious”) in order to emphasize that uncomfortable sensations can be experienced while one is still acting in accord with the value of good academic performance. Participants were also introduced to the “I’m having the thought/feeling that” exercise where the aforementioned stem is added to an anxious thought (“I don’t know any of the answers on this test” becomes “I’m having the thought that I don’t know any of the answers on this test”) in order to gain distance from the thought (Hayes, et al., 1999). Acceptance, an alternative to attempts at controlling internal experiences, was presented as embracing anxious thoughts, feelings, memories, and physiological reactions. We introduced participants to the “tug of war with the monster” exercise (Hayes, et al., 1999) in order to demonstrate that ceasing to struggle with test anxiety allows them to have more attentional resources devoted to the test.

After the three components of willingness were discussed, the participants engaged in a dramatized “passengers on the bus” exercise to demonstrate how the three concepts unify to allow individuals to act in accordance with their values (Hayes, et al., 1999). The group leader acted as the driver of the bus and the group participants were instructed to verbalize anxious thoughts and sensations. The bus driver initially struggled to quiet the thoughts, but then the participants realized that she was not driving very far. Then the bus driver utilized the concepts of willingness and was able to cope with the verbalizations and still accomplish her goal of driving. The participants then related this to their experiences with test anxiety.

Handling loss of focus. Finally, a “gentle refocusing” strategy adapted from MBSR and DBT skill manuals was taught to participants to use when they noticed themselves caught in a struggle with their thoughts/feelings during the examination or during studying. At each occurrence, no matter how frequent, the participant was taught to notice the distraction without judgment and gently (with acknowledgement of the limits of control over attention) redirect back to the exam (or to studying for an exam).

In-group exercises. When the group exercises described above (i.e. the mock examinations, the paragraph with study material) were conducted in the ABBT group, the rationale was that the more practice participants had with these exercises, the more that they would be able to nonjudgmentally notice the thoughts and sensations that occur for them by using mindfulness strategies, and accept their inevitable occurrence using defusion and psychological acceptance strategies. While the participants were completing the group study activity and the second mock examination, they were instructed to practice these strategies in order to be better able to cope with the anxious thoughts and sensations. They were also asked to use the gentle refocusing task whenever they noticed their attention wandering on either of these exercises.

Homework. The participants were given homework to use the thought defusion record for at least one day before the examination. They were instructed to practice becoming aware of whatever thoughts they have for at least one day before the examination, to practice defusing from these thoughts without having to write the thought on the thought record, practice embracing thoughts, and to practice using the gentle refocusing task whenever attention has wandered from study material.

Results

Descriptive statistics are presented in Table I. Five participants (4 from the CT group, 1 from the ABBT group) did not complete post-test ratings of anxiety; in order to be conservative, these participants' baseline observations were carried forward.¹ Due to the low sample size, a Fisher's Exact test was used in place of a chi-square analysis to prevent violation of cell number assumptions. This test revealed no between-group differences in completer rates (*Fisher's Exact test* $p = .31$), ethnicity (coded as white vs. non-white; *Fisher's Exact test* $p = .32$), or gender (*Fisher's Exact test*, $p = .31$). An independent samples t-test revealed no difference in age between the groups ($t(14) = -.993$, $p = .337$). A series of t-tests revealed no between-group differences on pre-treatment levels of test anxiety (TAI), emotionality (TAI-E), worry (TAI-W), trait and state anxiety (STAIT, STAIS), awareness (PHLMS-awareness), acceptance (AAQ), defusion (DDS), or midterm score. Because of scheduling conflicts, one participant assigned to the ACT condition received the intervention individually.²

Paired t-tests across both treatment groups detected a large overall reduction in test anxiety (TAI) from pre to post-intervention ($t(15) = 2.45$, $p < .05$), as well as a reduction in the emotionality scale (TAI-E; $t(15) = 3.78$, $p < .01$) and the test anxiety worry scale (TAI-W; $t(15) = 2.21$, $p < .05$). There were no significant reductions in state anxiety ($t(15) = -.01$, $p = .99$) or performance ($t(13) = -.14$, $p = .89$). The effect of treatment group was tested via ANCOVAs with post-intervention score as the outcome variable and pre-intervention score as the covariate. The ANCOVAs revealed a medium, but non-significant, effect of treatment group on the TAI

¹ Analyses of completer-only data (i.e., without observations carried forward) produced equivalent results.

