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Randomized Clinical Trial Investigating the Efficacy of Self-Administered Interventions for Reducing Pathological Academic Worry

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Randomized Clinical Trial Investigating the Efficacy of Self-Administered Interventions for Reducing Pathological Academic Worry

by

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Abstract: Despite the ostensible prevalence of academic worry at the college and university level, there is a paucity of research in this area. In addition, there is an even greater dearth of research investigating treatments for excessive and uncontrollable academic worry. Further, the research on non-pharmacological treatment strategies for reducing pathological worry (as seen in its most severe form in generalized anxiety disorder; GAD) is limited. The primary goal of this study was to investigate the potential benefits of two self-administered interventions for reducing pathological academic worry. Participants experiencing pathological academic worry (N = 113) were randomized to one of four conditions: (a) worry exposure (WE), (b) expressive writing (EW), (c) a credible placebo control, consisting of pulsed audio-photic stimulation (APS), and (d) wait-list control (WLC). Participants were instructed to practice their interventions three times per week for one month. Participants in all three of the intervention conditions showed significant improvement on self-report measures, while no such changes were observed for the control group. Findings were mixed on the objective measures. In general, neither the WE nor EW conditions consistently outperformed placebo, and in some cases, EW failed to outperform the waitlist control group at post-treatment. Overall,

those assigned to WE showed greater improvement than those assigned to EW at post-treatment, but few significant differences between the three intervention groups emerged at follow-up. These mixed findings suggest that either the efficacy of each of the treatments does not go beyond the that which would be expected of non-specific treatment effects, or that the pulsed audio-photic stimulation did in fact exert more of an effect than a typical placebo, suggesting there may have been an unanticipated active treatment component. Despite this, several participants in WE and EW showed marked improvement, and even continued improvement by follow-up, suggesting that, while perhaps not highly potent treatments when delivered in isolation, these may be easy, cost-effective interventions for pathological worry. Further research is needed with clinical GAD samples, and research is also needed on the placebo response rate in GAD.

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Chapter 1. Background and Significance

1.1 Epidemiology and Nature of Generalized Anxiety Disorder (GAD)

1.1.1. Overview

Generalized anxiety disorder (GAD), characterized by excessive, uncontrollable worry about daily life events, impairs the lives of approximately 5.1% of the U.S. population (Wittchen, Zhao, Kessler, & Eaton, 1994). The nature of GAD worries are typically future-oriented, rather than worry about immediate problems (Dugas, Freeston, Ladouceur, Rheaume, Provencher, & Boisvert, 1998). To meet criteria for the disorder, the worry must be pervasive, last for at least six months, and must be associated with at least three of the following symptoms: (a) restlessness or feeling keyed up, (b) becoming easily fatigued, (c) difficulty concentrating, (d) irritability, (e) muscle tension, and (f) sleep disturbance. As with all the anxiety disorders, patients must experience significant distress and/or life interference to meet criteria for the disorder.

Patients with GAD often report that they have been "worriers" since childhood (Anderson, Noyes, & Crowe, 1984), but the onset of the disorder usually manifests in mid to late adolescence and early adulthood (Blazer, Hughes, & George, 1987; Beck, Stanley, & Zebb, 1996). However, while research indicates most patients develop GAD earlier in life, some research has discovered a subset of GAD patients whose onset occurs in later adulthood (Wittchen at al., 1994). Early-onset GAD has been associated with a history of childhood fears, inhibited or avoidance behavior, developmental, academic, and social difficulties, marital dysfunction, interpersonal sensitivity, depression, and a

more severe course of the disorder (Hoehn-Saric, Hazlett, & McLeod, 1993; Woodman, Noyes, Black, Schlosser & Yagla, 1999).

GAD is a chronic psychological disorder, with approximately only 20% of GAD sufferers showing a complete remission of symptoms within two years (Keller, 2000; Ballenger, Davidson, Lecrubier, Nutt, Borkovec, Rickels, Stein & Wittchen, 2001). According to the National Comorbidity Study (NCS; Kessler et al., 1994), GAD is twice as likely to affect women as men, with lifetime prevalence rates of 6.6% and 3.6%, respectively (Wittchen et al., 1994).

1.1.2 Classification and Comorbidity

Perhaps more than any other anxiety disorder, the conceptualization and diagnostic criteria for GAD have changed significantly with each new revision of the Diagnostic and Statistical Manual (DSM). In the DSM-III (APA, 1980), GAD was classified as a residual category, similar to the current "Anxiety Disorder, Not Otherwise Specified" diagnosis. By the DSM-III-R (APA, 1987), the diagnosis for GAD could be made even if patients met diagnostic criteria for another anxiety disorder. Patients met criteria if they reported unrealistic and excessive worry in two or more spheres of life for at least six months and experienced several somatic symptoms associated with anxiety.

In order to improve reliability and validity of the diagnosis, major changes were made to the DSM-IV diagnostic criteria for GAD. Patients no longer needed to report two or more spheres of worry; rather, worry considered pervasive was sufficient, as data indicated that GAD patients often worried about several minor events that did not always fall into a particular sphere of worry (Borkovec, Shadick, & Hopkins, 1991; Craske,

Rapee, Jackel & Barlow, 1989). Further, the 18 somatic symptoms associated with GAD in the DSM-III-R (many of which were identical to symptoms of a panic attack, indicating autonomic arousal) were reduced to six associated symptoms. This decision was based on research that indicated GAD patients did not show autonomic arousal, but displayed symptoms of autonomic suppression (Hoehn-Saric, McLeod, & Zimmerli, 1989; Borkovec & Hu, 1990).

One difficulty with the six associated symptoms retained in the DSM-IV is the high degree of overlap between these GAD symptoms and symptoms of a major depressive episode (MDE). While some have argued that there is a lack of discriminant validity between GAD and major depressive disorder (MDD; Brown, Barlow & Leibowitz, 1994; Brown, Marten & Barlow, 1995), research has also found support for GAD as a distinct diagnosis, separate from depression (e.g., Joorman & Stober, 1999).

As data are currently being collected and evaluated in order to revise the diagnostic criteria for the DSM-V, researchers are addressing the issue of discriminant validity between GAD and MDD, as well as suggesting a change from the criteria that symptoms persist for six months or longer to 1-12 months. This recommendation is based on a study which found that cases in which patients met all other diagnostic criteria for GAD for 1-5 months did not differ from those with episodes lasting six months or more on age of onset, pervasiveness, impairment, or comorbidity (Kessler, Brandenburg, Lane, Roy-Byrne, Stang, Stein, & Wittchen, 2005).

Although there is mounting evidence suggesting GAD is a distinct disorder in its own right, GAD is often comorbid with other psychological disorders. One large-scale

study of a clinical sample found that 68% of GAD patients met for another Axis I disorder (Brown, Campbell, Lehman, Grisham & Mancil, 2001). Of those, 36% met for social phobia, 26% met for MDD, and 18% met for panic disorder. In addition, 64% reported a history of experiencing a major depressive episode. Interestingly, the NCS study also found high rates of comorbidity between GAD and alcohol-related disorders (Swendsen, Merikangas & Canino, 1998).

1.1.3 Medical Utilization

A large body of evidence suggests GAD is associated with high medical utilization. GAD is the most prevalent anxiety disorder found in primary care settings (Barrett, Barrett, & Oxman, 1988; Wittchen et al., 2001; see Wittchen 2002, for reviews), and among patients classified as high in medical care utilization, 40% met criteria for a lifetime history of GAD (Katon, von Korff, & Lin, 1990). The World Health Organization (WHO) multi-center Psychological Problems in General Health Care (PPGHC) study revealed that 8% of primary care utilizers met diagnostic criteria for GAD (Ustun & Sartorius, 1995).

This high rate of health care utilization is perhaps not surprising, as patients with pathological worry must present with at least three associated symptoms to meet criteria for the diagnosis, many of which are somatic. Approximately one-third of GAD patients seek medical attention for their somatic symptoms (Judd, Kessler, Paulus, Zeller, Wittchen, & Kunovac, 1998), a significant portion of which are visits to the gastroenterologist (Kennedy & Schwab, 1997). According to the most recent primary

care study of GAD health care utilization, GAD patients were twice as likely to visit a primary care doctor than patients with MDD (Wittchen et al., 2002).

In addition to GAD patients seeking non-mental health services at primary care facilities, GAD patients also utilize primary care settings for help with their anxiety. Maier, Gaensicke, Freyberger, Linz, Heun & Lecrubier (2000) found that 25% of patients visiting a primary care physician for a psychological problem met for GAD with no comorbid diagnoses. Wittchen et al. (2001) found that only 28% of GAD patients presenting with anxiety symptoms in primary care facilities were correctly diagnosed by their primary care physicians, and that these patients were rarely treated with empirically supported pharmacological and non-pharmacological treatments for GAD. These data suggest that evaluating pre to post treatment changes in medical utilization in patients with GAD may be an important outcome variable to consider and may be an important public health issue to evaluate (Telch, Smits, Brown & Beckner, 2002).

1.1.4. Impairment

Individuals with GAD experience significant levels of impairment. An analysis combining the results from the NCS study and the Midlife Development in the United States Survey indicated that GAD was associated with marked impairment in role functioning and social life (Kessler et al., 1999). This impairment was found to be equivalent to that of patients with major depression (MDD).

Providing further support, Wittchen, Carter, Pfister, Montogmery, & Kessler (2000) compared the level of impairment observed between GAD and MDD. After controlling for age, gender, and other psychopathology, GAD without MDD, MDD

without GAD, and comorbid GAD and MDD were each associated with high levels of impairment, as defined by at least three days of limited or impaired functioning within the past month, poor self-perceived health, and low self-reported quality of life. No differences on these measures of impairment were found between GAD alone and MDD alone.

1.2 Psychosocial Models of GAD

1.2.1 Overview and Etiology

Current conceptual models of the etiology of GAD suggest that early experiences of uncontrollability may be risk factors for the development of the disorder (Barlow, 1988). GAD has been described as the "basic" anxiety disorder (Barlow, 1998; Brown, Chorpita & Barlow, 1998), consisting of negative affect, a sense of uncontrollability, and attention to threat-related stimuli, all features that have been considered vulnerabilities to other emotional disorders (Clark, Watson, & Mineka, 1994). Research has consistently demonstrated that patients with GAD show a preattentive bias towards threatening information (e.g., MacLeod, Matthews, & Tata, 1986) and interpret ambiguous information as threatening (e.g., Eysenck, MacLeod, & Matthews, 1987). Because GAD patients show a preattentive bias to threat but do not show biased recall of threat words during memory tasks, Matthews (1990) has argued that, while threat information is quickly encoded, GAD patients may display a subsequent rapid cognitive avoidance.

Researchers have proposed that, given the early onset of GAD relative to comorbid diagnoses, conceptualizing GAD as a predisposing factor to the development of

other anxiety and mood disorders may explain the high rates of comorbidity (Brown et al., 1994).

1.2.2. "Meta-Worry" Cognitive Models of Pathological Worry

Wells' (1995) meta-cognitive model of pathological worry has been instrumental in the development of cognitive therapy aimed at addressing pathological beliefs about worry that serve as maintaining factors in GAD. Wells (1995) proposed a distinction between two types of worry. Type I worries are the general worries concerned with daily life events, while Type II worries are meta-worries, or worries about worry. Wells considers this "worry about worry" (Type II) to be the hallmark feature of and maintaining factor in pathological worry.

More specifically, Wells discusses that positive beliefs about worry (e.g., that it is useful for problem solving) may initiate the worry process (with Type I worries). These positive beliefs are maintained when the goals of worrying are met (i.e., patients perceive that a negative outcome did not occur because of worry, or a positive outcome did occur because of worry). However, often during these worry episodes, negative beliefs about worry may be activated (e.g., "I must control my worry or I will cease to function"), thus leading to Type II worry. This Type II worry influences emotional (i.e., increase in anxiety) and behavioral (i.e., avoidance or use of behaviors to reduce anxiety) changes, as well as attempts to control thoughts, all of which then maintain negative beliefs about the uncontrollability or harmful nature of worry.

A research group in Montreal has added to this model by including several other cognitive factors involved in the maintenance of GAD. This group has used their model

to develop innovative treatments for GAD based on their theory that pathological worry is maintained by distorted positive and negative beliefs about worry (e.g., "worrying helps me succeed in accomplishing my goals" and "worrying is dangerous," respectively), an inflated intolerance for uncertainty in life situations, cognitive avoidance of distressing situations, and difficulty with identifying and solving problems. Evidence has been found supporting this conceptual model (Dugas, Gagnon, Ladouceur, & Freeston, 1998).

1.2.3 Cognitive Avoidance Model of Worry

Borkovec's cognitive avoidance model (Borkovec, Shadick, & Hopkins, 1991; Borkovec, 1994) is one of the most widely recognized models of GAD in the research community. First, supported by research suggesting verbal thoughts produce less arousal than images (Vrana, Cuthbert & Lang, 1986), Borkovec posits that worry is a verbal/linguistic thought process used to avoid future aversive events and imagery. Research has suggested that worry takes a verbal, rather than image-based form (Borkovec & Lyonsfield, 1993; Borkovec & Inz, 1991). In a comparison of obsessions (as seen in obsessive compulsive disorder, OCD) and worries (as seen in GAD), Langlois, Freeston, & Ladouceur (2000) found that obsessions were experienced more as images, while worries were experienced more as verbal thoughts. Borkovec & Roemer (1995) found that, on a self-report measure assessing reasons why people worry, GAD patients were distinguished from non-GAD control groups in that they endorsed worrying as a "distraction from more emotional topics" significantly more than controls.

Second, Borkovec (1994) explains that worry is a negative reinforcer because it becomes a means to escape from or avoid more threatening imagery and somatic activation. This negative reinforcement comes from: (a) the non-occurrence of negative outcomes after worrying (consistent with Wells' meta-cognitive model in which worry produces distorted positive beliefs about worry); (b) the ability to avoid more distressing topics while worrying; and perhaps most importantly, (c) reductions in somatic arousal, or the absence of experiencing the somatic component of anxiety. Research has repeatedly found that worry itself (both in GAD and non-GAD samples) inhibits autonomic activity (Borkovec, Lyonfields, Wiser, & Deihl, 1993; Borkovec & Hu, 1990; Lyonfields, Borkovec, & Thayer, 1995; Wells & Papageorgeiou, 1995), and that GAD patients show overall autonomic suppression (Thayer, Friedman, Borkovec, Johnson, & Molina, 2000; Thayer, Friedman & Borkovec, 1996; Lyonsfields et al., 1995).

Borkovec & Hu (1990) found that socially phobic individuals who were instructed to worry before engaging in imaginal exposure to a speech showed no increase in heart rate (HR) during the imaginal exposure, while socially phobic individuals who were instructed to relax before imagining giving the speech showed an increase in HR. Similarly, Butler, Wells & Dewick (1992) exposed participants to a gruesome film. After the film, participants were randomized to four minutes of either: (a) engaging in imaginal rehearsal of the gruesome images, (b) worrying about the film, or (c) "settling down" (control group). After the four minutes, those in the worry and control conditions reported significant decreases in anxiety, while those who imagined scenes from the film showed significantly greater anxiety than the control group. However, over the next three

days, those in the “worry” condition showed a greater increase in intrusive thoughts than the imagery and control conditions. Another study using an identical paradigm found similar results (Wells & Papageorgiou, 1995). Interestingly, the latter study also included a “worry as usual” group, instructed to worry about everyday topics, rather than the content of the film. Both of the “worry” conditions showed a similar increase in intrusions over the 3-day period as compared to a control group. These three studies suggest that worry: (a) suppresses autonomic activation, (b) suppresses the activation of fear, and (c) maintains anxiety in the longer-term.

While these two aforementioned studies address the suppression found as a result of worrying in non-GAD samples, other studies reveal the overall autonomic suppression and inflexibility found in GAD patients. Hoehn-Saric & McLeod (1988) found that, while GAD patients did show increased muscle tension compared to controls, their heart rate and skin conductance levels showed a restricted range of variability. This finding suggests GAD patients show sympathetic nervous system inhibition. Research also illustrated the parasympathetic inflexibility found in GAD patients. In particular, the vagus nerve (indicative of parasympathetic activity) is the major determinant of HR reactivity. A vagus that is able to rapidly affect changes in heart rate has been thought to indicate a flexible and responsive attentional system (Porges, 1992). Lyonsfield et al. (1995) demonstrated that GAD patients show overall low vagal tone and autonomic inflexibility compared to nonanxious controls. More specifically, nonanxious controls showed incremental decreases in vagal tone from relaxing to focusing on aversive imagery to engaging in worrisome thinking, while GAD patients showed the same

consistent, low levels of vagal tone whether they were instructed to relax, worry, or imagine threat (Lyonsfield et al., 1995).

Thayer et al. (2000) argued that the sustained attentional resources directed towards a stimulus when engaging in worrisome thinking produce vigilance, suppression of HR variability, and vagal withdrawal. Measuring HR reactivity using a cued threat paradigm, Thayer et al. (2000) found that nonanxious controls showed greater habituation to novel neutral stimuli than GAD patients. Further, GAD patients showed greater HR acceleration ("defensive response") when presented with threatening stimuli, while the control group showed greater HR deceleration ("orienting response") after the introduction of the threatening stimulus. Finally, the GAD group showed an anticipatory HR deceleration before the second presentation of threat words, presumably in order to cope with perceived threat (Thayer et al., 2000). Overall, the findings of Lyonsfield, Thayer, and colleagues indicate that patients with GAD show autonomic (particularly parasympathetic) inflexibility, as evidenced by low vagal tone. Additionally, Thayer et al. (2000) propose that these findings suggest GAD patients show: (a) an attentional bias toward detecting threat, (b) overall vigilance, and (c) a defensive attempt to avoid threatening information.

Borkovec (1994) proposed that the presence of muscle tension, yet otherwise suppressed and inflexible autonomic system found in GAD patients may be explained by the "freezing" response. GAD differs from many other anxiety disorders in that there is no specific phobic target, core fear, or concrete threat. Thus, there is nothing to "fight or flee." Because GAD patients are attuned to threat, yet there is no actual, concrete threat to

confront or avoid, individuals with GAD must rely on cognitive coping strategies (i.e., worry) and ultimately tense their muscles in a “freeze” response.

In order to fully understand Borkovec's theory of cognitive avoidance as a maintaining factor in GAD, a basic understanding of Foa & Kozak's (1986) emotional processing theory is imperative. According to the emotional processing theory of fear (Foa & Kozak, 1986), fear is maintained in structures in memory. When an individual confronts the feared stimulus (e.g., a snake), the fear structure is activated. As the individual is presented with information that is incompatible with beliefs about the feared stimulus (e.g., the snake does not bite), fear begins to habituate.

Thus, the premise of Foa & Kozak's (1986) emotional processing theory is that fear reduction occurs via threat disconfirmation, and that this threat disconfirmation occurs via confrontation with the feared stimulus during which new associations are formed in memory that are not consistent with the threat. Foa & Kozak (1986) posit that, in order for this process to occur, there must be an activation of fear and that fear reduction will be most successful when within and between trial habituation occur (i.e., fear decline during one period of time with the feared stimulus, and between time periods with the feared stimulus, such that each time period, or trial, begins with lower fear than the previous trial). Foa & Kozak (1986) also discuss that distraction will inhibit fear reduction by preventing patients from fully processing threat disconfirming information that is presented during confrontation with the stimulus. Thus, they suggest that having patients attend to the threat will enhance threat disconfirmation, thereby enhancing fear reduction.

According to Borkovec's GAD theory, while worry may inhibit more intense anxiety in the short-term, worry itself maintains anxiety-producing cognitions because it does not allow for the full activation of fear structures in memory, presumably preventing the emotional processing of anxiety (Foa & Kozak, 1986). Borkovec (1994) argues that, while worry is used to avoid imagery and intense affect, worry itself is likely to conjure up aversive imagery, which must be immediately avoided via worrying. Thus, worry perpetuates threatening meanings about these images, thereby maintaining anxiety. By preventing emotional processing, according to both Foa & Kozak's (1986) and Borkovec's (1994) theories, long-term anxiety reduction will not occur. This inhibition of emotional processing may explain the autonomic suppression also found in GAD patients.

Support for this theory has been found in a few studies. For example, in the Wells & Papageorgiou study (1995), recall that although worry reduced autonomic activity and reduced anxiety in the short-term, worry was associated with significant increased intrusions over a 3-day period. Presumably, because emotional processing did not occur, threatening associations continued in an absence of new learning. Consistent with emotional processing theory, Barlow (2002) has argued that, because of the focus on future-oriented concerns, rather than present concerns, GAD patients are unable to learn new, non-anxious associations.

1.3 Current Status of GAD Treatment

1.3.1 Commonly Studied Treatment Strategies

Several cognitive and behavioral treatment strategies for GAD have been the subject of empirical investigation and are now commonly presented in treatment manuals. Below is a brief description of the most commonly studied strategies. It is worth noting that several of these individual strategies have only been tested within the context of multi-component treatment packages.

Progressive Muscle Relaxation (PMR) and Applied Relaxation (AR)

Progressive muscle relaxation consists of teaching patients to tense and relax specific muscle groups in a systematic way. One of the most commonly used PMR protocols for the treatment of GAD was originally developed by Bernstein & Borkovec (1973). One major aim of the protocol is to teach patients to become aware of the difference in the sensations of tension and relaxation. Applied relaxation takes PMR one step further and consists of two parts. First, patients are taught PMR and sometimes other relaxation strategies such as pleasant imagery. Second, after mastering the relaxation skills, patients are instructed to monitor their anxiety levels throughout the day and to use these relaxation strategies during situations in their daily lives that cause stress and anxiety. Although AR has been examined as a stand-alone treatment (e.g., Ost & Breitholtz, 2000), PMR as a treatment for GAD has only been studied as part of a larger treatment package (e.g., Butler, Fennel, Robson & Gelder, 1991)

Self-control Desensitization (SCD)

Self-control desensitization (Goldfried, 1971) consists of three main elements, the first few of which are similar to systematic desensitization. First, patients are taught relaxation skills. During relaxation, anxiety-provoking cues are presented in imagination.

Patients are instructed to conjure up images of worry-provoking scenarios and to imagine themselves relaxed in these situations. In addition, patients are taught cognitive coping resources such as self-statements and perspective shifts and are encouraged to generate these coping resources during imaginal exposure in order to reduce their anxiety during the worry-provoking scenario. SCD has not been tested for the treatment of GAD in isolation, but has been included in some tested multi-component treatment packages (e.g., Borkovec & Costello, 1993).

Behavioral Activation (BA)

Although primarily used as a treatment for depression, behavioral activation has also been used in the treatment of GAD. Because many patients with depressed mood are often not engaging in activities that bring them pleasure, BA aims to improve mood by helping patients to counter patterns of avoidance and withdrawal that are often found in patients with anxiety and mood disorders. BA consists primarily of helping patients to schedule pleasurable activities into their daily lives, as well as incorporating activities that provide patients with a sense of mastery or accomplishment. Although part of a multi-component treatment package in earlier cognitive therapy, BA was eventually established as a stand-alone treatment (Jacobsen et al., 1996). Although not commonly included in GAD treatment protocols, BA has been tested as part of a multi-component treatment package for GAD (Butler et al., 1991).

In vivo exposure

Patients with GAD sometimes avoid certain situations they fear may result in anxiety, stress, or worry. For example, a GAD patient who worries a lot about

relationships may avoid having a much needed discussion with a loved one about a particularly difficult issue; likewise, a GAD patient who worries a lot about health may avoid medical appointments for fear that the doctor will discover a new health problem which would evoke more anxiety. *In vivo* exposure, a strategy that is used across all of the anxiety disorders, consists of creating a hierarchy of anxiety-producing situations that patients avoid or experience with significant anxiety and then instructing the patients to confront these situations in their lives. Although exposure to worry-provoking situations has traditionally taken either an imaginal approach or an applied relaxation approach in the treatment of GAD, *in vivo* exposure has been included in multi-component treatment protocols to address avoidance behavior (e.g., Butler et al., 1991).

Worry Exposure/Cognitive Exposure

Worry exposure consists of having patients repeatedly confront worry-provoking scenarios by imagining their feared outcomes associated with these worry scenarios. The first worry exposure protocol was developed in line with Borkovec's cognitive avoidance model which posits that worry is a verbal process used to avoid more intense anxiety (Craske, Barlow, & O'Leary, 1992). The purpose of worry exposure is to activate anxiety through imagery-based techniques and to hold specific worries in mind until the distress associated with those worries habituates. Patients create a hierarchy of worry-provoking scenarios and typically create and listen to a loop-tape of themselves describing the scene to aid in their ability to form an image of it. Despite its presence in CBT manuals and its direct link with one of the most widely accepted models of GAD, worry exposure has not been tested as a stand-alone treatment. A similar procedure called "cognitive exposure,"

in which the worst possible feared outcomes of those worries not amenable to other forms of treatment are imagined, has been included as a minor component in a multi-component treatment package for GAD (Ladouceur, Dugas, Freeston, Leger, Gagnon, & Thibodeau, 2000). A more detailed description of worry exposure will follow (see "Chapter 2: The Current Study").

Cognitive Therapy (CT): Cognitive Restructuring and Behavioral Experiments

Originally developed by Beck, the primary goal of cognitive therapy is to identify, challenge, and modify dysfunctional thoughts and beliefs. CT for GAD was developed based on the cognitive theory of GAD (Beck, Emery & Greenberg, 1985). Cognitive restructuring consists of teaching patients to: (a) identify automatic thoughts that precede an emotion such as anxiety; (b) examine the evidence for and against that thought or belief; and (c) help the patient to come to a more accurate conclusion about the accuracy of the thought. Several techniques are available to therapists to accomplish this goal, such as Socratic questioning.

Behavioral experiments, while technically part of this CT approach, bridge behavioral and cognitive approaches by designing "experiments" to test out specific beliefs a patient may have. For example, if a patient with academic worry comes to class ten minutes early every day because she believes "If I miss a single minute of class I will be completely lost for the rest of the lecture," the therapist may instruct the patient to conduct an experiment in which she comes to class five minutes late and sees how well she can understand the rest of the lecture.

Cognitive therapy approaches have been subjected to research in the treatment for GAD as stand-alone treatments (e.g., Ost & Breitholtz) and as part of CBT packages (e.g., Ladouceur et al., 2000).

1.3.2 Efficacy Data for GAD Treatment

Because GAD has only been clearly defined since the DSM-IV (APA, 1994), research in the area of pathological worry is sparse compared to the research in other anxiety disorders. Although a plethora of pharmacological treatment studies have been conducted in the last decade on treatments for GAD (see Meunnier, Brawman-Mintzer, Wolitzky, and Labatte, 2004 for reviews), the literature on psychosocial treatments in this area is still far behind.

While empirically supported psychosocial treatments have been established, not all of the components of these multi-faceted treatment packages have been empirically tested individually. Further, there has been relatively little consistency across research groups in what treatment components should be included in a cognitive-behavioral treatment (CBT) package, yet each of these research groups uses the generic label of "CBT" in their papers. This may mislead clinicians who read one article finding support for CBT to believe that all CBT is effective for GAD.

Borkovec and Costello (1993) found that applied relaxation (AR) and CBT both outperformed non-directive therapy for GAD. CBT was comprised of self-control desensitization (SCD), applied relaxation (AR), and cognitive therapy (CT). In this study's literature review, Borkovec & Costello (1993) comment that, due to the "possible function of worry for escaping anxiety-provoking imagery to avoid somatic anxiety,"

treatments should focus on exposures to anxiety-provoking imagery. However, while this statement was made during an effort to introduce the rationale for the treatments they chose to investigate, none of the treatments examined in this study directly test this hypothesis. Although SCD does instruct patients to conjure up anxiety-provoking stimuli, patients are then told to think about how they might employ positive coping skills to make themselves less anxious in these situations. While this treatment may increase self-efficacy for addressing distressing situations, the theoretical basis behind SCD is inconsistent with the authors' argument that patients should confront anxiety-producing images in order to experience the anxiety they presumably avoid via worry.

Butler et al. (1991) found that CBT outperformed behavior therapy (BT), with 32% of those receiving CBT and 16% of those receiving BT achieving clinically significant change (defined as scoring more than two standard deviations towards improvement on the outcome variables at post-treatment). BT consisted primarily of PMR, graded exposure to situations which patients were avoiding, and introducing pleasurable activities into participants' lives. CBT consisted of the same behavioral strategies used in the BT condition, with the addition of cognitive therapy (CT), consisting solely of cognitive restructuring (i.e., no behavioral experiments).

In their study of comparing CT to AR, Ost & Breitholtz (2000) found that both treatments were equally effective in reducing GAD symptoms, with 53% in AR and 62% in CT achieving clinically significant change. Borkovec, Newman, Pincus, and Lytle (2002) compared (a) CT, (b) AR + SCD, and (c) CT+AR+SCD, which the authors label "CBT." At post-treatment, 43.48% of participants in CT, and 56.52% of participants in

the other two conditions had achieved clinically significant improvement, with no significant differences between conditions.

In line with their cognitive model of GAD (Ladouceur et al., 2000) designed a cognitive-behavioral treatment which targeted intolerance of uncertainty, erroneous beliefs about worry, poor problem orientation, and cognitive avoidance. At follow-up, 77% of participants no longer met diagnostic criteria for GAD. In a similar vein, Dugas, Freeston, Ladouceur, Leger, Langlois, Provencher, & Boisvert (2003) tested a similar cognitive behavioral treatment in a group setting and found that 52% of those receiving the experimental treatment (labeled "CBT") achieved clinically significant change, defined as reliable change (see Jacobsen & Truax, 1991) and scores moving more than two standard deviations towards improvement on outcome measures.

Taken together, these studies show that cognitive and behavioral treatments for GAD are efficacious. However, several limitations are worth noting. First, there is room for improvement, with the majority of these randomized clinical trials (RCTs) producing clinically significant change only for approximately half of the participants. Second, many of these studies devise treatment protocols that incorporate several different treatment components, and thus do not provide any information about which components are most efficacious and which are unnecessary. Even those studies attempting to conduct as analyses of treatment components, using constructive designs (i.e., Borkovec et al., 2002), do not evaluate each treatment component in isolation.

Third, the Borkovec model (1994) for GAD, suggesting worry is a means to avoid experiencing more intense anxiety, has yet led to the investigation of treatments that

target worry from this perspective, despite Borkovec & Costello's (1993) suggestion to do so. While two studies from the Montreal group did include some exposure to specific types of worry-provoking images in a multi-component treatment package consisting primarily of cognitive restructuring, problem solving, and self-monitoring (Ladouceur et al., 2000, individual sessions; Dugas et al., 2003, group sessions), that this CBT package outperformed waitlist control conditions provides little to no information about the efficacy of the exposure treatment component aimed at reducing cognitive avoidance. Thus, research is needed to: (a) design and evaluate treatments that will produce higher rates of clinically significant change, (b) dismantle multi-faceted treatment protocols in order to evaluate which components of treatment are most efficacious, and (c) examine treatments that target worry using Borkovec's model of worry as emotional avoidance.

Surprisingly, several components of CBT for GAD, as outlined in various popular CBT treatment manuals (e.g., Zinbarg, Craske & Barlow, 1993; Rygh & Sanderson, 2004) have not been empirically tested. Thus, there exist several widely used treatment techniques accepted by the research community, such as worry exposure and scheduled worry time, which have yet to be investigated[1]. Given that these treatments are already being disseminated, it may be in the research community's best interest to make these treatments a priority for investigation.

Interestingly, worry exposure was designed to address the cognitive avoidance in which GAD patients engage in order to avoid more intense anxiety. Consistent with Borkovec's model (1994), this treatment aims to reduce worry by having patients

[1] With worry time, patients are instructed to set aside a time every day to worry "on purpose," with the intention of teaching control over worry, as well as sending the message that worrying is not dangerous. Worry exposure will be described in more detail in subsequent sections.

confront their anxiety more intensely. Patients are taught to hold anxiety-provoking images in their minds without using any problem solving or coping skills, pleasant imagery, or cognitive restructuring (worry exposure will be described in more detail in the "Methods" section).

1.4 The significance of academic worry

Occupational worry (i.e., worry about school or work) is the third most common sphere of worry, with approximately 50% of patients meeting criteria for GAD reporting significant worry in this domain (Sanderson & Barlow, 1990). Thus, it is a highly relevant sphere of worry for patients with GAD. Further, academic worry may also be a common area of worry in non-GAD samples potentially at risk for developing GAD and thus may lend itself nicely to systematic testing of interventions designed to reduce worry.

Hazlett-Stevens & Craske (2003) found that introductory psychology students who scored within the clinical range for GAD on a valid and reliable self-report instrument assessing GAD symptoms (GAD-Q-IV; APA, 1994) rated the worry topic of "achievement" as more threatening than non-anxious counterparts, whereas there were no differences in threat rating between groups for worry topics such as "health," "safety," and "environment."[2] Further, results from coded interviews indicated that a fear of failure was coded significantly more in the interviews with the analog-GAD group than nonanxious controls. Clearly, achievement and failure are salient themes in academic environments.

[2] Consistent with the literature, analog-GAD participants also rated "social interactions" and "economics" as more threatening than their nonanxious counterparts.

