

The Efficacy of Stimulus Control Training for Worry

BY

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THESIS

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LIST OF ABBREVIATIONS

AT	Acceptance Training
ANOVA	Analysis of variance
AR	Applied Relaxation
BAI	Beck Anxiety Inventory
BDI	Beck Depression Inventory
CEQ	Credibility and Expectancy Questionnaire
<i>d</i>	Effect Size
df	Degrees of Freedom
DSM	Diagnostic and Statistical Manual
DWQ	Daily Worry Questionnaire
GAD	Generalized Anxiety Disorder
IEP	Interpersonal and Emotional Therapy
ISI	Insomnia Severity Index
<i>M</i>	Mean
<i>n</i>	Number in Subgroup
<i>N</i>	Number in Total Group
<i>ns</i>	Nonsignificant
<i>p</i>	Probability
PANAS	Positive and Negative Affect Scale
PSWQ	Pennsylvania State Worry Questionnaire
PMR	Progressive Muscle Relaxation
<i>r</i>	Correlation
<i>SD</i>	Standard Deviation

SCD	Self Control Desensitization
χ^2	Chi-Square
z	Standard Score

SUMMARY

Although worry is a part of the human experience, excessive worry is a central symptom of generalized anxiety disorder (GAD). For individuals with GAD, worry becomes associated with numerous aspects of life (e.g., time of day, specific stimuli, environmental cues) and is thus under poor stimulus control. Additionally, excessive worry is associated with sleep difficulties and poor sleep quality. This investigation seeks to provide empirical support for the use of stimulus control procedures in the treatment of worry. Forty-six participants were randomly assigned to receive two weeks of either Stimulus Control training (consisting of a 30-minute time-and place-restricted worry period each day) or Acceptance Training (consisting of the non-avoidance of worry), which served as a placebo control condition. The Stimulus Control Training condition was superior to the Acceptance Training condition at post-training on measures of worry, anxiety, negative affect, and insomnia symptoms. Additionally, Stimulus Control Training produced greater clinically significant change compared to Acceptance Training on measures of worry, anxiety, and depression. Results support the efficacy of Stimulus Control Training for worry and suggest the utility of including these techniques in larger treatment packages for GAD.

I. INTRODUCTION

Worry is a common cognitive human experience. Worry can be defined as mental activity, usually negative in nature, about uncertain outcomes of potential future events (Mennin, Heimberg, & Turk, 2004). In excess, however, worry is the central symptom of generalized anxiety disorder (GAD). In GAD, worry is pervasive and maladaptive, and interferes with daily functioning. GAD worry is not focused on any one specific fear, as are other anxiety disorders, but instead encompasses a multitude of frequent worries about a variety of topics. Indeed, pervasive and uncontrollable worry about several topics is among the diagnostic criteria for GAD in the fourth edition of the Diagnostic and Statistical Manual (DSM-IV; American Psychiatric Association [APA], 1994). In the sense that worry and future-oriented cognitive activity help prepare individuals for future threat, it is evolutionarily advantageous. The ability to remember past events and anticipate, plan for, and adjust behavior for future events is beneficial for survival. When behavioral avoidance is not possible, worry is a protective activity in that it is an attempt to problem solve and prepare for a possible future danger. Such advanced cognitive abilities distinguish humans from other animals.

A. The Avoidance Theory of Worry

According to Mowrer's (1947) two-stage theory of fear, fearful associations emerge via classical conditioning and are maintained via operant conditioning. Successful avoidance of feared stimuli results in short-term decreases in negative states, which result in avoidance strategies becoming negatively reinforced. One common belief among individuals with GAD is that worry helps them to prepare for future negative events. However, the content of the worry is usually focused on events that are unlikely to occur (Borkovec, Hazlett-Stevens, & Diaz, 1999). Therefore, worry is reinforced by the nonoccurrence of these feared events, and individuals'

belief in the efficacy of their worry is strengthened, thus leading to an increase in the frequency of worry.

Lang (1977) proposed that fear is represented through different propositional structures that include two types of information: (1) information about the feared situation or stimulus and (2) information about response mechanisms, including physiological, behavioral, and verbal responses. According to Foa and Kozak (1986), a fear structure is unique in its inclusion of an exaggerated response element (e.g., physiological, and behavioral) and by its inability or resistance to change. In order to change an existing pathological fear structure, the feared stimulus must be presented along with non-threatening factors that are not included in the fear structure such that new memories can be formed. Additionally, Foa and Kozak (1986) suggest that complete activation of the fear structure (including greater physiological activation in response to the feared stimulus) is necessary for eventual habituation and extinction of the feared response.

Unlike other anxiety disorders, an increase in physiological reactivity during exposure to feared stimuli is not observed in individuals with GAD (cf. Hofmann, Moscovitch, Litz, Hyo-Jin, Davis, & Pizzagalli, 2005). Extant research supports the assertion that worry acts to reduce internal somatic and emotional distress. For example, Borkovec and Hu (1990) randomly assigned college undergraduates with a fear of public speaking to engage in relaxed, neutral, or worry states prior to engaging in imagery of giving a public speech. Results indicated that participants in the relaxation condition had significantly higher cardiovascular responses during subsequent speech images than did participants in the neutral condition, who in turn had significantly higher cardiovascular responses to the speech imagery than did those in the worry condition. Results from this study suggest that worry may serve to inhibit cardiovascular

reactivity during subsequent fear-relevant stimuli (Borkovec & Hu, 1990). In a replication and extension of this study, Hazlett-Stevens and Borkovec (2001) investigated autonomic reactivity in speech phobic individuals prior to and during *in vivo* exposures to the feared stimuli. Participants were randomly assigned to engage in progressive muscle relaxation (PMR), worry, or a neutral control procedure prior to repeated *in vivo* speech presentations. Results indicated that while physiological responding did not differ across the three conditions throughout the subsequent repeated speech presentations, the worry group reported greater subjective ratings of anxiety than the progressive muscle relaxation or control groups (Hazlett-Stevens & Borkovec, 2001). Although this study found no between-groups differences in physiological reactivity to the speech stressor, there were differences in subjective ratings of anxiety across the speech presentations. The elevated subjective ratings of anxiety in the worry condition during the repeated speeches suggest a maintenance of anxious meaning, an element of the fear structure, thus precluding extinction due to incomplete processing of corrective information. Finally, Borkovec, Lyonfields, Wisner, and Diehl (1992) investigated physiological and subjective responses of speech phobic individuals while engaging in five types of mentation prior to imagining a phobic scene: relaxation, general worry, worry while focusing on images, worry while focusing on thoughts, or worry while focusing on affect. Results indicated that all four worry groups reported greater fear and vividness in response to phobic images than did the relaxation group (Borkovec et al., 1993). Additionally, the relaxation group had greater cardiovascular responses to the phobic image than did the thought-worry group, with the other types of worry falling nonsignificantly between the two groups. These findings support the claim that worrisome thinking acts to reduce physiological reactivity during subsequent fear-relevant material, and offer evidence in support of the cognitive avoidance theory of worry.

Decreases in physiological activation as a result of worry are negatively reinforcing, leading to an increased frequency of worry as a way to reduce aversive states.

Worry's inhibitory effects on cardiovascular reactivity are likely the result of worry's qualitative property. Importantly, worry has been found to be predominantly verbal-linguistic as opposed to imagery-based in nature (Behar, Zullig, & Borkovec 2005; Borkovec & Inz, 1990). Borkovec and Inz (1990) found that during relaxation, non-anxious participants reported mental content that was predominantly imagery-based, while participants with GAD reported a relatively equal proportion of imagery and verbal-linguistic thought. However, during worry periods, non-anxious participants reported greater verbal-linguistic thought activity than in the relaxation condition. Additionally, Vrana, Cuthbert, and Lang (1986) found that participants who engaged in verbal-linguistic activity about fearful material had a lower physiological response than did participants who engaged in imagery about the same fearful material. Thus, worry's verbal-linguistic nature may be at least partially responsible for its inhibitory effects on physiological reactivity.

Most anxiety disorders are characterized by fear of discrete stimuli (e.g., public situations for an individual with social anxiety disorder). However, the lack of an identifiable core fear in worry and instead a broad range of poorly defined constructs and future-oriented negative events limits our ability to design efficacious exposure-based behavioral treatments for GAD. As discussed above, pervasive worry is theorized to be a form of cognitive avoidance and, due to its verbal-linguistic nature, is associated with inhibited physiological reactivity. According to Foa and Kozak (1986), this lack of physiological arousal is indicative of incomplete accessions of the fear structure, which theoretically is a necessary condition for eventual habituation and

extinction. As a result, existing treatment packages for GAD focus on other areas of maladaptive functioning that are targeted by specific therapeutic techniques.

B. Psychotherapeutic Approaches to GAD

Given the fact that worry is characterized by cognitive (as opposed to behavioral) avoidance, traditional exposure-based therapy is not applicable in the treatment of GAD. Instead, protocol treatment packages for GAD focus on six major areas of maladaptive functioning: awareness, physiology, cognition, interpersonal behaviors, emotions, and behaviors. The first five components of treatment will be briefly reviewed below, followed by a detailed explanation of behavioral components in the treatment of GAD, given their applicability to the proposed study.