² Re-analysis with only participants assigned to groups produced equivalent results

($F(1,13) = 1.61, p = .23, \eta_p^2 = .11$), and the STAIS ($F(1,13) = 1.97, p = .18, \eta_p^2 = .13$). No significant effects were found for the TAI-E ($F(1, 13) = .815, p = .383, \eta_p^2 = .059$), TAI-W ($F(1, 13) = .046, p = .833, \eta_p^2 = .004$) STAIT ($F(1,13) = .09, p = .77, \eta_p^2 = .01$). In addition, there was a very large and significant effect of group on performance ($F(1,11) = 6.97, p < .05, \eta_p^2 = .39$). As seen in Figure I, the results indicate that participants in the ABBT condition demonstrated an improvement in performance following the intervention, whereas participants in the CT condition demonstrated deteriorated performance.

There were no significant differences between the groups when ANCOVAs were conducted for the PHLMS ($F(1,13) = 1.935, p = .188, \eta_p^2 = .130$), PHLMS-Awareness ($F(1,13) = .602, p = .452, \eta_p^2 = .044$), PHLMS-Acceptance ($F(1,13) = 4.170, p = .062, \eta_p^2 = .243$), DDS ($F(1,13) = .245, p = .629, \eta_p^2 = .019$), or AAQ ($F(1, 13) = .833, p = .378, \eta_p^2 = .060$). All of these measures capture data specific to acceptance-based therapies, and consistent with this, the ABBT group had higher means than the CT group for each measure on the post-examination administration except for awareness.

Given that Spielberger's (1980) norms for test anxiety found a large difference between gender, we reran the analyses covarying for gender. When we reran the ANCOVAs with gender and midterm score covaried, we found that the final exam score was still significantly different between groups ($F(1,10) = .018, p < .05, \eta_p^2 = .445$). The ANCOVAs continued to show no significant differences between groups for the TAI ($F(1,12) = .178, p = .680, \eta_p^2 = .015$), STAIS ($F(1,12) = 2.315, p = .154, \eta_p^2 = .162$), STAIT ($F(1,12) = .018, p = .894, \eta_p^2 = .002$), AAQ ($F(1,12) = 1.114, p = .312, \eta_p^2 = .085$), PHLMS ($F(1,12) = .910, p = .359, \eta_p^2 = .071$), PHLMS-Acceptance ($F(1,12) = 3.172,$

$p=.100$, $\eta_p^2=.209$), PHLMS-Awareness ($F(1,12)=.228$, $p=.642$, $\eta_p^2=.019$), or DDS ($F(1,12)=.548$, $p=.473$, $\eta_p^2=.044$) when gender and the pre-intervention measurements were covaried.

In terms of the perceived credibility of how helpful the interventions were, an independent samples t-test revealed that there were no significant differences between groups at pre-intervention ($t(14) = -0.22$; $p=.83$) or post-examination ($t(14) = -0.59$, $p=.57$). Across groups, participants reported feeling that the interventions were helpful both before ($M = 4.06$, $SD=1.24$) and after they took the examination ($M = 3.63$, $SD = 1.36$). Participants demonstrated that they both comprehended and utilized the strategies taught in the groups. Blind coding of the respondents' summarization statements revealed that 81.3% of participants had at least good comprehension (clearly describing at least one key concept/strategy of the particular intervention) and retention of their assigned intervention strategies (with 62.5% showing excellent comprehension, i.e. clearly describing at least two key concepts/strategies of the particular intervention). As for utilization, participants' open-ended responses to the utilization question indicated that 90.9% used a strategy fully consistent with their assigned intervention. There were no significant intergroup differences on either the comprehension or the utilization variables.