In addition to its utility in testing interventions for pathological worry, academic worry is also an important issue to consider in and of itself. Research suggests that perceived academic stress is linked to anxiety and depression in college students and high school students (Aldwin & Greenberger, 1987; Yadusky-Holahan & Holahan, 1983). While these studies do not establish temporal precedence between academic stress and psychopathology, interventions that can reduce academic worry and the distress associated with it may have profound public health implications. Further, while not surprising, academic stress has been found to correlate with lower grades (Struthers & Perry Menec, 2000), suggesting interventions designed to reduce academic worry may also have an impact on grade improvement.

Despite the impact of academic stress on students, research has yet to evaluate the efficacy of interventions designed to target this problem. While several college and university counseling centers provide "academic stress management" programs, these are neither empirically supported nor targeting excessive and uncontrollable worry about school. Because of the number of academic stress management programs available at colleges and universities, it can be implied that academic stress and academic worry may be important problems to address. Thus, research should evaluate interventions to reduce pathological academic worry.

1.5 Self-administered treatments and public health

Given the current managed health care system in the United States, coupled with the high prevalence of anxiety disorders, many have argued that disseminating information about treatments supported by controlled research to a wider audience, as

well as delivering more cost-effective, brief treatments, is essential in meeting the current needs and demands in the mental health field (e.g., Newman, 2000; Marks, 1991). The annual cost of anxiety disorders is estimated to be $42.3 billion, which is approximately 31% of the total annual mental health care costs in the U.S. (Greenberg, Sisitsky, Kessler, Finkelstein, Berndt, Davidson, Ballenger, & Fyer, 1999; Rice & Miller, 1995). The Greenberg et al. (1999) study took the costs of medical and psychiatric treatment, as well as indirect workplace costs and the costs of mortality into account when calculating this estimate. In addition, as mentioned previously, patients with GAD not only contribute to the mental health costs in the U.S., but also utilize primary care settings frequently (Barrett et al., 1988).Although there has been a fair amount of research on self-help and/or self-administered treatments for issues such as smoking cessation and depression (see Curry, Ludman & McClure, 2003, and McKendree, Floyd, & Scogin, 2003, respectively, for reviews), there has been relatively little research on self-administered treatments for anxiety disorders. Three meta-analyses examining the effects of self-administered treatments found moderate to large effect sizes for self-administered anxiety treatments when compared to waitlist control groups (Gould & Clum, 1993; Marrs, 1995; den Boer, Wiersma & van den Bosch, 2004). Further, these treatments were comparable to therapist-directed interventions in two of the meta-analyses (Gould & Clum, 1993; Marrs, 1995) and comparable to brief psychiatric treatment in the third (van den Boer et al., 2004). Very few studies have examined the efficacy of self-administered treatments for GAD. In their review, Newman, Erickson, Przeworski, and Dzus (2003) note that

there are no known published studies examining self-administered treatments for GAD in their purest form (i.e., contact with therapist only at the time of assessment).

Bowman, Scogin, Floyd, Patton, & Gist (1997) investigated a predominantly self-help treatment for GAD. Patients used a self-help manual that included problem solving training, and received four five-minute phone "check-in's" by the researchers. This treatment outperformed waitlist control groups at post-treatment and a three month follow-up.

Three other GAD treatment studies claiming to test "minimal therapist contact" interventions were found to be superior to waitlist control groups[3] (Jannoun, Oppenheimer, & Gelder, 1982; Newman, Consoli & Taylor, 1999; White, Keenan, & Brooks, 1992). However, upon closer inspection, these studies each involved six sessions with the patients before giving them the self-help tools for the remainder of the study, and thus do not significantly differ from therapist-directed treatment studies conducted in the field. Further, that they are only compared to a no-treatment control group is a significant limitation of all of these studies. However, it is worth noting that one study did find a general decrease in medical utilization (presumably an important measure of meaningful change in GAD), with a significant decrease in general practitioner visits and anxiolytic prescriptions for the treatment group compared to no-treatment controls (White et al., 1992).

Clearly, there is a lack of sound, well-controlled research in the area of self-administered treatments for GAD. Only one known published study has examined a self-

[3] note that two of these studies used participants meeting for DSM-III and DSM-III-R criteria

administered treatment for GAD, and the study did not compare the treatment to a placebo control or another active treatment. Due to the heavy burden placed on the medical field by GAD and other anxiety disordered patients, the development, empirical testing, and dissemination of cost-effective, efficacious treatments for GAD may have significant public health implications.

Chapter 2. The Current Study

2.1 Introduction

The purpose of this study was to evaluate the efficacy of self-administered interventions to reduce pathological worry. Participants with or without GAD who experienced excessive and uncontrollable worry about academics were randomly assigned to receive one month of either: (a) worry exposure (WE), (b) expressive writing (EW), (c) a credible placebo, consisting of pulsed audio-photic stimulation (APS) or (d) wait-list control (WLC). All interventions were self-administered.

There are several gaps between research and clinical practice in the treatment of GAD. More specifically, worry exposure, a commonly accepted behavioral strategy for reducing the severity of and distress associated with pathological worry, has not been carefully tested in an RCT. Despite this, several highly respected manuals, book chapters, and review articles authored by academic researchers discuss worry exposure as an established treatment component for GAD (Lang, 2004; Brown, O'Leary, & Barlow, 2001; Zinbarg, Craske, & Barlow, 1993, Craske et al., 1992; see "Worry Exposure Condition" in Methods section).

Experimental laboratory research provides some preliminary support for the promising nature of worry exposure. Roemer and Borkovec (1994) instructed high-worriers with and without GAD to identify a target anxiety-provoking situation. Next, participants were instructed to either relax (i.e., suppress thoughts/worries about the situation) or to express thoughts (i.e., think about the distressing situation). Then all participants were told to express the negative target thoughts. Those in the initial

"suppress worry" condition showed significantly greater increases in statements about the distressing situation than those who were initially instructed to express their negative intrusive thoughts. Those instructed to "express" both times showed decreases in the number of statements about the target thought. This study supports the hypothesis that worry can habituate. However, it should be noted that efforts were not made in this experiment to ensure participants were thinking about the worrisome scenarios via imagery.

Research on non-CBT alternative psychological treatments for GAD has received little attention. For example, Pennebaker's expressive writing paradigm, in which participants who write about emotional topics show improved health and academic outcomes, may be particularly important to test as a self-help worry intervention (see Pennebaker, 1997; Smyth, 1998; Frisina, Borod & Lepore, 2004; and Frattaroli, 2006, for reviews). Though this writing paradigm has not been tested in the reduction of worry, there is reason to believe that it may be a promising intervention. In an interesting study, participants who experienced the recent death of a spouse and did not talk to others about the death often ruminated about it (Pennebaker & O'Heeron, 1984). In contrast, people who disclosed to others about their spouses' death did not experience as many intrusive thoughts about the death.

Additionally, in line with research on autonomic suppression in GAD (e.g., Borkovec & Hu, 1990; Thayer et al., 2000), Pennebaker & Beall (1986) found that participants who wrote about a traumatic event displayed higher blood pressure and reported negative moods following the writing, but had fewer health visits in the long-

term (i.e., six months later) than those who wrote about trivial topics. This finding runs somewhat parallel to Foa & Kozak's (1986) theory of emotional processing, in which confrontation with the feared stimulus will result in initial fear activation followed by a decline in distress over time as emotional processing occurs.

In their review, Sloan & Marx (2004a) comment on the various theories regarding the mechanisms of change in expressive writing. They highlight emotional processing theory (Foa & Kozak, 1986) as a likely explanation. Sloan & Marx (2004a) explain that repeated writing sessions may be one medium of exposure to threatening material and that the writing intervention may activate fear and provide corrective information thus altering the meaning about the stimuli. Sloan & Marx (2004a) suggest that writing may help people to overcome a tendency to avoid or suppress distressing thoughts and emotions, which has been put forth as a major maintaining factor in psychopathology (Hayes, Wilson, Gifford, Follette, & Strosahl, 1996), particularly GAD (Borkovec, 1994). Pennebaker (1997) also discusses that inhibition increases the "probability of stress-related physical and psychological problems," and that writing is a means to confront this inhibition (pp. 9-10). Further, expressive writing has been found to reduce anxiety, depression, fatigue, and tension in students who experienced a traumatic event (Schoutrop, Lange, Hanewald, Davidovich, & Saloman, 2002). This provides some preliminary evidence suggesting repeated writing about academic worries may reduce avoidance of the worries, and may result in improved physical and psychological outcomes.

The expressive writing intervention fits nicely within the Borkovec conceptual model of worry, given that the nature of chronic worry in particular is seen as a form of inhibition or avoidance of confrontation with feared stimuli and emotional processing (see Borkovec, 1994). In addition to the emotional benefits of writing seen in numerous studies, many studies have shown that expressive writing leads to both reductions in visits to health services (e.g., Pennebaker, Colder, & Sharp, 1990) and grade improvement, which is particularly relevant when studying academic worry (e.g., Pennebaker & Francis, 1996). These data provide a compelling reason for studying the efficacy of expressive writing among those displaying pathological worry associated with academic performance.

Further, from an experimental point of view, including expressive writing (which can be argued is a verbal/linguistic means of emotional processing) is a direct test of whether decreases in overall worry can be accounted for by repeated focus on the sphere of worry (in this case, academics) regardless of the type of focus (i.e., verbal vs. image-based), or whether imagery-based exposure to worry-provoking scenarios is necessary for anxiety reduction, as would be predicted by Borkovec's model (1994). Interestingly, Roemer & Borkovec's (1994) study (see above) suggests that worry in its verbal form may habituate (i.e., without the use of imagery).

Although Pennebaker & Chung (2006) recommend using an instructional set that allows participants to explore whatever topics may emerge when writing about a specific problem or event, participants in the current study were instructed to try to stay as close to the topic of academic worry as possible. However, in order to maintain the integrity of

the original paradigm as much as possible, participants were encouraged to explore this topic loosely, in whatever ways were relevant for them. The rationale for this instructional set was that, in order to most systematically compare these two theory-driven approaches to emotional processing of pathological worry, confounding variables should be controlled. Thus, the best test of the relative efficacy of these approaches involves manipulating only one parameter (i.e., modality of exposure to stimuli). Sloan & Marx (2004) comment that the mixed findings in the expressive writing literature on changes in post-traumatic stress disorder (PTSD) symptoms may be due in part to the differences in the instructional set across studies (i.e., writing topics loosely defined vs. more concretely defined), but acknowledge that, while loosely defining the topics may work for many studies, researchers hoping to use expressive writing as a form of exposure argue convincingly that repeated exposure to the same stimulus is necessary for fear habituation (see Foa & Kozak, 1986).

Finally, no GAD treatment study has compared active treatments for excessive and uncontrollable worry to a credible placebo. Pulsed audio-photic stimulation (APS) has been used in our laboratory as a method for inducing dissociation (Leonard, Telch & Harrington, 1999; Leonard, Telch & Owen, 2000; Horowitz & Telch, 2008), and as a placebo control condition in specific and social phobia treatments (Powers, Smits & Telch, 2004; Smits, Powers & Telch, 2005; Wolitzky & Telch, in press). Interestingly, while placebo control groups are commonplace in pharmacological research, psychosocial treatment studies rarely test their active treatments against placebo. In a recent meta-analysis of specific phobias conducted in our laboratory (Wolitzky,

Horowitz, Powers, & Telch, in press), only five of the 35 studies included a placebo condition. Including the APS as a placebo control is important in controlling for expectancy effects.

This study provides a preliminary test of these interventions by using a sample of participants who experience excessive and uncontrollable worry about academics, but may or may not meet criteria for GAD. Since all participants in this study experienced their worry as excessive and uncontrollable, even those not meeting for GAD could be distinguished from typical non-GAD worry samples, and thus can be thought of as a sub-clinical, or analogue-GAD sample. Because, after instruction, these interventions lend themselves to being administered at home, this study also tested the efficacy of these treatments as self-administered interventions. Demonstration of efficacy for these self-administered interventions has important public health implications.

2.2 Specific Aims and Hypotheses

The current study has five specific aims:

Aim I. Test the efficacy of two self-administered interventions (i.e., worry exposure and expressive writing) in reducing academic worry in students with excessive and uncontrollable academic worry relative to a credible psychological placebo and wait-list control conditions.

Hypothesis I: Both active interventions will outperform placebo, which in turn will in turn will outperform waitlisted participants. More specifically, those receiving active interventions will report greater reductions in duration of academic worry, distress and interference due to academic worry, as well overall score on the primary self-report

measure of academic worry than those in the placebo and waitlist control groups. It is also hypothesized that those assigned to the active interventions will report greater reductions in general worry, depression, and stress.

Aim II. Examine the effects of the interventions on health outcomes including number of visits to the university student health center and perceived physical and mental health.

Hypothesis II: In line with previous research, the expressive writing condition will show improved health outcomes relative to all other treatment conditions, which will not differ from each other.

Aim III. Test the effects of the interventions on students' grade point averages (GPA).

Hypothesis III: Those receiving active interventions will show greater improvements in GPA and more hours of coursework completed compared to those assigned to the wait-list or placebo control groups.

Aim IV. Investigate potential moderators of treatment outcome including: number of home practice sessions completed, time during semester when intervention began, meta-cognitions (e.g., degree to which participants endorse positive or negative beliefs about worry), GAD status, gender, ethnicity, educational status (i.e. undergraduate/graduate student), and major field of study.

Hypothesis IV: It is predicted that: (a) consistent with previous research in CBT for anxiety disorders (Schmidt & Woolaway-Bickel, 2000), those who practice their intervention more will reduce their level of academic worry more than those who do not, (b) those who endorse more positive and negative beliefs about worry before starting the intervention will not benefit as much from the interventions as those who do not hold

dysfunctional beliefs about worry, (c) earlier randomization and intervention practice during the semester will be associated with more improved outcomes, while those who begin the study later in the semester will show less improvement (in line with research which would predict increases in anxiety or distress in the short-term and improvement in the longer-term for the EW and WE conditions), and (d) that those meeting diagnostic criteria for GAD will improve most from the worry exposure, as this intervention is specifically designed to facilitate emotional processing that, according to theory, may be essential for GAD symptom reduction.

Because the use of expressive writing is exploratory for this population, no specific hypotheses are made regarding the moderating effects of GAD severity for those in the expressive writing condition. No specific predictions have been made regarding other potential moderating variables.

Aim V. Investigate treatment process variables and potential mediators of treatment outcome for the worry exposure and expressive writing conditions.

Hypothesis V: For the expressive writing condition, it is predicted that: (a) consistent with previous work, those who use a high number of positive emotion words, a moderate amount of negative emotion words, and an increase in cognitive processing words over time (see Pennebaker & Seagal, 1999) will benefit more than those who do not; (b) use of more self-referencing words in the expressive writing condition will predict poorer outcome, as use of self-referencing words (e.g., "I") has been associated with depression (Rude, Gortner & Pennebaker, 2004; Mehl, 2004); (c) use of the past tense will be associated with less favorable outcome, while use of the future tense (i.e., worrying rather

than ruminating) will be associated with more favorable outcome; and (d) use of sensory words (in essence, measuring use of imagery) during the writing sessions will be associated with more favorable outcome (as would be expected with the Borkovec model for this population). Although exploratory, it is also hypothesized that use of more social words may be associated with greater improvement, as might be expected by those subscribing to a social integration explanation for the efficacy of expressive writing (Pennebaker, 2006, personal communication).

It is expected that anxiety slopes across home sessions will decline for both the worry exposure and expressive writing conditions. Consistent with the emotional processing theory of fear (Foa & Kozak, 1986), greater improvement at post-treatment will be associated with steeper anxiety decline slopes across home sessions.

Chapter 3. Research Design and Methods

3.1 Study Participants

Study participants (N=113) were recruited through announcements made to the University of Texas Counseling and Mental Health Center, university-based academic enrichment and mentoring programs, and academically-oriented Greek organizations. Administrators from a variety of departments sent email announcements to students and research assistants made verbal announcements in lecture hall classrooms. These email announcements and classroom visits permitted access to a wide range of departments and colleges, including, but not limited to engineering, natural sciences, liberal arts, public health, law, business, and nursing. Advertisements were printed in the Daily Texan newspaper, and recruitment flyers were posted around the University of Texas, St. Edwards University, and Concordia University campuses. In addition, an announcement was also made on our laboratory website.

A total of 545 students expressed interest after hearing about the study. After receiving further information, 178 of those students completed the online screening questionnaire (the Academic Worry Questionnaire). 159 of those 178 students were deemed eligible for the face-to-face laboratory assessment based on their online screening questionnaire scores. Of those 159 students invited to the laboratory, 130 completed the comprehensive pre-treatment assessment. 117 of those participants met criteria for the treatment phase of the study. However, four of these participants declined further participation. Thus, a total of 113 participants were enrolled in the study and randomized to one of the four treatment conditions. 84 participants completed treatment.

Of the 29 participants who did not complete the treatment phase of the study, eight were willing to complete a post-treatment assessment anyway. 17 participants who completed the post-treatment assessment (9 treatment completers and 8 non-completers, not including those in WLC, who did not complete a follow-up) did not complete their three-month follow-up assessment.

The final group of participants enrolled and randomized (N=113) was primarily female (75.2%) and undergraduate (85%). Majors and areas of study spanned a wide array of fields, with 21.3% natural sciences, 18.5% health sciences, 15.7% liberal arts, 13% business, 12% engineering, 6.5% law school, 3.7% school of public policy, 2.8% social sciences, 2.8% undeclared, 1.9% with a double major in public policy and liberal arts, 0.9% double majoring in a natural science and a liberal art, and 0.9% with a double major in the social sciences and liberal arts. The sample represented a diverse ethnic group, consisting of 45.1% Caucasian, 24.8% Asian-American, 16.8% Hispanic, 3.5% African-American, 8% biracial or multiracial, 0.9% Native American, and 0.9% Pacific Islander.

Slightly less than one-third of the sample (31.2%) met full DSM-IV criteria for a current diagnosis of GAD. That percentage rose to 40.4% when considering the number of participants who met for GAD at some point within the last year. Participants also met criteria for a number of current comorbid psychiatric diagnoses. Eleven percent of participants met diagnostic criteria for major depressive disorder, 1.8% met for dysthymia, 0.9% met criteria for bipolar disorder, 18.3% met for social anxiety disorder, 11% met for specific phobia, 5.5% met for panic disorder, 3.7% met for obsessive

compulsive disorder, 0.9% met for post-traumatic stress disorder, 4.6% met for a substance use disorder, and 0.9% met diagnostic criteria for an eating disorder.

3.1.1 Inclusion and Exclusion Criteria

Inclusion and exclusion criteria were as follows:

Inclusion Criteria

a. Score of a 2 or higher on the distress question (Q5) OR the life interference question (Q9) on the Academic Worry Questionnaire (AWQ), indicating at least a moderate level of distress and/or life impairment due to academic worry.
b. Fluent in English (written and spoken). This was required because several of the instruments are validated only in English and principal investigator and research assistants were not fluent in other languages.
c. 18 years of age or older
d. Enrolled in a college, university, or graduate education training program.

Exclusion Criteria

a. Currently taking psychotropic medication and unwilling to stay on the same dose during the treatment phase of the study (from assessment date until post-treatment date).
b. Planning to start or terminate psychotherapy for worry, stress, or anxiety and unwilling to wait until after the post-treatment assessment.
c. History of seizure disorder (due to slight increased risk of seizure during pulsed audio-photic stimulation for those with a history of seizure disorder).

3.1.3 Procedure for Obtaining Informed Consent

Prior to undergoing the face-to-face screening phase, all participants provided written informed consent. Those who met criteria for the intervention were invited to participate in the next phase of the study. Written informed consent was obtained before the intervention phase began.

3. 2 Measures

3.2.1 Diagnostic Assessment

Composite International Diagnostic Interview (CIDI, World Health Organization, 1997). Assessment of DSM-IV diagnoses of GAD and other Axis I disorders were conducted using the computerized version of the CIDI-Auto (World Health organization, 1997). The CIDI-Auto has been widely used for the assessment of DSM-IV diagnoses. The anxiety disorder module has demonstrated good psychometric properties including good sensitivity (.86) and acceptable specificity (.52). Moreover, the agreement between the clinical standard diagnosis and the CIDI-Auto was acceptable (73%) and similar to the clinician-administered version of the CIDI (Peters & Andrews, 1995). The CIDI has been used in several anxiety disorder clinical trials (e.g. Powers et al., 2004; Roy-Byrne, Katon, Cowley, & Russo, 2001; Roy-Byrne, Craske, Stein, Sullivan, Bystrisky, Katon, et al, 2005; Smits, Powers, Buxkamper, & Telch, 2006).

It should be noted that although this was a computerized diagnostic assessment, trained interviewers conducted the assessment, rather than instructing participants to answer the questions presented on the computer. A comprehensive diagnostic assessment was conducted using the CIDI at the pre-intervention assessment. The GAD module of

the CIDI was also administered either via telephone or in person at the three-month follow-up assessment.

3.2.2 Screening and Outcome Measures

3.2.2.1 Primary Outcome Measures

Academic Worry Questionnaire (AWQ; Wolitzky & Telch). This 10-item questionnaire assesses several domains of academic worry. Participants rated on a 5-point scale the degree to which they have experienced these different characteristics of worry in the past week. Domains include frequency of worry episodes, overall duration of worry per week, distress associated with worrying, anxiety experienced during worry episodes, negative beliefs about worry, positive beliefs about worry, controllability of worry, impairment due to academic worry, and use of safety behaviors to cope with academic worry (e.g., overpreparing for exams, arriving extremely early for class). This measure demonstrates good internal consistency (Cronbach's α=.87) and test-retest reliability (r = .83), as well as convergent and discriminant validity.

Penn State Worry Questionnaire (PSWQ; Meyer, Miller & Metzger, 1990). This 16-item questionnaire uses a 5-point Likert scale. Participants rated how typical each statement was for them. Statements rated tap into frequency and controllability of worry, as well as general propensity to worry. Items include statements such as "I am always worrying about something," "My worries overwhelm me," and "Once I start worrying I can't stop." This measure shows good internal consistency, as well as convergent and discriminant validity (Brown, Antony & Barlow, 1992).

Health Care Utilization. The number of medical visits was obtained from student health records as a measure of health outcome and medical utilization (with written permission of the participant via informed consent). Additionally, participants who reported seeing medical professionals in the community were given the option to sign a separate release form to release this same information from a community doctor to the specified research staff in the laboratory (e.g., the Principal Investigator, Principal Investigator's advisor, or PI and specified research assistants). This information was collected for the semester prior to participation, the semester of participation, and the semester after participation.

Semester grades. Overall GPA and credit hours completed were obtained from the registrar with written permission of the participant via informed consent. This information was collected for the semester prior to participation, the semester of participation, and the semester after participation. No information about specific classes was obtained.

3.2.2.2 Secondary Outcome Measures

Perceived Stress Scale (PSS; Cohen, Kamarck & Mermelstein, 1983). This 10-item questionnaire uses a 5-point scale. The PSS is a widely used psychological instrument for measuring the perception of stress. It measures the degree to which participants appraise life situations as stressful. Items were designed to tap how unpredictable, uncontrollable, and overloaded people find their lives to be. The scale also includes a number of direct queries about current levels of experienced stress**.** The PSS demonstrates good internal

consistency (Cronbach's α=.86), good test-retest reliability, r = .85, and correlated highly with measures of physical symptomology and health care utilization.

Beck Depression Inventory-II (BDI-II; Beck, 1996). This 21-item questionnaire uses a 4-point scale. The measure taps various domains of depression, including emotional symptoms (e.g. feelings of sadness, pessimism, feelings of worthlessness) and vegetative symptoms (e.g. fatigue, sleep changes, eating changes). This measure demonstrates good internal consistency, with a Cronbach's α=.89 (Whisman, Perez, & Ramel, 2000).

SF-36 (Ware & Sherbourne, 1992). This widely used 36-item instrument asks participants to report their perceptions of their own physical and mental health on a 5-point Likert scale. The first section asks participants to rate their physical health and degree to which they may have difficulty completing physical tasks such as vigorous exercise or climbing stairs. The second part of the questionnaire asks participants to rate their psychological well-being asking questions such as "How much of the time during the past 4 weeks did you feel worn out?" and "How much of the time during the past 4 weeks have you felt happy?" Participants rate their levels of physical and mental functioning with higher scores associated with better health. The SF-36 shows good internal consistency (.85; Brazier, Harper, Jones, O'Cathain, Thomas, Usherwood & Westlake, 1992).

Cortisol Levels. A large body of evidence suggests that psychological stressors can activate the HPA axis, which regulates the release of cortisol, a hormone implicated in psychological and physical health (see Dickerson & Kemeny, 2004, for reviews). Prolonged cortisol activation, presumably caused by repeated exposure to psychological

stressors, has been linked to immunosuppression and development of chronic physical diseases (e.g. Boomershine, Wang & Zwilling, 2001) and psychopathology (e.g. Brown & Suppes, 1998). In their meta-analysis, Dickerson & Kemeny (2004) found that perceived uncontrollability was associated with higher levels of cortisol release. In addition, an interesting study revealed that cortisol levels upon waking were higher on weekdays than weekends, and that this difference was significantly more apparent for those who reported chronic levels of work overload and worrying (Schlotz, Hellhammer, Schultz, & Stone, 2004).

Given these above findings, investigating potential pre to post cortisol changes after treatment may be an important physiological index of treatment efficacy. Participants were given a cotton swab to collect a saliva sample at pre-treatment (before randomization) and at the post-treatment assessment. Participants were brought into the laboratory at the same time of day (within two hours) for the two assessments to enhance consistency and accuracy of the analysis, as cortisol release varies throughout the day. Samples were stored in a freezer. A laboratory in Washington analyzed samples for those participants who completed both pre and post-treatment assays. Cortisol levels in the saliva samples were measured in nano moles (nM).

3.2.3 Treatment Credibility and Treatment Fidelity

Reaction to Treatment Questionnaire (RTQ; Borkovec & Nau, 1972). This questionnaire, given before the instructional intervention session begins, asks four questions regarding how logical and credible the intervention seems to the participant. On a 0 to 100 scale, participants are asked, “At this point, how logical does the intervention

offered to you seem?" "At this point how successful do you think the intervention will be in reducing your worry about school?" "How confident would you be in recommending this intervention program to a friend who experiences similar problems?" and "By the end of the intervention period, how much improvement in your academic worry do you think will occur?" This questionnaire served to evaluate whether all three intervention conditions (i.e., worry exposure, expressive writing, and audio-photic stimulation) seemed equally credible to the participants. Although the original Borkovec & Nau (1972) scale uses a 0-9 point scale, the scale was modified to 0-100 in the current study.

Assessment of Treatment Activities (ATA). Participants completed a two-part, author-constructed questionnaire measuring treatment fidelity. In Part A, participants answered basic Yes/No questions about what they did during treatment, such as "I listened to a tape," or "I wrote about my academic worries." Part B asked participants to rate on an 11-point Likert scale (0-10) how much they agreed with statements about their treatment activities, such as "I expressed my innermost thoughts and feelings about academic worry-related topics" and "I focused on worry-related images during my home practice of my intervention."

Some of the items refer to the degree to which the participants were able to engage in behaviors that were important to the integrity of the treatment condition (e.g., the degree to which participants used imagery in the worry exposure condition), while others refer to the degree to which the treatment exerted its expected and desired impact on participants (e.g., degree to which participants were distracted by the placebo device). Overall, the measure is meant to provide a general picture of both of these concepts.

3.2.4 Assessment of Putative Moderators of Treatment Outcome

Meta-Cognitions Questionnaire-30 (MCQ-30; Wells & Cartwright, 2004). This questionnaire was created from the original MCQ which had 65 items. This consolidated questionnaire taps the same constructs of dysfunctional thoughts about worry with 30 items and uses a 4-point Likert scale. The measure assesses positive and negative beliefs associated with worry. The questionnaire is divided into five factors: (a) positive beliefs about worry; (b) beliefs about the uncontrollability and danger of worry; (c) concerns about memory and cognitive confidence; (d) beliefs about the need to control thoughts and worries; and (e) cognitive self-consciousness, or general "worry about worry." The Cronbach's α for each factor ranges from .72-.89, and the test-retest reliability for each factor ranges from .76-.94, suggesting it is a reliable measure. This measure also demonstrates concurrent and predictive validity. This measure was administered once during the pre-intervention assessment.

Online diagnostic interview for GAD (Telch & Lee, 2005). In order to explore the feasibility of obtaining diagnostic information through web-based, self-administered diagnostic interviews, an online diagnostic interview for GAD on our laboratory website was administered at pre-treatment and at the 3-month follow-up assessment. GAD status at baseline was assessed as a treatment moderator. Cases in which there was a discrepancy between the CIDI-Auto and the GAD online interview diagnoses was resolved through a careful diagnostic assessment conducted by the PI and confirmation of this diagnosis by the PI's mentor.

Dropout/completer status. Participants were considered completers if they completed at least one-third of the prescribed treatment sessions plus a post-treatment assessment.

3.2.5 Intervention Process Measures

Treatment process measures were obtained through an online record system that participants completed after each home practice. Each online record asked questions that pertained specifically to the individual interventions. However, a measure of peak anxiety was obtained for all conditions. Data gathered from these online records were used not only for treatment process analyses but also as additional checks on treatment fidelity. A description of each online record log is provided below.

Worry Exposure Home Practice Log. Participants completed a brief self-monitoring form online after each home practice worry exposure. The form instructed the participants to record the start and stop time of the worry exposure, rate their peak anxiety during the worry exposure, rate how much they were able to engage in imagery, describe in a few sentences the content of the worry, rate how much they were able to stay on the worry topic, and rate how much they were able to concentrate on the worry scenario. All ratings were done on a 0-100 scale, with 0 being no anxiety/no imagery/unable to stay on topic/completely distracted and 100 being extreme anxiety/total use of imagery/completely able to stay on topic/complete concentration. In keeping with the worry exposure self-monitoring form proposed by Brown, O'Leary & Barlow (2001) in their description of worry exposure implementation, participants were

then asked to describe alternative outcomes for the worry scenario in a few sentences. The Worry Exposure Daily Log was used only for the worry exposure group.

Expressive Writing Home Practice Log. Participants completed a brief self-monitoring form online after each home practice expressive writing session. This online record of expressive writing home practice was similar to the Worry Exposure Daily Log, but was more relevant to the specific intervention. Participants recorded the start and stop time of expressive writing, rated their peak anxiety during the expressive writing, rated how much they were able to stay on the topic of academic concerns, and rated how much they distracted themselves or were not able to concentrate on the topic during the expressive writing. Participants were also asked to rate how much they felt they were able to express their innermost thoughts and feelings during the expressive writing session. All ratings were done on the 0-100 scale described above.

APS Home Practice Log. Participants in the APS (placebo) condition completed an online log of their APS use after each home session. Participants recorded start and stop time of their use of the APS that day. They then rated their peak anxiety during the administration of the APS, how much they were able to relax during the use of the APS, and how much they concentrated on an academic worry during the use of the APS, and how much they believed the APS distracted them from their worries during that session. All ratings were the 0-100 scale.

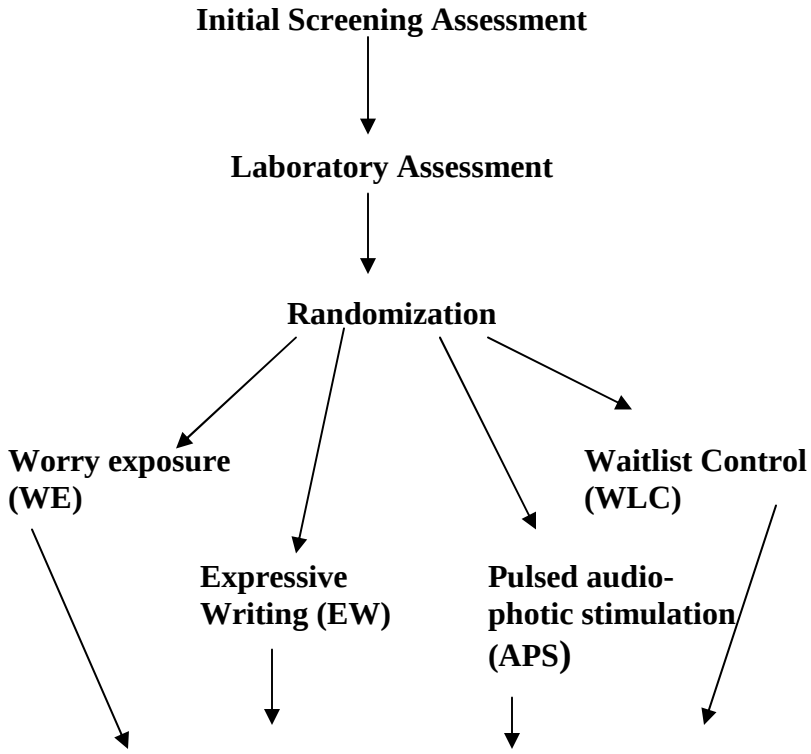
Linguistic Inquiry Word Count (LIWC; Pennebaker, Francis, & Booth, 2001). A software program (LIWC) was used to assess potential mediators in the expressive writing condition. The program is composed of a set of words, phrases and parts of

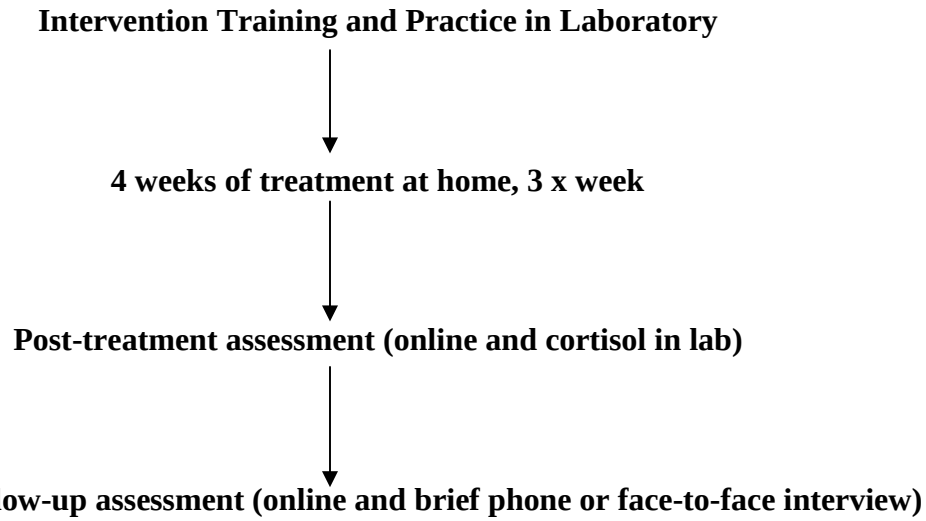
speech made of 2,300 words grouped into over 70 linguistic dimensions, including standard language categories (e.g., articles, prepositions, pronouns), psychological processes (e.g., emotion words), relativity-related words (e.g., time, verb tense), and traditional content dimensions (e.g., sex, death). The program was run on numerous essays containing over 8 million words. The original categories that had very low reliability, consistency, or that were identified at very low rates were eliminated (less than 0.3% of the original categories). Francis & Pennebaker (1993) reported that the categories of emotions, a number of cognitive strategies, several thematic contents, and various language composition elements showed appropriate external validity.