1. Maladaptive awareness. Individuals with GAD have poor awareness of their internal states and of their external realities, and spend large amounts of time worrying about future events (Dugas, Freeston, Ladouceur, Rheume, Provencher, & Boisvert, 1998). Anxious individuals also tend to interpret ambiguous information as threatening (Mogg, Bradley, Miller, & Potts, 1994). Such catastrophic predictions and biased interpretations of events lead to overall maladaptive awareness in individuals with GAD. In treating maladaptive awareness, therapists focus on helping clients improve their self-monitoring skills. By understanding how internal states interact with each other and with external stimuli, clients can begin to control their levels of anxiety.

2. Maladaptive physiology. Individuals with GAD also have rigid physiological functioning and poor insight into their somatic experiences. As mentioned earlier, individuals with GAD subjectively report increases in autonomic symptoms, but objective measures do not support those self-reports. Treatment for maladaptive physiological functioning in GAD

includes training in relaxation methods. In applied relaxation (AR), clients are taught how to reach a state of relaxation when faced with feared stimuli, or when they begin to feel anxious (Öst, 1987). The therapist first explains the rationale for AR to client and spends the first few sessions helping the client relax his/her entire body using progressive muscle relaxation (PMR), in which specific muscle groups are tensed and then released. Clients practice these exercises between sessions and become skilled enough in AR that they can easily and quickly place themselves in a state of relaxation. Eventually, clients are asked to engage in worry and then practice deploying their relaxation skills in the moment. Clients are also taught diaphragmatic breathing methods, in which they are instructed to breathe slowly through the diaphragm instead of engaging in rapid and shallow chest breathing. Finally, clients are taught to engage in relaxing imagery and meditation techniques in order to achieve deep states of relaxation.

3. Maladaptive cognitive styles. Individuals with GAD also have many maladaptive cognitions. Cognitive therapy for GAD (adapted from Beck, 1976) focuses on identifying these maladaptive cognitions and challenging them, with the goal of helping clients achieve greater flexibility in their thinking. Clients learn skills to assess the accuracy of their daily cognitions, challenge them, and develop alternative explanations and perspectives for those cognitions. Therapists also aid cognitive change with the use of worry diaries, in which clients record: (1) their worries; (2) the feared outcomes of their worries; (3) how the outcomes, if they occur, compared to their original feared outcomes; and (4) how well they coped with the outcome of worries that materialized. This technique allows clients to realize that the majority of their worries do not come true and that when they do, they are better prepared to handle those situations than they initially expected (Borkovec, Hazlett-Stevens, & Diaz, 1999).

4. Maladaptive interpersonal styles. Maladaptive interpersonal behaviors are also central to GAD clients' experiences. Borkovec, Newman, Pincus, and Lytle (2002) found that interpersonal difficulties, as measured by the Inventory of Interpersonal Problems Circumplex Scales (IIP-C), following cognitive behavioral therapy predicted poorer outcomes, suggesting the possible utility of adding interpersonal treatments to cognitive-behavioral therapy to increase its efficacy. In interpersonal and emotional processing therapy (IEP; Newman, Castonguay, Borkovec, & Molnar, 2004), therapists and clients work to improve interpersonal skills by identifying the maladaptive ways in which clients behave in specific interpersonal situations. The therapist encourages the client to critically examine past interpersonal exchanges and work to develop better responses in the future. Furthermore, the therapist-client relationship is used as an example of a positive and adaptive interpersonal relationship.

5. Maladaptive emotional experiences. Individuals with GAD have difficulty processing and describing their emotions (Yamas, Hazlett-Stevens, & Borkovec, 1997). Additionally, they show difficulty managing emotions (specifically, in recovering from negative moods), as well as negative beliefs about emotional experiences (Mennin, Heimberg, Turk, & Fresco, 2005). Treatment in this area of maladaptive functioning includes focusing on emotional difficulties in GAD. In the emotional element of IEP, the therapist aids the client in developing a deeper emotional awareness and exposes the client to emotions (both positive and negative) that the client might habitually avoid.

6. Maladaptive behaviors. Individuals with GAD show subtle signs of behavioral avoidance (Butler, Cullington, Hibbert, Klimes, & Gelder, 1987), and therapists accordingly encourage clients to approach such situations. However, given that *in vivo* exposure techniques are inappropriate in the treatment of GAD, behavioral techniques focus instead on self-control

desensitization (SCD; Goldfried, 1971) and stimulus control techniques. In SCD, clients use vivid imagery and relaxation skills in combination to rehearse coping responses. While engaged in vivid imagery about anxiety-provoking situations, when clients report the onset of anxiety cues, they are instructed to utilize previously learned relaxation skills in the scene until the anxiety is reduced. They are further instructed to continue to imagine relaxing in the situation, allowing them to further experience successful relaxation during the fearful imagery. This technique is rehearsed until the image fails to elicit an anxious response from the client.

A second behavioral approach in the treatment of GAD is the use of stimulus control procedures. The rationale behind stimulus control treatment for worry comes from Bootzin's (1972) stimulus control treatment for insomnia. Indeed, this procedure's presumed applicability to the treatment of GAD was originally based on findings regarding the frequent co-occurrence of GAD and sleep disturbance. Insomnia affects a large portion of the population and is highly co-morbid with a number of psychological disorders, especially anxiety and depression (Ree & Harvey, 2004). Insomnia can be a risk factor for many psychological disorders as well as a result of pre-existing psychological disorders. Insomnia and anxiety symptoms commonly co-occur. Additionally, individuals with anxiety disorders (especially GAD) often report the inability to fall asleep as a result of excessive worry while trying to engage in sleep (Monti & Monti, 2000). In the National Institute of Mental Health Catchment Area Study, Ford and Kamerow (1989) found that anxiety disorders were some of the more common disorders diagnosed in individuals who complained of insomnia. Finally, Mellinger, Balter, and Uhlenhuth (1985) found that among patients with severe sleep disturbances, 42% reported elevated anxiety symptoms and 13% of those patients reported symptoms typical of GAD when using clusters for symptoms.

One theory regarding the etiology of insomnia posits that individuals with insomnia have come to associate the physical properties of their bedroom with an inability to fall or remain asleep (i.e. their sleep is under poor stimulus control). To treat such sleep pathology, the principles of sleep hygiene and stimulus control for insomnia are utilized (Bootzin, 1972). As part of sleep hygiene, clients are asked to follow a set of rules that are designed to promote a better sleep environment and sleep routine (e.g., awaken at the same time each day, maintain a bedroom environment that is conducive to sleep). As part of stimulus control treatment, clients are given six core principles to follow, which focus on limiting activities in the bedroom to those that are conducive to sleep. The goal of stimulus control treatment is to reestablish the bedroom as a conditioned stimulus that will promote sleep onset as the conditioned response. Empirical investigations have provided strong support for the efficacy of stimulus control techniques in the treatment of insomnia (e.g. Espie, Lindsay, Brooks, Hood, & Turvey, 1989; Lacks, Bertelson, Sugerman, & Kunkel, 1983; Riedel, Lichstein, Peterson, Means, Epperson, & Aguillarel, 1998).

The same rationale for and principles of stimulus control for insomnia have been applied to the behavioral treatment of GAD. For individuals with GAD, worry has become associated with numerous aspects of daily life (e.g., time of day, specific stimuli, environmental cues) and is thus under poor stimulus control. In order to break such maladaptive associations, clients are taught to utilize principles of stimulus control in their attempts to gain greater control over the incidence of worry.

In stimulus control for worry, clients are provided with four general rules: (1) identify worrisome and unpleasant thoughts and learn to distinguish those from other more pleasant thoughts; (2) establish a 30-minute “worry period” to occur at the same time and in the same location; (3) delay spontaneous worry to the worry period and instead focus on the present

moment; and (4) use the 30-minute worry period to worry about concerns and problem solve to reduce or eliminate concerns (Borkovec, Wilkinson, Folensbee, & Lerman, 1983).

Unlike the other components of treatment for GAD reviewed above, stimulus control for worry has limited empirical support. Only one study known to the author has investigated the efficacy of stimulus control for worry (Borkovec et al., 1983). This investigation consisted of two experiments with identical protocols, except that Experiment 2 had an additional treatment group. Participants were selected from an introductory psychology class if they reported that they worried at least 50% of the time. In Experiment 1, participants were randomly assigned to either a stimulus control treatment or to a waiting list no-treatment condition. In Experiment 2, participants were randomly assigned to one of two stimulus control conditions (Written or Mental Worry period) or to a waiting-list no-treatment control condition. All participants were given Daily Worry Questionnaires (DWQs) to complete each day during a one-week baseline assessment period. Following this baseline assessment, participants in the stimulus control training condition(s) were asked to continue completing DWQs each day for the 4-week treatment and were given instructions for stimulus-control treatment of worry as detailed above (Borkovec et al., 1983). In Experiment 2, participants in the Mental-Worry condition were asked to worry mentally while engaged in their worry period, whereas participants in the Written-Worry condition were given additional instructions to write their thoughts while engaged in their worry period. Participants in the no-treatment condition were not given any additional instructions and were asked to continue filling out DWQs throughout the treatment period. DWQs were used to measure the percentage of time that participants worried or felt tense throughout the treatment period. Additionally, participants rated the severity of tension they experienced, and the degree to which their worry content for that day related to six topics: past

experiences, present-moment experiences, future experiences, solving problems, realistic changes the participant would like to make, and unrealistic changes the participant would like to make (Borkovec et al., 1983).