Discussion

This randomized controlled pilot trial directly compared traditional cognitive therapy (CT) and an acceptance-based behavior therapy (ABBT) for test anxiety. Results indicated that ABBT was more effective at improving exam performance. In fact, whereas CT participants evidenced a small decline in performance, ABBT participants' scores markedly improved. Although not statistically significant, it is worth noting that a parallel finding was observed for

self-reported test anxiety, i.e., a medium-sized (albeit non-significant) group-by-time interaction effect. In this case both treatments effectively reduced test anxiety, but the reduction appeared to be more pronounced for those in the ABBT group. Importantly, participants demonstrated equally good comprehension of the two interventions, the interventions were rated as equally helpful and they were utilized to the same degree by participants.

The results of this study demonstrate that the techniques of an acceptance based intervention may be more effective at helping students cope with the worry and emotionality that accompanies test anxiety in a way that facilitates improved performance in high stakes situations. Rather than teaching students to engage with their fearful cognitions through labeling and disputation, it may be advantageous to approach the testing situation with an accepting and nonjudgmental mindset that conserves resources and frees students to focus on their desired activity. However, there has not been any research on the cognitive demand for participants in an ABBT versus a CT intervention, and this research could help with the interpretation of the results. Although cognitive restructuring may reduce momentary anxiety, this apparently does not necessarily translate into better performance, potentially due to the time that it takes to restructure each negative thought that presents itself in an anxiety provoking situation, or to the fact that the individual becomes dependent on convincing him or herself that fearful thoughts are not true. Results from this pilot study point to the potential advantages of an alternative approach whereby one notices but does not attempt to alter one's fearful thoughts, recognizes that thoughts are simply products of the mind, and gently and continually refocuses on the desired activity.

Several limitations to the study temper conclusions that may be drawn. The main limitation was the small sample size of this pilot study; replication with a larger sample is required. The fact that the group-by-time interaction effect for self-reported anxiety was medium but nonsignificant highlights this shortcoming. It is worth noting, however, that even a conservative interpretation of the findings does not weaken our conclusions in the sense that the acceptance-based intervention was not explicitly designed to reduce subjective test anxiety but instead was focused on better managing this anxiety such that performance could be maximized. In addition, the generalizability of the results may be limited by the constrained population (college students from one specific program of study). It would be interesting to research the efficacy of an acceptance-based versus a cognitive-based intervention for middle school and high school students, as well as in college students sampled from outside of the psychology department. Also worth noting is the relatively short duration of each intervention; more intensive intervention may have resulted in better transmission of strategies and perhaps different results. On the other hand, results indicate that participants both comprehended and utilized both interventions. Unfortunately, no data was collected regarding adherence to homework, which could provide insight into the amount that each participant practiced the techniques of his/her assigned intervention. Similarly, it would be important in future studies to measure the amount of time that participants spend studying for their examination in order to investigate if either intervention affected test preparation. The method for collecting the post-treatment anxiety measures was not ideal due to the possibility of the participants demonstrating memory biases; however, collecting data within 48 hours of the final examination was the only feasible way to gather information in this pilot study, particularly

because of time limitations for college students during the time when final examinations are administered. Additionally, the performance measures were reported directly from faculty members and, therefore, were not subject to memory biases. The time difference between the groups on the implementation of the intervention and the time of the final examination could temper our conclusions given that the material may be fresher for the ABBT group. Future studies should also randomize participants according to initial test performance in order to insure that the groups are matched for this variable. Another shortcoming of the current study is the inability to investigate mediating mechanisms. Future studies should collect both CT-related and ABBT-related mediator variables at multiple time points in order to permit appropriate mediational analyses.

A few strengths of the study are worth highlighting. These include randomization to condition, use of exam performance (and not merely subjective anxiety scores) as an outcome measure, use of *instructor*-reported exam scores, and the fact that both conditions represented active, “best-practices” interventions. Moreover, this is one of the few trials directly comparing standard CT and ABBT, and the only trial of which the authors are aware that compared these two treatments for test anxiety. In addition, the differences in outcome for the groups may have been diluted by the many similarities between the two interventions, thus further differences may have been obtained had we included less commonalities for the interventions.