3.3 Procedure

Figure 1 shows the flow of participants through the study.

Figure 1. Participant Flow Through the Study





3.3.1 Procedures for Screening, Informed Consent, and Assessments

Participants who contacted the laboratory were instructed to complete the AWQ online as a screening measure. Those who reported at least moderate impairment or distress due to academic worry (i.e., scores of 2 or higher on items 5 or 9) were invited to come to the laboratory for a pre-intervention face-to-face interview. After signing informed consent, participants completed a full CIDI assessment and the pre-intervention assessments, which included the AWQ, MCQ-30, SF-36, BDI-II, PSS, PSWQ, and the online GAD interview. These screening assessments were used as pre-intervention scores for the participants who met criteria and continued with the intervention phase of the study.

Participants who continued with the intervention phase of the study signed informed consent again and were provided a thorough description of the study as part of the informed consent procedure. Before randomization, participants provided a saliva sample, which was put in a freezer and later sent to be analyzed for cortisol levels.

Participants were then randomized to one of four treatment conditions: (a) worry exposure (WE), (b) expressive writing (EW), (c) audio-photic stimulation (APS), or (d) wait list control condition (WLC). Randomization was conducted by using a random sequence table generated on the internet. After randomization, participants in each condition underwent a 30-40 minute training session in order to ensure that participants could effectively implement their respective interventions at home. These instructional sessions varied slightly depending on the condition (see below for details). Participants were instructed to use their respective interventions at least three times per week at home, either when they were experiencing academic-related worry, when they were about to study, or any other time they wished. They were also instructed to complete online record forms after any use of the intervention at home (details of these online record forms are described in the Measures section).

Participants were instructed to continue practicing their interventions for one month. They completed an online questionnaire (AWQ) once a week and completed a more comprehensive assessment battery (see Measures) at the end of the 4th week. Participants were asked to return to the lab for a short visit, in which they returned any items borrowed from the lab (e.g., tape player for worry exposure, APS device), completed the treatment fidelity questionnaire, and gave a post-treatment saliva sample. Participants (except those who were assigned to the WLC condition) were then asked to complete a 3-month follow-up online assessment battery, consisting of questionnaires and the online GAD interview, as well as a phone or face-to-face interview, consisting of the GAD module of the CIDI.

The large majority of participants chose to come to the lab for their 3-month follow-up CIDI, at which point they received their $30 financial compensation. In the few cases in which only a telephone assessment was possible, the financial compensation was mailed to the participants. Participants in the WLC condition were offered worry exposure at post-treatment and thus did not complete a follow-up assessment. They were provided with compensation at the post-treatment assessment.

3.3.2 Treatment Conditions

A brief description of each treatment rationale and protocol follows:

Worry exposure. The worry exposure protocol used in this study was based on the protocol proposed by Brown, O'Leary & Barlow (2001), which is also outlined in a treatment manual by Rygh & Sanderson (2004). Worry exposure consists of having the participant actively engage in worrying about a specific target concern for a specific amount of time, using imagery instead of verbal forms of worry. First, the rationale for worry exposure was provided to participants in this condition (see Manualized Protocol for exact wording, as described in lay terms).

Namely, worrying over and over with a very specific image in mind will lead to habituation of distress or anxiety associated with the worry scenario, such that that the participant no longer associates distress with the previously troublesome thoughts, or is no longer distressed by "worrying" about the particular scenarios.

Many people with pathological worry often do not focus on one topic while worrying, which may explain why their normal worry does not habituate. Further, worriers often worry to avoid more intense anxiety and anxiety-provoking images

(Borkovec et al., 1993; Borkovec, 1994). One way worriers accomplish this avoidance is by worrying through verbal means in order to avoid distressing images of negative outcomes (Borkovec & Lyonsfield, 1993; Langlois et al., 2000). Worry exposure requires that participants focus on images rather than verbal means of worrying. Participants were informed that it is to be expected that their anxiety may increase a bit at first, as they are now confronting images they often avoid through verbal means of worrying.

Although not proposed by in the original conceptualization of worry exposure, there may be other mechanisms of change at work. Simply by setting aside a specific time and way in which to "worry," worry exposure may reduce the uncontrollability of pathological worry by imposing stop/start rules on worry time. In addition, simply the act of worrying on purpose (and under the prescription of experts) may send messages directly to the brain that there is nothing dangerous about worrying, addressing the characteristic "worry about worry," or negative beliefs about worry, often seen in GAD. This theory is in line with research suggesting that simply engaging in specific actions may directly affect emotion without higher-order cognitive processing (e.g., Dimberg, 1988; Wolitzky & Telch, in press).

Participants received the following worry exposure training:

1. Imagery training by guided instruction to imagine pleasant scenes (e.g., walking on the beach). (approx. 5-7 minutes)

2. Construction of a list of approximately five worry-provoking images relating to school (e.g. failing a test, forgetting to turn in a paper, getting an F in a class). The list was constructed by the therapist and participant, and created in a hierarchy such that less

distressing images were at the beginning. Participants were taught the subjective units of distress scale (SUDS) and were instructed that the least distressing image should fall in the 40-60 range, on a 0-100 scale.

3. Beginning with the first image on the list, the participant was instructed to worry out loud into a tape recorder about each school-related concern for approximately five minutes per image. Participants were told to focus on the image and to use as much detail as possible about the situation, including sensory experiences (e.g. “My teacher is telling me I failed a test and my hands are getting clammy and my stomach is in knots”). Participants described each worry image (using the present tense) for approximately five minutes. If participants had difficulty describing the worry scenario in this manner, the tape was stopped, the therapist coached the participant, and that worry scenario was repeated in an improved manner into the tape.

4. After 25-30 minutes of taping the worry exposure stimuli, participants were told to take the tape home. They were instructed to listen to one worry image on the tape over and over for approximately 25-30 minutes at least three times a week, beginning with the first worry image. They were told to move onto the next worry on the tape only after they could rate their distress as relatively low for the preceding worry image (30 or below on a scale from 0-100, 0 = no distress, 100 = extreme distress). Participants were also encouraged to avoid distraction as much as possible and were encouraged to focus on the description of the scenario using as much imagery as possible. Finally, participants were told that once they habituated to all five of the worry scenarios they described on the tape during the weeks of home practice, that they could use the tools they learned to

either make a new tape of worry images, or try the same techniques without using a taped recording for any remaining time in the acute treatment phase of the study.

5. Participants were provided with the laboratory phone number and the email address of the PI and the research assistant who would be monitoring their compliance. Participants were told they could contact either the PI or the research assistant in case they had any questions about the protocol during the month of home practice. Participants were also given a Walkman-type tape player to borrow from the lab.

6. After each home practice worry exposure, participants accessed the online system in order to complete a Worry Exposure Log (see "Measures"), which took no more than 5-10 minutes per worry exposure. Before leaving the laboratory instructional session, participants were given instructions for accessing the necessary online forms, including the online testing system through the Laboratory for the Study of Anxiety disorders.

Expressive writing. Participants were provided with the rationale for expressive writing, as outlined by Pennebaker and colleagues (see Manualized protocol for exact wording in lay terms). In other words, participants were told that writing about a specific topic (in this case, academic concern and worries) can lead to positive psychological and physical health outcomes. Pennebaker and colleagues have consistently found that writing about a traumatic event leads to improved health and well-being outcomes (see Smyth 1998; Frisina et al., 2004; and Frattaroli, 2006, for reviews). This is the first study to explore the possibility that writing about worries may alleviate symptoms of pathological worry, and may also lead to improved health outcomes. Repeated exposure

to academic worries (in this case in its verbal form) may result in habituation of anxiety or distress associated with worry. The protocol for expressive writing was as follows:

1. Participants were instructed to write, in as much detail as possible, about their academic worry for 20 minutes per session at least three times per week. Participants were encouraged to explore their deepest thoughts and feelings regarding their academic worries, concerns, pressures, and demands. While they were instructed to stay on the same topic of worry as much as possible, it was emphasized that this topic could be defined loosely, and differently for each individual. Examples of academic worries that spanned a wide range of possibilities were given to participants, from the more obvious (e.g., failing an exam) to the more exploratory (e.g., the pressures of parental expectations).

2. Training in the laboratory included setting up the participant to write through the online expressive writing system and to complete the online Expressive Writing Log through the online system. Participants were also given directions for accessing the Laboratory for the Study of Anxiety Disorders' online testing system in order to complete the questionnaire batteries.

3. In order to make sure all conditions received the same amount of in-session contact with researchers, participants in the expressive writing condition spent the remainder of time (approximately 20 minutes) practicing the expressive writing in-session, by logging onto the writing system online and completing one writing entry.

4. Participants were instructed to complete 20-minute writing sessions at home at least three times a week, and were told to complete the expressive writing record online after each expressive writing home session.

Credible Placebo Control; Pulsed Audio-Photic Stimulation (APS). Our laboratory group has considerable experience with pulsed audio-photic stimulation as a credible placebo treatment for specific phobia and social phobia. In four independent investigations, (Powers et al., in press; Powers et al, 2004; Smits et al, 2005; Wolitzky & Telch, in press), participants assigned to one 30–min. APS treatment displayed significant improvement in subjective and behavioral indices of phobic symptoms. The APS device flashes lights through goggles and makes a metronome-like noise through headphones at 12 Hz. The creator of the APS devices (Dave Seiver, Mind Alive, Inc.), asserts that audio-photic stimulation reduces anxiety and depression by altering brain wave activity.

Participants in the APS condition were provided with the following rationale:

Recent evidence suggests that phobia-related thoughts and emotions are stored in the brain and that different emotional states have patterns of brain wave activity associated with them. Since the 1920s researchers and clinicians have written about how flickering light at certain frequencies can alter brain wave activity and reduce anxiety. This procedure of introducing pulsed flickering lights into the visual field and pulsed audio tones into the auditory system has been called brainwave entrainment (BWE) or more commonly today "Audio Visual Entrainment" (AVE). Some clinical studies suggest that AVE may be beneficial in the treatment of anxiety, phobias, and stress-related problems.

The device will deliver pulsed light through these goggles and pulsed tones through these headphones at a special frequency designed to induce a pattern of brain wave activity called alpha that is associated with deep states of relaxation and meditation. During the procedure, it is important that you keep your eyes closed and focus only on the lights and sounds. For the procedure to have maximum benefit, it is important that you keep your mind free of any thoughts and focus only on the flickering lights and pulsing sounds. If you find your mind wandering, focus your attention back to the pulsing lights and sounds.

1. Participants were instructed to self-administer APS at least three times per week. The session was pre-programmed to administer 25-minute sessions. Participants were instructed to complete the 25-min pre-programmed session every time they used the device. The device automatically turned off when the session was completed. If participants needed to end a session early, there was an option on the device to end the session at any time, in which case the device skipped to the final 2-min of the program and then turned off. Participants in this condition were told that the APS would be most effective in relaxing them when they were about to study or while experiencing a worry episode, but that they could use it at other times if they wished.

2. Participants were instructed to complete the online record of APS use following every home session.

3. In order to make sure all conditions received the same amount of in-session contact with researchers, participants in the APS condition spent the remainder of time (approximately 20 minutes) using the APS in-session.

Wait list control. Participants in the wait list control group completed the pre and post-treatment assessments and did not receive any intervention until the post-intervention assessment was completed at the end of the 4th week of the intervention. After that assessment, participants in the wait-list control condition had the opportunity to come in for a 30-minute session in which they created a worry exposure tape to take home for home practice. No assessments were conducted on this group after the post-treatment assessment. Participants in this condition received financial compensation upon completion of the post-treatment assessment.

3.3.3 Treatment Adherence

Participants were given typed and verbal instructions before leaving the laboratory session outlining how to log onto their daily home practice online records. Participants were reminded that they should complete these records after each use of the intervention.

When participants logged onto the online system to complete their records of home practice, they were automatically reminded to complete their home practice at least three times per week. Those in the expressive writing condition logged onto the same system to do both their home practice writing intervention and the home practice record. The computerized program was designed such that every time participants completed their online records (and writing sessions, in the case of the expressive writing condition), the data were sent directly to a private folder for the principal investigator as a text document. In the case of the expressive writing condition, the entire written entry was also available, in addition to the responses on the record of home practice. The PI

checked regularly to ensure that participants were completing their home practice. If a participant was not completing the home practice records, the PI instructed a research assistant to contact the participant through email or phone to remind the participant to complete the home practice three times per week. Research assistants were also assigned to track the compliance of specific participants as an additional check, and were instructed to send reminder emails as needed.

In addition, adherence was monitored for those receiving the placebo control (APS) through the device's program itself. More specifically, the device was programmed for a certain number of sessions. Each time a session was completed, the number of sessions remaining was reduced by one. Thus, in addition to the online data gathered, monitoring of number of home sessions completed was as simple as recording how many sessions were left when the participant returned the device at the end of the one-month intervention phase of the study (there is a feature in which researchers can obtain the number of sessions remaining when the device is returned).

In order to increase compliance with online measures completed at home, research assistants also used an excel spreadsheet tracking system to keep track of when participants should complete their measures (the AWQ weekly and the post and 3-month follow-up batteries of questionnaires) and sent email reminders to complete the measures when they were due.

Finally, participants who contacted researchers stating they wished to discontinue the study received one follow-up email stating they may discontinue if they wish, but that they are encouraged to finish the study. Any particular questions or issues that arose for

the individual were addressed in that email. For example, some participants forgot that they may experience a slight increase in anxiety at the beginning of worry exposure and decided the treatment was not working and wanted to stop. If participants expressed this in their email, education was provided, reminding them about initial fear activation and normalizing their experience. These encouragement emails often gave participants additional motivation to complete the study. Participants who wished to discontinue after the encouragement email was sent were no longer contacted unless they agreed to complete their online post-treatment and follow-up questionnaire batteries for the intent-to-treat (ITT) analyses (see Statistical Analyses section).

3.3.4 Treatment Integrity

In order to assure the greatest possible treatment integrity, assessments and treatments were manualized and administered by trained experimenters.

Manualized Protocol. The protocol (see Appendix A) describes each step for all assessments and treatment training. Scripts were provided throughout the manual to be read aloud by experimenters.

Experimenter Training. The training of experimenters involved (a) didactic orientation to the project provided by the PI; (b) observation of assessment and treatment procedures; (c) role-plays of procedures with trained experimenters; and (d) conducting of assessments with the direct supervision of the PI once training steps (a)-(c) were successfully completed. Experimenters were observed and monitored, and were provided with additional training as needed throughout the process. Experimenters were not

allowed to administer assessments or treatments until they demonstrated proficiency with the protocol.

Chapter 4. Statistical Analyses

4.1 Statistical Power Considerations

The following steps were taken in order to ensure that statistical power was maximized in this study (≥ .70):

- Recruited a large sample size (initially proposed N = 100, actually recruited N = 113) for a 4-cell study assuming a moderate effect size (*d* = 0.50). Power analysis assuming this effect size, set at alpha = .05 would require *n* = 25 per cell (Cohen, 1977; Howell, 2002).
- Assigned fewer participants to the waitlist control condition than the intervention conditions, as it was expected that fewer participants were needed to detect differences between intervention and waitlist than were needed to detect differences between different interventions.
- When appropriate, pre-intervention scores were used as covariates to maximize power (see Stevens, 1992).

4.2 Attrition

4.2.1. Sample Breakdown and Definition of Completer and Dropout

Based on pilot testing, it was expected that approximately 20% of participants randomized and trained to implement an intervention at home would drop out of the study (i.e., would complete fewer than one-third of the recommended home practices). Thus, it was expected at the time of proposal that there would be 80 completers in the sample and 20 dropouts. Due to the nature of the study, in which we are investigating the

potential for these interventions to be successfully implemented at home, attrition data were considered important in and of itself.

Because the dose of treatment (3 x week for one month, for a total of 12 sessions) was highly recommended but not required (i.e., participants were not dropped from the study if they did not complete all treatment sessions), participants were considered treatment drop-outs if they completed fewer than one-third of the recommended treatment sessions (0-3 home practices) and were considered completers if they completed four or more home practice sessions.

This allowed the distinction between completers and dropouts to be standardized, rather than relying on participants' report of whether they completed treatment or not. For example, pilot testing revealed that some participants contacted the researchers before doing any home practices stating they wished to discontinue the study, and others contacted the researchers after completing nine or ten treatments saying they could not complete the study. Thus, relying on participants reporting they would like to "drop-out" yielded inconsistencies in categorization. Further, other participants did not contact the lab to withdraw; rather, they ceased contact with researchers and stopped completing their home practices at varying times during their participation. It is important to note that number of home practice sessions was examined as a potential moderator of treatment outcome.

4.2.2 Intent-to-treat Analyses

Separate analyses were conducted on the completers' sample and intent-to-treat (ITT) samples (i.e., all participants who were randomized). Any differences in findings

between these two groups might suggest interesting treatment implementation and feasibility implications. In the case that participants did not complete a particular assessment, ITT scores were entered. However, if participants were categorized as dropouts but were willing to complete the online assessments at the appropriate post-treatment and follow-up dates, these available scores were used to index treatment outcome[4]. As is good practice in conducting randomized clinical trials, two different types of ITT analyses were conducted: ITT-Liberal (ITT-L) and ITT-Conservative (ITT-C). At post-treatment, all measures except for the AWQ had only one type of ITT sample, with baseline scores used as the dependent variable for those who did not complete the post-treatment assessment. Because participants completed the AWQ throughout treatment, outcome analyses were conducted for both the liberal ITT sample (ITT-L) and conservative ITT sample (ITT-C). ITT-L carried the last obtained AWQ score forward, while ITT-C carried the AWQ baseline score forward as the post-treatment score for those who did not complete the post-treatment assessment. ITT statistics are reported if they differed from their completers sample counterparts.

At follow-up, the procedure for conducting ITT analyses was identical to that of the post-treatment analyses with one exception: now all measures include an ITT-L (last score obtained used as the follow-up dependent variable if no follow-up assessment completed) and an ITT-C (baseline score used as the follow-up dependent variable if no follow-up assessment was available).

4.2.3 Treatment Completion and Attrition Analyses

[4] Although the actual scores were entered, it is important to note these participants were still only analyzed with the other dropouts, and these scores were not included in the completers analyses.

One-way ANOVA (for sessions completed) and chi-square (for dropout/completer status) tests were used to assess whether completion of treatment and attrition differed between groups. Further probing of significant inter-group differences was conducted using Tukey's post hoc tests for continuous measures and chi-square tests for categorical indices.

Logistic regression was used to examine predictors of attrition. Gender, race, undergraduate/graduate status, major, time during semester in which intervention began, all current diagnoses assessed in the CIDI at baseline, and pre-treatment AWQ score were all entered as predictors, with dropout/completer status as the dependent variable.

4.3 Randomization Check

Analyses were conducted to assess whether any significant differences at baseline were present between groups on both demographic and clinical status variables. One-way ANOVAs were used to assess continuous variables, with Tukey's post hoc tests used to assess specific inter-group comparisons. Chi-square tests were used to analyze differences between categorical variables, with planned pairwise comparisons used to further investigate any significant differences.

4.4 Treatment Fidelity

Chi-square tests were used to examine between-group differences on Part A of the treatment fidelity questionnaire (Yes or No questions assessing the use of the most basic activities of each condition). Significant omnibus tests were followed up by planned comparisons, examining the condition expected to report a "yes" on the particular item compared to the condition(s) expected to report a "no." One-way ANOVAs were

conducted to assess whether participants experienced what was intended for each of their conditions relative to those in the other conditions for Part B of the treatment fidelity questionnaire. Tukey's post-hoc tests were used to further explore significant differences.

In addition, information gathered during the treatment sessions (see "Treatment Process Analyses") was averaged for each participant and used as additional measures of treatment fidelity. These variables provided a more *in vivo* report regarding the degree to which the participants were able to successfully engage in behaviors and activities during treatment that were theoretically important to the integrity of the treatment condition. Examples include the degree to which participants in the worry exposure condition used imagery during the session, or the degree to which participants in the expressive writing condition expressed emotions. Because different data were collected for each condition, these data provide only descriptive information about the magnitude of these facets of treatment, and do not provide information needed for between-group analyses, except in the cases in which there was overlap (e.g., degree to which participants focused on worry content during treatment was assessed for WE and EW and subjected to a *t*-test).

4.5 Credibility Check

In order to ensure that the three interventions were deemed equally credible by participants, a one-way ANOVA was conducted used to assess any differences between groups on the RTQ.

4.6 Testing of Hypotheses

4.6.1 Aim 1:

To evaluate the relative efficacy of the interventions, data on self-report outcome measures were assessed using continuous and categorical analyses. For post-treatment analyses, a series of 2 (assessment time; pre, post) x 4 (condition; WE, EW, APS, and WLC) repeated measures ANOVAs were conducted on each of the major outcome variables (i.e., AWQ, PSWQ, BDI, and PSS) from pre to post-treatment to assess main effects of time and most importantly the time x condition interaction. Follow-up tests were conducted to determine which conditions, in particular, showed significant change from pre to post-treatment. Simple effects tests were conducted for any significant or marginally significant time x condition omnibus tests by conducting a univariate ANCOVA with post-treatment score as the dependent variable, condition as the fixed factor, and pre-treatment score as the covariate[5]. Pairwise comparisons using LSD tests were used to evaluate inter-group differences at post-treatment. The assumption of homogeneity of variances was tested on all omnibus tests. The sphericity assumption was tested for all repeated measures ANOVAs.

A similar approach was taken to analyze the effects of treatment at the 3-month follow-up. 2 (post, follow-up) x 3 (WE, EW and APS) repeated measures ANOVAs were conducted to assess whether change occurred from post to follow-up on the self-report measures (recall that WLC participants did not complete a follow-up assessment). In addition, univariate ANCOVAs were conducted to assess differences between groups at

[5] Although this is somewhat statistically redundant, the univariate ANCOVA allowed for the examination of inter-group differences via LSD tests, while the repeated measures approach allowed for an examination of changes across time.

follow-up while controlling for pre-treatment scores[6]. LSD pairwise comparisons were used to further explore the inter-group differences when a condition effect was present. The assumptions of homogeneity of variance and sphericity were evaluated as they were with post-treatment analyses.

In addition to continuous analyses of treatment outcome, a categorical approach to treatment response and clinically significant improvement was also taken on the primary outcome variables (i.e., AWQ and PSWQ; see Jacobsen & Truax, 1991). This approach involves two-pronged criterion in which participants are classified as achieving clinically significant change (CSC) if they: (a) display responder status and (b) clinically significant improvement. First, each participant's responder status (yes vs. no) was determined based on whether their pre to post-treatment improvement was statistically reliable based on the reliable change index (RCI; Jacobsen & Truax, 1991). Specifically, participants who achieved an RCI greater than or equal to 1.96 were classified as treatment responders.

Second, a measure by measure approach was taken to determine the algorithm for which clinically significant improvement would be determined. Jacobsen & Truax (1991) propose three viable ways in which to determine whether a participant meets criteria for clinically significant improvement: (a) participant shows a level of improvement greater than or equal to two SDs from the baseline mean of the "clinical" group (i.e., the sample); or (b) participant's post-treatment score falls within two SDs of the mean of a "normal"

[6] These simple effects tests at follow-up were conducted regardless of significance of the time x condition effect on the post-to-follow-up repeated measures ANOVA because between-group differences at follow-up while controlling for pre-treatment scores may be observed even if there is no differential treatment effect from post to follow-up. In contrast, simple effects univariate ANCOVAs at post were only conducted when the time x condition repeated measures ANOVA from pre to post was significant or approached significance, as these two analyses are highly related.

("functional") population; or (c) score is closer to the mean of the functional population than the "dysfunctional" (i.e., clinical) population. The decision to use one of these three acceptable methods is based on factors such as the availability of normative data (as well as the nature of that data)[7] for the measure in question, the degree of overlap between the two populations, and the range of potential pre to post improvement in the sample. These factors were considered in order to choose the most stringent, feasible, and accurate picture of percentage of participants achieving clinically significant improvement for each individual measure.

The final percentages reported refer to the stringent test for clinically significant change (CSC). That is, percentage of participants who achieve a level of pre to post-treatment change that is both statistically reliable and clinically meaningful. Chi-square tests were used to test for differences between groups in the proportion of participants who achieved clinically significant change. An identical approach was used to determine percentage of participants achieving clinically significant change at the 3-month follow-up, with the addition of ITT-L and ITT-C analyses for this variable (see "Intent-to-treat Analysis" above).

In addition, GAD status at follow-up was examined as a clinically meaningful index of change. Although not all participants met criteria for GAD at pre-treatment, percentage of participants meeting criteria for GAD at pre-treatment and at the follow-up assessment across conditions (completers sample) was assessed. A series of chi-square

[7] For example, many apparently normal samples contain responses from participants who may report scores in the clinical range, as in a student sample. Thus, these norms may be "contaminated" and lead to overlap in population means (see Jacobsen & Truax, 1991, for a discussion).

analyses were used to assess potential between-groups differences in percentage of participants meeting criteria for GAD at follow-up.

4.6.2 Aim 2:

In order to assess potential differential treatment effects on objective and subjective measures of health, an identical analytical approach as described in Aim 1 was used to assess differences between conditions on perceived health (SF-36), cortisol levels, and number of visits to the health center at post-treatment and follow-up. For the health visits variable, number of visits for the semester before the intervention entered as time 1 ("pre") and the number of visits for the semester during the intervention entered time 2 ("post") in a repeated measures ANOVA, with condition as the fixed factor. For follow-up analyses, semester during the intervention was entered as time 1, and semester after the intervention number of visits was entered as time 2. Because the number of health visits were obtained for any semester in which the participant was enrolled at the university, regardless of dropout/completer status in the study, the "ITT" analysis for this variable simply included the actual available data obtained for the full sample randomized to treatment. It should also be noted that follow-up data for the health visits variable was collected for the waitlist control group, and thus included in follow-up analyses, unlike the self-report measures.

4.6.3 Aim 3:

In order to assess potential intervention effects between groups on grades and credit hours completed, an identical analytical approach was used as described in Aims 1 and 2. A 2 (semester before intervention, semester of intervention) x 4 (condition)

repeated measures ANOVA was conducted to assess whether improvement in grades occurred even as early as in the semester in which the intervention occurred (post-treatment analysis). To assess change at follow-up, the repeated measures ANOVA included semester of intervention as time 1 and semester after intervention as time 2. An identical approach was taken to assess number of credit hours completed.

As with the health visit data, GPA and number of credit hours completed for each relevant semester were obtained for any semester in which the participant was enrolled at the university, regardless of dropout/completer status in the study. Thus, the "ITT" analysis for these two variables simply includes the actual available data obtained for the full sample randomized to treatment. Also similar to the health visit data, grade information was obtained for those in the waitlist control group for the semester after the intervention. Thus, the waitlist control group was assessed at follow-up on these measures.

4.6.4 Aim 4:

Moderator analyses were conducted as outlined by Baron & Kenny (1986). Although it was expected that some variables would simply be general predictors of outcome (i.e., a significant main effect for a particular putative moderator but no variable x condition interaction), analyses were conducted using a series of hierarchical linear regressions for all of the following variables in order to assess for treatment moderation: (a) number of treatment sessions completed; (b) beliefs about worry at baseline, as measured by the MCQ (with each of the five factors examined separately as putative moderators); (c) time during semester when entered study (participants were classified as

either beginning in the first half or second half of the semester); (d) major field of study (classified as either "engineering," "natural sciences," "liberal arts," "social sciences," "law school," "business," "health professions," "public policy," or "other"); (e) GAD status at baseline; (f) educational status (i.e., undergraduate vs. graduate/professional school student); (g) race/ethnicity; (h) major; and (i) gender.

The ITT sample was used to assess whether number of treatment sessions moderated treatment outcome, while the completers sample was used for the other measures. Dummy coded variables and interaction terms were created. Pre-treatment scores for the measure of interest were entered in the first block, with the outcome measure as the dependent variable (i.e., AWQ, PSWQ, and GPA at post-treatment). In the second block, the condition terms (dummy coded) and moderator term were entered. The third block consisted of interaction terms. If the final model with the interaction terms was significant, the variable significantly moderated treatment outcome. In order to interpret the direction of differential condition x moderator effects, predicted values at post-treatment for each category of the moderator/condition interaction (adjusted for pre-treatment) were calculated by constructing equations based on the final model of significant predictors. If no significant condition x moderator interaction was observed, a simplified model excluding the interaction terms was analyzed to assess for significant main effects of the putative moderator on the outcome variable. If this simplified model was significant and the putative moderator provided a unique contribution to the model, the variable was considered a general predictor of outcome.

Because of the large number of categories for the variables major and race/ethnicity, dichotomous variables were created to maximize power (science vs. non-science and Caucasian vs. non-Caucasian, respectively). Models were run first with all of the categories' dummy codes and their interaction terms. If no significant interactions were observed, the dichotomous variables were entered into a separate model. WLC cases were excluded from the moderator analyses.

4.6.5 Aim 5:

Change in AWQ Scores During Treatment

The completers sample was used to examine the potential differential decline slopes of AWQ scores between conditions, taken across five time points from the beginning to the end of treatment: baseline, week 1, week 2, week 3, and post-treatment. A 2-level HLM was conducted with AWQ score as the outcome variable, assessment period as the level-1 predictor, and three dummy-coded variables to represent the four conditions (with WLC as the reference category) as the level-2 predictors.

Treatment Process Variables as Predictors of Change

Some data gathered throughout treatment that were not necessarily expected to change over time, nor theoretically required to *change* in order to confer benefits (i.e., overall level of ability to engage in imagery during WE, overall level of ability to distract during APS, overall level of relaxation during the APS, overall ability to stay focused on thoughts and emotions regarding academic worry for the EW condition, and ability to focus on academic worry content during WE and EW) were averaged for each participant

and examined as predictors of outcome.[8] Each variable of interest was entered into a linear regression model in the second block, with AWQ at post-treatment as the dependent variable and AWQ at pre-treatment statistically controlled in block 1 of the regression.

Mechanisms of Change During Treatment

In order to assess whether fear significantly declined for either or both of the two intervention conditions, as well as whether these slopes differed between groups, a 2-level HLM was conducted with fear as the outcome variable, intervention session as the level-1 predictor, and treatment condition as the level-2 predictor. A residual file was also created to obtain slopes and fear intercepts for each individual participant, which were then used in a series of hierarchical linear regressions to assess whether these treatment process parameters predicted outcome on the AWQ. Mediation was tested using the MacArthur guidelines as outlined by Kraemer, Wilson, Fairburn & Agras (2002). In this approach, a variable can be considered a mediator of treatment outcome if it (a) occurs during treatment; (b) is correlated with treatment condition; and (c) has either a direct relation with the outcome variable or interacts with the treatment variable in its relation with the outcome. Treatment process parameters that failed to meet the requirements for mediation were still examined as general predictors of outcome.

Additionally, the LIWC output for each EW participant (see "Treatment Process Measures") was used to conduct a series of hierarchical regressions to assess whether the following were associated with greater improvement on the AWQ at post-treatment and

[8] These averages were also used as additional measures of treatment fidelity.

follow-up: (a) an increase in use of positive emotion words; (b) a decrease in negative emotion words across writing sessions; and (c) an increase in use of cognitive processing words across writing sessions. Additionally, average percentage of positive and negative emotion words were also entered as predictors of outcome in two separate models. Regressions were also performed to assess whether use of the following types of word categories were associated with outcome: (a) self-referencing words; (b) social words; (c) sensory words; and (c) past, present, and future tenses. These categories were all chosen based on theory-driven hypotheses. AWQ at pre-treatment was entered into the first block of each regression to control for these scores.