Results indicated that in both experiments, participants in the stimulus control group evidenced significant decreases in daily worry relative to participants in the no-treatment condition. In Experiment 1, participants in the stimulus control condition reported greater reductions in the percent of the day spent worrying and in the amount of focus on unrealistic change relative to those in the no-treatment condition. In Experiment 2, participants in both stimulus control conditions reported greater reductions in the daily percentage of worry and daily percentage of tension relative to those in the no-treatment condition. The two stimulus control treatment conditions in Experiment 2 did not differ from each other on any measure.

A major methodological limitation of this investigation is that it failed to include a placebo condition, introducing numerous rival hypotheses to explain observed differences between the stimulus control and no-treatment conditions. Thus, the current study sought to provide empirical support for the use of stimulus control procedures for worry by comparing the efficacy of stimulus control to a condition in which worry is not subject to discrimination training, but rather occurs throughout the day without limitations to time or place.

C. The Present Study

The present study was a replication and extension of the Borkovec et al. (1983) investigation. The goal of this study was to test the efficacy of stimulus control for worry among high trait worry individuals in (a) alleviating subjective reports of symptomatic functioning and (b) enhancing sleep quality. As discussed earlier, worry becomes associated with a large number of internal and external cues (time of day, specific locations, certain circumstances, etc.) and is

pervasive throughout the day, often causing distress and impairment. The goal of restricting worry to a specific time and location is to help individuals develop an enhanced ability to experience worry in the presence of discriminative stimuli, so that daily experiences do not act as cues for the onset of worrisome thinking.

It was hypothesized that among individuals with high trait levels of worry, in comparison to Acceptance Training, a Stimulus Control Training (consisting of time/place-restricted worry with delay-of-worry instructions) would lead to (a) ameliorations in subjective reports of symptomatic functioning; and (b) enhanced subjective reports of sleep quality.

Participants were first asked to complete baseline measures of trait worry, state anxiety, depression, positive and negative affect, and insomnia symptoms. Participants in the Stimulus Control condition were asked to identify a consistent daily 30-minute worry period to take place in a specific time and location, and to delay spontaneous worry throughout the day to this worry period. Participants in the Acceptance Training condition were instructed to worry as they normally do without delaying spontaneous worry and physical location during any worry periods was not specified or restricted. Following two weeks of training, all participants completed post-training measures to assess trait worry, state anxiety, depression, positive and negative affect, and sleep disturbance.

II. METHOD

A. Participants

Fifty-three introductory psychology students from the University of Illinois at Chicago were included in this investigation. Participants were invited to participate if they scored 67 or higher on the Penn State Worry Questionnaire (PSWQ; Meyer, Miller, Metzger, & Borkovec, 1990), which was administered as part of a group screening process. This score has been shown to distinguish GAD individuals from non-anxious individuals (Molina & Borkovec, 1994). Participants were included in the study if they scored 53 or higher on the PSWQ at the baseline assessment. This score has been shown to be one standard deviation above the mean of normal individuals (Gillis, Haaga, & Ford, 1995). On average, participants' scores on the PSWQ decreased from the group screening administration to the baseline assessment ($M = -4.00$, $SD = 6.44$), however, participants still evidenced elevated PSWQ scores at the baseline assessment ($M = 67.85$, $SD = 5.78$). Seven participants' data were excluded from analyses because the participants did not provide enough data (more than 30% missing data, $n = 4$ [3 in SC and 1 in AT]), or no longer met the inclusionary criteria at the baseline assessment ($n = 1$ in SC), or dropped out of the study for personal reasons prior to being randomly assigned to a condition ($n = 2$). Remaining participants were predominantly female (82.6%), with a mean age of 19.9 years ($SD = 3.8$ years). Our sample was ethnically diverse and was comprised of 43.5% Caucasian, 10.9% African-American, 19.6% Asian, 13.0% Latino, and 13.0% Other participants. Participants included in the analyses did not differ from excluded participants with respect to age ($t[50] = -0.98$, ns), sex ($\chi^2[1] = 0.00$, ns), ethnicity ($\chi^2[1] = 1.62$, ns) or race ($\chi^2[7] = 7.33$, ns). Race, ethnicity, and gender were equivalent across the two experimental conditions; however, age was not equivalent (SC: $M = 21.00$, $SD = 5.00$; AT: $M = 18.74$, $SD = 1.45$, $t[44] = -2.08$, $p <$

.05) and was therefore included as a covariate in all analyses. The purpose and hypothesis of the study was masked throughout the experiment (as detailed below). Participants were randomly assigned to either Stimulus Control Training (n = 23) or Acceptance Training (n = 23).

Participants received class credit as compensation for participation in the experiment.

B. Procedure

1. Pre-Training. Following participants' consent to take part in the study, they were asked to complete pre-training measures including the Penn State Worry Questionnaire (PSWQ), the Beck Anxiety Inventory (BAI), the Beck Depression Inventory (BDI), the Positive and Negative Affect Schedule – General (PANAS-General), and the Insomnia Severity Index (ISI). The experimenter met with each participant individually to explain the training instructions. All instructions were scripted in order to ensure consistency of information across participants. After participants demonstrated understanding of their assigned training condition, they were asked to complete the Credibility and Expectancy Questionnaire (Borkovec & Nau, 1972) to allow for testing of potential between-groups differences in the degree to which the two types of training were perceived as credible and the degree to which each elicited expectancy for improvement. Participants were also provided with written materials that reiterated the rationale for the training procedure and all instructions that had been delivered by the experimenter. Participants completed the experimental protocol over a fourteen day period¹.

2. Stimulus Control condition. The experimenter first provided participants with the rationale for Stimulus Control Training. Participants were told that when worry occurs throughout the day, it can become associated with many places, times, and situations, such that

¹ Participants also provided multiple daily assessments of affect and the content of their worries through personal data assistant (PDA) technology, but this data is not presented in the current manuscript.

over time mere exposure to those places, times, and/or situations can come to elicit spontaneous worry. The goal of Stimulus Control Training is to limit the amount of worry that occurs throughout the day by gradually coming to associate worry with more distinct and specific times and locations, so that only those times and locations come to elicit worry. Participants were given the same four instructions as outlined earlier from Borkovec et al. (1983). Specifically, they were asked to identify a 30-minute worry period each day. They were told that this period must be at the same time each day and that it must always take place in the same location. Importantly, this worry period needed to take place at least 3 hours before bedtime so that the worry process would not interfere with participants' ability to fall asleep, given that worry and anxiety that occur before bedtime can lead to increased subjective reporting of insomnia and daytime fatigue (Chambers & Kim, 1993). During this time, participants were instructed to worry as they normally do, but as intensely as possible and to keep the focus of their attention on the worry process. Finally, they were instructed to postpone spontaneous worry to the worry period and instead focus on the present-moment experience.

3. Acceptance Training condition. Participants in the Acceptance Training condition were told that people often try to avoid the occurrence of worry throughout the day, which paradoxically leads to increased levels of worry and anxiety. They were told that the goal of this training program was to not avoid spontaneous worry in order to decrease the frequency and intensity of paradoxical increases in anxious thoughts and emotions. Participants were instructed to worry as they normally do, but as intensely as possible and to keep the focus of their attention on the worry process in order to ensure that they were not avoiding worry.

4. Post-Training. At the post-training session, participants were asked to complete the same measures that were given at the pre-training session. Upon completion, participants were

given a debriefing form that informed the participants about the purpose of the two training conditions.

5. Measures of symptomatic functioning. Participants were asked to fill out the following measures during the pre- and post-training sessions to assess trait levels of worry, state levels of anxiety, depression, positive and negative affect, and sleep quality.

a. Penn State Worry Questionnaire (PSWQ; Meyer et al., 1990). The PSWQ is a 16-item self-report questionnaire that assesses the frequency and intensity of worry. The PSWQ has demonstrated favorable reliability and validity for both clinical and nonclinical populations (Brown, Antony, & Barlow, 1992). The PSWQ has excellent retest reliability (0.92) and internal consistency (0.93; Meyer et al., 1990). It has good sensitivity (0.75) and specificity (0.86), as well as the ability to distinguish GAD samples from non-anxious controls and from other anxiety groups (Behar, Alcaine, Zuellig, & Borkovec, 2003; Brown et al., 1992).

b. Beck Anxiety Inventory (BAI; Beck, Epstein, Brown & Steer, 1988). The BAI is a 21-item self-report questionnaire that measures severity of anxiety. The BAI has favorable internal consistency (0.92) and retest reliability (0.75), as well as good convergent (0.51) and discriminant validities (0.15-0.48; Beck et al., 1988).

c. Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961). The BDI is a 21-item self-report questionnaire that measures severity of depression in both clinical and nonclinical samples. In an undergraduate sample, the BDI has good internal consistency (0.84), stability (0.83), and favorable discriminant validity (Beck, Steer, & Garbin, 1988).

d. Positive and Negative Affect Schedule – General (PANAS-General; Watson, Clark, & Tellegan, 1988). The PANAS is a 20-item self-report measure that assess both positive

and negative affect. The PANAS evidences good convergent (0.81-0.92 for positive; 0.76-0.91 for negative) and discriminant (-0.36-0.12 for positive; -0.43-0.11 for negative) validities. Additionally, the PANAS demonstrates good reliability for positive (0.47-0.68) and negative (0.39-0.71) affect. Because of favorable convergent and discriminant validity and reliability, the PANAS is an appropriate measure for assessing general affect.

e. **Insomnia Severity Index** (ISI; Bastien, Vallieres, & Morin, 2001). The ISI is a 7-item self-report questionnaire that assesses sleep problems, impairment of functioning due to inadequate sleep, and perceptions of severity of insomnia. The ISI has good internal consistency (0.74), as well as good concurrent validity at baseline (0.32-0.55) and following CBT, pharmacotherapy, or combination treatment (0.50-0.91; Bastien et al., 2001).