In sum, this pilot RCT produced preliminary evidence that an acceptance-based behavioral treatment for test anxiety was more effective than traditional CT treatment at boosting real-world performance on course examinations. Although requiring replication, the results raise interesting questions about the efficacy of cognitive change strategies, and the

potential that acceptance-based strategies are especially well suited to high stakes, performance and evaluation situations.

Figure 1
Midterm and final examination scores

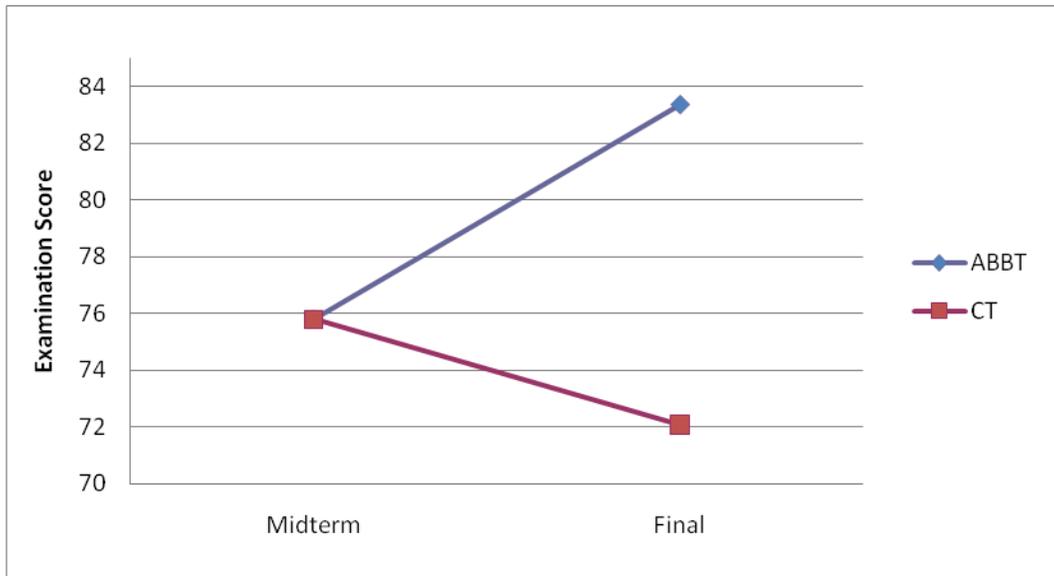


Figure 1. Adjusted mean examination scores at pre-intervention (i.e., midterm exam) and post-intervention (i.e., final exam), by treatment group [i.e., acceptance-based behavior therapy (ABBT) or traditional cognitive therapy (CT)].

Table I. Means and Standard Deviations of Outcome Measures

	<u>Time 1: M(SD)</u>		<u>Time 2: M(SD)</u>	
	<u>CT</u>	<u>ABBT</u>	<u>CT</u>	<u>ABBT</u>
TAI	57.8(9.3)	53.0(8.1)	55.7(10.5)	46.7(10.5)
TAI-E	24.8(4.6)	22.1(3.6)	22.2(3.8)	19.1(4.0)
TAI-W	22.1(4.2)	21.4(4.4)	20.1(3.4)	20.0(4.4)
STAIS	41.2(11.9)	39.6(7.9)	44.8(14.0)	35.1(11.6)
STAIT	52.4(5.0)	52.0(4.8)	50.9(5.4)	50.0(4.7)
Performance	72.9(13.9)	80.9(11.0)	69.8(14.3)	87.5(8.4)
AAQ	39.6(9.1)	48.4(7.8)	42.6(12.2)	44.9(15.7)
DDS	26.2(6.8)	28.4(7.5)	34.8(8.7)	38.0(9.8)
PHLMS	38.8(8.7)	40.6(9.4)	40.6(9.4)	47.7(12.8)
PHLMS-Accept	14.6(5.9)	16.8(9.3)	14.8(9.0)	24.4(8.1)
PHLMS-Awareness	24.2(6.3)	24.0(8.6)	25.8(10.7)	23.3(9.9)