In cases in which a change in percentage of words across sessions was the variable of interest, residualized change scores were calculated by regressing the average percentage of words in that category during the first half of the sessions onto that of the second half of the sessions. This approach is consistent with previous statistical analysis in the expressive writing literature.

Chapter 5: Results

5.1 Equivalence of Groups at Baseline

Despite random assignment to condition, some variables differed between groups at baseline. A significant difference was found for gender, χ^2 (3) = 8.22, $p < .05$. Pairwise comparisons revealed that significantly more males were assigned to the EW condition than the APS condition [χ^2 (1) =6.14, $p < .01$] and the WE condition [χ^2 (1) = 4.59, $p < .05$]. No other differences were found on demographic variables, including status in school (undergraduate vs. graduate/professional school), ethnicity, diagnosis of GAD, and psychiatric comorbidity. Additionally, no differences were found between groups on the time during the semester in which participants began the intervention (i.e., first half of semester vs. second half).

Means and standard deviations of the baseline clinical measures across conditions (for all randomized participants) are presented in Table 1. Unfortunately, differences between groups at baseline were also observed on three clinical outcome measures: the AWQ [F (3,109) = 3.19, $p < .05$], the PSWQ [F (3,109) = 2.72, $p < .05$], and the physical health factor on the SF-36 [F (3, 109) = 3.05, $p < .05$]. Post hoc tests revealed that those receiving WE reported significantly higher levels of academic worry (AWQ) and generalized anxiety (PSWQ) than those in the APS condition (all ps < .05), and that those in the EW condition reported marginally significantly higher levels of academic worry than those in the APS condition (p = .09). In addition, those assigned to EW reported marginally significantly better physical health (SF-36 P) at baseline than those assigned to WE and APS (ps = .07). Thus, pre-treatment PSWQ, AWQ, and SF-36 P scores were

controlled for in subsequent analyses of these variables. Furthermore, although between-group differences at baseline were not statistically significant on the PSS, pre-treatment PSS scores were entered as covariates in analyses including post-treatment or follow-up PSS scores, because the *p*-value for the between-group difference was below .25 ($p = .17$).

5.2 Treatment Completion and Attrition

5.2.1 Between-group differences

Table 1 also reports treatment completion and attrition data. Differences between groups on number of treatment sessions approached significance, $F(2,92) = 2.59$, $p = .08$. Further probing of the inter-group differences revealed that those in the APS condition tended to complete more sessions than those assigned to EW ($p < .07$).

Although no significant between-group differences were observed on completer/dropout status ($p = .16$), a significant between-group difference emerged on the number of participants who completed the entire study, $\chi^2 (2) = 7.45$, $p < .05$. More participants completed the entire study in the APS condition (N = 23) than in the EW condition (N =15), $\chi^2 (1) = 7.46$, $p < .01$. No other significant between-group differences were observed.

Table 1. Means and Standard Deviations of Baseline, Attrition, and Credibility Measures for All Randomized Participants

Condition	*Measure*												
	AWQ	PSWQ	PSS	BDI	SF36-M	SF36-P	GPA	#hrs	health	cort	#sess	%DO	RTQ
WE	21.18	67.09	26.06	18.39	46.81	75.23	3.43	13.00	1.28	6.77	6.36	30	64.44
	(4.40)	(8.67)	(4.90)	(8.67)	(13.86)	(14.45)	(0.59)	(1.87)	(1.97)	(4.76)	(4.36)		(19.54)
EW	20.70	63.70	24.21	16.94	49.48	83.87	3.27	13.23	1.03	9.20	5.55	39	59.83
	(3.67)	(9.24)	(5.82)	(9.62)	(16.95)	(10.78)	(0.66)	(2.97)	(1.66)	(4.80)	(4.40)		(17.46)
APS	18.34	60.34	23.25	17.10	50.73	74.78	3.09	13.74	0.95	8.37	7.93	17	58.54
	(3.18)	(10.55)	(4.09)	(6.71)	(13.88)	(14.46)	(0.86)	(2.05)	(1.02)	(5.13)	(3.62)		(20.30)
WLC	19.44	63.33	24.33	16.61	49.61	74.36	3.23	12.50	0.77	6.67	-	6	-
	(4.49)	(8.39)	(4.68)	(8.93)	(14.86)	(19.32)	(0.84)	(1.79)	(0.93)	(3.46)			

Key: #hrs = number of credit hours completed; health = # of visits to health service; cort = cortisol; %DO = percent drop-outs

5.2.2 Predictors of Attrition

Only two variables were associated with dropout/completer status. Female gender was associated with greater likelihood of completion (OR = 6.34 vs. males, 95% CI = 1.39 to 28.91, Wald = 5.69, $p < .05$). Time in which treatment began during the semester also uniquely contributed to the model (see "Statistical Analyses" for the full details of the model), with increased likelihood of dropout associated with randomization occurring later in the semester (OR = 9.09 vs. randomized during first half of semester; 95% CI = 1.81 to 45.34, Wald = 7.21, $p < .01$[9]).

5.3 Treatment Fidelity

For Part A of the ATA questionnaire, all omnibus chi-square tests were significant: "listened to a tape," χ^2 (2) = 25.57, p < .001 (100% "yes" for WE, 0% "yes" for EW, 14% "yes" for APS); "wrote about worries," χ^2 (2) = 21.81, $p < .001$ (15% "yes" for WE, 100% "yes" for EW, 0% "yes" for APS); "wore headset and goggles," χ^2 (2) = 29.00, $p < .001$ (0% "yes" for WE, 0% "yes" for EW, 100% "yes" for APS); "formed images of worry scenes," χ^2 (2) = 6.64, $p < .05$ (54% "yes" for WE, 22% "yes" for EW, 0% "yes" for APS); and "expressed thoughts through words," χ^2 (2) = 16.68, $p < .001$ (38% "yes" for WE, 100% "yes" for EW, 0% "yes" for APS). Planned comparisons revealed that those in the APS condition did in fact wear a headset and goggles, χ^2 (1) = 29.00, $p < .001$, more than those assigned to WE or EW. Furthermore, those in EW reported that they wrote about their worries, χ^2 (1) = 21.36, $p < .001$, and expressed their

[9] The model predicted completion, with OR = .11 for "time" (reference group first half of semester). Thus, the reported OR is the inverse, in order to present a positive OR for dropout.

worries through words, χ^2 (1) = 13.98, $p < .001$, more than those assigned to the other two intervention conditions. Finally, those who received WE treatment listened to a tape, χ^2 (1) = 4.27, $p < .05$, and reported forming images of worry scenes, χ^2 (1) = 5.73, $p < .05$, more than those in the other intervention conditions.

On Part B of the ATA questionnaire, no difference was observed on the omnibus test for question 1 (relaxation question), suggesting that contrary to expectation, those assigned to APS did not feel significantly more relaxed during treatment than those in the other two conditions. However, questions 2-6 [distraction, F (2, 52) = 8.14, $p < .001$; expressed thoughts and feelings, F (2, 52) = 21.17, $p < .001$; focused on worry content, F (2, 52) = 30.47, $p < .001$; worry images about school, F (2, 52) = 30.47, $p < .001$; and worry-related images, F (2, 52) = 16.23, $p < .001$, respectively; see Appendix for complete questionnaire] all revealed significant differences between groups.

As expected, post-hoc tests revealed that those receiving APS reported that they were significantly more distracted from their worries while undergoing treatment as compared to those in the WE ($p < .001$) and EW ($p < .01$) conditions. Also as expected, those in the EW condition reported expressing more thoughts and feelings than those in APS ($p < .001$). While not surprising, those in WE also reported expressing more thoughts and feelings than those in APS ($p < .001$). However, the EW condition was not uniquely defined by this expression, as no significant differences were observed between those in WE and EW. Consistent with prediction, participants in both the WE and EW conditions reported focusing on the content of their worries more than those in APS ($ps < .001$). Also consistent with expectation, those in WE reported conjuring up more worry

related images of school than those in EW ($p < .01$) and APS ($p < .001$) during treatment, with those in EW also reporting more worry related images of school during treatment than those in APS ($p < .001$). Contrary to prediction, those in WE did not report focusing on worry-related images more than those in EW ($p = .21$). However, those assigned to WE or EW focused on worry-related images more than those in APS (ps $< .001$).

Overall, these findings suggest that participants completed the basic activities unique to each of their treatment conditions, and that, for the most part, treatment activities and objectives were appropriately differentiated. While not surprising, the least distinctive aspect of the treatments was degree of emotional expression between the WE and EW conditions. Although no differences were observed between WE and EW on one of the three imagery items, the fact that significant differences did emerge for the other two items provides evidence that those assigned to WE did in fact use more worry-related imagery than those assigned to EW.

In addition, treatment process data showed that, on average, participants in the WE condition used "a lot" of imagery (M = 67.70, SD = 17.99 on the 0-100 scale); that participants in the WE and EW conditions focused on the content of their worries during treatment "a lot" ($M_{EW} = 66.87$, $SD_{EW} = 16.96$; $M_{WE} = 64.37$, $SD_{WE} = 16.77$ on the 0-100 scale), with no significant differences between the two conditions ($p = .59$); and that those in the EW condition reported expressing thoughts and emotions during the treatment sessions "a lot" (M = 73.21, SD = 21.97).

Finally, the mean percentage of "school" words used in the EW condition (as obtained by LIWC) was 3.71% (SD = 1.65), which is more than one SD above the norm

(Pennebaker et al., 2001; M_{norm} = 1.5%, SD_{norm} = 1.9) based on 43 studies using the expressive writing paradigm. This indicates that participants did write about school more than those who were in studies not focusing on academic worry.

5.4 Treatment Credibility

As shown in Table 1, a one-way ANOVA revealed no significant difference between groups on the RTQ (p = .50), indicating that participants across the three intervention conditions viewed their treatments as equally credible. The mean RTQ score across conditions was M = 61.00 (SD = 18.98), suggesting that, overall, participants found their treatments to be at least moderately credible.

5.5 Testing of Hypotheses: Aim 1

5.5.1 Treatment Effects: Continuous Analyses of Clinical Self-Report Measures

The assumptions of ANOVA assessed (see "Statistical Analyses") were met for all analyses. Figures 2-5 show the means for each condition across assessment periods for each measure. Table 2 presents the means and standard deviations across assessment periods for the AWQ, PSWQ, PSS, and BDI (completers sample).

5.5.1.1 Academic Worry Questionnaire (AWQ) at Post-treatment. A significant effect of time was observed across groups on the AWQ, F (1, 80) = 52.77, p < .001, η = .40, power = 1.00. Further analysis revealed that those in the WE, APS, and EW conditions all showed significant reductions in AWQ scores from pre to post-treatment (p < .001 for WE and APS, p < .01 for EW), while those in the WLC condition did not show a statistically significant change in AWQ score (p = .09). These findings show that those

assigned to an intervention showed significant reductions in AWQ scores, while those assigned to no treatment showed only marginal improvement over time.

The time x condition effect approached significance, F (3, 80) = 2.42, p =.07, η = .08, power = .59. Simple effects tests revealed a significant between-group difference at post-treatment, F (3, 79) = 3.21, $p < .05$, η = .11, power = .72. Pairwise comparisons indicated that those receiving WE marginally outperformed WLC (p = .08), while those in APS outperformed both WLC and EW (ps < .05). Contrary to expectation, no differences were observed between EW and WLC; nor did WE outperform APS.

The same pattern of findings was observed using the ITT-L sample, with the exception of inter-group differences at post-treatment: those in the WE condition reported significantly greater improvement on AWQ scores than those in the EW condition ($p <$ .05), while those receiving the APS reported significantly greater improvement on AWQ scores than those in both EW ($p < .01$) and WLC ($p < .05$). No other specific between-group differences emerged. When considering the ITT-C sample (baseline AWQ scores entered at post-treatment for dropouts), WE marginally outperformed EW (p = .08), and APS outperformed both WLC ($p < .05$) and EW ($p < .01$), with no other significant differences. Thus, with each successively more conservative analytical approach, those in WE and EW did not perform as well, while those in APS showed similar performance.

Because of the nature of the AWQ as a tool to identify the presence and degree of several different facets of academic worry, univariate ANCOVAs controlling for pre-treatment scores were conducted on an item by item basis on the completers sample to shed light on between-group differences in specific domains of academic worry.

Interestingly, a condition effect at post-treatment was only significant for two of the ten items [items two, F (3, 79) = 3.68, $p < .05$, $\eta = .12$, power = .78, and three, F (3, 79) = 4.16, $p < .01$, $\eta = .14$, power = .74] and approached significance on two other items [items eight, F (3, 79) = 2.24, $p = .09$, $\eta = .08$, power = .55, and ten, F (3, 79) = 2.32, $p = .08$, $\eta = .08$, power = .56].

Table 2. Means and SDs Across Assessment Periods for Self-Report Clinical Measures

	WE			EW			APS			WLC	
	Pre	*Post*	*FU*	*Pre*	*Post*	*FU*	*Pre*	*Post*	*FU*	*Pre*	*Post*
AWQ	21.30	15.70	12.45	20.75	17.65	12.80	18.63	13.13	11.26	19.59	17.53
	(4.52)	(4.56)	(5.11)	(3.43)	(6.10)	(6.81)	(3.31)	(4.38)	(4.34)	(4.58)	(5.36)
PSWQ	66.65	56.48	51.50	63.30	58.65	51.67	60.63	55.17	50.70	64.06	63.12
	(9.39)	(11.44)	(15.01)	(10.08)	(11.07)	(13.80)	(10.66)	(9.23)	(9.61)	(8.04)	(7.98)
PSS	26.17	19.43	17.15	23.95	20.65	16.80	23.47	18.29	14.30	24.18	23.76
	(5.38)	(7.59)	(7.45)	(5.05)	(7.14)	(7.94)	(3.98)	(4.68)	(4.97)	(4.77)	(6.29)
BDI	18.04	10.61	9.40	15.15	11.80	7.13	17.50	10.38	5.52	16.53	13.76
	(8.96)	(9.16)	(9.86)	(9.07)	(11.14)	(7.30)	(6.61)	(7.76)	(4.46)	(9.20)	(6.74)

On item two, “total time spent worrying about school,” those receiving WE and APS reported spending less time worrying about school than those in the WLC group ($p < .05$ for WE and $p < .01$ for APS) and the EW group (approaching significance, $p < .06$, for WE and $p < .05$ for APS). No differences were found between EW and WLC or between WE and APS. On item three, “duration of a typical worry episode,” a similar pattern emerged. Those in WE and APS reported experiencing shorter worry episodes than those in WLC (approaching significance, $p < .06$, for WE and $p < .05$ for APS) and EW (all ps $< .01$), with no other differences observed. These findings suggest that, at post-treatment, the WE and APS interventions may have had the most impact on duration of time spent worrying, and that the impact of these two treatments on duration of worry was greater than that of the EW intervention.

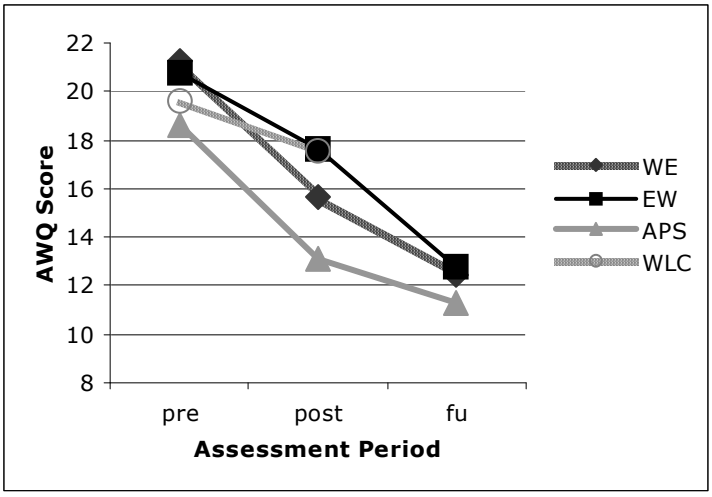
On item eight, which taps into the belief that worry is dangerous and harmful, those in the WLC condition believed worry to be more harmful than those who received WE ($p < .05$) or APS (approaching significance, $p < .07$). Those assigned to APS reported significantly lower scores on item ten (which taps into the degree of safety behavior utilization in an effort to reduce worry or mitigate anxiety) than those in EW ($p < .05$), and marginally lower scores than those assigned to WE ($p = .06$), suggesting that those who received the APS treatment used fewer safety behaviors at post-treatment than those assigned to the other two treatment conditions. No other inter-group differences emerged.

5.5.1.2 AWQ at Follow-up. A significant effect of time was observed from post to follow-up assessments, F (1, 55) = 19.03, $p < .001$, $\eta = .26$, power = .99, with an overall

improvement in scores. Simple effects tests revealed that those who received WE (p < .01) and EW (p < .05) showed significant continued improvement from post to follow-up, while those who received the APS intervention showed marginally significant improvement from post to follow-up (p < .08). This time effect was maintained for both ITT samples (ps < .01).

Neither a time x condition effect (p = .49) nor a condition effect (p = .85) were observed. ITT-L and ITT-C analyses also failed to show a time x condition effect. However, both ITT analyses revealed a marginally significant condition effect at follow-up on the simple effects test [F (2, 91) = 2.80, p < .07, η = .06, power = .54 for ITT-L and F (2, 91) = 2.82, p < .07, η = .06, power = .54 for ITT-C]. Pairwise comparisons revealed that APS outperformed EW (both ps < .05), with no other inter-group differences. No between-group differences emerged when considering each item individually.

Figure 2. Academic Worry Scores Across Assessment Periods (Completers)



5.5.1.3 Penn State Worry Questionnaire (PSWQ) at Post-treatment. A significant effect of time from pre to post-treatment was observed on the PSWQ, F (1, 80) = 33.02, p < .001, η = .29, power = 1.0, suggesting that change was observed across groups on this measure. Follow-up analyses revealed that those in WE, EW, and APS showed significant decreases in PSWQ score from pre to post-treatment (p < .001 for WE, ps < .01 for EW and APS), while those in the WLC condition showed no significant effect of time on this measure (p = .46).

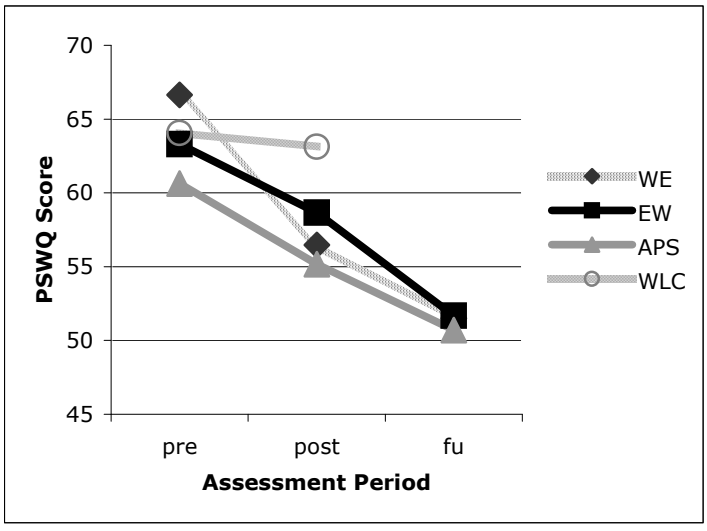
A significant time x condition effect was also observed, F (3,80) = 4.12, p < .01, η = .13, power = .83. Simple effects tests at post-treatment revealed a significant condition effect, F (3, 79) = 3.91, p < .01, η = .13, power = .81. Pairwise comparisons showed that those receiving the WE treatment outperformed those in WLC (p < .001) and EW (approaching significance, p = .07), while those receiving APS also outperformed WLC (p < .05). No other between-group differences were observed.

When conducting identical analyses on the ITT sample, findings were identical on the repeated measures ANOVA. However, the simple effects test at post-treatment only approached significance on the test for a condition effect, F (3, 108) = 2.48, p < .07, η = .06, power = .60. Pairwise comparisons revealed that those assigned to WE reported significantly more improvement on the PSWQ (i.e., lower scores) at post-treatment than those assigned to WLC (p < .05) and EW (approaching significance, p = .07). Those assigned to the APS condition also showed marginally more improvement on the PSWQ compared to those in WLC (p = .08). No other significant differences emerged.

5.5.1.4 PSWQ at Follow-up. A significant time effect was observed, F (1, 55) =11.83, p < .001, η = .18, power = .92, with overall continued improvement from post-treatment to follow-up. This post to follow-up improvement was significant for those assigned to APS (p < .05), but only marginally significant for those assigned to EW (p < .07). Those in the WE condition maintained gains, but showed no significant improvement (p = .16). Post-to-follow-up improvement was observed for the ITT-L (p < .001) and ITT-C (p < .01) samples.

Neither a significant time x condition effect (p = .89), nor a condition effect on at follow-up (p = .56) were observed, indicating no significant between-group differences. Both ITT analyses mirrored the completer analyses.

Figure 3. PSWQ Scores Across Assessment Periods (Completers)



5.5.1.5 Perceived Stress Scale (PSS) at Post-treatment. A significant effect of time was observed from pre to post-treatment on the PSS, F (1, 79) = 39.87, p < .001, η = .34, power = 1.0. This pre to post reduction was significant for those receiving WE (p < .001),

EW ($p < .01$), and APS ($p < .001$), but was not significant for those assigned to the WLC condition ($p = .74$). A significant time x condition effect was also observed, F (3, 79) = 4.57, $p < .01$, $\eta = .15$, power = .87. Simple effects tests revealed a significant effect of condition at post-treatment on the PSS, F (3, 78) = 4.22, $p < .01$, $\eta = .14$, power = .84. Pairwise comparisons revealed that those receiving WE and APS outperformed WLC (ps < .01), with no other inter-group differences attaining statistical significance.

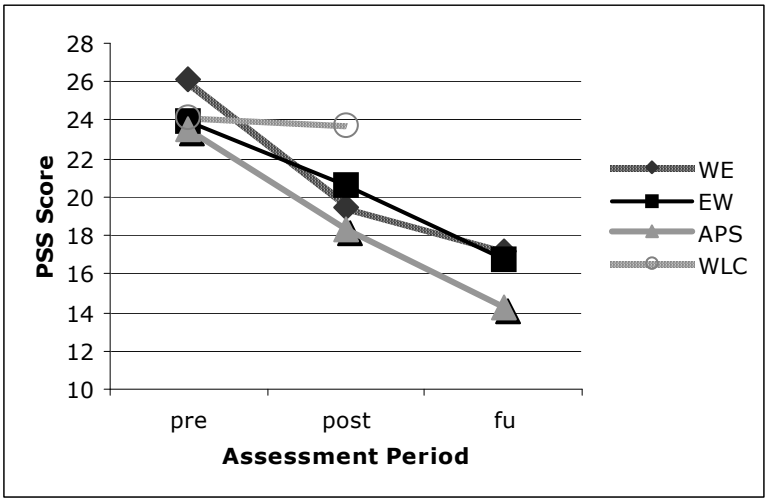
The only difference between the completers and ITT samples emerged with respect to the inter-group differences. On the ITT analyses, the pairwise comparisons for the ANCOVA indicated that, in addition to those in WE and APS outperforming those in WLC (ps < .05), those receiving WE and APS also outperformed those in EW (ps < .05).

5.5.1.6 PSS at Follow-up. Like the above measures, a significant time effect was observed showing continued improvement from post-treatment to follow-up, F (1, 55) = 15.11, $p < .001$, $\eta = .22$, power = .97. The post to follow-up effect of time was significant for those assigned to APS ($p < .01$) and EW ($p < .05$), while those assigned to WE maintained gains ($p = .19$). Post to follow-up improvement was also significant for the ITT-L sample ($p < .05$), but only marginally significant for the ITT-C sample ($p = .06$)

Also similar to the above measures, neither a time x condition effect from post-treatment to follow-up ($p = .53$), nor a condition effect at follow-up ($p = .47$), was observed using the completers sample. However, like the ITT analyses on the AWQ, a between-group effect was marginally significant at follow-up for the ITT-L sample, F (2, 89) = 2.51, $p < .09$, $\eta = .05$ power = .49, and was statistically significant at follow-up

with the ITT-C sample, F (2, 88) = 3.56, $p < .05$, $\eta = .08$, power = .65. In both cases, APS outperformed EW (ps < .05), with no other inter-group differences.

Figure 4. PSS Scores Across Assessment Periods (Completers)



5.5.1.7 Beck Depression Inventory-II (BDI-II) at Post-treatment. BDI scores significantly improved overall from pre to post-treatment, F (1, 80) = 41.68, $p < .001$, $\eta = .34$, power = 1.0. Further analysis revealed that those assigned to WE and APS (ps < .001) showed significant reductions in BDI score, while those assigned to EW and WLC (ps > .10) showed no significant changes from pre to post on this measure.

A time x condition effect approached significance, F (3, 80) = 2.32, $p = .08$, $\eta = .08$, power = .57. However, simple effects tests revealed no significant between-group differences on the BDI at post-treatment ($p = .13$). These findings suggest that, while those in the WE and APS conditions showed significant reductions in BDI score from pre to post-treatment, the differential effect of treatment on BDI score was not significant.

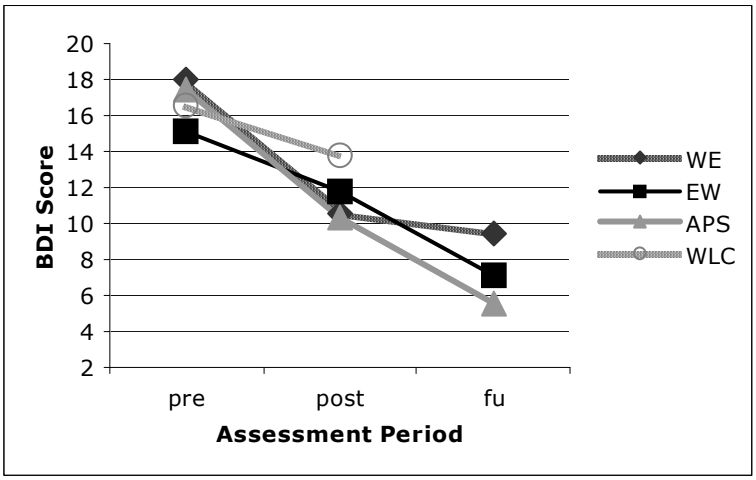
Like the completers sample, the ITT sample also revealed a marginally significant time x condition effect. Interestingly, despite the lack of significant between-group

differences on the completers sample, simple effects tests using the ITT sample revealed a marginally significant time x condition effect from pre to post-treatment and the simple effects tests using the ITT sample did produce a marginally significant effect of condition, F (3, 108) = 2.27, $p < .09$, $\eta = .06$, power = .56. Pairwise comparisons revealed that those assigned to either WE or APS outperformed those assigned to EW (ps < .05). No differences were observed between any of the treatment conditions and WLC.

5.5.1.8 BDI at Follow-up. A significant time effect from post-treatment to follow-up was also observed on the BDI, F (1, 55) = 18.28, $p < .001$, $\eta = .25$, power = .99, with continued improvement observed for those assigned to EW ($p < .05$) and APS ($p < .01$). Post to follow-up gains were maintained for those assigned to WE ($p = .30$). The significant improvement from post to follow-up was maintained when considering the ITT samples (all ps < .01).

A time x condition effect was not observed from post-treatment to follow-up on the BDI ($p = .16$). Likewise, a between-group effect was not significant at follow-up on the ANCOVA ($p = .15$). In contrast, a significant time x condition effect was observed on the BDI when considering the ITT-L sample, F (2, 92) = 4.46, $p < .05$, $\eta = .09$, power = .75. Simple effects tests at follow-up for the ITT-L revealed a significant condition effect, F (2, 91) = 5.97, $p < .01$, $\eta = .12$, power = .87, with those in APS outperforming EW ($p < .001$) and WE ($p < .05$). Although a significant post to follow-up time x condition effect was not observed for the ITT-C sample, the simple effects test at follow-up did reveal a significant condition effect, F (2, 91) = 5.71, $p < .01$, $\eta = .11$, power = .85, with APS outperforming EW ($p < .001$) and WE ($p < .05$).

Figure 5. BDI Scores Across Assessment Periods for Completers Sample



5.5.2 Clinically Significant Change: Achieving Meaningful Improvement

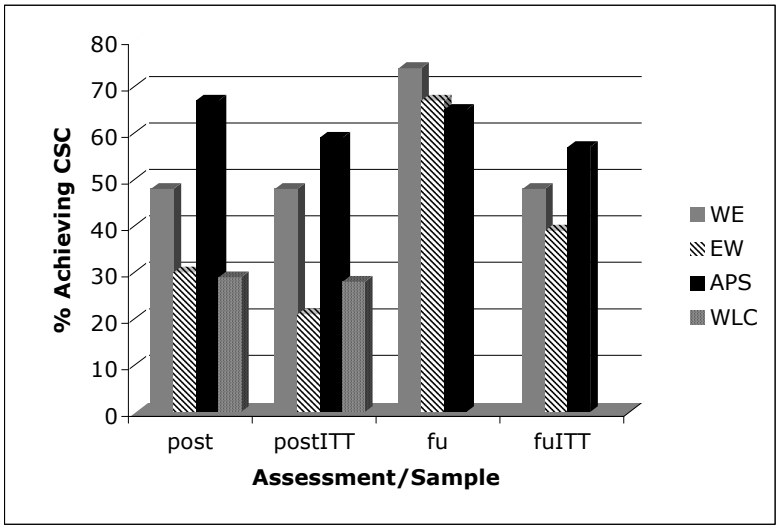
5.5.2.1 AWQ at Post-treatment. Because normative data were available for this measure, yet there was a high degree of overlap between the "functional" and "dysfunctional" populations, criterion *c* was chosen as the cutoff for clinically significant improvement, as recommended by Jacobsen & Truax (1991, see "Statistical Analyses"). As shown in Figure 6, at post-treatment, percentages of participants achieving CSC were 48% for the WE condition, 30% for the EW condition, 67% for those receiving APS, and 29% for participants assigned to WLC. An omnibus chi-square test, $\chi^2(3) = 8.10$, $p < .05$, suggested differences in percentage achieving CSC were significant between groups. Planned comparisons revealed that those in the APS condition achieved higher rates of CSC than those assigned to WLC, $\chi^2(1) = 5.53$, $p < .05$, and EW, $\chi^2(1) = 5.87$, $p < .05$. No other differences were statistically significant.

When considering the ITT sample, these percentages changed to 48% for WE, 21% for EW, 59% for APS, and 28% for WLC. Again, a chi-square test, $\chi^2(3) = 10.25$, *p*

< .05, suggested between-group differences were significant. Further exploration of these differences revealed that, similar to the completers sample, those assigned to APS outperformed EW, χ^2 (1) = 9.10, p < .01 and WLC, χ^2 (1) = 4.24, p < .05, while those in WE also showed marginally significantly higher percentages of CSC than those assigned to EW, χ^2 (1) = 3.42, p < .06.

5.5.2.2 AWQ at Follow-up. Overall, percentages of participants achieving CSC at follow-up were higher than at post-treatment, with no significant differences between groups. For the completers sample, 74% for those assigned to WE, 67% in the EW condition, and 65% of participants assigned to APS achieved CSC. When considering the ITT samples, these percentages dropped for all conditions. Analysis of the ITT-L sample revealed that 48% of those in WE, 39% of those in EW, and 57% of those in APS achieved CSC on the AWQ. When considering the ITT-C sample, 45% in WE, 30% in EW, and 52% in APS achieved CSC.

Figure 6. Percentage of Participants Achieving Clinically Significant Change on AWQ



5.5.2.3 PSWQ at Post-treatment. Because normative data were available for this measure and the normal population curve was not highly overlapping with the "clinical" sample[10], criterion *b* was chosen as the cutoff for clinically significant improvement, as recommended by Jacobsen & Truax (1991). As shown in Figure 7, percentages of participants achieving CSC were 30% for WE, 10% for EW, 17% for APS, and 0% for WLC. An omnibus chi-square test approached significance, χ^2 (3) = 7.53, $p < .06$. Those assigned to WE outperformed WLC, χ^2 (1) = 6.27, $p < .05$, with those in APS marginally outperforming those in WLC, χ^2 (1) = 3.14, $p < .08$. No other significant differences emerged.