III. RESULTS

A. Preliminary Analyses

1. **Assumptions of Normality.** Prior to conducting analyses, data from the six outcome measures (PSWQ, BAI, BDI, ISI, Positive Affect [PA], and Negative Affect [NA]) were examined for assumptions of normality. Cases whose z -score exceeded 3.0 were considered univariate outliers and the Windsor method was utilized in order to convert them to one unit above or below the next closest unit. One case from the BAI questionnaire at post-training ($z = 3.08$) and another case from the PANAS questionnaire at post-training ($z = 3.11$) were univariate outliers. Following the Windsor method, these data points were converted to one unit above the next closest unit.

2. **Mean substitution for missing data.** Prior to analyses, missing data were identified across the six outcome measures. For each measure, the percentage of missing data allowable to maintain a Cronbach's alpha of at least 0.60 was calculated. According to this criterion, we determined that for each outcome measure, mean substitution would be utilized if at least 50% of the data on any questionnaire were available. There were ten cases where mean substitution was necessary and, in these cases, a mean substitution score was calculated from the available data within an individual's questionnaire and replaced with the missing data in that questionnaire (Tabachnik & Fidell, 2001).

3. **Equivalence of symptomatic functioning at pre-training.** Preliminary analyses sought to ensure equivalent pre-training levels of symptomatic functioning across the two experimental conditions. Measures of symptomatic functioning included the PSWQ, BAI, BDI, ISI, PA, and NA. A univariate analysis of variance (ANOVA) for each self-report measure indicated that participants across the two experimental conditions did not differ at pre-training on

any of these measures (all *ps ns*). Thus, random assignment to condition successfully produced equivalent scores on these measures of symptomatic functioning across conditions. Table 1 presents the means and standard deviations on all of these measures at pre- and post-training.

Table 1

Means (and SDs) for Each Outcome Measure, 2X2 ANOVAs, and Effect Sizes

Assessment	Stimulus Control		Acceptance Training		F-values (df 1,43)	Effect size Cohen's <i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
<i>PSWQ</i>						
Pre-training	68.48	5.24	67.22	6.34		W: 1.81
Post-training	53.22	10.74	60.61	9.91	8.52*	B: 0.72
<i>BAI</i>						
Pre-training	22.54	8.38	19.48	9.78		W: 1.46
Post-training	11.71	6.36	17.65	9.90	12.24*	B: 0.71
<i>BDI</i>						
Pre-training	22.96	9.57	18.97	9.66		W: 1.10
Post-training	11.85	10.53	16.35	11.75	1.21	B: 0.62
<i>PANAS-PA</i>						
Pre-treatment	24.13	6.48	23.30	7.71		W: 0.41
Post-treatment	27.52	9.69	23.09	8.73	2.94	B: 0.48
<i>PANAS-NA</i>						
Pre-training	29.00	7.43	25.52	8.21		W: 1.81
Post-training	17.57	5.00	21.43	8.60	8.66*	B: 0.55
<i>ISI</i>						
Pre-training	14.09	5.76	11.75	4.86		W: 0.93
Post-training	8.64	5.90	11.62	5.88	16.20*	B: 0.51

Note. W = Cohen's *d* for the within group effect size for the Stimulus Control training condition from pre- to post-training, B = Cohen's *d* for between group effect size at post-training, PSWQ = Penn State Worry Questionnaire; BAI = Beck Anxiety Inventory; BDI = Beck Depression Inventory; PANAS = Positive and Negative Affect Schedule; ISI = Insomnia Severity Index.

* = $p < .01$.

4. Credibility and Expectancy. Preliminary analyses sought to ensure that participants in the two conditions perceived their assigned training conditions to be equally credible and that they evidenced equivalent levels of expectancy to change. A univariate ANOVA with Condition as the between-subjects variable conducted on the CEQ indicated that there were equivalent levels of credibility and expectancy across both the Acceptance Training ($M = 53.30$, $SD = 14.97$) and Stimulus Control ($M = 57.70$, $SD = 12.88$) conditions, $F(1,43) = 1.26$, *ns*.

B. Primary Outcome Measures

A 2 (Condition: Stimulus Control, Acceptance Training) X 2 (Time: Pre-Training, Post Training) repeated measures multivariate analysis of variance (MANOVA) was run on the three primary outcome measures (PSWQ, BAI, and BDI). Given that the three dependent variables were moderately correlated (see Table 2), we interpreted the Roy-Bargman stepdown analyses instead of the univariate analyses. Furthermore, according to the aims of this investigation, there exists a theoretical reason to enter these three dependent variables in a specific order so as to allocate the shared variance to specific factors (Tabatchnik & Fidell, 2001). The Roy-Bargman stepdown analysis gives the first DV entered its full unique and shared variance; all subsequent DVs are only allocated their unique variance beyond what has been previously entered into the model. As such, the DVs were entered in order of their theoretical and empirical importance. Given the purpose of the training conditions (i.e., to reduce worry), the PSWQ was entered into the MANOVA first. Because the BAI measures current anxiety symptoms, which is theoretically closely related to symptoms of worry, it was entered second. Finally, because the BDI is moderately correlated with both the PSWQ and BAI, and because symptoms of depression tend to be comorbid with symptoms of anxiety, BDI was entered into the MANOVA last.

Table 2

Correlations of Three Primary Outcome Measures

	1	2	3
1. PSWQ		0.37*	0.27
2. BAI			0.49**
3. BDI			

Note. PSWQ = Penn State Worry Questionnaire; BAI = Beck Anxiety Inventory; BDI = Beck Depression Inventory.

* $p < .05$, ** $p < .01$.

Results indicated that there was a main effect of Time, $F(3,42) = 15.52, p < .001$, which was qualified by a significant multivariate Condition X Time interaction, $F(3,42) = 4.76, p < .01$. The results of the Roy-Bargman stepdown analyses indicated that the Condition X Time interaction was significant for the PSWQ ($F[1,44] = 6.95, p < .05$) and for the BAI, ($F [1,43] = 5.36, p < .05$), but not for the BDI.

Follow-up analyses for the PSWQ and BAI findings involved conducting mixed model ANOVAs with Condition as a between-subjects variable and Time as a repeated measures variable. Both comparisons yielded significant results (see Figures 1 and 2). First, for the PSWQ analysis, results indicated a main effect of Time, $F(1,43) = 6.07, p < .05$, which was qualified by a Condition X Time interaction, $F(1,43) = 8.52, p < .01$. To examine the simple effects in this interaction, we conducted separate repeated measures ANOVAs with Time as the within-subjects variable for both conditions. Results indicated that participants in the Acceptance Training condition evidenced a significant reduction in PSWQ scores from pre- to post-training ($F[1,21] = 9.02, p < .01$, Cohen's $d = 0.79$); however, participants in the Stimulus Control condition evidenced even greater reductions in PSWQ scores from pre- to post-training ($F[1,21] = 36.76, p < .001, d = 1.81$; between subjects $d = 0.72$; see Figure 1). Second, for the

BAI analysis, results indicated a Condition X Time interaction, $F(1,43) = 12.24, p < .01$. To examine the simple effects in this interaction, we conducted separate repeated measures ANOVAs with Time as the within-subjects variable for both conditions. Results indicated that participants in the Acceptance Training condition did not evidence significant reductions in BAI scores from pre- to post-training ($F[1,21] = 0.26, ns; d = 0.19$); however, participants in the Stimulus Control condition evidenced significant reductions in PSWQ scores from pre- to post-training ($F[1,21] = 38.31, p < .001, d = 1.46$; between subjects $d = 0.71$; see Figure 2).

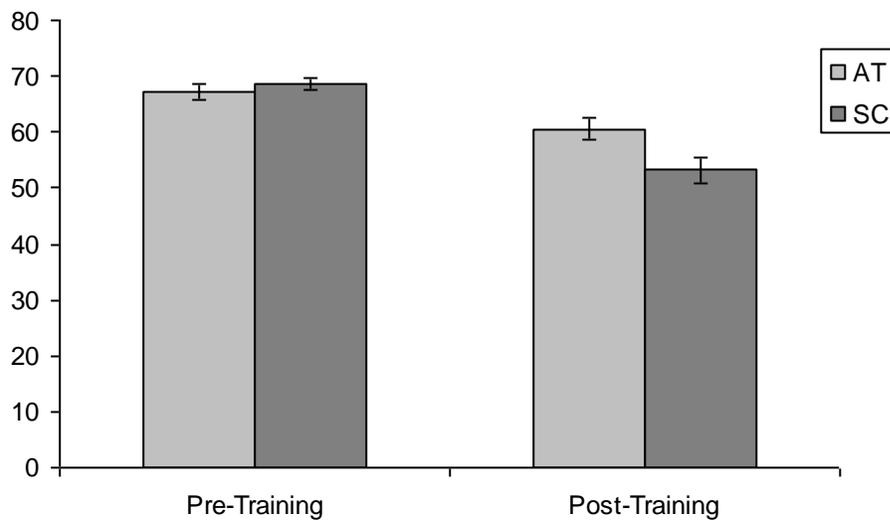


Figure 1. Pre-to-post-training changes in Penn State Worry Questionnaire scores for the Acceptance Training and Stimulus Control conditions.