References

- Baer, R. A. (2003). Mindfulness Training as a Clinical Intervention: A Conceptual and Empirical Review. *Clinical Psychology: Science and Practice, 10*(2), 125-143.
- Beck, A. T. (1987). Cognitive Models of Depression. *Journal of Cognitive Psychotherapy: An International Quarterly, 1*, 5-37.
- Beck, A. T. (1991). Cognitive therapy: A 30-year retrospective. *American Psychologist, 46*(4), 368-375.
- Beck, A. T., Emery, G., & Greenberg, R. (1985). *Anxiety disorders and phobias*. New York: Basic Books.
- Bond, F. W., & Bunce, D. (2003). The Role of Acceptance and Job Control in Mental Health, Job Satisfaction, and Work Performance. *Journal of applied psychology, 88*, 1057-1067.
- Cardaciotto, L. (2005). Assessing mindfulness: The development of a bi-dimensional measure of awareness and acceptance. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 66*(6-B), 3399.
- Cassady, J. C., & Johnson, R. E. (2002). Cognitive Test Anxiety and Academic Performance. *Contemporary Educational Psychology, 27*(2), 270-295.
- Chapell, M. S., Blanding, Z. B., Silverstein, M. E., Takahashi, M., Newman, B., Gubi, A., et al. (2005). Test Anxiety and Academic Performance in Undergraduate and Graduate Students. *Journal of Educational Psychology, 97*(2), 268-274.
- D'Alelio, W. A., & Murray, A. J. (1981). Cognitive therapy for test anxiety. *Cognitive therapy and research., 5*, 299-307.
- Dalrymple, K. L., & Herbert, J. D. (2007). Acceptance and Commitment Therapy for Generalized Social Anxiety Disorder: A Pilot Study. *Behavior Modification, 31*, 543-568.
- Dendato, K. M., & Diener, D. (1986). Effectiveness of cognitive/relaxation therapy and study-skills training in reducing self-reported anxiety and improving the academic performance of test-anxious students. *Journal of Counseling Psychology, 33*(2), 131-135.
- Eifert, G. H., & Forsyth, J. P. (2005). *Acceptance & Commitment Therapy for Anxiety Disorders*. Oakland: CA: New Harbinger.
- Ergene, T. (2003). Effective interventions on test anxiety reduction: A meta-analysis. *School Psychology International, 24*(3), 313-328.
- Finger, R., & Galassi, J. P. (1977). Effects of modifying cognitive versus emotionality responses in the treatment of test anxiety. *Journal of Consulting and Clinical Psychology, 45*(2), 280-287.
- Forman, E. M., Herbert, J. D., Moitra, E., Yeomans, P. D., & Geller, P. A. (2007). A randomized controlled effectiveness trial of Acceptance and Commitment Therapy and Cognitive Therapy for anxiety and depression. *Behavior Modification, 31*(6), 772-799.
- Forman, E. M., Hoffman, K. L., McGrath, K. B., Herbert, J. D., Brandsma, L. L., & Lowe, M. R. (2007). A comparison of acceptance- and control-based strategies for coping with food cravings: An analog study. *Behavior Research and Therapy, 45*(10), 2372-2386
- Gaudiano, B. A., & Herbert, J. D. (2006). Acute treatment of inpatients with psychotic symptoms using Acceptance and Commitment Therapy: Pilot results. *Behaviour Research and Therapy, 44*(3), 415-437.
- Goldfried, M. R., Linehan, M. M., & Smith, J. L. (1978). Reduction of test anxiety through cognitive restructuring. *Journal of Consulting & Clinical Psychology, 46*(1), 32-39.
- Harned, M. S., Champman, A. L., Dexter-Mazza, E. T., Murray, A., Comtois, K. A., & Linehan, M. M. (2008). Treating Co-Occurring Axis I Disorders in Recurrently Suicidal Women