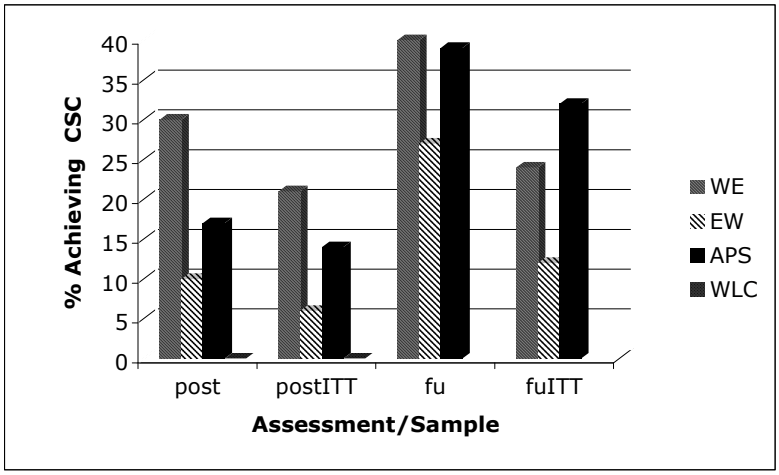
When considering the ITT sample at post-treatment, a similar pattern emerged, with lower rates across conditions: 21% for WE, 6% for EW, 14% for APS, and 0% for WLC. A chi-square test comparing between-group differences on percentage of participants achieving CSC approached significance, χ^2 (3) = 6.50, $p < .09$. Planned comparisons revealed that whose assigned to WE outperformed WLC, χ^2 (1) = 4.43, $p < .05$, and marginally outperformed those assigned to EW, χ^2 (1) = 3.22, $p = .07$. No other significant differences were observed between groups.

5.5.2.4 PSWQ at Follow-up. As described above, percentage of participants achieving CSC on the PSWQ at follow-up is presented in Figure 7. Like the CSC rates on the AWQ, percentage of participants achieving CSC increased from post to follow-up, with 40% of those in WE, 27% of EW, and 39% of APS meeting criteria. No significant between-group differences emerged. When considering the ITT-L sample, these rates

[10] In fact, the sample pre-treatment PSWQ descriptives (M = 63.77, SD = 9.52) were similar to clinical GAD sample descriptives (M = 68, SD =10).

dropped to 24% for the WE condition, 12% for EW, and 32% for APS. Percentages were almost identical for the ITT-C sample, with 24% WE, 12% EW, and 31% of those in APS meeting the stringent criteria for achieving CSC on the measure of general worry. No significant between-group differences were observed on this measure for either of the ITT samples.

Figure 7. Percentage of Participants Achieving Clinically Significant Change on PSWQ

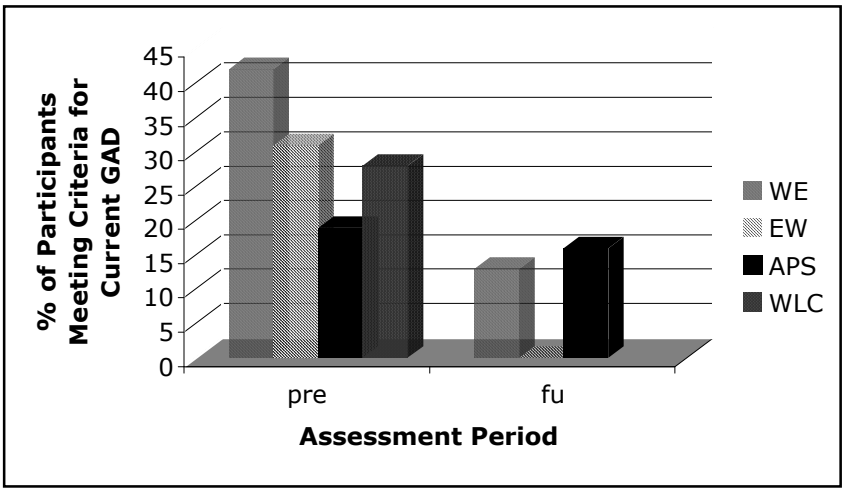


5.5.3 Diagnostic Status from Pre-treatment to Follow-up

At pre-treatment, groups did not differ on percentage of participants meeting current diagnostic criteria for GAD; nor did they differ on percentage of participants meeting criteria for GAD within the last year (*p*s > .10). Figure 8 shows the percentage of participants meeting current criteria for GAD at baseline and follow-up assessments. At pre-treatment, 42% and 48% of those in WE, 31% and 44% of those randomized to EW, 19% and 27% of those in APS, and 28% and 39% of those assigned to WLC met criteria for current and within one year GAD diagnoses, respectively. By follow-up, those percentages dropped significantly across conditions, particularly for those who received

WE and EW. Of those participants who completed the follow-up assessment, 13% of those who received WE, 0% of those in EW, and 16% of those assigned to APS met current diagnostic criteria for GAD. Differences between groups were not statistically significant. Across the sample, percentage of participants meeting current diagnostic criteria for GAD dropped from 31% at pre-treatment to 10% at follow-up.

Figure 8. Percentage of Participants Meeting Diagnostic Criteria for Current GAD



5.6 Testing of Hypotheses: Aim 2

5.6.1 Treatment Effects on Health Outcomes

Assumptions of homogeneity of variances for all ANOVAs and sphericity for all repeated measures ANOVAs were met. Table 3 presents the means and standard deviations across assessment periods for the SF-36, number of visits to the health center, and cortisol levels (completers sample).

5.6.1.1 SF-36 at Post-treatment. Figure 9 shows the condition means across assessment periods for the physical and mental factors of the SF-36. A significant effect of time was found for both the mental factor, F (1, 78) = 44.84, $p < .001$, $\eta = .37$, power = 1.0, and

the physical factor, F (1, 78) = 17.77, $p < .001$, $\eta = .19$, power = .99, of the SF-36. On the mental factor, participants in the WE ($p < .001$), EW ($p < .001$), and APS ($p < .01$) conditions showed significant pre to post-treatment improvement, while those in the WLC condition did not ($p = .10$). A different pattern emerged on the physical factor such that those assigned to WE and APS showed significant improvement in physical functioning (ps < .01), while those assigned to either EW or WLC showed no such improvement (ps > .10).

Between-group differences on the mental factor were not significant from pre to post-treatment ($p = .13$). However, a significant time x condition effect was observed on the physical factor, F (3, 78) = 3.21, $p < .05$, $\eta = .11$, power = .72. Simple effects tests at post-treatment revealed a condition effect approaching significance, F (3, 77) = 2.37, $p < .08$, $\eta = .08$, power = .57. Pairwise comparisons showed that APS outperformed EW ($p < .05$) and WLC (approaching significance, $p < .06$), and that WE tended to outperform EW ($p = .09$). No other inter-group differences emerged.

While an effect of time was still present on both of the SF-36 factors when conducting ITT analyses, time x condition effects were not observed on either factor when including all randomized participants.

5.6.1.2 SF-36 at Follow-up. Overall, participants showed improvement in overall mental well-being from post-treatment to follow-up assessment, F (1, 55) = 16.53, $p < .001$, $\eta = .23$, power = .98. While those in EW ($p < .05$) and APS ($p < .001$) showed continued improvement, those in WE maintained gains but showed no significant improvement ($p >$

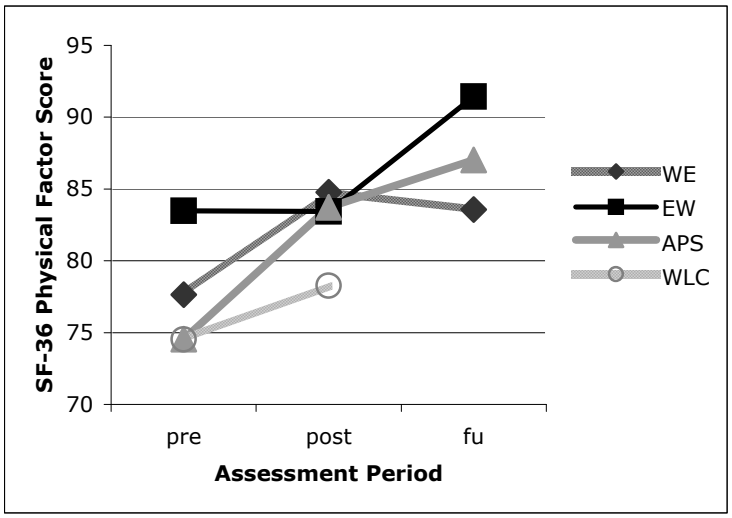
.10). No significant time x condition effect on the mental factor was observed; nor was a condition effect observed at follow-up on a univariate ANCOVA.

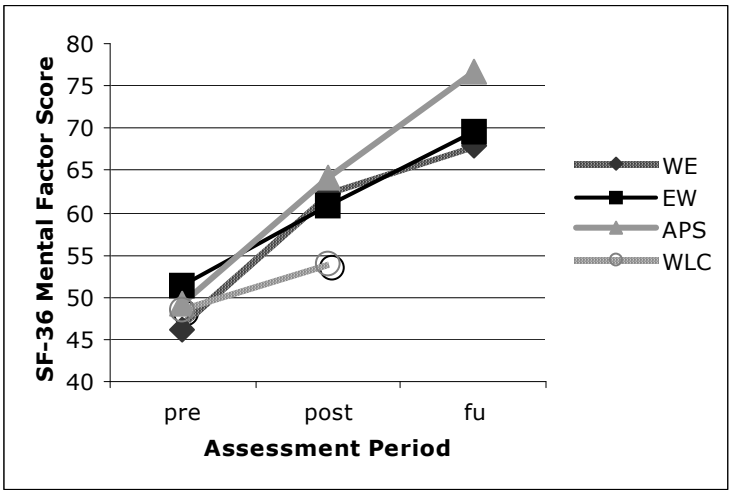
When considering the physical factor, a similar pattern emerged. A significant time effect was observed from post to follow-up, F (1, 55) = 6.84, $p < .05$, $\eta = .11$, power = .73, with significant continued improvement for those in EW ($p < .01$), marginally significant improvement for those assigned to APS ($p = .09$), and a maintenance of treatment gains but no improvement for those receiving WE ($p = .24$). A significant time x condition effect was revealed on the physical factor, F (2, 55) = 6.00, $p < .01$, $\eta = .18$, power = .86, and a condition effect at follow-up was marginally significant, F (1, 53) = 2.51, $p = .09$, with those in EW ($p < .05$) and APS (approaching significance, $p < .09$) outperforming those in WE.

When considering the ITT-L sample, a few differences emerged. On the mental factor, unlike the completers sample, both a marginally significant time x condition interaction [F (2, 90) = 2.77, $p < .07$, $\eta = .06$, power = .53] and a significant condition effect at follow-up [F (2, 88) = 8.72, $p < .001$, $\eta = .17$] were observed. APS was found to outperform both EW ($p < .001$) and WE ($p < .01$) at the follow-up assessment. Unlike the completer sample, neither the effect of time from post-treatment to follow-up ($p = .30$) nor a time x condition effect ($p = .24$) was significant for the physical factor in the ITT-L sample. However, simple effects tests at follow-up revealed a marginally significant condition effect, F (2, 88) = 2.55, $p < .09$, with APS showing more improvement in physical health at follow-up than those assigned to WE ($p < .05$).

Some differences were also revealed between the ITT-L and ITT-C samples. While time x condition effects were observed for the mental factor using the ITT-L sample, no such interaction effect was observed with the ITT-C sample. While the ITT-L sample did not reveal a time or time x condition effect at follow-up on the physical factor, the ITT-C sample yielded findings more similar to the completers sample. The main differences between the completers sample and ITT-C sample were that the ITT-C sample yielded only a marginally significant time x condition effect ($p < .09$), and yielded a significant condition effect at follow-up, F (2, 88) = 4.93, $p < .01$ $\eta = .10$, with those in APS outperforming the other two conditions (ps < .05).

Figure 9. Physical and Mental SF-36 Factors Across Assessment Periods

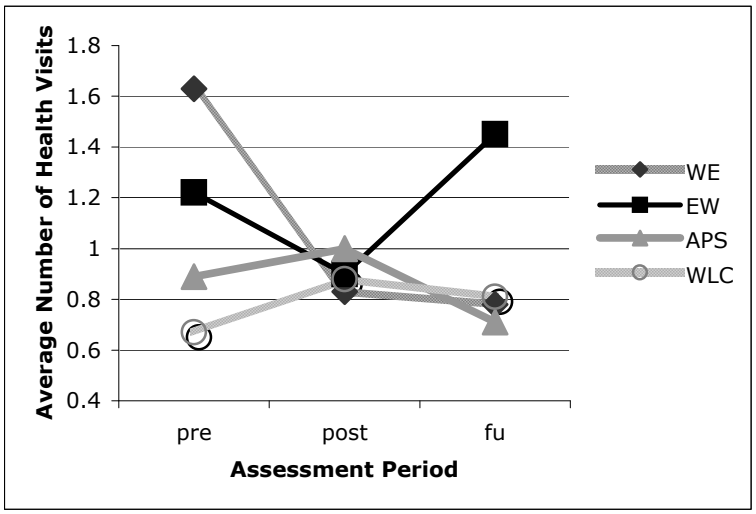




5.6.1.3 Health Center Visits: Acute effects at Post-treatment. Figure 10 shows the mean number of health visits for each condition across the three assessment periods. No time or time by condition effects were observed for this variable on either the completers or ITT samples, indicating that, by the end of the semester during which the treatment was conducted, no significant changes in health visits were observed across conditions.

5.6.1.4 Health Visits at Follow-up. No significant effects of time or time x condition were observed from post-treatment to follow-up, indicating that no changes were observed from post to follow-up on the number of visits to the health center. In addition, simple effects examining between-group differences at follow-up revealed no significant between-group differences. No differences were observed between the completers and ITT samples.

Figure 10. Number of Health Visits Across Assessment Periods by Condition



5.6.1.5 Physiological Measure of Health: Cortisol level. No significant time or time x condition effect was found on the physiological measure of stress (p = .41 for time and p = .75 for time x condition).

Table 3. Means and SDs of Health Outcomes by Condition Across Assessment Periods

	WE			EW			APS			WLC		
	Pre	*Post*	*FU*	*Pre*	*Post*	*FU*	*Pre*	*Post*	*FU*	*Pre*	*Post*	*FU*
SF36-P	77.64	84.77	83.56	83.47	83.44	91.44	74.54	83.72	87.02	74.53	78.26	-
	(12.62)	(10.02)	(12.75)	(13.25)	(15.85)	(7.84)	(14.77)	(11.24)	(9.07)	(19.94)	(19.29)	
SF36-M	46.15	62.34	68.03	51.25	60.81	69.49	48.48	64.07	76.59	48.71	54.00	-
	(14.16)	(17.24)	(18.56)	(16.23)	(20.07)	(20.90)	(14.56)	(15.98)	(9.97)	(14.51)	(15.44)	
#Visits	1.63	0.83	0.78	1.22	.90 (1.25)	1.45	.89 (1.05)	1.00	0.71	1.15	0.88	0.81
	(2.14)	(1.53)	(0.95)	(1.93)		(2.54)		(1.77)	(1.20)	(1.65)	(1.26)	(1.05)
Cort	7.09	7.62	-	9.20	8.30	-	7.94	8.69	-	6.67	9.72	-
	(5.13)	(5.44)		(4.81)	(5.79)		(4.83)	(5.82)		(3.46)	(6.84)	

5.7 Testing of Hypotheses: Aim 3

5.7.1 Treatment Effects on the Objective Academic Measures

ANOVA assumptions tested were met unless otherwise specified. Several of the repeated measures ANOVAs examining GPA violated the homogeneity of variances assumption. Measures taken to attempt to correct for these violations are discussed. Figures 11 and 12 show the differential treatment change across the three assessment periods for the two academic achievement measures. Table 4 presents the descriptive information across assessment periods for GPA and number of hours of coursework completed (completers sample).

5.7.1.1 Grade-point Average (GPA): Acute effects at Post-treatment. A significant effect of time was observed from the semester before the intervention ("pre") to the semester during the intervention ("post"), F (1, 58) = 4.35, $p < .05$, $\eta = .07$, power = .54, suggesting that grade improvement was observed overall from pre to post-treatment.

However, Levene's test of homogeneity of variances was significant, suggesting that the *p*-value for the effect of time may have been inaccurate. In particular, violation of this assumption may result in inflation of Type I error. Because this violation of ANOVA assumption would not be relevant for the tests in which within-group change was analyzed for each condition, tests were still conducted to assess change across time for each condition. These analyses revealed that those assigned to the EW condition showed a significant improvement in GPA from pre to post ($p < .05$), whereas no significant pre to post improvement was observed for any of the other conditions ($ps > .10$). The omnibus repeated measures ANOVA revealed no significant time x condition effect.

Because heterogeneity of variances is likely to result in Type I error, this likely reflects a true null finding.

Measures were taken in order to explore GPA with more certainty that the findings did not reflect inaccuracies due to a violation of the ANOVA assumption of homogeneity of variances. First, several transformations were conducted on the GPA data (i.e., square, square root, inverse, and logarithmic). Unfortunately, none of these transformations had the desired effect of creating homogeneous variances across groups. Next, a univariate ANCOVA approach was taken instead of repeated measures. This approach was more robust, resulting in non-significant Levene's tests (p = .25 for the completers sample). A univariate ANCOVA controlling for pre-treatment GPA was not statistically significant for the completers (p = .12) or ITT (p = .58) samples. Overall, these findings suggest that GPA did not significantly improve during the semester of the intervention and that there were no significant differences between groups.

To increase power, a planned comparison of the active conditions (WE and EW) vs. the control conditions (APS and WLC) on GPA during the intervention (controlling for baseline GPA) did reveal a statistically significant difference between groups, F (1, 61) = 4.39, $p < .05$, $\eta^2 = .07$, power = .54 (Levene's test non-significant). Those assigned to the two active conditions obtained significantly higher GPAs for the semester during which they participated in the study than those assigned to the control conditions. However, this finding was no longer significant when using the "ITT" sample (all those participants randomized who had GPA data available for the "pre" and "post" semesters, p = .43).

Because the average GPA before the semester of the intervention was M = 3.31 (SD = 0.76), a ceiling effect may have been obscuring changes in GPA within conditions from pre to post as well as differential treatment effects. Although GPA did not significantly differ at baseline across conditions, it was worth exploring whether a different pattern emerged when only selecting participants who had more room for improvement: those whose GPAs at baseline were below the mean for this sample.

Limiting the analysis to below-the-mean GPA completers did not result in a violation of the homogeneity of variances assumption (i.e., non-significant Levene's test for both the "pre" and "post" within-group variables entered). The repeated measures ANOVA using this sample yielded a significant effect of time, F (1, 20) = 10.73, $p < .01$, $\eta = .35$, power = .88. Simple effects tests within groups revealed significant pre to post change for those in WE ($p < .05$) and EW ($p < .01$), whereas a marginally significant effect of time was observed for those who completed APS ($p = .06$) and no significant time effect was observed for those in WLC ($p = .79$). Despite these differences across groups in change across time, the time x condition effect did not attain statistical significance ($p = .17$). These findings should be interpreted with some caution, given the significant decrease in sample size when limiting the analysis to this subset of participants (i.e., N < 8 for each condition). The pattern of findings was identical when examining the ITT sample.

5.7.1.2 GPA at Follow-up. An omnibus test revealed no significant changes in GPA from post to follow-up in both the completers sample ($p = .48$) and the "ITT"/full sample ($p = .74$), indicating that grade point averages achieved in the semester during the

intervention were largely maintained in the following semester. No significant time x condition effects were observed for either of the samples (p = .15 and p = .32 for the completers and total samples, respectively). Because Levene's tests again revealed a significant violation of the homogeneity of variances assumption, these findings should be interpreted with caution. However, these null findings are likely to reflect true non-significant differences, since the violation of this assumption typically results in Type I error inflation. Despite this, measures were taken to transform the data such that the variances were more equal across groups. Unfortunately, none of the transformations to the data resulted in a correction of this violation.

As with the pre to post-treatment change across time in GPA, simple effects tests to examine changes from post to follow-up within each condition could be conducted because variance across groups is not relevant when only one group is being analyzed. These tests revealed no significant changes from post to follow-up for the WE, APS, and WLC conditions (all ps > .20). In contrast, there was a marginally significant trend in the EW condition (completers sample), F (1, 18) = 4.31, p = .05, η^2 = .19, power = .50, indicating that GPAs decreased from the semester during the intervention to the semester after the intervention. When considering the full sample (ITT), no such drop in GPA was observed for any of the four treatment conditions (all ps > .15).

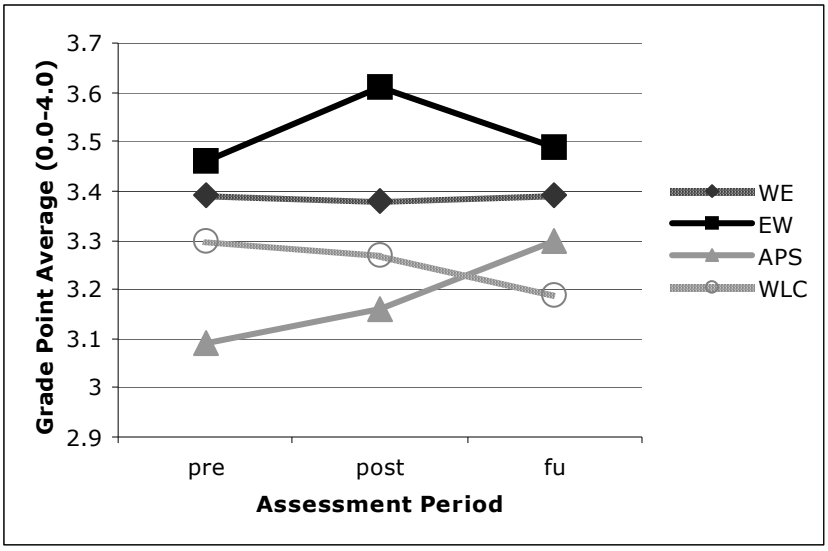
Table 4. Means and SDs by Condition Across Assessment Periods for Academic Achievement Outcomes

	WE			EW			APS			WLC		
	Pre	*Post*	*FU*	*Pre*	*Post*	*FU*	*Pre*	*Post*	*FU*	*Pre*	*Post*	*FU*
GPA	3.39	3.38	3.39	3.46	3.61	3.49	3.09	3.16	3.30	3.30	3.27	3.19
	(0.65)	(0.55)	(0.64)	(0.65)	(0.53)	(0.55)	(0.90)	(0.76)	(0.59)	(0.83)	(0.88)	(0.99)
Hrs	12.53	13.05	13.47	13.81	13.80	12.70	13.65	13.58	13.61	12.77	13.41	13.21
	(3.69)	(2.26)	(1.90)	(2.32)	(2.33)	(2.58)	(1.97)	(2.92)	(1.75)	(1.54)	(1.77)	(3.31)

Univariate ANCOVAs with GPA for the semester after the intervention as the dependent variable and GPA for the semester before the intervention as the covariate did not violate the ANOVA assumption of homogeneity of variances (Levene's test *p*-value = .20 for completers). This analysis revealed no significant between-group differences on GPA at follow-up. Assessing between-group differences at follow-up only for those participants whose GPAs were below the group mean at baseline also revealed a non-significant condition effect for the completers sample ($p = .11$) and the ITT sample ($p = .14$).

In order to maximize power, a planned comparison was conducted using a univariate ANCOVA to compare the active treatments (WE and EW) to the control groups (APS and WLC) controlling for GPA at baseline. Levene's test was non-significant ($p = .21$ for completers sample). A significant condition effect was not observed for either the completers ($p = .31$) or the ITT samples ($p = .22$).

Figure 11. Grade-point Average Across the Three Assessment Periods by Condition



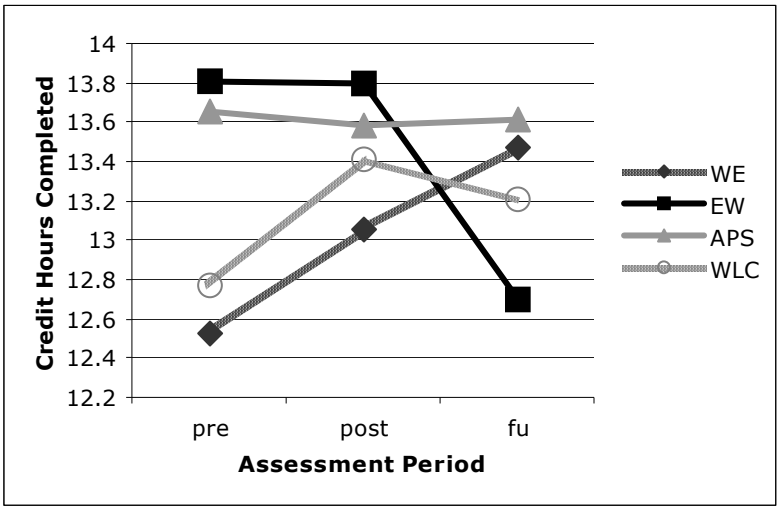
5.7.1.3 Number of course hours completed: Acute effects at Post-treatment

Neither a time (p = .38) nor a time x condition interaction (p = .77) was observed from the semester before the intervention to the semester of the intervention on number of hours of coursework completed. Findings were identical when including all participants (as opposed to completers only) who had a GPA for the two semesters in question ("ITT").

5.7.1.4 Number of course hours completed at Follow-up

No significant effects of time or time x condition were observed on this measure (all ps > .15), indicating that number of course hours completed did not change overall or within groups from post-treatment to follow-up, and that there were no significant differences between groups on number of course hours completed for the semester after completion of the intervention.

Figure 12. Number of Credit Hours Completed Across Assessment Periods by Condition



5.8 Testing of Hypotheses: Aim 4 (Treatment Moderators)

5.8.1 Number of treatment sessions completed. No significant condition x home session interaction terms were observed with either the AWQ, PSWQ, or GPA at post-treatment as the outcome variable. However, tests for main effects revealed that the final model was significant, $R^2 \Delta = .13$, F (3, 90) = 5.80, $p < .001$, with more sessions associated with greater improvement on the AWQ at post-treatment, $\beta = -.32$, t (90) = -2.82, $p < .01$. Likewise, number of treatment sessions completed was also a significant predictor of outcome on the PSWQ at post-treatment, $R^2 \Delta = .10$, F (3, 90) = 6.05, $p < .001$, with more home sessions associated with more improvement (i.e., lower PSWQ scores) at post-treatment, $\beta = -.72$, t (90) = -3.84, $p < .001$. In addition, a main effects final model with GPA as the dependent variable was significant, $R^2 \Delta = .10$, F (3, 58) = 4.08, $p < .01$, with more home session practice associated with higher GPAs at post-treatment, $\beta = .05$, t (58) = 3.49, $p < .001$. Thus, more home practice was associated with greater improvement overall, with no significant differences between conditions on the degree to which level of home practice impacted outcome.

5.8.2 Meta-cognitions questionnaire (MCQ). Of the five MCQ factors, two moderated treatment outcome and one revealed a significant main effect. The MCQ factor 1 (MCQF1), which assesses positive beliefs about worry, did not reveal a significant interaction. However, main effects tests were significant, with the MCQF1 significantly predicting treatment outcome on the AWQ, $R^2 \Delta = .13$, F (3, 52) = 3.75, $p < .05$ such that endorsing more positive beliefs about worry at baseline (e.g., “worrying helps me to succeed”) was associated with less favorable outcome on the AWQ at post-

treatment, $\beta = .42$, t (52) = 2.79, $p < .01$. No significant moderation or main effects were observed with the PSWQ as the outcome variable for this factor.

The MCQ factor 2 (MCQF2), which assesses beliefs about the danger and uncontrollability of worry, was found to moderate treatment outcome on the AWQ at post-treatment, $R^2 \Delta = .14$, F (3, 38) = 5.63, $p < .01$. The regression equation derived from the final model was used to explore the nature of this moderation relation. Higher levels of negative beliefs about worry in the EW and WE conditions at baseline (particularly EW) were associated with poorer outcome on the AWQ, whereas higher levels of negative beliefs about worry in the APS condition were associated with more favorable outcome.

In order to evaluate whether these specific differences within the overall moderator x condition interaction were statistically significant, an "APS vs. not APS" dummy coded variable was created based on the pattern of findings and subjected to a moderator analysis, with MCQF2 x APS as the interaction term in the final model. The final model was statistically significant, $R^2 \Delta = .09$, F (1, 52) = 7.53, $p < .01$, with a significant APS x MCQF2 interaction, $\beta = -1.04$, t (56) = -2.74, $p < .01$, suggesting the specific difference between groups on the MCQF2 as a moderator of outcome was such that those in those in the APS condition reporting more negative beliefs about worry showed more improvement, whereas those in the other two conditions who reported more negative beliefs about worry showed less improvement.

The final MCQ factor that moderated treatment outcome was factor 5 (MCQF5), which assesses cognitive self-consciousness, or "worry about worry." When PSWQ at

post-treatment was entered as the outcome variable, the final model with the interaction terms approached significance, R^2 Δ = .06, F (2, 38) = 3.22, p = .05. Using the equation derived from the final model produced adjusted estimates for each condition at various levels of the continuous moderator. Consistent with the findings for MCQF2, inspection of the pattern of findings revealed that endorsing more "worry about worry" in the EW and WE conditions (particularly WE) was associated with poorer outcome, whereas endorsing high levels of "worry about worry" was associated with more favorable outcome on the APS condition.

Based on the regression lines derived from the final model, the "APS vs. not APS" dummy code was used to statistically decompose this interaction. The APS x MCQF5 interaction was entered in the final model and was statistically significant, R^2 Δ = .04, F (1, 52) = 4.93, p < .05, with a significant interaction observed, β = -1.14, t (56) = -2.22, p < .05. This demonstrates that the observed differences described above were statistically significant.

5.8.3 Time in semester when randomized. Although no significant interaction was observed in the final model for moderation, main effects tests did reveal a marginally significant main effect for time in semester when randomized on the AWQ at post-treatment, R^2 Δ = .07, F (3, 79) = 2.42, p = .07, with randomization during the second half of the semester associated with more improvement (i.e., lower AWQ scores), β = -2.76, t (79) = -2.14, p < .05. Likewise, this same pattern was observed with the PSWQ at post-treatment as the outcome variable. A significant main effect was observed after controlling for baseline scores, R^2 Δ = .10, F (3, 79) = 4.70, p < .01 such that

randomization occurring in the latter half of the semester was associated with greater improvement, β = -5.63, *t* (79) = -2.71, *p* < .01. Contrary to prediction that earlier randomization would result in more improvement, particularly on the GPA measure which is assessed at the end of the semester for all participants, time during semester when randomized neither moderated nor generally predicted GPA at post-treatment.

5.8.4 Major. No significant major x condition interaction was observed; nor were any main effects for major observed.

5.8.5 Gender. Gender was found to moderate treatment outcome on the AWQ at post-treatment, with a marginally significant final model including the interaction terms, R^2 Δ = .05, *F* (2, 71) = 2.78, *p* < .07. Values for each dummy code were entered into the regression equation to evaluate the nature of this moderating relation. Simple effects tests were conducted to further decompose the interaction to shed more light on the significance of particular differences among the three groups. Because the pattern revealed APS and WE showed similar regression lines, whereas EW showed a different pattern between males and females on the AWQ, an "EW vs. not EW" variable was entered in a new model to assess whether the effect of the moderator was indeed significantly driven by this difference between EW and "not EW" (the composite of the other two conditions). The final model for this regression was significant, R^2 Δ = .05, *F* (1, 78) = 5.51, *p* < .05, with a significant EW x gender interaction, β = 7.10, *t* (83) = 2.35, *p* < .05. The nature of this significant difference was such that those females assigned to EW did not perform as well as those females assigned to the other two conditions, while no differences between groups appeared for males. Although males who completed EW

appeared to perform more favorably than females in EW, simple effects tests selecting for each condition level and evaluating whether gender was a significant predictor revealed that this difference was not statistically significant.

5.8.6 GAD Status. GAD status at pre-treatment was not found to moderate treatment outcome; nor did GAD status have a significant main effect on outcome. Thus, whether participants entered the study meeting criteria for current GAD or not did not impact treatment efficacy.

5.8.7 Educational Status. Educational status (graduate/professional school vs. undergraduate) did not moderate treatment outcome and no significant main effects were observed.

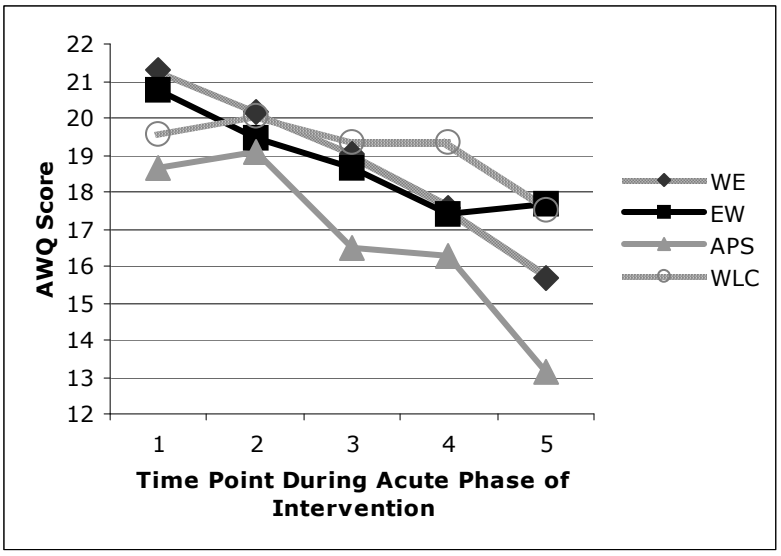
5.8.8 Race and Ethnicity. Race/ethnicity did not moderate treatment outcome.