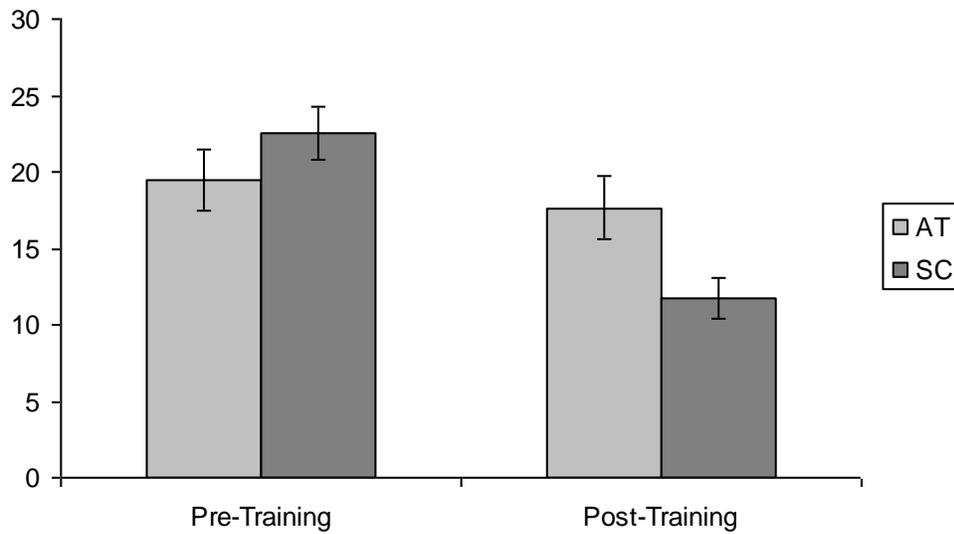


Figure 2. Pre-to-post-training changes in Beck Anxiety Inventory scores for the Acceptance Training and Stimulus Control conditions.

Three separate 2 (Condition: Stimulus Control, Acceptance Training) X 2 (Time: Pre-Training, Post-Training) mixed model ANOVAs, with Condition as a between-subjects variable and Time as a repeated measures variable, were run on each of the three secondary outcome measures (ISI, PA, and NA). For the ISI analysis, results indicated a main effect of Time, $F(1,43) = 6.35, p < .05$, which was qualified by a Condition X Time interaction, $F(1,43) = 16.20, p < .01$. We examined the simple effects by conducting separate repeated measures ANOVAs with Time as the within-subjects variable for both conditions. Results indicated that participants in the Acceptance Training condition did not evidence significant reductions in ISI scores from pre- to post-training ($F[1,21] = 0.22, ns, d = 0.02$); however, participants in the Stimulus Control condition evidenced significant reductions in ISI scores from pre- to post-training ($F[1,21] = 29.91, p < .001, d = 0.93$; between subjects $d = 0.51$; see Figure 3).

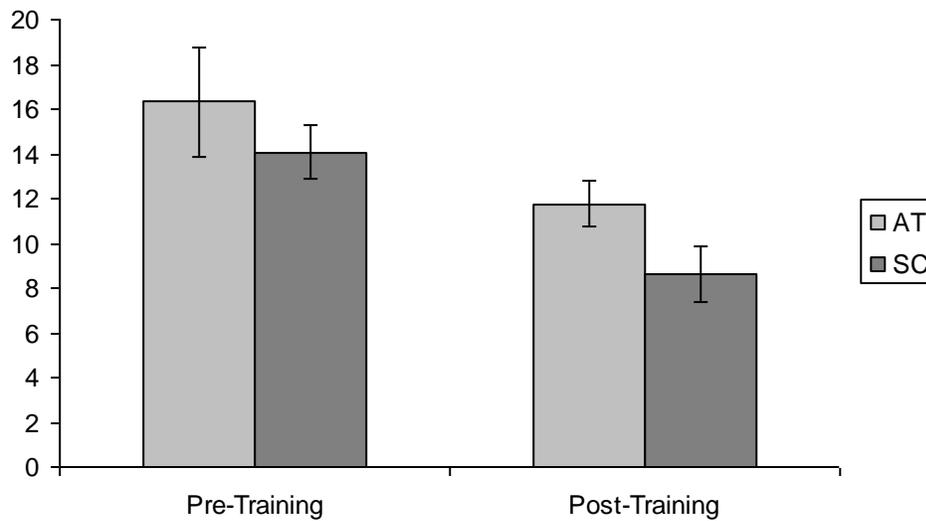


Figure 3. Pre-to-post-training changes in Insomnia Severity Index scores for the Acceptance Training and Stimulus Control conditions.

For the NA analyses, results indicated a Condition X Time interaction, $F(1,43) = 8.66, p < .01$. To examine the simple effects in this interaction, we conducted separate repeated measures ANOVAs with Time as the within-subjects variable for both conditions. Results indicated that participants in the Acceptance Training condition evidenced a significant reduction in PSWQ scores from pre- to post-training ($F[1,21] = 5.69, p < .05, d = 0.49$); however, participants in the Stimulus Control condition evidenced even greater reductions in PSWQ scores from pre- to post-training ($F[1,21] = 42.24, p < .001, d = 1.81$; between subjects $d = 0.55$; see Figure 4).

Analyses conducted on PA did not yield significant effects related to either Condition or Time.

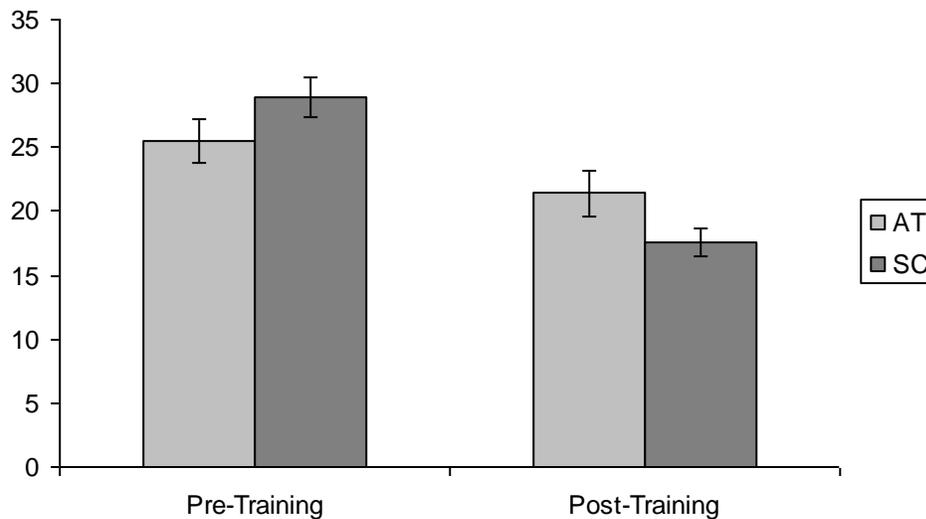


Figure 4. Pre-to-post-training changes in Negative Affect scores for the Acceptance Training and Stimulus Control conditions.

C. Clinically Significant Change

In addition to testing for statistically significant change, it is also important to assess clinically significant change (Behar & Borkovec, 2003). Consistent with recommendations by Jacobson, Follette, and Ravenstorf (1984) and Jacobson and Traux (1991), we assessed clinically significant change by calculating the proportion of participants in each group who scored two standard deviations (SDs) below the pre-training group mean for the PSWQ, BAI, BDI, and ISI. Results indicated that for the PSWQ, 65.2% of participants in the Stimulus Control condition and 30.4% of participants in the Acceptance Training condition decreased their scores by 2 SDs; this difference was statistically significant ($\chi^2[1] = 5.58, p < .05$; see Table 3). On the BAI, 21.7% of participants in the Stimulus Control condition decreased their scores by 2 SDs; however, none of the participants in the Acceptance Training condition achieved clinically significant change.

This difference was also statistically significant ($\chi^2[1] = 5.61, p < .05$). On the BDI, 13% of participants in the Stimulus Control condition decreased their scores by 2 SD's; however, none of the participants in the Acceptance Training condition achieved clinically significant change. This difference showed a trend toward significance ($\chi^2[1] = 3.21, p = .07$). On the ISI, 8.7% of participants in the Stimulus Control condition decreased their scores by 2 SD's; however, none of the participants in the Acceptance Training condition achieved clinically significant change. The two groups did not statistically differ ($\chi^2[1] = 2.09, ns$).

Table 3

Percentage of Participants with Clinically Significant Change at Post-Training

	Stimulus Control	Acceptance Training	χ^2
PSWQ	65.2% (15/23)	30.4% (7/23)	5.58*
BAI	21.7% (5/23)	0% (0/23)	5.61*
BDI	13.0% (3/23)	0% (0/23)	3.21 ⁺
ISI	8.7% (2/23)	0% (0/23)	2.09

Note. PSWQ = Penn State Worry Questionnaire; BAI = Beck Anxiety Inventory; BDI Beck Depression Inventory; ISI = Insomnia Severity Index.

* $p < .05$, ⁺ $p < .10$.