- with Borderline Personality Disorder: A 2-Year Randomized Trial of Dialectical Behavior Therapy versus Community Treatment by Experts. *Journal of Consulting & Clinical Psychology*, 76(6), 1068-1075.
- Hayes, S. C., Luoma, J. B., Bond, F. W., Masuda, A., & Lillis, J. (2006). Acceptance and Commitment Therapy: Model, processes and outcomes. *Behaviour Research and Therapy*, 44.
- Hayes, S. C., Strosahl, K., & Wilson, K. G. (1999). *Acceptance and Commitment Therapy: An Experimental Approach to Behavior Change*. New York: Guilford Press.
- Hayes, S. C., Strosahl, K., Wilson, K. G., Bissett, R. T., Pistorello, J., Toarmino, D., et al. (2004). Measuring experiential avoidance: a preliminary test of a working model. *The Psychological Record*, 54(4), 553(526).
- Hembree, R. (1988). Correlates, Causes, Effects, and Treatment of Test Anxiety. *Review of Educational Research*, 58(1), 47-77.
- Herbert, J. D., Forman, E. M., & England, E. L. (2009). Psychological acceptance. In W. O'Donohue & J. E. Fisher (Eds.), *General principles and empirically supported techniques of cognitive behavior therapy* (pp. 77-101). Hoboken, NJ: Wiley.
- Himle, D. P., Thyer, B. A., Papsdorf, J. D., & Caldwell, S. (1984). In vivo distraction-coping in the treatment of test anxiety: A 1-year follow-up study. *Journal of Clinical Psychology*, 40(2), 458-462.
- Huberty, T. J., & Dick, A. C. (2006). Performance and Test Anxiety. In G. G. B. K. M. Minke (Ed.), *Children's Needs III: Development, Prevention, and Intervention* (pp. 281-291). Bethesda, MD.: NASP Publications.
- Jha, A. P., Krompinger, J., & Baime, M. J. (2007). Mindfulness training modifies subsystems of attention. *Cognitive, Affective, & Behavioral Neuroscience*, 7(2), 109-119.
- Juarascio, A. S., Forman, E. M., & Herbert, J. D. (2010). Acceptance and Commitment Therapy Versus Cognitive Therapy for the Treatment of Comorbid Eating Pathology. *Behavior Modification*, 34, 175-190.
- Kabat-Zinn, J. (1990). *Full catastrophe living: Using the wisdom of your body and mind to face stress, pain, and illness*. New York: Delacourt.
- Kirkland, K., & Hollandsworth, J. G. (1980). Effective test taking: Skills-acquisition versus anxiety-reduction techniques. *Journal of Consulting and Clinical Psychology*, 48(4), 431-439.
- Lang, J. W. B., & Lang, J. (2010). Priming Competence Diminishes the Link Between Cognitive Test Anxiety and Test Performance. *Psychological Science*, 21(6), 811-819.
- Lappalainen, R., Lehtonen, T., Skarp, E., Taubert, E., Ojanen, M., & Hayes, S. C. (2007). The Impact of CBT and ACT Models using Psychology Trainee Therapists: A Preliminary Controlled Effectiveness Trial. *Behavior Modification*, 31(4), 488-511.
- Liebert, R. M., & Morris, L. W. (1967). Cognitive and emotional components of test anxiety: a distinction and some initial data. *Psychological Reports*, 20, 975-978.
- Linehan, M. M. (1993). *Cognitive behavioral therapy for borderline personality disorder*. New York: Guilford Press.
- Linehan, M. M., Armstrong, H. E., Suarez, A., Allmond, D., & Heard, H. L. (1991). Cognitive-Behavioral treatment of chronically parasuicidal borderline patients. *Archives of General Psychiatry*, 48(12), 1060-1064.
- Lynch, T. R., Trost, W. T., Salsman, N., & Linehan, M. M. (2007). Dialectical Behavior Therapy for Borderline Personality Disorder. *Annual Review of Clinical Psychology*, 3, 181-205.