5.9 Testing of Hypotheses: Aim 5

5.9.1 Treatment Process Analyses

5.9.1.1 Change in AWQ Scores During Treatment. Those in the WLC group did not show significant AWQ score decline across treatment ($p = .19$). Those receiving the EW treatment did not show significantly steeper decline slopes than those assigned to WLC ($p = .38$). In contrast, those assigned to WE [$\beta = -1.37$, $t\ (368) = -2.25$, $p < .05$] and APS [$\beta = -1.41$, $t\ (368) = -2.21$, $p < .05$] both showed significantly greater AWQ decline slopes across treatment than the waitlist control group. These decline slopes are shown in Figure 14. An identical analysis was conducted using the ITT sample. No differences between the two samples were observed.

Figure 14. AWQ Across Time Points: Pre, Treatment Weeks, and Post-treatment



5.9.1.2 Treatment Process Variables as Predictors of Change

Use of imagery in WE. Contrary to hypothesis, use of imagery did not predict outcome on the AWQ or PSWQ at post-treatment or follow-up.

Use of emotional expression in EW. Contrary to hypothesis, self-reports of degree to which participants expressed emotions during writing sessions was not associated with outcome on the either AWQ or PSWQ for either assessment period.

Ability to focus on content of worries during WE and EW. Degree of focus/concentration on worries (0 = not at all, 100 = completely) was marginally associated with AWQ scores at post-treatment, $\beta = -.08$, $t\ (42) = -1.85$, $p = .07$ and at follow-up, $\beta = -.11$, $t\ (34) = -1.93$, $p = .06$, such that greater focus on worries during self-administration of the interventions was associated with more improvement on the AWQ at post-treatment. However, this association was not observed with the PSWQ as the dependent variable.

Distraction as a predictor of outcome for APS. Level of distraction did not predict AWQ scores at post-treatment. However, the same model with PSWQ at post-treatment as the dependent variable yielded a significant final model, F (2, 21) = 8.27, $p < .01$, with a unique contribution made by level of distraction, $\beta = .22$, t (23) = 2.15, $p < .05$, such that higher levels of distraction during APS administration were associated with less improvement on the PSWQ. Findings were not significant at follow-up.

Relaxation as a predictor of outcome for APS. Contrary to expectation, level of relaxation during APS administration was not associated with post-treatment AWQ or PSWQ. However, a different pattern emerged at follow-up. Becoming more relaxed during administration of the APS during the acute phase of treatment was associated with poorer outcome by the three-month follow-up period on both the AWQ (approaching significance), $\beta = .11$, t (22) = 1.76, $p = .09$, and the PSWQ, $\beta = .25$, t (22) = 2.13, $p < .05$, suggesting that those who successfully became relaxed by the APS ended up not faring as well three months after discontinuation of the device administration.

5.9.2 Mechanisms of Change During Treatment

5.9.2.1 Worry Exposure and Expressive Writing: Fear Decline as Predictors of Outcome. Contrary to expectation, fear ratings did not significantly decline in either condition ($p = .25$), with no differences between groups ($p = .73$). Fear activation was significantly non-zero for both conditions (M = 45.55 for EW and 55.13 for WE; $p < .001$), with those in EW showing marginally lower fear activation than those in WE, t (52) = -1.91, $p = .06$.

Despite the lack of significant fear decline overall across participants, individual slopes were still used to conduct the subsequent analyses (see "Statistical Analysis" section). However, because the second condition for mediation was not met for fear slopes, only fear activation was tested as a mediator (see Kraemer et al., 2002). Despite this, fear decline slopes were still entered into a model with pre-treatment AWQ scores in the first step and fear slope entered as a predictor in the second step, with AWQ at post-treatment as the dependent variable, in order to test whether fear slope was a predictor of outcome.

Fear decline slope did not predict outcome for the WE and EW conditions. In contrast, fear activation was found to mediate treatment outcome. When treatment condition, fear activation, and their interaction term were all entered into the second block of a linear regression (with AWQ at pre-treatment as the Block 1 predictor), the final model was significant, F (4, 40) = 5.25, $p < .01$. Fear activation uniquely contributed to the model, $\beta = 1.65$ (standardized $\beta = .34$), t (44) = 2.03, $p < .05$, such that higher fear activation in the two conditions was associated with higher AWQ scores at post-treatment.

5.9.2.2 Expressive Writing: Predictors of Outcome. Neither average percentage of positive nor negative emotion words predicted outcome. Based on previous research, it was considered that the association between negative emotion words and treatment outcome may have been better explained by a quadratic function, with a moderate percentage of words predicting more positive outcome and high and low percentages predicting poorer outcome (see Pennebaker & Chung, 2007, for reviews). However, this

model did not account for a significant proportion of variance either. Likewise, changes in the percentage of positive and negative emotion words were not associated with outcome at post-treatment or follow-up. Contrary to prediction, use of self-referencing words, social words (average and across sessions), and sensory words were not associated with outcome.

In contrast to the aforementioned null findings, an increase in cognitive processing words across sessions was associated with more improvement at post-treatment. The final model was significant, F (2, 19) = 9.43, $p < .001$, with an increase in use of cognitive processing words associated with more improvement on the AWQ at post-treatment, $\beta = -1.61$, t (21) = -2.28, $p < .05$. However, an increase in cognitive processing words no longer predicted level of academic worry by follow-up.

In addition, another interesting finding emerged. Words in the "time" category were associated with AWQ, with significant final models at post-treatment and follow-up [F (4, 23) = 9.58, $p < .001$ for post-treatment and F (4, 17) = 5.84, $p < .01$ for follow-up]. When post-treatment AWQ was entered as the dependent variable, use of past, present, and future words all uniquely contributed to the model [$\beta = 1.76$, t (23) = 2.74, $p < .05$ for use of past tense words, $\beta = 1.01$, t (23) = 2.70, $p < .05$ for use of present tense words, $\beta = - 3.88$, t (23) = -3.05, $p < .01$ for use of future tense words] such that greater use of past and present tense words was associated with less favorable outcome, whereas use of future tense words was associated with more favorable outcome (i.e., lower AWQ scores). "Time" words continued to significantly predict outcome at follow-up, with use of more present tense words was associated with less improvement, $\beta = 1.55$, t (17) =

2.81, $p < .05$, while greater use of future tense words was associated with more improvement on the AWQ, $\beta = -6.67$, $t(17) = -3.64$, $p < .01$.

Chapter 6: Discussion

This study sought to examine the efficacy of two self-administered treatments for reducing excessive and uncontrollable academic worry: (a) worry exposure, an imagery-based behavioral treatment, and (b) expressive writing, a verbal-based intervention. These interventions were compared to: (a) a placebo condition consisting of pulsed audio-photic stimulation and (b) a waitlist control group. Treatment fidelity was achieved, and participants viewed their respective interventions as equally credible. Several differences emerged between groups; several variables were found to moderate treatment outcome; and treatment process analyses yielded interesting findings regarding the potential mechanisms of change in the two active treatment conditions.

Below is a discussion of the treatment outcome findings including pre to post-treatment change, between-group differences at post-treatment, post-treatment to follow-up changes, and between-group differences at follow-up. The treatment outcome section is followed by a discussion of moderator findings and treatment process findings. Next, general findings and issues for the treatment conditions will be discussed. Overall treatment implications and public health implications will follow. Finally, study limitations and directions for future research are presented.

6.1 Treatment Outcome

6.1.1 Pre to post-treatment change

Clinical self-report measures. Relative to non-treated wait-list participants who showed no significant improvement on any of the primary or secondary outcome measures, those assigned to worry exposure, expressive writing, or the pulsed audio-photic stimulation

placebo treatment all showed a general pattern of improvement from pre to post-treatment on all psychometric outcome indices of worry and other clinical measures with the exception of depression for the expressive writing group.

On the primary outcome measure (Academic Worry Questionnaire), approximately one-half of participants in the worry exposure condition and one-third of those assigned to the expressive writing condition achieved clinically significant change, a stringent measure of treatment outcome indicating a statistically reliable response to treatment and clinically significant improvement. Pre to post-treatment improvement was also observed on the measure of generalized anxiety (Penn State Worry Questionnaire), with one-third of those assigned to worry exposure achieving clinically significant change. Although only one-fifth of participants assigned to expressive writing achieved clinically significant change on the generalized anxiety measure, continuous analyses revealed significant pre to post-treatment improvement. Penn State Worry Questionnaire scores at baseline were in the clinical GAD range across groups, indicating that this improvement could be compared to clinically significant change in treatment studies using clinical GAD samples.

While those assigned to waitlist control did not show statistically significant improvement on the continuous analysis, it is noteworthy that their scores changed marginally in the direction of improvement on the academic worry measure. Furthermore, similar to that observed for the expressive writing condition, just under one-third of waitlist control participants achieved clinically significant improvement. These findings indicate that the passage of time (and/or the weekly monitoring of academic

worry symptoms) may offer some beneficial effects for reducing excessive and uncontrollable academic worry, albeit not significantly. However, these marginally significant effects in the waitlist control group did not generalize to other relevant areas of psychological well-being.

Approximately two-thirds of participants in the placebo condition achieved clinically significant change on the measure of academic worry at post-treatment. Thus, those assigned to the placebo condition experienced significantly more reduction of academic worry than expected. Interestingly, although pre to post-treatment improvement was observed on the measure of generalized anxiety in the placebo condition, clinically meaningful change was only observed for a small percentage of participants.

Health and Physiological Outcomes. A strikingly different pattern of pre to post-treatment findings emerged for measures tapping change in physiological (i.e., cortisol response) and health (i.e. visits to the health center) outcomes. Specifically, no significant improvement was observed for any of the groups with respect to either cortisol response or visits to the health center. On the SF-36, which measures overall physical and mental health, pre to post-treatment improvement was observed for all three interventions on the mental health factor, with no statistically significant improvement in the waitlist control group. On the physical factor, only those in worry exposure and placebo conditions showed pre to post-treatment improvement in self-reported physical health.

Academic Achievement Outcomes. Only those assigned to expressive writing showed significant improvement in grade-point average during the semester in which they completed treatment. This change was achieved more rapidly than hypothesized.

Improvement in grade-point average was not significant for those assigned to placebo or waitlist control.

Although only those in the expressive writing condition showed significant improvement in grade-point average when considering the completers sample, improvement was also observed for the worry exposure condition when considering only those participants whose baseline grade-point averages fell below the sample mean (M = 3.31) and thus had more room for improvement. Marginally significant improvement was also observed in the placebo condition, whereas waitlist control group showed no such improvement. These findings suggest that there may have been a ceiling effect for grade-point average when including all completers.

No significant pre to post-treatment increase in number of course hours completed was observed for any of the conditions.

6.1.2 Between-group differences at post-treatment

Self-report Clinical Measures. In general, between-group comparisons of the magnitude of improvement revealed greater short-term improvement in the worry exposure and placebo groups relative to the expressive writing and wait-list groups, which did not differ significantly from each other. On the measure of academic worry, contrary to expectation, the placebo condition not only outperformed the waitlist control, but also outperformed expressive writing, with no differences between worry exposure and placebo.

Furthermore, on the measures of stress and generalized anxiety, worry exposure and placebo outperformed expressive writing and waitlist control at post-treatment.

Those in the worry exposure condition showed the highest percentages of participants achieving clinically significant change on the Penn State Worry Questionnaire relative to other groups. These percentages were lower for the other conditions, although the only statistically significant difference was between worry exposure and waitlist control, in which no participants achieved this meaningful level of change. Still, although moderator analyses did not reveal that those with GAD performed better in the worry exposure condition than other conditions, these findings provide some evidence that the worry exposure condition may have had a unique acute impact on generalized anxiety that was not observed in the other conditions to the same degree.

The fact that the worry exposure and placebo conditions showed similar reductions in academic worry suggests that this symptom reduction may be at least in part due to expectancy effects. However, it is unclear why the placebo intervention would exert a larger effect than the expressive writing condition if only expectancy drove these changes. The possibility that those assigned to the expressive writing condition showed an initial worsening of symptoms is not supported by the data. Thus, the fact that placebo outperformed expressive writing despite non-significant differences in treatment credibility suggests the audio-photic stimulation may have exerted an unanticipated active treatment effect.

A somewhat different pattern of between-group differences emerged on the measure of academic worry at post-treatment when considering the intent-to-treat samples. Worry exposure no longer outperformed waitlist control, but did show more improvement than those assigned to expressive writing. Again, the placebo condition did

surprisingly well, showing more improvement at post-treatment than both expressive writing and waitlist control with no differences between placebo and worry exposure. The differences between the completers and intent-to-treat samples were most striking in the two active conditions. Although there were no statistically significant differences in the number of dropouts across treatment conditions, the impact of including dropouts in the analyses clearly had a differential impact on outcome. The placebo condition had the fewest number of dropouts across the three interventions. The impact of the intent-to-treat analysis is in large part influenced by the number of cases that included scores carried over from previous assessment periods, especially in the conservative analysis.

Because several dropouts completed post-treatment assessments, differences between completers and intent-to-treat samples also reflect differences in improvement between those who completed fewer than four sessions and those who completed four or more sessions. The differences between the two types of analyses suggest those in expressive writing who dropped out of the study fared much worse than those who dropped out of the placebo condition. Similarly, those in the worry exposure condition who dropped out did not perform as well as dropouts in the placebo condition. Although number of treatment sessions completed did not have a differential treatment impact on outcome, another possibility is that a dose-response relation may have been somewhat more evident in the two active conditions, or at least that those conditions required more sessions completed in order to show improvement.

In addition to total Academic Worry Questionnaire scores, an item-by-item analysis was conducted to assess differential treatment outcome on several domains of

academic worry. At post-treatment, two of the four items that showed differential treatment outcome assessed the amount of time spent worrying about school. Both worry exposure and placebo participants reported (a) spending less time worrying overall; and (b) experiencing shorter worry episodes than those in waitlist control and expressive writing. Thus, these interventions had the most substantial and acute impact on frequency of symptoms, rather than distress or interference associated with the symptoms.

Those who received worry exposure reported holding fewer negative beliefs about academic worry than those who did not undergo any intervention by the post-treatment assessment. This finding indicates that worry exposure may not only work to reduce worry by habituation of anxiety associated with worry-provoking images, but by sending a message to the patients that worry must not be dangerous-otherwise a professional would not be instructing them to worry intentionally. This message is similar to the message sent in CBT for panic disorder, in which clinicians encourage patients to induce the bodily sensations they fear, sending the message that these sensations are harmless. In addition to the message sent about the harmless nature of worry, the actual act of worrying on purpose may also contribute to the weakening of this dysfunctional belief as more direct threat disconfirming evidence is presented that one can worry without negative consequences. Evidence has been found supporting the concept that engaging in actions that are in direct opposition to natural threat tendencies enhances the efficacy of exposure treatment (Wolitzky & Telch, in press). As worry about worry is a key ingredient in the recipe for generalized anxiety disorder, the fact that this message can be

altered by just four total hours of prescriptive worrying (for someone who completed all 12 sessions) is remarkable.

Interestingly, those assigned to the placebo condition reported using fewer safety behaviors to reduce academic worry than those assigned to the other interventions. Although one could argue that putting a headset and goggles on in order to avoid worrying is a safety behavior in and of itself, the benefits of the device (presumably relaxation and distraction) may have mitigated anxiety enough so that participants were not compelled to use alternative safety behaviors to reduce anxiety. In contrast, those whose interventions activated anxiety (i.e., expressive writing and worry exposure) did not have the device to use as a means to distract or relax themselves, and thus may have looked elsewhere for safety aids.

Health and Physiological Outcomes. The general pattern of between-group differences observed at post-treatment on the clinical self-report measures was similar to that of the self-report measure of overall physical health. Although no differences were found between groups at post-treatment on the mental factor, on the physical factor, placebo and worry exposure both outperformed expressive writing with placebo also outperforming waitlist control. In contrast, no between-group differences emerged on the objective measures of health, cortisol levels and number of visits to the health center.

Although randomization should have controlled for individual differences that could impact cortisol levels (e.g., non-school related stress, immune problems, amount of food eaten prior to coming to the lab, etc.), these individual differences were not

measured. Thus, the possibility that unknown between-group differences on factors such as these were present cannot be completely ruled out.

Academic Achievement Outcomes. Although between-groups differences on grade-point average were not significant at post-treatment when including each of the four individual conditions, a planned comparison of active conditions vs. control conditions revealed that those assigned to the active treatment conditions obtained significantly higher grade-point averages at post-treatment than those assigned to either of the control groups (although inspection of the data indicates expressive writing was driving this significant between-group difference).

6.1.3 Post-treatment to follow-up change

Self-report Clinical Outcome Measures. At the three-month follow-up, a different pattern emerged with respect to treatment outcome as indexed by the self-report measures. Participants in all conditions showed overall continued improvement from post-treatment to the three-month follow-up session on the primary outcome measure of academic worry (although improvement in the placebo condition was only marginally significant). Interestingly, participants assigned to the expressive writing and placebo conditions showed continued improvement from post-treatment to follow-up on the measures of stress, generalized anxiety and depression as well, while those in the worry exposure condition maintained their pre to post-treatment gains but displayed no additional improvement during the post-treatment to follow-up period.

The post-treatment to follow-up pattern of improvement on the continuous analyses was mirrored on the measure of clinically significant change, in which

percentages of participants achieving clinically significant change on the measure of academic worry rose to nearly three-quarters of participants in the worry exposure condition and approximately two-thirds for the expressive writing. The percentage of participants achieving clinically significant change in the placebo condition remained close to two-thirds of participants. Similarly, percentages of participants achieving clinically significant change on the generalized anxiety measure also increased across conditions by the three-month follow-up period.

One might expect a strong placebo response acutely, as participants experience the effects of treatment expectancy. However, as time passes and participants are faced with their academic worries, one might expect this acute symptom reduction to be followed by a return of symptoms. Although those assigned to the placebo did not show statistically significant improvement at follow-up on the academic worry measure (but some change in the direction of improvement), they did maintain their gains and showed some post-treatment to follow-up improvement on other clinical measures, suggesting that the placebo effects were lasting.

The continued improvement in the two active conditions is consistent with the expressive writing literature and emotional processing of fear literature, both of which may expect (and have shown empirically) initial symptom increase before symptom decrease, presumably as the fear is being emotionally processed (Sloan & Marx, 2004b; Kamphius & Telch, 2000; Wolitzky & Telch, in press). However, Frattaroli's (2006) meta-analysis examining the effects of expressive writing found that studies evaluating outcomes within one month of the writing sessions showed larger effects than studies

with follow-up assessments occurring one month or longer after the writing sessions. Perhaps the use of specific writing topics and specific populations may interact with length of follow-up and course of outcome severity over time. The heterogeneity among the studies in the meta-analysis may have obscured these potential interactions.

Health Outcomes. Similar to the pre to post-treatment improvement observed on the mental factor of the SF-36, continued improvement on this factor was observed for all three intervention conditions from post-treatment to follow-up. Interestingly, on the physical factor, those in the expressive writing condition showed significant post to follow-up improvement, with marginally significant improvement for those assigned to placebo and a maintenance of treatment gains for those assigned to worry exposure. In contrast, no post-treatment to follow-up change was observed on number of visits to the health center in any of the conditions. Thus, for all conditions, number of health visits did not significantly change across the three assessment periods.

Academic Achievement Outcomes. Although grade-point averages were largely maintained from post-treatment to follow-up in the worry exposure and placebo conditions, those in the expressive writing condition showed a decrease in grade-point average from post-treatment to follow-up. In other words, improvement in grade-point average in the expressive writing condition was observed only acutely and was not stable over time. By follow-up, the decline in grade-point average in the expressive writing condition essentially returned participants to grade-point averages similar to those they obtained for the semester before the intervention. That grade-point average improvement was observed only acutely for the expressive writing condition is consistent with

Frattaroli's (2006) finding that shorter-term outcomes showed larger effects than longer-term outcomes in expressive writing studies. Interestingly, these findings indicate that, in the expressive writing condition, improvement in worry symptoms was delayed, whereas improvement in academic achievement was observed only acutely.

6.1.4 Between-group differences at follow-up

Clinical Outcome Measures. The differential improvement observed during the follow-up period among the three treatment groups resulted in significant and equivalent levels of improvement from pre-treatment to follow-up for those who completed the worry exposure, expressive writing, and placebo interventions. No significant differences emerged between groups at follow-up on the measures of academic worry, stress, depression, or generalized anxiety.

Examination of only post-treatment data would suggest that worry exposure outperforms expressive writing, lending support to Borkovec's (1994) theory of cognitive avoidance in GAD. Had only post-treatment data been collected, one might argue that, when exposing patients to their own worries, imagery-based processing of worry-provoking scenarios is necessary for the ultimate reduction of worry, whereas verbal-based processing, presumably operating during expressive writing, may be contraindicated. Our findings provide a clear illustration of the importance of follow-up assessments. Consistent with previous research on expressive writing, the benefits gained from writing about the emotional topic (in this case, academic worry) led to improvement several months after the intervention occurred (e.g., Pennebaker & Beall, 1986; Smyth, Stone, Hurewitz & Kaell, 1999). However, in the current health care system, rapid

change is often preferred over delayed improvement. Thus, while imagery may not be necessary for reduction of worry, it may lead to more rapid improvement, and thus may be preferred over expressive writing because of the more proximal benefits over expressive writing.

As with the post-treatment analyses, between-group differences were examined on individual items from the Academic Worry Questionnaire. It is important to note that, despite the between-group differences at post-treatment, no differences between the three interventions were observed on any individual items three months after the treatments were completed. Because there was a general pattern of improvement from post-treatment to follow-up, this suggests that expressive writing also ultimately reduced negative beliefs about worry. Thus, "worrying," or thinking consistently about worry-provoking situations during specifically scheduled times can confer benefit without the use of imagery. This provides some evidence that scheduled worry time, another untested behavioral strategy seen in CBT manuals, which consists of having patients set aside time to worry each day as they would normally worry (presumably in verbal form), may be a promising technique for the treatment of pathological worry.

The general pattern of differences between the completers and the intent-to-treat samples at follow-up on the measures of academic worry, generalized anxiety, stress, and depression was such that the intent-to-treat samples for the worry exposure and expressive writing conditions generally did not show as much improvement as those who completed the interventions, whereas no major differences were observed between the

two samples in the placebo condition. Implications will be discussed (see "Public Health Implications").

Perhaps one of the most clinically relevant indices of treatment outcome is the percentage of participants meeting diagnostic criteria for GAD at follow-up. Although a GAD diagnosis was not required for participation, over one-third of participants met criteria for a current GAD diagnosis as pre-treatment. Although differences did not attain statistical significance, more participants in the two active treatment conditions met for GAD at pre-treatment than those assigned to placebo or waitlist control. By follow-up, the proportion of participants meeting criteria for GAD declined in all three intervention conditions. However, these declines were particularly notable in the two active treatment conditions. Approximately one-half of participants in the worry exposure condition met for GAD criteria at pre-treatment. This percentage dropped to 13% by follow-up. Likewise, rates dropped from approximately one-third to 0% for those assigned to expressive writing. These findings are noteworthy in light of the low dose, self-directed nature, and specificity of the intervention, which did not even aim to combat GAD per se.

Taken together, these findings indicate that (a) worry exposure has lasting effects; (b) those who were assigned to a placebo did not show a return of symptoms, as would be expected; and that (c) the effects of the expressive writing were delayed, consistent with hypothesis.

Health Outcomes. Several interesting findings emerged with respect to the measures of health outcomes at follow-up. On the SF-36 physical factor, between-group analyses revealed that expressive writing outperformed worry exposure and that placebo

marginally outperformed worry exposure. This was the only measure in which expressive writing outperformed either of the two other interventions. Furthermore, it was the only analysis in which the placebo outperformed worry exposure in the completers sample (albeit non-significantly). Although the effects of expressive writing on clinical indices are not often tested, several studies examining the efficacy of the expressive writing paradigm have used measures of physical well-being or disease activity. The current finding is consistent with prediction and in accord with findings from the Frattaroli (2006) meta-analysis examining the effects of self-reported measures of disease activity.

In contrast, no between-group differences emerged on the number of visits to the health center. Analyses examining the number of visits to the health center may have lacked power to detect statistically significant differences, as the base rates were relatively low ($M_{baseline}$ = 1.05, SD = 1.03). Still, the current findings suggest that group differences in health outcomes were null acutely after the intervention as well as during the semester following the intervention.

Academic Achievement Outcomes. At follow-up, as with many of the self-report measures of symptom severity, the difference between the groups (i.e., active treatments vs. control groups) on grade-point average was no longer statistically significant.

Although grade-point average is not a clinical index of improvement, improvement in grade-point average for those who worry excessively about school is a relevant index for this population. The discrepancy between the improvement observed in the worry exposure and placebo conditions on self-report measures of symptom severity and the general lack of improvement on objective measures of academic achievement

suggests that either: (a) self-report biases were present in two of the three intervention conditions, stressing the importance of collecting objective measures; (b) grade improvement and improvement in academic worry are not necessarily correlated; or (c) based on the findings that more improvement (at post-treatment) was observed when including only lower-half grade-point averages, perhaps the relation between academic worry and grade-point average is more complex.

Further exploration of the relation between grade-point average and academic worry in a non-clinical, undergraduate sample revealed a quadratic function, such that those with high and low grades reported higher levels of academic worry, whereas those with average grades reported low levels of academic worry. Thus, the existing association is non-linear. There may be two groups of students with academic worry: those who are perfectionistic, overachievers with high grade-point averages who may worry about being at the top of their class, and those who struggle with school and worry about doing well enough to succeed. Collapsing these groups together in the sample produced a mean baseline grade-point average similar to the average grade-point average at the University of Texas but obscured the larger picture.

Because the target of the intervention was academic worry and did not include a grade improvement intervention, it still remains unclear whether we should expect participants who report an improvement in symptoms to report improvement in grade-point average. Clearly, there is little to no room for improvement in the high-grade-point average subgroup. The quadratic relation between grade-point average and academic worry only explains the nature of the relation and nothing about the direction of change.

In other words, it is still unclear whether grade improvement in the low-grade-point average subgroup (presumably into the low-academic worry, average grade-point average range) will lead to lower academic worry, or whether decreases in academic worry will result in grade improvement. We can infer that a successful intervention should result in grade improvement for those in the low-grade-point average subgroup, as evidenced by the pre to post-treatment change in the three intervention groups for this subgroup.

Taken together, the major findings of the academic achievement measures suggest that: (a) consistent with hypothesis, the expressive writing condition showed improvement in grade-point average. However, contrary to hypothesis, this improvement was acute and not stable over time; (b) there was some evidence that grades improved in the worry exposure condition at post-treatment, particularly when considering those participants whose baseline grade-point averages were below the mean for the sample; and (c) no such improvement was observed in the control groups, although those in the placebo condition with grade-point averages below the mean showed marginally significant improvement at post-treatment.

6.2 Treatment Moderators

Although many of the putative moderators were not found to interact with treatment condition to significantly impact treatment outcome, several main effects emerged as general predictors of outcome. Overall, consistent with prediction, completing more home sessions was associated with greater improvement on the two self-report primary outcome measures, as well as on grade-point average. Thus, an association between number of sessions completed and outcome was observed for all

three interventions. Perhaps not surprisingly, completing more worry exposure sessions was associated with more positive outcome. This finding is in accord with previous research showing a positive relation between homework completion and treatment outcome in studies examining cognitive-behavioral interventions (e.g., Schmidt & Woolaway-Bickel, 2000). Interestingly, completion of more expressive writing was also associated with more positive outcome. This finding is somewhat consistent with the meta-analytical finding that three or more writing sessions yielded greater improvement than fewer than three writing sessions (Frattaroli, 2006), and calls into question the necessity of adhering to the traditional three to four session protocols used commonly with this paradigm (e.g., Pennebaker, Kiecolt-Glaser & Glaser, 1988).

The average number of writing sessions completed in the intent-to-treat sample was similar to the number of sessions prescribed in the traditional expressive writing paradigm ($M = 5.55$, $SD = 4.40$), whereas the average number of writing sessions completed in the completers sample was $M = 8.55$ ($SD = 2.82$). By examining the difference in performance in the expressive writing condition between the completers and intent-to-treat samples, one can infer that those who dropped out of the expressive writing condition performed more poorly relative to the other conditions than those who completed. Thus, while three to four writing sessions may be beneficial for non-clinical samples, additional writing sessions may be indicated in the treatment of pathological worry.

Interestingly, completion of more home sessions was also associated with more positive outcome in the placebo condition. One possibility is that the audio-photic

stimulation was administering some active treatment ingredient that showed incremental benefit over time. Alternatively, completing more sessions may have simply activated greater expectation for improvement.

In addition to the impact of sessions completed on outcome, several interesting findings emerged with respect to the meta-cognitions reported at baseline. Overall, these findings were consistent with prediction that holding more dysfunctional beliefs about worry would be associated with poorer outcome. Although not a significant treatment moderator, follow-up main effects tests revealed that endorsing more positive beliefs about worry at baseline was associated with higher scores on the academic worry measure at post-treatment for all three interventions. Occupational and academic worriers, in particular, may be susceptible to holding this belief because there are natural activities in the workplace and academic environment that can easily mutate into worry and its associated beliefs and behaviors. For example, students may confuse the act of studying with worrying, spending endless hours imagining what might be on the next exam or going over flashcards hundreds of times. These students, especially those without acute test anxiety, may actually perform well because in the midst of all of their worrying, they also accomplished a good amount of studying and attribute their performance to this "studying," which actually included a great deal of unnecessary worry. Additionally, students who worry excessively about academics may hold the belief that worry prevents negative outcomes from occurring, which is a commonly reported belief about worry (Freeston, Rheaume, Letarte, Dugas & Ladouceur, 1994).

Experiences like those fuel the erroneous belief that it was their worrying that helped them to succeed, rather than their studying of the material (which could have been accomplished in a much shorter period of time and without as much distress had they not worried during the study period). The beliefs that worrying is essential for motivation and for doing well are only reinforced when bosses or instructors encourage specific organizational or studying strategies that may lead to over-preparation in worriers, but ultimately result in higher performance. One possibility in the current study is that participants who began the study with strongly held beliefs that their worries were important for their academic success may have been less inclined to let go of their worrying during treatment.

In addition to this main effect, two other Meta-Cognition Questionnaire factors significantly moderated treatment outcome with treatment differential impact. The two factors were similar and the findings were consistent. Endorsing more negative beliefs about worry (e.g., “worrying will cause me harm”) and exhibiting cognitive self-consciousness (i.e., worrying about one’s own worry) was associated with more favorable outcome in the placebo condition and less favorable outcome in the expressive writing and worry exposure conditions. These findings were particularly striking in the expressive writing condition on the “negative beliefs” factor and particularly striking in the worry exposure condition on the “cognitive self-consciousness” factor.

The findings with regard to the expressive writing and worry exposure conditions are consistent with prediction, such that holding more dysfunctional beliefs about worry would be associated with poorer outcome. These interventions were not specifically

designed to address dysfunctional beliefs about worry. Thus, strongly held beliefs may have interfered with treatment. Unfortunately, although change in meta-cognitions was not evaluated, these findings may suggest that neither intervention had a significant impact on chipping away at these potentially worry-maintaining beliefs simply by having participants intentionally worry. Because these interventions were self-directed, it was considered that those who held strong negative beliefs about worry may have been apprehensive to implement interventions at home that consisted of confronting their worries directly by intentionally bringing them to mind. These participants may not have fully engaged in the interventions, thereby resulting in less improvement. Perhaps with more therapist involvement, these interventions could have had the most dramatic impact on those who endorsed these beliefs, rather than having less of an impact. If negative beliefs are truly maintaining factors that can be challenged through exposure to worry, it would be expected that these participants would show dramatic improvement once these beliefs are weakened.

To assess the possibility that those who held more dysfunctional beliefs about worry in the two active conditions were reluctant to fully engage in treatment, correlations were conducted between the relevant Meta-Cognitions Questionnaire factor for each condition (i.e., “negative beliefs about worry” for the expressive writing condition and “worry about worry” for the worry exposure condition) and presumed indices of treatment engagement (i.e., number of home sessions completed, degree of focus on worry content, emotional expression in expressive writing, and use of imagery in worry exposure). Although no significant correlations were observed in the worry

exposure condition, a negative correlation between home sessions completed and scores on the "negative beliefs" factor in the expressive writing condition was observed such that holding more negative beliefs about worry was associated with completing fewer home sessions. This finding supports the idea that those in the expressive writing condition who held negative beliefs about worry had difficulty fully engaging in treatment. However, this hypothesis is not supported with regard to the worry exposure condition.

Coupled with the fact that the item-by-item analysis of the Academic Worry Questionnaire showed a decrease in negative beliefs about worry in the worry exposure condition at post-treatment, these moderator findings suggest that there may be potential for worry exposure to change cognitions, but that the protocol of the current study may not have had as positive of an impact on those who held very strong beliefs that worry is dangerous and harmful.

Interestingly, more dysfunctional negative beliefs about worry were associated with more improvement in the placebo condition. Perhaps participants who feared their own worry were relieved to be assigned to a treatment in which they could avoid their worry and distract themselves. It was considered that these participants may have been more actively involved in completing their interventions. However, no significant relation was observed between dysfunctional beliefs about worry and number of home sessions completed in the placebo condition. Although it is not entirely clear why those who underwent the placebo would improve more if they endorsed negative beliefs about worry at baseline, the fact that a different pattern of outcome was observed for the

placebo condition emphasizes the importance of conducting moderator analyses in treatment outcome studies. The major implication of this finding is that audio-photic stimulation may be particularly indicated for those who hold dysfunctional negative beliefs about worry. These participants may have been well matched for an intervention thought to be relaxing.