IV. DISCUSSION

The present study examined the efficacy of Stimulus Control Training for individuals with high trait levels of worry. Participants were randomly assigned to receive two weeks of either Stimulus Control Training or Acceptance Training, which served as a credible placebo control condition. Measures of trait worry, state anxiety, depression, positive and negative affect, and insomnia were assessed at pre- and post-training. The present study was a replication and extension of Borkovec et al.'s (1983) investigation, which found that Stimulus Control Training successfully reduced trait worry and tension. The current investigation utilized an identical Stimulus Control Training to that of Borkovec and colleagues; however, we further included a placebo control training procedure in order to control for common factors, and we included additional measures of affect and symptom functioning. Results indicated that participants receiving Stimulus Control Training evidenced greater decreases in their worry symptoms from pre- to post-training compared with participants in the Acceptance Training condition. Additionally, our results also found a greater reduction in state anxiety symptoms following the Stimulus Control Training. Equivalent levels on the CEQ across the two training conditions indicate that these effects exist beyond the contribution of credibility and expectancy of treatment success. Thus, the results of this study provide evidence that Stimulus Control Training is efficacious in reducing worry and is a viable treatment option for individuals with chronic worry. Additionally, because chronic worry is the cardinal symptom of GAD, these findings suggest the utility of incorporating Stimulus Control for worry into a treatment package for individuals with GAD.

Lang's (1979, 1985) bio-informational theory states that a strong memory network expands (through rehearsal and new experiences that strengthen the fear) to build a coherent

associative network. The more extensive this network, the greater the fear activation (i.e., emotional processing; Foa & Kozak, 1986) elicited upon exposure to fear stimuli, and the greater the likelihood that specific, reliable cues will elicit that fear. Lang argues that the anxiety disorders are distributed along a continuum of affective memory defined by the extent to which emotional responses are elicited by specific and stable stimuli. Lang proposed that at one end of the continuum are specific phobias, given that a single type of situation reliably activates the memory network and thus leads to an emotional response. At the other end of the continuum is generalized anxiety disorder, wherein worry and anxiety are associated with a variety of stimuli and situations; this low specificity of stimuli means that the memory network is not reliably activated. Additionally, Otto et al. (2007) found that worry predicts heightened conditionability, suggesting that individuals with GAD are more easily conditioned and therefore become conditioned to worry in a variety of contexts with which worry and anxiety have become associated. Indeed, individuals with GAD experience worry across multiple contexts (Craske, Rapee, Jackel, & Barlow, 1989), and this low specificity of stimuli may make successful treatment of worry especially difficult, given that it limits the degree to which emotional processing occurs during exposure. Stimulus control training may reduce symptoms in part by increasing the specificity of situations that will elicit worry. Greater specificity may increase emotional processing of fear cues, so that habituation of fear is more likely.

Contrary to our hypothesis, neither condition produced decreases in symptoms of depression. This is surprising given high rates of comorbidity between depression and GAD (see Mineka, Watson, & Clark, 1998) and the strong association between worry and depressive symptoms (Andrews & Borkovec, 1988). Research has shown that other treatments for GAD produce general improvements in symptomatic functioning including reductions in depressive

symptoms (Borkovec & Costello, 1993; Butler, Fennell, Robson, & Gelder, 1991), as well as beneficial effects of GAD treatment on comorbid depression (Andrews & Borkovec, 1988). However, most of these treatments for GAD include multiple sessions lasting from a few weeks to several months (Borkovec & Costello, 1993; Borkovec et al., 2002; Butler et al., 1991) with individuals who have been formally diagnosed with GAD. In contrast, our participants came from an analogue student sample, training was administered in a single session, and participants engaged in training for only two weeks. It could be that Stimulus Control Training that is administered and practiced over the course of several weeks would be successful in alleviating related symptoms such as depression. An empirical investigation might utilize multiple training sessions to strengthen participants' stimulus control skills as well as a longer treatment period to examine the long-term effects of stimulus control training. It is also possible that decreases in worry precede decreases in depression; however, this claim is speculative and requires further research that might employ a longitudinal design to examine the temporal relationship of worry and depressive symptom reduction.

We also examined the impact of Stimulus Control Training on negative affect given the strong association between negative affect and worry (Borkovec, Robinson, Pruzinsky, & DePree, 1983). As hypothesized, Stimulus Control Training led to greater decreases in negative affect compared with Acceptance Training. Interestingly, our results indicated that there was no change in positive affect for either training condition. This is not completely surprising given that reduced positive affect is uniquely implicated in depression (Clark, Watson, & Mineka, 1994) but not in GAD (Brown, Chorpita, & Barlow, 1998). The Stimulus Control condition's lack of impact on depression symptoms is consistent with its lack of impact on positive affect. Given the comorbidity between worry and insomnia (see Harvey, 2002), we also hypothesized

that Stimulus Control Training for worry would lead to enhanced subjective reports of sleep quality. As expected, there was a larger decrease in insomnia symptoms from pre- to post-treatment for participants receiving Stimulus Control Training compared with participants receiving Acceptance Training. Although these findings seem to refute the idea that Stimulus Control Training for worry will specifically target worry symptoms as opposed to symptoms related to worry, it is noteworthy that the theoretical rationale for stimulus control procedures for worry and insomnia are identical (i.e., to achieve increased specificity of stimuli that will elicit the maladaptive response), and stimulus control procedures for worry were developed directly from Bootzin's stimulus control procedures for insomnia (Behar & Borkovec, 2009). Worry is a common complaint among clients with sleep disturbance (Monti & Monti, 2000). Additionally, for many chronic worriers, the bedroom is another context associated with worry, which often leads to insomnia symptoms. Thus, as clients gain greater control over the incidence of their worry, it is likely that this association will become weakened, thereby producing improvements in sleep quality. Also, it is possible that instructions regarding worry postponement encourage clients to delay the worry that often occurs prior to sleep onset. These results suggest the utility of including stimulus control for worry instructions in larger treatment packages for insomnia in order to target the worry associated with insomnia.

Although the current study demonstrated the efficacy of Stimulus Control Training for worry, the multiple components of this intervention introduce rival hypotheses to explain the beneficial effects of the training procedure. Specifically, the stimulus control instructions instructed participants to both delay worry to a later period and to worry actively in a prescribed place and time. The postponement instructions were included to reduce the likelihood of participants experiencing a paradoxical increase in worry during the times outside of their worry

period (Borkovec et al., 1983). It is unclear whether treatment effects were due to the controlled incidence (i.e. stimulus control) of worry or to the postponement of worry. Because of the well documented success of stimulus control in the insomnia literature that does not include a postponement instruction (e.g., Espie, Lindsay, Brooks, Hood, & Turvey, 1989; Lacks, Bertelson, Sugerman, & Kunkel, 1983; Riedel, Lichstein, Peterson, Means, Epperson, & Aguillarel, 1998), we believe that it is more likely that the effects can be attributed to the stimulus control procedures themselves. However, this question needs to be addressed empirically to identify the causal mechanism. Such an investigation would usefully utilize a dismantling design (i.e. stimulus control v. postponement of worry v. stimulus control + postponement of worry) to examine the necessary ingredients of the stimulus control training needed for symptom change.

In addition to finding that the Stimulus Control Training was statistically superior to the Acceptance Training condition in reducing several measures of symptomatic functioning, we found that the Stimulus Control Training evidenced a higher rate of end-state functioning on these measures than did the Acceptance Training condition. A larger percentage of participants in the Stimulus Control Training condition compared with the Acceptance Training condition reduced their scores by at least two standard deviations on measures of trait worry, state anxiety, depression, and insomnia symptoms. Thus, although this was not a clinical population, the Stimulus Control Training was successful in producing clinically significant change. Additionally, it is noteworthy that although we were unable to demonstrate a statistically significant decrease in depressive symptoms from pre- to post-training, 13% of the participants receiving the Stimulus Control Training reduced their depressive symptoms by two standard deviations at post-training.

The results of the present study have implications for the use of stimulus control for worry in clinical practice as part of larger treatment packages for worry and GAD. Stimulus control for worry has been cited as a useful behavioral technique to include in CBT packages (Borkovec, Newman, Castonguay, 2004; Behar & Borkovec, 2005; 2009), and has recently been cited as being useful to include as a pre-treatment to a cognitive behavioral group therapy for stress management (Verkuil, Brosschot, Korrelboom, Reul-Verlaan, & Thayer, 2010). Additionally, the present study demonstrated that positive effects of Stimulus Control Training for worry can be obtained after a single treatment session and two weeks of practice. Thus, Stimulus Control for worry is a relatively simple treatment to disseminate that helps individuals reduce their levels of worry and anxiety and decrease levels of negative affect. Furthermore, although formal, effective treatments exist for primary insomnia (i.e. sleep restriction, stimulus control), Stimulus Control for worry seems to be effective in decreasing the sleep disturbance that may occur as an associated symptom of GAD as well as sleep disturbance resulting from worrisome thoughts that occur during attempts to sleep.