- Martin, J. R. (1997). Mindfulness: A Proposed Common Factor. *Journal of Psychotherapy Integration*, 7(4), 291-312.
- McCordick, S. M., Kaplan, R. M., Smith, S., & Finn, M. E. (1981). Variations in cognitive behavior modification for test anxiety. *Psychotherapy: Theory, Research & Practice*, 18(2), 170-178.
- McCracken, L. M., Vowles, K. E., & Gauntlett-Gilbert, J. (2007). A Prospective Investigation of Acceptance and Control-Oriented Coping with Chronic Pain. *Journal of Behavioral Medicine*, 30, 339-349.
- Meichenbaum, D. H. (1971). *Cognitive behavior modification*. New York: Plenum Press.
- Naveh-Benjamin, M., Lavi, H., McKeachie, W. J., & Lin, Y.-G. (1997). Individual Differences in Students' Retention of Knowledge and Conceptual Structures Learned in University and High School Courses: The Case of Test Anxiety. *Applied Cognitive Psychology*, 11, 507-526.
- Orbach, G., Lindsay, S., & Grey, S. (2007). A randomised placebo-controlled trial of a self-help Internet-based intervention for test anxiety. *Behaviour Research and Therapy*, 45, 483-496.
- Rothman, D. K. (2004). New approach to test anxiety. *Journal of College Student Psychotherapy*, 18(4), 45-60.
- Segal, Z. V., Williams, J. M. G., & Teasdale, J. D. (2002). *Mindfulness-based cognitive therapy for depression: A new approach to preventing relapse*. New York: Guilford Press.
- Shapiro, S. L., Brown, K. W., & Biegel, G. M. (2007). Teaching self-care to caregivers: Effects of mindfulness-based stress reduction on the Mental Health of Therapists in Training. *Training and Education in Professional Psychology*, 1(2), 105-115.
- Spielberger, C. D. (1980). *Preliminary professional manual for the test anxiety inventory*. Palo Alto: CA: Consulting Psychologists Press.
- Spielberger, C. D., Gorsuch, R. L., & Lushene, R. (1970). *Manual for the State-Trait Anxiety Inventory*. Palo Alto: CA: Consulting Psychologists Press.
- Taylor, J., & Deane, F. P. (2002). Development of a short form of the Test Anxiety Inventory (TAI). *Journal of General Psychology*, 129(2), 127-136.
- Teasdale, J. D., Segal, Z. V., Williams, J. M. G., Ridgeway, V. A., Soulsby, J. M., & Lau, M. A. (2000). Prevention of relapse/recurrence in major depression by mindfulness-based cognitive therapy. *Journal of Consulting & Clinical Psychology*, 68(4), 615-623.
- Telch, C. F., Agras, W. S., & Linehan, M. M. (2001). Dialectical Behavior Therapy for Binge Eating Disorder. *Journal of Consulting & Clinical Psychology*, 69(6), 1061-1065.
- Welch, S. S., Rizvi, S., & Dimidjian, S. (2006). Mindfulness in Dialectical Behavior Therapy (DBT) for Borderline Personality Disorder. In R. A. Baer (Ed.), *Mindfulness-Based Treatment Approaches*. New York: Elsevier.
- Zatz, S., & Chassin, L. (1985). Cognitions of Test-Anxious Children Under Naturalistic Test-Taking Conditions. *Journal of Consulting & Clinical Psychology*, 53(3), 393-401.
- Zebell, J., Yeomans, P. D., Forman, E. M., & Moitra, E. (2006). *Development and Proposed Validation of the Drexel Defusion Scale*.
- Zeidner, M. (1998). *Test anxiety: The state of the art*. New York: Plenum Press.
- Zettle, R. D. (2003). Acceptance and commitment therapy (ACT) vs systematic desensitization in treatment of mathematics anxiety. *The Psychological Record*, 53, 197-215.