In addition to the effects of dysfunctional beliefs about worry on outcome and their interactions with condition on outcome, other predictors of treatment outcome emerged. Although no interaction with treatment condition was observed, time during semester when randomized to treatment was significantly associated with outcome as a main effect variable. Interestingly, while those who were randomized during the second half of the semester were more likely to drop out of the study, those who were randomized later and did complete the study showed more improvement than those completers who were randomized during the first half of the semester. Although this finding is contrary to prediction, there may be a clear explanation for the direction of this association. Participants who entered the study at the beginning of the semester may have been more motivated for treatment. These participants may have known already that they had a problem with academic worry even during, say, the winter break or summer vacation, and sought out this opportunity at the beginning of a new semester, likely before their workloads were at their peak. These participants may have had more severe symptoms, or may have already had GAD. Additionally, these participants may have been more organized or better planners, as evidenced by their commitment to work on

their problem before the semester was fully underway. Thus, they may have completed the study but began with more chronic symptoms.

In contrast, participants randomized later in the semester were already attempting to cope with the demands of school when they entered the study, and may have done so because they began to realize they were worrying excessively about academics and were having difficulty managing. These participants may not have experienced chronic symptoms of pathological worry before, and may have been responding to a newer problem. Perhaps frantically searching for help to alleviate this problem, these participants may have either (a) decided to drop out because they may have been looking at the short-term effects of their current situation and saw the study requirements as one more burden to their already overwhelming workload; or (b) showed more improvement if they decided to finish the study because they were addressing a new problem before it spiraled out of control. An examination of the data provides compelling support for this idea: GAD diagnosis within the past year was higher for participants who entered the study during the first half of the semester (46%) compared to those who entered during the second half (22%), χ^2 (1) = 4.91, $p < .05$.

These findings suggest that there may be two distinct types of participants entering the study with different motivations and levels of chronicity. Recall, however, that (a) time randomized during the semester did not moderate treatment outcome, suggesting that these types of participants are not particularly better suited for any particular intervention; and (b) importantly, there were no between-condition differences on this variable.

Although other variables were found to moderate treatment outcome, the only demographic variable found to moderate treatment outcome was gender. Females completing the expressive writing condition showed less improvement than females in the other conditions, with no differences between conditions for the males. In addition, while not statistically significant, males who completed the expressive writing intervention appeared to respond somewhat more favorably to the intervention than did females. This finding (although non-significant) is consistent with the earlier meta-analysis of expressive writing interventions (Smyth, 1998) but inconsistent with the more comprehensive and methodologically sound meta-analysis (Frattaroli, 2006). It is also important to interpret these findings with caution, as there were significantly more females enrolled in the study than males. Thus, scores for a few males could have driven these findings. However, inspection of the data suggests there were no outliers.

The fact that certain variables did not moderate treatment outcome is also of interest. Contrary to prediction, GAD diagnostic status did not moderate treatment outcome. This finding suggests that none of the interventions appear to be particularly well-suited or ill-suited for participants meeting criteria for GAD as compared to those without GAD. This suggests that alternatives to behavioral treatment may be promising approaches to the treatment of GAD. Furthermore, the fact that no interaction or main effects for putative moderators of major and race/ethnicity were observed suggests that these interventions may be useful for a wide range of students and racial/ethnic groups.

6.3 Treatment Process Analyses

Several *a priori* and exploratory treatment process analyses were conducted in order to elucidate the mechanisms of change during the interventions. Contrary to hypothesis, anxiety ratings across sessions did not decline for either of the active treatment conditions. For the worry exposure condition, a lack of fear habituation would be expected to result in minimal to no change in symptoms at post-treatment (Foa & Kozak, 1986). Although worry exposure did show significant change on all outcome measures, this finding may suggest that the worry exposure was not successful in reducing anxiety through fear habituation. Whether other, untested mechanisms were at work, or whether this finding simply reflects an unsuccessful treatment intervention is unclear. Considering these findings in combination with the fact that worry exposure did not outperform placebo supports the possibility that expectancy played a large role in the changes in symptoms.

The lack of significant fear decline across writing sessions is even more difficult to interpret for a number of reasons. One possibility is that the emotional processing theory does not adequately explain the change observed in expressive writing; other theories may more adequately explain the changes observed in expressive writing. Rather than conceptualizing the expressive writing sessions as a means to disinhibit oneself or emotionally process the fear associated with academic situations, participants may have benefited from the expressive writing by using it as means for problem-solving or emotional expression. Alternatively, expressive writing did not outperform waitlist control on several measures at post-treatment, indicating that perhaps fear habituation is

an important mechanism of change in expressive writing, and that this particular intervention was not successful in facilitating that change.

Although no differences between groups were observed on fear decline slopes, participants assigned to worry exposure reported marginally higher fear activation than those in expressive writing. This finding is consistent with previous work demonstrating that worry-related imagery produces more anxiety than worry-related verbal thoughts (Vrana et al., 1986). Interestingly, greater fear activation at the beginning of treatment was associated with poorer outcome. This finding is consistent with a growing body of literature finding this same pattern (Wolitzky &Telch, 2008; Kamphius & Telch, 2002; Telch et al., 2004; Telch, Valentiner, Ilai, Petruzzi &Hehmsoth, 2000), and calls into question Foa & Kozak's (1986) assertion that fear activation is necessary for successful emotional processing.

Several other measures were collected during the course of treatment to shed light on the treatment process. Few of these variables examined for each particular intervention proved helpful in accounting for the improvements observed for each treatment. Contrary to prediction, the ability to form images was not predictive of change in the worry exposure condition, adding to the growing evidence from this study that imagery is not a necessary component of exposure to worry-provoking thoughts for the reduction of worry. Because imagery does not seem necessary for anxiety habituation associated with worry, yet those in worry exposure showed more rapid improvement than those in expressive writing, it is unclear what mechanism was operating to result in more rapid improvement in the worry exposure condition compared to the expressive writing

condition. Neither treatment showed significant fear decline across sessions; both interventions imposed "start and stop rules" to address controllability of worry. One possibility is that there was more control imposed in the worry exposure condition regarding the specificity of the worries per session. Despite the instructions to focus on academic worries in the expressive writing condition, participants could explore this topic in a number of ways. While they may not have been granted the flexibility to jump from one worry sphere to another, they certainly were allowed to move from one academic-related worry to another, which participants may have done to avoid anxiety associated with particular worries. Thus, worry exposure may have exerted a more acute effect by instructing participants to focus on one very specific worry at a time.

Although the use of imagery was not associated with outcome, some evidence was found indicating that focusing on the content of the worries during both of the active interventions was associated with more improvement. This finding would be expected based on the emotional processing theory (Foa & Kozak, 1986), as well as Borkovec's (1994) theory that would expect those who can stay focused on one sphere of worry without using avoidance strategies (e.g., skipping from one worry to another) would see a reduction in worry and GAD symptoms. This finding provides some support for the idea that the interventions contained active and specific treatment effects, despite the fact that they did not outperform placebo. This finding also supports the hypothesis that worry exposure outperformed expressive writing at post-treatment because the worry exposure intervention focused more specifically on worry as well as on more narrowly defined worries. Regardless of whether or not participants reported different levels of focus on

worries between the two conditions, inherent in the worry exposure intervention is the use of refined, precise, worry-specific focus that may require more concentration than the focus required in the expressive writing condition.

Interestingly, higher levels of distraction from worries in the placebo condition were associated with poorer outcome. Although distraction from worry is one of the primary rationales a proponent of audio-photic stimulation would have for using this method, and thus seems counter-intuitive at first, this finding is actually in accord with research demonstrating the negative impact of distraction during treatment in confronting subsequent anxiety (Telch et al., 2004). Furthermore, according to the cognitive avoidance theory of GAD, worry is a means to distract oneself from more intense anxiety (Borkovec, 1994). Thus, the use of specific distraction techniques would be contraindicated for GAD.

Similarly, although level of relaxation during the audio-photic stimulation did not predict outcome at post-treatment, ability to relax during the intervention was associated with poorer outcome at the three-month follow-up. Although it is surprising that relaxation was not associated with improvement at post-treatment, given the previous demonstrations of relaxation as an efficacious treatment for GAD, the follow-up findings are not surprising. Those who became relaxed using the device learned no relaxation skills that they could use once the device administration was discontinued. Thus, participants instructed to rely on a device to relax fared more poorly when they discontinued the use of the device and had no skills for relaxing themselves, nor any other skills for coping with worry. Taken together, these findings suggest that those who

experienced the presumed or potential active agents of the placebo intervention did not show as much improvement as those in the placebo condition who experienced no active agents (or benefited from the audio-photic stimulation in a way which was not examined). This raises the question of what was exerting the strong effect at follow-up observed in the placebo condition since the audio-photic stimulation was still performing as well as the other two conditions at follow-up. Perhaps other untested mechanisms in the audio-photic stimulation related to brain wave activity were at work.

Finally, the analysis of writing session content yielded some interesting findings. First, this study failed to replicate previous findings with regard to the role of emotion words and self-referencing words in predicting outcome. However, consistent with previous reports, an increase in cognitive processing words was associated with more improvement, suggesting that participants who were able to develop insight, use reasoning to make sense of their anxiety or academic situation, or perhaps engage in problem-solving as an active coping strategy for dealing with anxiety showed more improvement than those who did not address their worries in this manner. Providing support for the cognitive processing theory of emotional disclosure, this finding is in accord with a significant body of work in the area of expressive writing and suggests that perhaps participants who showed more improvement used the expressive writing sessions as a cognitive, problem-solving outlet.

Interestingly, “worrying” during the expressive writing sessions was associated with more improvement (i.e., greater use of the future tense), while rumination about past events (as may be expected with more depressed participants) and/or focus on present

events (e.g., listing what needed to be accomplished that day, describing how they felt at the moment) was associated with less favorable outcome. This finding is not surprising given that rumination about past events may maintain psychopathology, particularly depression (e.g., Singer & Dobson, 2007). These findings suggest that those who followed the instructional set more closely by writing about academic worries (with worry typically considered future-oriented) showed more improvement than those who ruminated about past events or described present issues.

6.4 General Discussion of Issues Relevant to the Interventions

In hindsight, each intervention showed the most improvement in domains in which it would be expected to show improvement. For example, those assigned to the expressive writing condition showed particular improvement in grade-point average (at least acutely) and health outcomes (at least self-report), whereas they did not show as much improvement on clinical measures. This finding is consistent with the Frisina et al. (2004) meta-analysis of expressive writing which showed a small effect size of less than d = .20 on outcomes for clinical populations, and found that expressive writing showed larger effects for physical conditions than mental conditions. In addition, worry exposure, a strategy developed with Borkovec's GAD theory of cognitive avoidance in mind, seemed to exert a unique impact on generalized anxiety and GAD. However, moderator analyses did not suggest that participants meeting criteria for GAD were particularly well-matched for worry exposure.

Although several findings were consistent with prediction, perhaps the most surprising finding of the current study was that the placebo condition not only showed

significant and lasting improvement, but that neither of the active treatment conditions outperformed this intervention. In particular, that worry exposure did not outperform the placebo calls into question the value of including worry exposure in CBT manuals alongside treatment techniques that have been received empirical support for GAD, such as cognitive restructuring and progressive muscle relaxation. Although those assigned to worry exposure did show significant improvement, this improvement did not consistently go beyond the effects of the pulsed audio-photic stimulation. Thus, there is compelling evidence to suggest that worry exposure produced little to no more than expectancy effects or non-specific treatment effects. The fact that the placebo condition performed so well on the primary outcome measure suggests that future studies examining active treatments for GAD ought to consistently include placebo conditions to determine whether the effects of the presumed active treatments go beyond that of expectancy effects.

However, because the literature to date on psychosocial treatments for GAD has consistently excluded placebo conditions, no direct comparisons of psychological placebo interventions to treatment strategies founded in behavioral and cognitive principles have been generated. Thus, it is difficult to draw firm conclusions about (a) whether the audio-photic stimulation was unusually more efficacious than previously tested placebos for generalized anxiety; and (b) whether the potency of the presumed active treatment(s) went beyond non-specific treatment effects.

The first possibility to address is whether the audio-photic stimulation may have been unusually efficacious for a placebo control group. Although a few studies have

included “treatment control” groups such as supportive psychotherapy and non-directive therapy, these treatments differ from true placebos in that they are not only widely delivered in clinical settings, but more importantly, would be expected to exert some active treatment effect (e.g., Maina, Forner & Bogetto, 2005; Stice, Burton, Bearman & Rohde, 2006).

In an extensive literary search, only one GAD treatment study was found that included an active treatment (biofeedback) as well as a “pseudomeditation” placebo and a waitlist control group (Rice, Blanchard & Purcell, 1993). Participants in both the biofeedback and placebo conditions showed significant improvement in anxiety, with no significant change in the waitlist control group. However, no significant differences were observed between the pseudomeditation and the biofeedback groups. Firm conclusions cannot be drawn from one study, especially one in which the active treatment is not a widely studied or accepted evidence-based treatment for GAD. However, the placebo response in this particular study is consistent with the response in the current study and indicates a need for more research in this area.

The current findings raised questions about the nature of placebo controls and highlight the importance of investigating placebo response rates. Those assigned to audio-photic stimulation reported feeling relaxed by administration of the device and reported that it distracted them from their worries. At what point do researchers draw the line between treatment expectations exerting these effects and the possibility that the intervention contains unanticipated active ingredients? The creators of the audio-photic stimulation deliver this intervention as a bona fide treatment they believe is effective in

treating anxiety. Thus, one difficulty with psychological placebos is that sometimes one researcher's placebo is another's active treatment. Although it is currently unknown whether audio-photic stimulation contains an active treatment element beyond expectancy effects, future research is needed before this possibility can be completely ruled out.

One line of evidence to support the current conceptualization of the audio-photic stimulation as a true placebo comes from the pharmacological research on GAD treatment. A review of several randomized clinical pharmacology trials for GAD treatment (examining diazepam, imipramine, venlafaxine, paroxetine, and escitalopram) found placebo response rates ranging from 41-47%, compared to 62-73% response rates for the active pharmacological agent (Rickels, Downing, Shneizer & Hassman, 1993; Gelenberg et al., 2000; Rickels et al., 2003; Davidson, Bose, Korotzer & Zheng, 2004). The placebo response rate across these studies is surprisingly high and consistent with the placebo response in the current study (at least on the Academic Worry Questionnaire). It also suggests that perhaps the two active conditions in the current study were exerting no more than what would be expected of a placebo control. However, it is unclear how much of a comparison can be made between the pill placebo response in GAD and psychological placebo response in sub-clinical GAD. Furthermore, the response rate on the measure of generalized anxiety in the audio-photic stimulation condition did not compare favorably to the aforementioned pharmacological placebo rates.

In order to most comprehensively test whether the audio-photic stimulation was an active treatment that produced more than expectancy effects or non-specific treatment

effects would be to compare it directly to an established, evidence-based treatment technique for GAD that had already been shown to outperform a different placebo treatment. Because of the lack of research comparing evidence-based treatment techniques for GAD (e.g., progressive muscle relaxation or cognitive restructuring) to a psychological placebo, this test would be difficult to conduct. To date, the only study that comes close to being able to extend our knowledge in this area is the Borkovec & Costello (1993) study showing that cognitive therapy and applied relaxation both outperformed non-directive therapy. Because non-directive therapy may produce little more than non-specific treatment effects, comparing audio-photic stimulation to cognitive therapy or applied relaxation may elucidate the effects of the presumed placebo control. However, non-directive and supportive psychotherapies are not inert interventions, whereas a true placebo would be expected to contain no active component. Still, a comparison of the pre to post-treatment effect size on the Penn State Worry Questionnaire between the non-directive condition in the Borkovec & Costello (1993) study (d = 0.83) and that of the audio-photic stimulation in the current study (d = 0.51) indicates that the non-directive therapy was showing larger effects. This suggests the audio-photic stimulation may not have been exerting more than non-specific treatment effects. However, although the Borkovec & Costello (1993) study did not use the Academic Worry Questionnaire as an outcome measure, the effect size was huge for the audio-photic stimulation condition (d = 1.66) and suggests that audio-photic stimulation may have exerted more than a typical placebo response at least on the primary outcome measure.

Other ways to test whether the audio-photic stimulation exerts an active effect include comparing audio-photic stimulation to a treatment that had outperformed a pill placebo, testing audio-photic stimulation against a pill placebo, or having the audio-photic stimulation creators program devices that would be contraindicated for anxiety and compare those to the program used in the current study on a GAD sample.

The issue of what constitutes an active treatment is a much grayer area in psychosocial treatment research as compared to psychiatric research investigating pharmacological agents. After a landmark study found that cognitive therapy, behavioral activation, and social skills training all performed equally well in the treatment of depression (Zeiss, Lewihsohn & Munoz, 1979), the authors concluded that any treatment that: (a) provides a rationale; (b) encourages patients to do something based on that rationale outside of the treatment session; and (c) attributes improvements to the patient's new skill would be an effective treatment for depression. The audio-photic stimulation administration in this study at least meets the first two of these three criteria. Similar to the Zeiss et al. (1979) study, Stice et al. (2006) found that CBT, supportive therapy, bibliotherapy, expressive writing, and journaling all showed significant depression symptom decline at post-treatment. Especially considering the high comorbidity between GAD and depression, perhaps these criteria are true of treatments for sub-clinical GAD as well. If this is the case, this finding has important public health implications, as a number of simple interventions such as audio-photic stimulation could be used to address problems such as academic worry. Clearly, further research described above would need

to be conducted before offering audio-photic stimulation to patients as an active treatment.

Given the above findings, if a "placebo" or "alternative treatment control" demonstrates its efficacy, or is at least comparable to other currently administered treatments, it may be advantageous to administer it to patients who may not be willing or able to undergo other treatments such as worry exposure. In the current study, the audio-photic stimulation intervention seemed to be the most palatable, with more sessions completed in that condition than in the other conditions, particularly expressive writing. This may have been because all participants had to do was recline, close their eyes, and relax during the administration of pulsing noises and flashing lights, rather than conjuring up distressing thoughts and images and activating the fear structure. Moreover, even if it was just expectation that made participants feel relaxed, the participants' subjective experience was of relaxation. Audio-photic stimulation may be an alternative treatment option to explore for those unable or unwilling to engage in other types of interventions. However, future research, as described above, must be conducted before administering audio-photic stimulation with the intent of treating a patient with an active intervention to reduce generalized anxiety symptoms. At this point, the conceptualization of audio-photic stimulation as an inert intervention would suggest the treatments did not produce effects beyond non-specific treatment effects or expectancy effects.

If it is possible that the audio-photic stimulation did generate more than a typical placebo response, it is thus also possible that the other two interventions did produce effects that went beyond non-specific and expectancy effects. Thus, the second issue to

address is the potency of these presumed active interventions. In order to compare the worry exposure and expressive writing interventions to existing single-component evidence-based interventions, Cohen's *d* effect sizes were calculated within each condition from pre to post on the Penn State Worry Questionnaire. Considering that these studies consisted of multi-session, therapist-directed treatment protocols, the effect sizes for the active interventions in the current study were consistent with the effects of several of the other treatments. The pre to post-treatment effect sizes on the Penn State Worry Questionnaire were $d = 1.08$ and $d = 0.46$ for the worry exposure and expressive writing conditions, respectively (and $d = 1.24$ and $d = 0.90$ for the Academic Worry Questionnaire). Single-component behavioral treatment pre to post-treatment effect sizes on the Penn State Worry Questionnaire ranged from $d = 0.21$ (Ost, 2000) to $d = 2.75$ (Borkovec, 1993). The research community accepts these treatments (i.e., applied relaxation, self-control desensitization, and behavior therapy) to be evidence-based, despite their lack of comparison to a placebo control. Thus, this line of evidence suggests that the worry exposure and expressive writing interventions compare favorably to acceptable evidence-based treatment techniques for GAD. However, despite the large effects, it would be interesting to evaluate whether these treatment strategies (e.g. applied relaxation, self-control desensitization, and behavior therapy) outperform the audio-photic stimulation. Based on the findings from the Borkovec & Costello (1993) study, it is reasonable to assume that cognitive therapy and applied relaxation should outperform a true placebo because these interventions outperformed a control treatment that may exert some (albeit weak) treatment effect. However, if these treatments do not outperform

audio-photic stimulation, this may provide evidence for the unexpected potency of audio-photic stimulation in the treatment of worry.

6.5 Overall Treatment Implications

The current findings suggest that worry exposure and expressive writing targeting academic worry significantly improve not only symptoms of academic worry but other relevant clinical indices as well. Unfortunately, these interventions did not consistently outperform a placebo control group. This finding suggests that these interventions may not have produced more than expectancy or non-specific treatment effects. However, the effects of these interventions are large and consistent with the effect sizes found for other evidence-based behavioral treatments for GAD. Furthermore, an examination of treatment process variables suggests that specific factors relevant to the interventions were associated with improvement.

More specifically, those who followed the protocol and instructional sets most closely (e.g., completed their sessions, focused on worries, worried instead of ruminated) in both treatment conditions showed more improvement than those who did not. This suggests that if more control and direction is imposed in future studies (or in clinical practice), the efficacy of these interventions may be increased.

There are important clinical implications for the findings that those in the expressive writing condition who focused more on worries (i.e., future events) showed more improvement whereas those who ruminated about past events showed less improvement. Several techniques such as worry exposure, worry time, and expressive writing (as designed in this study), all include “ intentional worrying” to some degree.

Clinicians using these interventions for pathological worriers should emphasize the importance of future-oriented thoughts/images/writing, rather than allowing patients to explore past and present issues as well.

In addition, completing more home sessions was associated with greater improvement in both the expressive writing and worry exposure conditions. This finding provides direction for clinicians who train patients to administer these interventions for worry. Clinicians may see more improvement in their patients if they encourage them to engage in more than the four sessions required to be considered a completer in the current study. Despite the marginal differences in number of sessions completed, the fact that there were no significant differences between conditions in actual dropout status is promising, and suggests that those who are motivated to complete a minimum of 4-12 worry exposure sessions or expressive writing sessions may show significant improvement in their academic worry.

Examination of the fear parameters during treatment also may provide direction for clinicians administering worry exposure (as well as exposure treatments for other anxiety disorders). Because this study added to the growing body of research showing that greater initial activation of anxiety is associated with poorer outcome, perhaps attempting to evoke a moderate level of fear with the first hierarchy item is not indicated; rather, beginning with a less anxiety-provoking item on the hierarchy may be more therapeutic.

Because the primary aim of the study was to test the efficacy of a specific, imagery-based behavioral strategy for reducing worry and compare it to an alternative,

verbal-based technique, it was imperative that these treatments were delivered in isolation. This is an important distinction because the majority of treatment outcome studies, particularly for GAD, compare their control groups to multi-component CBT protocols. Thus, it is difficult to compare the effects of a single treatment component to the effects of multi-component protocols. Although it was not expected that the magnitude of the effects would compare favorably to treatment protocols that include four to five components, worry exposure and expressive writing did compare somewhat favorably to a few multi-component treatment packages for GAD (Butler et al., 1991; Borkovec & Costello, 1993) on the Penn State Worry Questionnaire index of clinically significant change, suggesting they may be useful interventions.

Despite the efficacy of worry exposure and expressive writing, whether they deserve a place in published treatment manuals is a different issue. In the interest of conserving resources, it is important to dismantle multi-component protocols to determine what components are most effective and which can be eliminated. Since most of the multi-component treatment protocols include evidence-based techniques such as progressive muscle relaxation and cognitive therapy, the findings of the current study suggest that the incremental utility of including worry exposure in these protocols may be low. If future studies with clinical samples show that worry exposure does not outperform alternative treatment or placebo control groups, worry exposure should be eliminated from clinician treatment manuals and worry exposure and expressive writing should not be delivered as first-line treatments in clinical practice. However, their ability to be self-

administered and easily disseminated suggests that implementation of these interventions could make a significant impact on public health.

6.6 Public Health Implications

It is important to highlight the public health impact of the current findings. Participants who completed a problem-specific treatment self-administered between four and twelve 20-minute sessions of their home practices after one brief training session in the laboratory. That all of these interventions, including a presumed placebo treatment, had any impact at all on general worry, overall stress, and depression is significant. The fact that the placebo also showed this improvement means either it takes only the expectancy of treatment effects to achieve these results, or that perhaps the audio-photic stimulation did exert some sort of unexpected active treatment effect. Regardless, these findings suggest that there may be several options for primary care doctors, clinicians, and college and university counselors to implement with little time, effort, or cost.

Although the percentages of participants achieving clinically significant change are somewhat lower than what one would expect in an efficacy study of a twelve-session, therapist-directed GAD treatment (particularly more recent GAD treatment studies with higher efficacy), it is important to keep in mind the small dose of treatment, the self-directed nature, and the specificity of the interventions, all of which have significant potential to weaken the potency of a treatment technique. Although it is unlikely that a clinician would deliver only one treatment component to a patient in the real world, primary care doctors may only have time to teach patients one self-administered intervention. Still, GAD treatment outcome studies to date that report percentages of

those achieving clinically significant change have reported percentages ranging from 16% (Butler et al., 1991) to 77% (Ladouceur et al., 2000), suggesting the current findings are clearly within that range.

Although the worry exposure and expressive writing conditions did not outperform placebo, from a public health standpoint, they may still be useful interventions compared to strategies such cognitive restructuring. The advantage of worry exposure and expressive writing is that they lend themselves well to self-administration, whereas strategies such as self-control desensitization and cognitive restructuring do not. If worry exposure can reduce worry in a sizeable percentage of participants, it may still be worth disseminating to primary care doctors as a self-administered treatment, as even some improvement is better than no improvement for those who would otherwise not be treated. Additionally, if future research with the audio-photic stimulation indicates that this program does outperform alternative treatments or known placebos, audio-photic stimulation may also be a useful tool for reducing worry.

The current findings also emphasize the importance of conducting attrition and intent-to-treat analyses in treatment outcome research, particularly for self-administered interventions. The feasibility of successful self-administration as well as what one would expect in a "real-world" setting are important public health questions to address. Those who dropped out of the study in the expressive writing and worry exposure conditions fared much more poorly than those who completed (perhaps an index of a successful treatment) and those who dropped out in the audio-photic stimulation condition. Furthermore, slightly more participants dropped out of the study in the two active

conditions, presumably because their interventions required more effort. From a public health perspective, the audio-photic stimulation was the most palatable intervention. Future research should explore whether the device is efficacious when compared to other relaxation strategies that teach skills, such as progressive muscle relaxation.

In addition to the public health implications of the outcome analyses, the fact that participants randomized later in the semester (and seemed to have less chronic symptoms) showed more improvement than those randomized earlier (more of whom met criteria for GAD) has important implications for prevention interventions. Addressing the problem of academic worry before patients meet criteria for GAD or experience chronic symptoms seems to produce more benefit than waiting until a patient is already experiencing chronic symptoms. If researchers and/or clinicians can develop methods for motivating patients and/or students to enter prevention programs before their worry becomes a chronic problem, this may alleviate the monetary and mental health costs of treatment later, when patients may not respond as well to treatment. As soon as problems with academic worry are identified, motivational interviewing may be a useful tool in helping students to enter and stay in prevention programs.

6.7 Limitations and Directions for Future Research

There were several limitations to the current study worth noting. One limitation common to all studies investigating the efficacy of a self-administered intervention is that the researchers must rely on the participants' reports of their home practice. Although several measures were in place to track participant compliance, it is nearly impossible to know for certain how much time participants spent at home practicing their interventions.

Thus, the study is limited by the assumption that participants completed the home practice logs accurately and honestly. Similarly, this study suffers from the same limitations of all studies gathering self-report data, in that researchers must assume that participants are reporting accurately and honestly to the questions posed to them. Although this study also included a number of objective measures, the clinical symptom measures were primarily self-report.

In addition, the study is limited by the use of a sub-clinical, or analogue-GAD sample, in that we cannot generalize the findings of the current study to clinical samples of GAD patients or to other worries beyond academic worries. Although participants were all treatment-seeking (i.e., they were not psychology students seeking experimental credit), only about one-third of participants met diagnostic criteria for GAD and they were seeking help only for their academic worry. Future studies should evaluate the efficacy of worry exposure and expressive writing with clinical GAD samples. In particular, typical GAD patients worry about many aspects of everyday life. It would be interesting to see whether differences in the efficacy of either of these interventions emerge when participants are asked to imagine scenes related to, or write about many different spheres of worry (e.g., family, work, money, health).

Finally, for ethical reasons, the waitlist control group was not evaluated at follow-up on the self-report or diagnostic measures. Thus, it is unclear whether the significant improvement observed for the other conditions from post-treatment to follow-up was simply due to the passage of time. It is unlikely that this is the case, given that the waitlist control group did not significantly improve from pre-treatment to post-treatment.

However, this possibility cannot completely be ruled out and thus remains a limitation of the current study. This limitation is common to most randomized clinical trials in keeping with ethical guidelines that encourage researchers to treat waitlist participants as soon as possible.

Although not necessarily considered a limitation, there was one issue relevant to the study that deserves comment. Including a placebo condition (a) before the research community has established a typical psychological placebo response rate for GAD; and (b) that had not been used as a placebo in previous GAD studies made it difficult to interpret the findings given that the presumed active interventions did not consistently outperform placebo, particularly by follow-up. While the inclusion of a placebo is actually a strength of the study, the interpretation of the findings is limited perhaps also because of the limited previous research. At this point, we can only conclude that the worry exposure and expressive writing conditions did not perform better than an intervention that may have produced only non-specific treatment effects.

In addition to these issues, the findings of the current study generated questions that should be subjected to future research. First, in line with previous recommendations (Huppert, 2004), future research is needed to further investigate the placebo response rates for the anxiety disorders, particularly generalized anxiety disorder. Researchers should develop placebo treatments and test them with specific populations against already established treatments, preferably on disorders in which something is already known about the placebo response, even if it is only response to a pill placebo. Once placebo conditions have been developed, researchers should consistently use these

placebo control groups in clinical trials when investigating new treatment techniques in order to determine the true efficacy of the new treatment under investigation.

Second, the moderator analyses yielded interesting findings with regard to meta-cognitions. Unfortunately, because change in meta-cognitions over time was not assessed in the current study, it is difficult to know whether specific treatments may have changed specific types of dysfunctional beliefs about worry. Future research should evaluate whether these treatments increase or decrease certain types of worry beliefs. In particular, the item-by-item analysis of the academic worry measure revealed that those in the worry exposure condition showed significant improvement in negative beliefs about worry as compared to waitlist control. Future research should (a) evaluate the impact of worry exposure on beliefs about worry; and (b) compare cognitive restructuring to worry exposure in reducing dysfunctional beliefs about worry, as this finding also adds to the body of literature showing that a purely behavioral intervention can lead to cognitive change (e.g., Jacobsen et al., 1996; Wolitzky, Pai & Telch, in prep).

Third, based on the findings that increased focus on worry content and writing about future events was associated with more improvement in the expressive writing condition suggests that future research should re-design and evaluate an expressive writing intervention that encourages participants to focus more narrowly on specific, future worry-provoking scenarios. Future studies are needed that compare writing about future events versus writing about past or current events. Based on the current findings, it would be predicted that the efficacy of expressive writing for pathological worry might be enhanced by focusing the writing on future events.

Fourth, because the current study did not find that use of imagery was associated with more improvement in the worry exposure condition, future research should compare worry exposure to scheduled worry time. If worry time compared favorably to or outperformed worry exposure, there could be significant public health implications, as worry time could also very easily lend itself to self-administration and would be even easier to teach primary care patients than would worry exposure.

Fifth, the dose-response relation observed in the current study suggests that future research should evaluate whether higher prescribed doses of worry exposure and expressive writing show larger effects. A study that manipulates the dose parameter of treatment could help to discover the optimal dose for each of these interventions.

In general, although the current study does not provide strong evidence that these interventions produced significantly more than expectancy effects, if further research with clinical samples and alternative treatment control groups support the efficacy of expressive writing and worry exposure, these brief, easy, cost-effective interventions should be disseminated.

Appendix A.

Scripts

Worry Experiment
Screening/Pre-treatment assessment

OVERVIEW

The screening procedure contains **five** steps:

(1) Greeting, overview of session, informed consent

(2) Screening Questionnaire and Demographic Information

(3) Online assessments: Academic Worry Battery Pre-intervention

(4) CIDI Interview

(5) Debriefing

RUNNING THE SUBJECT

1. GREETING, OVERVIEW OF SESSION, AND CONSENT

Greet the subject and introduce yourself. Say:

Hi. My name is _____. I am the experimenter for the academic worry study and I will run today's session. Please have a seat. Today's session includes several phases. First, I will have you read a consent form and sign it when finished. Then I will have you fill out some online questionnaires, and then I will conduct a comprehensive interview with you. Finally, I will go over the results of your assessment to determine whether you will be eligible to participate in the academic worry intervention. Do you have any questions? [Answer questions as briefly as possible and hand them the clipboard with the consent form]. Say: *Here is a form we need you to read and sign before we can get started. Please let me know if you have any questions.*

After they sign informed consent, tell them they can have a copy if they want. If the want one, give them a copy (make the copy while they're doing the online testing).