This investigation has several limitations. First, participants were recruited using cutoff scores on a self-report measure of worry (i.e., PSWQ). Although we utilized a cutoff score that ensured that our participants had similar PSWQ severity to individuals with diagnosed GAD (Molina & Borkovec, 1994), we cannot state with certainty whether these results would generalize to a population of individuals with formally diagnosed GAD. Future investigations should examine the efficacy of Stimulus Control Training procedures on individuals with diagnosed GAD. Second, the current study did not include a measure of treatment compliance. Especially given the demands of Stimulus Control Training, we cannot be certain that all participants followed their treatment instructions as outlined. Third, the current investigation did

not include follow-up assessments. Although Stimulus Control for worry demonstrated improvements in symptoms at post-treatment, a follow-up assessment is necessary to examine the maintenance of treatment gains. Forth, the current study was unable to control for the overall time spent worrying, thereby introducing the possibility that participants receiving Acceptance Training worried for more time per day relative to participants receiving Stimulus Control Training and thus potentially accounting for greater severity of reported symptoms on measures of functioning. Finally, given the instructions to not avoid spontaneous worry in the Acceptance Training condition, it is possible that the manipulation led to higher reports of symptoms in the Acceptance Training condition relative to the Stimulus Control condition. However, participants were selected for this study because they exhibited high trait worry and likely experienced frequent worrisome thoughts. Additionally, participants in the Acceptance Training condition showed decreases in symptoms from pre- to post-training, suggesting that the training did provide some benefit to participants.

APPENDICES

APPENDIX A

Penn State Worry Questionnaire

*Choose the number that best describes how typical or characteristic each item is of you.
PLEASE MAKE ALL RESPONSES ON THE FORM*

1 Not at all typical	2	3 Somewhat typical	4	5 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 any more.
- ____ 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 all done.

BAI

Below is a list of common symptoms of anxiety. Please read each item in the list carefully. Indicate how much you have been bothered by each symptom during the PAST WEEK, INCLUDING TODAY by placing an X in the corresponding space in the column next to each symptom.

	Symptom	Not at all	Mildly – It did not bother me much.	Moderately – It was very unpleasant but I could stand it.	Severely – I could barely stand it.
1	Numbness or tingling				
2	Feeling hot				
3	Wobbliness in legs				
4	Unable to relax				
5	Fear of the worst happening				
6	Dizzy or lightheaded				
7	Heart pounding or racing				
8	Unsteady				
9	Terrified				
10	Nervous				
11	Feelings of choking				
12	Hands trembling				
13	Shaky				
14	Fear of losing control				
15	Difficulty breathing				
16	Fear of dying				
17	Scared				
18	Indigestion or discomfort in abdomen				
19	Faint				
20	Face flushed				
21	Sweating (not due to heat)				

BDI-II

Instructions: This questionnaire consists of 21 groups of statements. Please read each group of statements carefully, and then pick out 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 (Changes in Sleeping Pattern) or Item 18 (Changes in Appetite).

1.) Sadness

- 0 I do not feel sad.
- 1 I feel sad much of the time.
- 2 I am sad all 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 feel 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 pleasures 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 or blame 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 and 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.
- 4 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 or fatigued 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.

PANAS-General

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you **generally feel this way, that is, how you feel on the average**. Use the following scale to record your answers.

1	2	3	4	5
very slightly or not at all	a little	moderately	quite a bit	extremely

___ interested

___ irritable

___ distressed

___ alert

___ excited

___ ashamed

___ upset

___ inspired

___ strong

___ nervous

___ guilty

___ determined

___ scared

___ attentive

___ hostile

___ jittery

___ enthusiastic

___ active

___ proud

___ afraid

Insomnia Severity Index

For each question, please *CIRCLE* the number that best describes your answer.

Please rate the *CURRENT* (i.e. *LAST 2 WEEKS*) *SEVERITY* of your insomnia problem(s).

Insomnia problem	None	Mild	Moderate	Severe	Very severe
1. Difficulty falling asleep	0	1	2	3	4
2. Difficulty staying asleep	0	1	2	3	4
3. Problem waking up too early	0	1	2	3	4

4. How SATISFIED/DISSATISFIED are you with your CURRENT sleep pattern?

Very Satisfied	Satisfied	Moderately Satisfied	Dissatisfied	Very Dissatisfied
0	1	2	3	4

5. How NOTICEABLE to others do you think your sleep problem is in terms of impairing the quality of your life?

Not at all Noticeable	A Little	Somewhat	Much	Very Much Noticeable
0	1	2	3	4

6. How WORRIED/DISTRESSED are you about your current sleep problem?

Not at all Worried	A Little	Somewhat	Much	Very Much Worried
0	1	2	3	4

7. To what extent do you consider your sleep problem to INTERFERE with your daily functioning (e.g. daytime fatigue, mood, ability to function at work/daily chores, concentration, memory, mood, etc.) CURRENTLY?

Not at all Interfering	A Little	Somewhat	Much	Very Much Interfering
0	1	2	3	4

CITED LITERATURE

- American Psychiatric Association (APA). (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: Author.
- Andrews, V.H. & Borkovec, T.D. (1988). The differential effects of inductions of worry, somatic anxiety, and depression on emotional experience. *Journal of Behavioral Therapy and Experimental Psychiatry*, *19*, 21-26.
- Barrett L.F., & Barrett, D.J. (2001). An introduction to computerized experience sampling in psychology. *Social Science Computer Review*, *19*, 175-185.
- Bastien, C.H., Vallieres, A., & Morin, C.M. (2001). Validation of the Insomnia Severity Index as an outcome measure for insomnia research. *Sleep Medicine*, *2*, 297-307.
- Behar, E., Alcaine, O., Zuellig, A.R., & Borkovec, T.D. (2003). Screening for generalized anxiety disorder using the Penn State Worry Questionnaire: A receiver operating characteristic analysis. *Journal of Behavior Therapy and Experimental Psychiatry*, *34*, 25-43.
- Behar, E., & Borkovec, T.D. (2009). Avoiding treatment failures in generalized anxiety disorder. In M.W. Otto & S. Hofmann (Eds.), *Avoiding treatment failures in the anxiety disorders* (pp. 185-208). Springer.
- Behar, E., & Borkovec, T.D. (2005). The nature and treatment of generalized anxiety disorder. In B.O. Rothbaum (Ed.), *The nature and treatment of pathological anxiety: Essays in honor of Edna B. Foa* (pp. 181-196). New York: Guilford.
- Behar, E., & Borkovec, T.D. (2003). Between-group psychotherapy outcome research. In J.A. Schinka & W. Velicer (Eds.), *Comprehensive handbook of psychology (Volume 2): Research Methods* (pp. 213-240). New York: Wiley.
- Behar, E., Zuellig, A.R., & Borkovec, T.D. (2005). Thought and imaginal activity during worry and trauma recall. *Behavior Therapy*, *36*, 157-168.
- Beck, A.T. (1976). *Cognitive therapy and the emotional disorders*. New York: New American Library.
- Beck, A.T., Epstein, N., Brown, G., & Steer, R.A. (1988). An inventory for measuring clinical anxiety: Psychometric properties. *Journal of Consulting and Clinical Psychology*, *56*, 893-897.
- Beck, A.T., Steer, R.A., & Garbin, M.G. (1988). Psychometric properties of the Beck Depression Inventory: Twenty-five years of evaluation. *Clinical Psychology*

Review, 8, 77-100.

- Beck, A.T., Ward, C.H., Mendelson, M.L, Mock, J.E., & Erbaugh, J. (1961). An inventory for measuring depression. *Archives of General Psychiatry*, 4, 561-571.
- Bootzin, R. R. (1972). A stimulus control treatment for insomnia. *Proceedings of the American Psychological*, 395 – 396.
- Bootzin, R.R., Epstein, D., & Wood, J.M. (1991). Stimulus control instructions. In Hauri P. *Case studies in insomnia* (pp. 19-28). New York: Plenum Press.
- Borkovec, T.D., Alcaine, O.M., & Behar, E. (2004). Avoidance theory of worry and generalized anxiety disorder. In R.G. Heimberg, C.L. Turk, & D.S. Mennin (Eds.), *Generalized anxiety disorder: Advances in research and practice* (pp.320-350). New York: Guildford.
- Borkovec, T.D. & Costello, E. (1993). Efficacy of applied relaxation and cognitive-behavioral therapy in the treatment of generalized anxiety disorder. *Journal of Consulting and Clinical Psychology*, 61, 611-619.
- Borkovec, T.D., Hazlett-Stevens, H., & Diaze, M.L. (1999). The role of positive beliefs about worry in generalized anxiety disorder and its treatment. *Clinical Psychology and Psychotherapy*, 6, 126-138.
- Borkovec, T.D., & Hu, S. (1990). The effect of worry on cardiovascular response to phobic imagery. *Behaviour Research and Therapy*, 28, 69-73.
- Borkovec, T.D., & Inz, J. (1990). The nature of worry in generalized anxiety disorder: A predominance of thought activity. *Behaviour Research and Therapy*, 28, 153-158.
- Borkovec, T.D., Lyonfields, J.D., Wiser, S.L, & Deihl, L. (1993). The role of worrisome thinking in the suppression of cardiovascular response to phobic imagery. *Behaviour Research and Therapy*, 31, 321-324.
- Borkovec, T.D., & Nau, S.D. (1972). Credibility of analogue therapy rationales. *Journal of Behavior Therapy and Experimental Psychiatry*, 3, 257-260.
- Borkovec, T.D., Newman, M.G., & Castonguay, L.G. (2004). Cognitive-behavioral therapy for generalized anxiety disorder with integrations from interpersonal and experiential therapies. *The Journal of Lifelong Learning in Psychiatry*, 2, 392-401.
- Borkovec, T.D., Newman, M.G., Pincus, A.L., & Lytle, R. (2002). A component analysis of cognitive-behavioral therapy for generalized anxiety disorder and the role of interpersonal problems. *Journal of Consulting and Clinical Psychology*, 70, 288-298.