2. SCREENING QUESTIONNAIRE AND DEMOGRAPHICS

Say: *The information you provide during the following interview, and your answers on all the questionnaires, are confidential. Only the graduate student who is the principal investigator for this experiment will have access to the information, and the data is analyzed anonymously.* [This means that we do not look at a particular individual's answers—they are coded by number]. *There are a couple of exceptions to this confidentiality however. If you mention that you intend to hurt yourself or hurt another person, or that you were aware of any on-going child abuse, we would need to ensure your safety or the other person's safety. Any questions?*

Ask them the questions on the Screening Questionnaire and Demographic Information form and fill them out. If they are on medications, write these on the form. If they are stable and willing to not change them during the course of the month intervention, they can still participate.

3. ONLINE TESTING

Say: *The next thing we're going to do is that I'm going to set you up to take some online questionnaires. They will take about 20-25 minutes to complete. I will be in the other room if you have any questions or concerns while you're filling out the questionnaires.* Go to www.telchlab.com. Click "clinical services," then "online testing and interview system," have the participant enter his/her username and password, then select the Academic Worry Intervention Battery Pre and leave the participant in the room for about 20 minutes. Check on participant after 15 minutes and every 5 minutes after than until done.

After participant is done, say: *I just have one more paper and pencil questionnaire for you to complete. I'm just going to take a few moments to review some of your scores while you finish that last one.* Give them the MCQ hard copy from the packet. Check the AWQ. Make sure the AWQ scores for items 5 or 9 are at least a 2. Check BDI item 9 and contact PI if suicide assessment is necessary.

If the scores on the AWQ are too low for eligibility, discuss them with the participant.

*If the scores are too low, say: *It looks like you're experiencing some significant worry about school, but we are looking for people who are experiencing more distress and impairment because of their worry. Unfortunately you're not eligible for the study. Thank you for your time.* Then give them the debriefing and they're done. Their packets should be taken out of the hanging file, put in a file folder, and moved into the "ineligible" hanging file. A new packet should be put in the original hanging file so the participant number can be reassigned.
*If the scores deem them eligible for the study, move onto the next section of the assessment (below).

4. CIDI

Say: *Now I'm going to be asking you several questions about problems you may be experiencing. Some areas will be more relevant than others, and as you'll see, we'll be spending more time discussing those.* Set up the CIDI, enter the participant's initials and participant # for the ID, get any other demographic information necessary, and begin the CIDI. Make sure you have the online interview for GAD printed out and at your side. If you notice any discrepancies, ask for clarification. After the CIDI is done, pull up the results and print them out. Any diagnosis is fine except for a psychotic disorder. They do not need to have GAD.

5. DEBRIEFING

Say: *You have just finished the pre-treatment assessment. You are eligible for the treatment phase of the study. Before we begin talking about that, I need to give you this form. It explains that you have just finished the first phase of the study. Please read and sign this form, and let me know if you have any questions.* [Give participant Phase I debriefing form].

6. **PRINT OUT AND SCORE ALL QUESTIONNAIRES. PRINT OUT CIDI RESULTS AND LABEL AS PRE-TX CIDI. PUT EVERYTHING IN PARTICIPANT'S FILE AND CLIP ALL PRE-INTERVENTION MATERIALS TOGETHER. MAKE SURE DATE AND PARTICIPANT NUMBER ARE ON ALL FORMS. LABEL ALL PRINTOUTS WITH PARTICIPANT ID NUMBER AND CROSS OUT ALL NAMES AND PERSONAL INFO. PAPERCLIP CONSENTS AND DEBRIFING AND PUT IN APPROPRIATE HANGING FILE**

Note: If participant reports suicidal plan or says will attempt suicide at any time during the assessment visit, do not let the participant leave without finding a graduate student in the lab (preferably the PI if available). If no grad student is around and neither is Dr. Telch, go to the clinic down the hall and ask for help. You must always check BDI-II item 9 to see if the participant is reporting suicidality. If item 9 is a 2 or higher, you must talk to them about it, make sure it's accurate, and then get a grad student or Dr. Telch.

Worry Experiment
Intervention Phase
Procedures Before Intervention Training
AND
Procedures After Intervention Training Common to All Conditions

MATERIALS

(1) APS device

(2) Tape

(3) Tape recorder

(4) Intervention phase packet

OVERVIEW

The intervention phase procedure contains **five** steps

(1) Overview of session, sign consent

(2) Randomization, RTQ

*(3) Intervention training **(see detailed separate protocols for each condition)**

(4) Show participant how to access the intervention record forms online and give printed instructions, reiterate expectations for intervention practice and get a verbal agreement, explanation of completing online questionnaires

(5) Put participant's timeline into the excel spreadsheet and other wrap-up procedures

RUNNING THE PARTICIPANT

1. OVERVIEW OF SESSION AND INFORMED CONSENT

Say: *We've determined that you're eligible for the treatment phase of the study. Treatment consists of one month of self-administered treatment, or home practice. We expect that all the interventions in this study are effective ways to reduce excessive and uncontrollable worry. We are going to randomly assign you to one of the 4 treatment conditions and will give you training today so you will feel confident in your ability to apply these interventions to your life at home. Before we can assign you to a condition, I'll need you to sign another consent form. Because we are entering the intervention phase of the study, we need to do another consent form. Please read and sign this form and let me know if you have any questions. Before you do, I just want to point out a few things. We will be asking you to spend about 20-30 minutes practicing your intervention three times a week for one month. Every week we'll have you complete a brief online questionnaire and at the end of the month, we'll ask you to fill out a longer battery of questionnaires, much like the one you did earlier today. After the month you do not need to do any more of the intervention, but we will contact you three months later to complete another set of questionnaires and an online interview. We will also be calling you to do a brief phone questionnaire. In addition, I want to point out that by signing this form you agree to let us get some basic information from UT. We will find out how many times you went to the University Health Service and your GPA. We will not get any detailed information about specific medical problems or classes you took. Do you have any questions?* [Answer any questions]. Have participant sign consent. Ask participants if they go to any other doctor besides the UT student health service. If they do, ask them if they'd be willing to complete a voluntary release form for us to get the same information from that doctor. If so, have them fill out and sign the form after signing consent form.

2. RANDOMIZATION

Look on the randomization sheet. Cross off the next condition and assign participant to that condition. Circle the demographic and screening form with the correct intervention

3. INTERVENTION TRAINING: USE INTERVENTION-SPECIFIC MANUALS!

4. HOME PRACTICE HANDOUTS

Get out the online instructions form and circle the appropriate link. Tell the participant to go to that website to do the online practice forms. Also show participant the first page explaining how to get to the online testing system to do the weekly AWQ and the 1-month and 3-month questionnaire batteries, as well as the 3-month GAD interview. Make sure they feel comfortable with the instructions. Reiterate instructions for home practice and online questionnaires, get a verbal agreement and remind them we will be tracking their use of the intervention and will give them reminders for completing the questionnaires.

5. BEFORE THEY LEAVE AND BEFORE YOU LEAVE:

Make sure

- they have your email address should they have any questions.
- they are in the excel spreadsheet
- you are aware of when to give the participant reminders.
- all intervention-phase information is clipped and filed
- you've crossed off the intervention you just assigned on the randomization chart

After Randomization

Intervention Training Manual for Worry Exposure

1. PRESENT RATIONALE AND GIVE RTQ

Say: *You have been randomly assigned to the worry exposure condition. Worry exposure is a behavioral technique used for people with generalized anxiety disorder. We are going to be using it specifically for academic worry. Worry exposure consists of gradually exposing you to worry-provoking images such as failing an exam or forgetting to turn in your homework.*

You may be thinking, "I already worry enough. Why would you tell me to worry on purpose?" Well that's a good question. My guess is that when you worry, you let your mind wander to all sorts of topics. I would bet that you also have lots of thoughts that come into your mind, but you may not focus on any one particular image that might make you anxious. These may be some reasons why your anxiety may not decrease when you worry on your own. Worry exposure is thought to work by having people focus on the same worry over and over again, using imagery instead of words to really confront what you're afraid of.

This technique can be applied to all sorts of anxiety problems. For instance, there is a great deal of research showing that people who are afraid of things, such as heights, can eliminate their fear by repeatedly going up to a high place. The idea is that exposing you to images that are normally distressing to you over an over again should begin to make your anxiety while imagining those situations decrease over time. Eventually you will not worry about those situations and may no longer become anxious when you think about them. Worry exposure might also work because it begins to introduce times to start and stop worrying on purpose, which may help you to control your worry. Do you have any questions so far? [Answer questions, and then give participant the RTQ]:

Say: *Now that you've learned about what type of treatment you will be getting, I'd like you to fill out this brief questionnaire.* [Participant fills out RTQ].

2. ORIENTATION TO BASIC INSTRUCTIONS AND EXPECTATIONS

When ready to start, say:

We will construct a hierarchy of worry provoking images, beginning with one that produces only a moderate level of distress or anxiety, and finishing with one that generally produces a lot of distress if you were to imagine it happening, such as failing a class. Today we will construct this hierarchy and make a tape for you to take home with all your worries on them. Before going into more detail, I want to briefly teach you about rating your level of anxiety. [Teach them the 0-100 anxiety rating scale]. After learning how to rate anxiety from 0-100, say:

Again, you will be asked to listen and really focus on the images on this tape for at least 20 minutes a day, three times a week, for one month. You should start with the first image on the tape and listen to it over and over for the 20 minutes. You will be completing online record forms of your home practice which ask you to rate your peak level of anxiety. When you can listen to the image on the tape and have an anxiety or distress rating of only 30 on a 0-100 scale, you can move onto the next worry on the tape, even if this takes several 20 minute sessions of listening and focusing on the image.

One thing I want to point out is that, much like other anxiety problems that are treated by confronting what it is you're afraid of, you may experience a slight increase in anxiety at first. This is completely expected. You may have been avoiding confronting some of the images you have put on your tape today. It is normal that at first, these confrontations with the images may make you a bit anxious. That does not necessarily mean that the worry exposure is not working. Do you have any questions?

3. INTERVENTION TRAINING

Say: *We are now going to go over how to do your intervention at home.*

First I am going to help you make a list of situations which you feel you could imagine in detail. Let's brainstorm and then we'll put them in order from easiest to hardest. We're going to come up with about 5 scenes. We'd ideally want to start with an image that would produce about a 40 or 50 on the 0-100 scale of anxiety or distress. We'd like to end with something in the 90-100 range. Help participant come up with ideas. Write them down and rank order them. Make sure the participant is confident she/he could imagine these scenes. Make sure they are very specific and detailed. Say, *It is important that you describe these on the tape in detail, describing any sensory experiences, including visual, auditory, or bodily sensations. For example, if one of your images is coming into class late during an exam, you could say something like, "I'm walking into class late, the door is creaking behind me and everyone turns around and stares. My heart is racing and I feel my backpack heavy on my shoulders and I grab the nearest seat. It has gum stuck to the desk."* [Or use and example from the list created earlier]. *Make sure to describe the scenes in the present tense, and really try to put yourself there as you describe the scenes. Any questions?* [Assess how well the participant feels she/he can create images in her/his head. Do the practice imagery scene. Have the participant close his/her eyes as you describe a scene of the participant walking down staircase onto a sandy beach with the wind blowing and the ocean crashing, etc. Make sure to describe scene in the present tense].

When ready to start worry tape, say: *OK, let's start. I'm going to put the tape in and start recording* [test for volume ahead of time. Start recording.] *OK, we're starting with worry image #1, [fill in the name of the situation you and participant have ranked easiest]. Go ahead and lay back in your chair and close your eyes and relax. Take some deep breaths and clear your mind. When you're ready, begin to bring the image into your mind and begin describing it.* [Participant describes image #1. When done, turn off tape and given any necessary feedback. Turn tape back on and announce second worry image. Have participant describe it. If done correctly, do not

stop tape, just keep announcing the next scene to describe. Scenes can be any length, usually around 3 minutes each. Continue until all scenes are done. Rewind tape and give it to participant.] At the end, say: *it's really important that you really try to focus on these images and not let yourself get distracted while you listen to them at home. Make sure there are no distractions around.*

After Randomization

Intervention Training Manual for Expressive Writing

1. RATIONALE AND RTQ

Say: *You have been assigned to the expressive writing condition. There is a huge and exciting body of research showing that writing about highly emotional topics such as a traumatic event or starting college can have lasting psychological and physical health benefits, and can even improve grades. For this study, we will be asking you to write about your academic worry repeatedly over the course of the next month. We ask that you focus on the topic of your academic worries as much as possible, and explore your deepest thoughts and emotions about your academic worry. While we ask you to try to stay focused on the topic, this topic is actually pretty loosely defined. For example, you may choose to write about your fears such as failing a test, getting a bad grade, or forgetting to turn in an assignment. But we also encourage you to explore other areas such as pressures you feel from yourself, family, or others to do well academically, concerns about not getting the summer internship or job you want because of potential academic issues, or anxiety about being called on in class or taking tests. Of course these are just examples. Some of them may sound familiar to you, some may not. But please be sure to explore YOUR feelings and thoughts, and let your worries about school really come out in whatever form and on whatever issues pertain to you. We expect that this should help you emotionally process some of your academic concerns and should lead to*

psychological and physical improvements. Do you have any questions? [Answer questions, and then give participant the RTQ]:

Say: *Now that you've learned about what type of treatment you will be getting, I'd like you to fill out this brief questionnaire.* [Participant fills out RTQ].

2. ORIENTATION TO BASIC INSTRUCTIONS AND EXPECTATIONS

Say: *You will be asked to write for 20 minutes a day, three times a week, for one month. You will be able to do all your writing online and will be asked to complete a brief online record form at the end of each home practice. Do you have any questions?*

3. INTERVENTION TRAINING AND PRACTICE

Say: *We're going to begin the intervention now. Later, I'm going to give you a sheet that gives you the link to get onto the website to complete your writing. First you'll just be doing one writing session here in the lab. Here is the form to do the writing on. It will alert you when 20 minutes has elapsed. Please try to finish up your last thought or sentence when you see the 20 minutes have elapsed. When you're done writing, click the button at the bottom of the page to go onto the next page. It will take you to a brief questionnaire that you'll need to complete after each home writing session. Remember, try to explore your deepest thoughts and feelings about your academic worries. Don't worry about sentence structure, spelling, or grammar. I'm going to leave you in here to do your writing. Once you begin writing, please continue to do so until your time is up. I'll be in the other room. Come get me if you have any questions, and I'll be back in 20 minutes.* [Leave room].

After Randomization

Intervention Training Manual for APS

1. RATIONALE AND RTQ

Say: *You have been assigned to the relaxation condition, in which we use a special device called audio-photic stimulation, or "APS" for short. This device has a headset which emits a pulsing noise and goggles that flash lights. The device is programmed specifically for people who experience anxiety and worry.*

Recent evidence suggests that phobia-related thoughts and emotions are stored in the brain and that different emotional states have patterns of brain wave activity associated with them. The procedure of introducing pulsed flickering lights into the visual field and pulsed audio tones into the auditory system, which has been studied for decades, has been called brainwave entrainment (BWE) or more recently, "Audio Photic Stimulation" (APS). Some clinical studies suggest that APS may be beneficial in the treatment of anxiety, phobias, and stress-related problems. The device will deliver pulsed light through these goggles and pulsed tones through these headphones at a special frequency designed to induce a pattern of brain wave activity called alpha that is associated with deep states of relaxation and meditation. During the procedure, it is important that you keep your eyes closed and focus only on the lights and sounds. For the procedure to have maximum benefit, it is important that you keep your mind free of any thoughts and focus only on the flickering lights and pulsing sounds. If you find your mind wandering, focus your attention back to the pulsing lights and sounds.

We have experience using the APS in our laboratory. Research in our laboratory has shown that the APS can successfully reduce fears of specific objects and situations.

Do you have any questions? [Answer questions, and then give participant the RTQ]:

Say: *Now that you've learned about what type of treatment you will be getting, I'd like you to fill out this brief questionnaire.* [Participant fills out RTQ].

2. ORIENTATION TO BASIC INSTRUCTIONS AND EXPECTATIONS

This device records how often you are using it, so we will know how much practice you're getting at home when you return it at the end of the month. But we would also like you to complete online record forms after each home practice. They are very brief. The APS is also pre-programmed, such that it will automatically turn off at the end of its course, after about 20-30 minutes. We ask that you use the APS at least three times a week for a month. If you are unable to complete the entire session for some reason, you may turn it off in the middle by holding these two buttons down at the same time (demonstrate), which will end your session in two minutes. You may not get all the benefits if you repeatedly end sessions early, so we ask that you try to do the entire pre-programmed session each time. We will also ask you to return the device when you're done. Do you have any questions?

3. INTERVENTION TRAINING

Say: *We're going to start the intervention now. This is the APS device. Here is the button to press to turn it on. Then you'll need to press these buttons to get the program started* [get this information from the APS manual in the cabinet and have them follow along]. *You'll want to do this reclining in a comfortable chair or lying down. Just put these goggles on and the headphones on, sit back and relax, and close your eyes. I will leave you alone and come back in a while when the program is done. Then I'll ask you to complete a brief online record of your practice, which I'll ask you to do after every home session. I will give you a handout later on with the link for you to access the home*

practice logs. [Set participant up with APS and leave room. After done and you come back in, review the instructions for turning it on and off.]

What to tell participants if they are assigned to Waitlist Control:

Say: *You have been assigned to the wait-list control group. Because this is a research study, one group of participants will act as a control group. They will not get any treatment and will not participate in any intervention until after the initial month-long intervention phase. This is the group to which you have been assigned. You will be asked to complete a brief questionnaire once a week and a longer battery of questionnaires at the end of the month. After the month is over, you are encouraged to make an appointment with me to come in for an intervention training. You will be given instructions and training that will give you the tools to complete one of the active interventions at home. We will also be available for email and phone consultations if necessary.*

Appendix B.

Questionnaire Assessments Administered Online

Participant #_____
Date_____ Condition_____
Assessment Time (circle one): pre post fu

Academic Worry Questionnaire

The following questions refer to your worry about school. Please rate the degree to which you have experienced each of the following in the PAST WEEK:

1. Frequency: How often you worry about school performance.
0=never
1=rarely (1-2 worry episodes per week)
2=sometimes (3-5 worry episodes per week)
3=often (worry episodes almost every day or every day)
4=constantly (multiple worry episodes per day)

2. Duration: Total time spent worrying about school.
0=no time spent worrying
1=mild (less than 3 hours per week)
2=moderate (3-6 hours per week)
3=severe (between 1-3 hours per day)
4=extreme (more than 3 hours per day)

3. Average duration of a typical worry episode about school.
0=no time
1=mild (less than 15 minutes)
2=moderate (15-30 minutes)
3=severe (30-60 minutes)
4=extreme (more than 1 hour)

4. Anxiety **during** worry episodes about school
0=none
1=mild
2=moderate
3=severe
4=extreme

5. Distress about academic worry.
0=none
1=mild
2=moderate
3=severe

4=extreme

6. Control over academic worry.
0=none
1=very little
2=some control
3=moderate control
4=complete control

7. Rate the degree to which your worry assists you in coping with the demands or pressures of school.
0=worry is not at all helpful
1=minimally helpful (worry provides some assistance in helping me cope with school)
2=moderately helpful (worry provides moderate assistance in helping me cope with school demands)
3=very helpful (worrying provides a great deal of assistance in helping me cope with academic demands)
4=extremely helpful (I couldn't function in school without worrying about it)

8. Rate the degree to which you believe your worry is harmful or dangerous to your physical or emotional well being.
0=not at all harmful/dangerous
1=slightly harmful/dangerous
2=moderately harmful/dangerous
3=very harmful/dangerous
4=extremely harmful/dangerous

9. Life disruption/interference caused by worrying about school.
0=none
1=mild
2=moderate
3=severe
4=extreme

10. Use of specific actions taken in response to threats associated with academic worry (e.g. over-preparing for class or presentations, excessive studying, arriving extremely early to class, excessive assistance from other students or teaching assistant, seeking reassurance from professor that you will succeed in the class).
0=never
1=rarely
2=sometimes
3=most of the time
4=all of the time

Participant #_____
Date_____ Condition_____
Assessment Time (circle one): pre post fu

BDI-II

This questionnaire consists of 21 groups of statements. Please read each group of statements carefully, and then pick the one statement in each group that best describes the way you have been feeling during the past two weeks, including today. Circle the number beside the statement you have picked. If several statements in the group seem to apply equally well, circle the highest number for that group. Be sure that you do not choose more than one statement for any group, including Item 16 or Item 18.

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

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

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

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

5. Guilty Feelings
0 I don't feel particularly guilty
1 I feel guilty over many things I have done or should have done

2 I feel quite guilty most of the time
3 I feel guilty all of the time

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

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

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

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

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

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

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

13. Indecisiveness

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

14. Worthlessness

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

15. Loss of Energy

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

16. Changes in Sleeping Pattern

0 I have not experienced any change in my sleeping pattern
1a I sleep somewhat more than usual
1b I sleep somewhat less than usual
2a I sleep a lot more than usual
2b I sleep a lot less than usual
3a I sleep most of the day
3b I wake up 1-2 hours early and can't get back to sleep

17. Irritability

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

18. Changes in Appetite

0 I have not experienced any change in my appetite
1a My appetite is somewhat less than usual
1b My appetite is somewhat greater than usual
2a My appetite is much less than before
2b My appetite is much greater than usual
3a I have no appetite at all
3b I crave food all the time

19. Concentration Difficulty

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

20. Tiredness or Fatigue

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

21. Loss of Interest in Sex

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

Participant #_____
Date_____ Condition_____
Assessment Time (circle one): pre post fu

WORRY QUESTIONNAIRE

INSTRUCTIONS: Rate each of the following items according to how typical each is of you. Put your rating (1-5) next to the number of each item.

1	2	3	4	5
Not at all typical	Somewhat typical		Very typical	

_____ 1. If I don't have enough time to do everything, I don't worry about it.

_____ 2. My worries overwhelm me.

_____ 3. I don't tend to worry about things.

_____ 4. Many situations make me worry.

_____ 5. I know I shouldn't worry about things, but I just can't help it.

_____ 6. When I am under pressure, I worry a lot.

_____ 7. I am always worrying about something.

_____ 8. I find it easy to dismiss worrisome thoughts.

_____ 9. As soon as I finish one task, I start to worry about everything else I have to do.

_____ 10. I never worry about anything.

_____ 11. When there is nothing more I can do about a concern, I don't worry about it anymore.

_____ 12. I've been a worrier all my life.

_____ 13. I notice that I have been worrying about things.

_____ 14. Once I start worrying, I can't stop.

_____ 15. I worry all the time.

_____ 16. I worry about projects until they are done.

Meta Cognitions Questionnaire

Participant #_____

Date_____ Condition_____

Assessment Time (circle one): pre post fu

MCQ-30

Adrian Wells & Samantha Cartwright-Hatton (1999)

This questionnaire is concerned with beliefs people have about their thinking. Listed below are a number of beliefs that people have expressed. Please read each item and say how much you <u>generally</u> agree with it by <u>circling</u> the appropriate number.
Please respond to all the items, there are no right or wrong answers.

Please describe how true the statement has been for you in the PAST MONTH:

		Do not agree	Agree slightly	Agree moderately	Agree very much
1.	**Worrying helps me to avoid problems in the future**	**1**	**2**	**3**	**4**
2.	**My worrying is dangerous for me**	**1**	**2**	**3**	**4**
3.	**I think a lot about my thoughts**	**1**	**2**	**3**	**4**
4.	**I could make myself sick with worrying**	**1**	**2**	**3**	**4**
5.	**I am aware of the way my mind works when I am thinking through a problem**	**1**	**2**	**3**	**4**
6.	**If I did not control a worrying thought, and then it happened, it would be my fault**	**1**	**2**	**3**	**4**
7.	**I need to worry in order to remain organised**	**1**	**2**	**3**	**4**
8.	**I have little confidence in my memory for words and names**	**1**	**2**	**3**	**4**

9.	**My worrying thoughts persist, no matter how I try to stop them**	**1**	**2**	**3**	**4**
10	**Worrying helps me to get things sorted out in my mind**	**1**	**2**	**3**	**4**
11.	**I cannot ignore my worrying thoughts**	**1**	**2**	**3**	**4**
12.	**I monitor my thoughts**	**1**	**2**	**3**	**4**
13.	**I should be in control of my thoughts all of the time**	**1**	**2**	**3**	**4**
14.	**My memory can mislead me at times**	**1**	**2**	**3**	**4**
15.	**My worrying could make me go mad**	**1**	**2**	**3**	**4**
16.	**I am constantly aware of my thinking**	**1**	**2**	**3**	**4**
17.	**I have a poor memory**	**1**	**2**	**3**	**4**
18.	**I pay close attention to the way my mind works**	**1**	**2**	**3**	**4**
19.	**Worrying helps me cope**	**1**	**2**	**3**	**4**
20.	**Not being able to control my thoughts is a sign of weakness**	**1**	**2**	**3**	**4**
21.	**When I start worrying, I cannot stop**	**1**	**2**	**3**	**4**
22.	**I will be punished for not controlling certain thoughts**	**1**	**2**	**3**	**4**

23.	**Worrying help me to solve problems**	**1**	**2**	**3**	**4**
24.	**I have little confidence in my memory for places**	**1**	**2**	**3**	**4**
25.	**It is bad to think certain thoughts**	**1**	**2**	**3**	**4**
26.	**I do not trust my memory**	**1**	**2**	**3**	**4**
27.	**If I could not control my thoughts, I would not be able to function**	**1**	**2**	**3**	**4**
28.	**I need to worry, in order to work well**	**1**	**2**	**3**	**4**
29.	**I have little confidence in my memory for actions**	**1**	**2**	**3**	**4**
30.	**I constantly examine my own thoughts**	**1**	**2**	**3**	**4**

Participant #_____
Date_____ Condition_____
Assessment Time (circle one): pre post fu

Perceived Stress Scale

Directions: The questions in this scale ask you about your feelings and thoughts **during the last month.** In each case, you will be asked to indicate ***how often*** you felt or thought a certain way.

For each question choose from the following alternatives:

1. never
2. almost never
3. sometimes
4. fairly often
5. very often

1. In the last month, how often have you been upset because of something that happened unexpectedly?

- ☐ never
- ☐ almost never
- ☐ sometimes
- ☐ fairly often
- ☐ very often

2. In the last month, how often have you felt that you were unable to control the important things in your life?

- ☐ never
- ☐ almost never
- ☐ sometimes
- ☐ fairly often
- ☐ very often

3. In the last month, how often have you felt nervous and "stressed"?

- ☐ never
- ☐ almost never

- ☐ sometimes
- ☐ fairly often
- ☐ very often

4. In the last month, how often have you felt confident about your ability to handle your personal problems?

- ☐ never
- ☐ almost never
- ☐ sometimes
- ☐ fairly often
- ☐ very often

5. In the last month, how often have you felt that things were going your way?

- ☐ never
- ☐ almost never
- ☐ sometimes
- ☐ fairly often
- ☐ very often

6. In the last month, how often have you found that you could not cope with all the things that you had to do?

- ☐ never
- ☐ almost never
- ☐ sometimes
- ☐ fairly often
- ☐ very often

7. In the last month, how often have you been able to control irritations in your life?

- ☐ never
- ☐ almost never
- ☐ sometimes

- ☐ fairly often
- ☐ very often

8. In the last month, how often have you felt that you were on top of things?

- ☐ never
- ☐ almost never
- ☐ sometimes
- ☐ fairly often
- ☐ very often

9. In the last month, how often have you been angered because of things that were outside of your control?

- ☐ never
- ☐ almost never
- ☐ sometimes
- ☐ fairly often
- ☐ very often

10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

- ☐ never
- ☐ almost never
- ☐ sometimes
- ☐ fairly often
- ☐ very often

SF-36

This survey asks you for your views about your health. This information will help us track how you feel and how well you are able to do your usual activities. Answer every question by selecting the answer as indicated. If you are unsure about how to answer a question, please give the best answer you can.

1. In general, would you say your health is:
Excellent
Very Good
Good
Fair
Poor

2. Compared to one year ago, how would you rate your health in general now?
   Much better now than one year ago
   Somewhat better now than one year ago
   About the same as one year ago
   Somewhat worse than one year ago
   Much worse now than one year ago

The following questions are about activities you might do during a typical day. Does your health now limit these activities? If so, how much?

	Yes, limited a lot	Yes, limited a little	No, not limited at all
3. Vigorous activities, such as running, lifting heavy objects, participating in strenuous sports			
4. Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf			
5. Lifting or carrying groceries			
6. Climbing several flights of stairs			
7. Climbing one flight of stairs			
8. Bending, kneeling, or stooping			
9. Walking more than a mile			
10. Walking several hundred yards			
11. Walking one hundred yards			
12. Bathing or dressing yourself			

During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of your physical health?

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
13. Cut down on the amount of time you spent on work or other activities					

14. Accomplished less than you would like					
15. Were limited in the kind of work you would like					
16. Had difficulty performing the work or other activities (for example, it took extra effort)					

During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a results of any emotional problems (such as feeling depressed or anxious)?

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
17. Cut down on the amount of time you spent on work or other activities					
18. Accomplished less than you would like					
19. Did work or activities less carefully than usual					

20. During the past 4 weeks, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?
Not at all
Slightly
Moderately
Quite a bit
Extremely

21. How much bodily pain have you had during the past 4 weeks?
None
Very Mild
Mild
Moderate
Severe
Very Severe

22. During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?
Not at all
A little bit
Moderately
Quite a bit
Extremely

These questions are about how you feel and hoe things have been with you during the past 4 weeks. For each question, please give the one answer that comes closest to the way you have been feeling.

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
23. How much of the time during the past 4 weeks did you feel full of life?					
24. How much of the time during the past 4 weeks have you been very nervous?					
25. How much of the time during the past 4 weeks have you felt so down in the dumps that nothing could cheer you up?					
26. How much of the time during the past 4 weeks have you felt calm and peaceful?					
27. How much of the time during the past 4 weeks did you have a lot of energy?					
28. How much of the time during the past 4 weeks have you felt downhearted and depressed?					
29. How much of the time during the past 4 weeks did you feel worn out?					
30. How much of the time during the past 4 weeks have you been happy?					
31. How much of the time during the past 4 weeks did you feel tired?					
32. During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting friends, relatives, etc.)?					

How TRUE or FALSE is each of the following statements for you?

	Definitely true	Mostly true	Don't know	Mostly false	Definitely false
33. I seem to get sick a little easier than other people					
34. I am as healthy as anybody I know					

35. I expect my health to get worse					
36. My health is excellent					

Assessment of Treatment Activities

Participant ID Number_____

Please think back to the treatment intervention you were assigned to complete. There were four different treatment conditions, and each of them was meant to do certain things and help in different ways.

Remember to answer the questions based on what happened and what you did WHILE you were practicing your intervention at home, rather than how you felt afterwards or after the study. There are no right or wrong answers. Some statements may sound like things you did a lot, and some things not at all.

PART A
Please choose YES or NO for the following 5 items if you did them as an integral part of your treatment.

1. I listened to a tape
YES/NO

2. I wrote about my academic worries
YES/NO

3. I used a programmed headset and goggles
YES/NO

4. I focused on mental images that make me worry
YES/NO

5. I focused on expressing my feelings about school through words
YES/NO

PART B
Please indicate on a 0-10 scale how much you agree with each statement. Please choose any whole number between 0 and 10:

1. The treatment usually made me feel relaxed WHILE I was administering it
0=disagree completely; 10=completely agree_____

2. The treatment distracted me from my worries WHILE I administered it
0=disagree completely; 10=completely agree_____

3. I expressed my inner thoughts and feelings about academic worry-related topics DURING the administration of my intervention

0=disagree completely; 10=completely agree_____

4. I focused on and paid attention to the content of the worries I was having WHILE I practiced my intervention
0=disagree completely; 10=completely agree_____

5. I usually created and focused on mental images related to worry-provoking scenarios I had about school DURING the administration of my intervention
0=disagree completely; 10=completely agree_____

6. I focused on worry-related images DURING my home practice of my intervention
0=disagree completely; 10=completely agree_____

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Vita

Kate Wolitzky-Taylor was born and raised in Tucson, Arizona. She obtained her bachelors degree from Emory University in Atlanta, Georgia in May of 2002. Kate graduated with highest honors, majoring in psychology and minoring in art history. After working as a case manager for a non-profit behavioral health center serving low-income individuals with mental health needs, she began the doctoral program in Clinical Psychology at The University of Texas at Austin in the fall of 2003. Since then, Kate has been studying the nature and treatment of anxiety disorders under the supervision of Michael J. Telch, Ph.D. in the Laboratory for the Study of Anxiety Disorders in the Department of Psychology. She is the first author on four peer-reviewed journal articles and is co-author on four other journal articles. She received the Ruth Kirchstein National Research Service Award (NRSA) Individual Predoctoral Fellowship in the fall of 2005 from the National Institutes of Mental Health. Beginning in August 2008, she will be a Psychology Intern at the Medical University of South Carolina.

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