- Borkovec, T.D., Robinson, E., Pruzinsky, T., & DePree, J.A. (1983). Preliminary exploration of worry: Some characteristics and processes. *Behavioral Research Therapy*, *21*, 9-16.
- Borkovec, T.D., Wilkinson, L., Folensbee, R., & Lerman, C. (1983). Stimulus control applications to the treatment of worry. *Behaviour Research and Therapy*, *21*, 247-251.
- Brown, T.A., Antony, M. M., & Barlow, D.H. (1992). Psychometric properties of the Penn State Worry Questionnaire in a clinical anxiety disorders sample. *Behaviour Research and Therapy*, *30*, 33-37.
- Brown, T.A., Chorpita, B.F., & Barlow, D.H. (1998). Structural relationships among dimensions of the DSM-IV anxiety and mood disorders and dimensions of negative affect, positive affect, and autonomic arousal. *Journal of Abnormal Psychology*, *107*, 179-192.
- Butler, G., Cullington, M., Hibbert, G., Klimes, A., & Gelder, I. (1987). Anxiety management: Developing effective strategies. *Behaviour Research and Therapy*, *25*, 517-522.
- Butler, G., Fennell, M., Robson, P., Gelder, M. (1991). Comparison of behavioral therapy and cognitive behavioral therapy in the treatment of generalized anxiety disorder. *Journal of Consulting and Clinical Psychology*, *59*, 167-175.
- Chambers, M.J., & Kim, J.Y. (1993). The role of state-trait anxiety in insomnia and daytime restedness. *Behavioral Medicine*, *19*, 42-46.
- Clark, L.A., Watson, D., & Mineka, S. (1994). Temperament, personality, and the mood and anxiety disorders. *Journal of Abnormal Psychology*, *103*, 103-116.
- Craske, M.G., Rapee, R.M., Jackel, L., & Barlow, D.H. (1989). Qualitative dimensions of worry in DSM-III-R generalized anxiety disorder subjects and nonanxious controls. *Behavior Research Therapy*, *27*, 397-402.
- Dugas, M.J., Freeston, M.H., Ladouceur, R., Rheume, J., Provencher, M., & Boisvert, M.M. (1998). Worry themes in primary GAD, secondary GAD and other anxiety disorders. *Journal of Anxiety Disorders*, *12*, 253-261.
- Espie, C.A., Lindsay, W.R., Brooks, D.N., Hood, E.M., & Turvey, T. (1989). A controlled comparative investigation of psychological treatments for chronic sleep-onset insomnia. *Behaviour Research and Therapy*, *27*, 79-88.
- Foa, E.B., & Kozak, M.J. (1986). Emotional processing of fear: Exposure to corrective information. *Psychological Bulletin*, *99*, 20-35.

- Ford, D.E., & Kamerow, D.B. (1989). Epidemiologic study of sleep disturbances and psychiatric disorders. An opportunity for prevention? *The Journal of the American Medical Association*, *262*, 1479-1484.
- Goldfried, M.R. (1971). Systematic desensitization as training in self-control. *Journal of Consulting and Clinical Psychology*, *37*, 228-234.
- Harvey, A.G. (2002). A cognitive model of insomnia. *Behaviour Research and Therapy*, *40*, 869-893.
- Harvey, A.G., & Payne, S. (2002). The management of unwanted pre-sleep thoughts in insomnia: distraction with imagery versus general distraction. *Behavior Research and Therapy*, *40*, 267-277.
- Hazlett-Stevens, H., & Borkovec, T.D. (2001). Effects of worry and progressive relaxation on the reduction of fear in speech phobia: An investigation of situational exposure. *Behavior Therapy*, *32*, 503-517.
- Hofmann, S.G., Moscovitch, D.A., Litz, B.T., Hyo-Jin, K., Davis, L.L., & Pizzagalli, D.A. (2005). The worried mind: Autonomic and prefrontal activation during worrying. *Emotion*, *5*, 464-475.
- Lacks, P., Bertelson, A.D., Sugerman, J. & Kunkel, J. (1983). The treatment of sleep-maintenance insomnia with stimulus-control techniques. *Behaviour Research and Therapy*, *21*, 291-295.
- Lang, P.J. (1977). Imagery in therapy: An information processing analysis of fear. *Behavior Therapy*, *8*, 862-886.
- Lang, P.J. (1979). A bio-informational theory of emotional imagery. *Psychophysiology*, *16*, 495-512.
- Lang, P. J. (1985). The cognitive psychophysiology of emotion: Fear and anxiety. In A, H. Tuma & J.D. Mazer (Eds.), *Anxiety and the anxiety disorders* (pp. 131-170). Hillsdale, NJ: Erlbaum.
- MacLeod, C., Mathews, A., & Tata, P. (1986). Attentional biases in emotional disorders. *Journal of Abnormal Psychology*, *95*, 15-20.
- Mellinger, G.D., Balter, M.B., & Uhlenhuth, E.H. (1985). Insomnia and its treatment. Prevalence and correlates. *Archives of General Psychiatry*, *42*, 225-232.
- Mennin, D.S., Heimberg, R.G., & Turk, C.L. (2004). Clinical presentation and diagnostic features. In R.G. Heimberg, C.L. Turk, & D.S. Mennin (Eds.), *Generalized anxiety disorder: Advances in research and practice* (pp. 3-28). New York: Guildford.

- Mennin, D.S., Heimberg, R.G., Turk, C.L., & Fresco, D.M. (2005). Preliminary evidence for an emotion dysregulation model of generalized anxiety disorder. *Behaviour Research and Therapy*, *43*, 1281-1310.
- Meyer, T.J., Miller, M.L., Metzger, R.L., & Borkovec, T.D. (1990). Development and validation of the Penn State Worry Questionnaire. *Behaviour Research and Therapy*, *28*, 487-495.
- Mineka, S., Watson, D., & Clark, L.A. (1998). Comorbidity of anxiety and unipolar mood disorders. *Annual Review of Psychology*, *49*, 377-412.
- Mogg, K., Bradley, B.P., Miller T., & Potts, H. (1994). Interpretation of homophones related to threat: Anxiety or response bias effects? *Cognitive Therapy and Research*, *18*, 461-477.
- Molina, S., & Borkovec, T.D. (1994). The Penn State Worry Questionnaire: Psychometric properties and associated characteristics. In G.C.L. Davey, & F. Tallis (Eds.). *Worrying: Perspectives on theory, assessment and treatment*. Wiley series in clinical psychology. (pp. 265-283). Oxford, England: John Wiley & Sons.
- Monti J.M. & Monti, D. (2000). Sleep disturbance in generalized anxiety disorder and its treatment. *Sleep Medicine Review*, *4*, 263-276.
- Mowrer, O.H. (1947). On the dual nature of learning: A re-interpretation of “conditioning” and “problem-solving.” *Harvard Educational Review*, *17*, 102-148.
- Newman, M.G., Castonguay, L.G., Borkovec, T.D., & Molnar, C. (2004). Integrative psychotherapy. In R.G. Heimberg, C.L. Turk, & D.S. Mennin (Eds.), *Generalized anxiety disorder: Advances in research and practice* (pp.320-350). New York: Guildford.
- Öst, L. (1987). Applied relaxation: Description of a coping technique and review of controlled studies. *Behaviour Research and Therapy*, *25*, 397-409.
- Otto, M.W., Leyro, T.M., Deveney, C.M., Reese, H., Pollack, M.H., & Orr, S.P. (2007). Prediction of “fear” acquisition in healthy control participants in a de novo fear-conditioning paradigm. *Behavior Modification*, *31*, 32-51.
- Pincus, A.L., & Borkovec, T.D. (1994, June). *Interpersonal problems in generalized anxiety disorder: Preliminary clustering of patients' interpersonal dysfunction*. Paper presented at the annual meeting of the American Psychological Society, New York.
- Ree, M., & Harvey, A. (2004). Insomnia. In: J. Bennett-Levy, G. Butler, M. Fennel

- (Eds.), *Oxford Guide to Behavioral Experiments in Cognitive Therapy* (pp.287-305).
Oxford: Oxford University Press.
- Riedel, B.W., Lichstein, K.L., Peterson, B.A., Means, M.T., Epperson, M.K., & Aguillarel, R.N. (1998). A comparison of the efficacy of stimulus control for medicated and nonmedicated insomniacs. *Behavior Modification*, 22, 3-28.
- Roemer, L., Molina, S., & Borkovec, T.D. (1997). An investigation of worry content among generally anxious individuals. *Journal of Nervous and Mental Disease*, 185, 314-319.
- Tabachnick, B.G. & Fidell, L.S. (2001). *Using Multivariate Statistics*. New York: Harper Collins.
- Vrana, S.R., Cuthbert, B.N., & Lang, P.J. (1986). Fear imagery and text processing. *Psychophysiology*, 23, 247-253.
- Watson, D., Clark, L.E., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, 54, 1063-1070.
- Yamas, K., Hazlett-Stevens, H., & Borkovec, M. (1997, November). *Alexithymia in generalized anxiety disorder*. Paper presented at the annual meeting of the Association for the Advancement of Behavior Therapy, Miami Beach, FL.
- Verkuil, B., Brosschot, J.F., Korrelboom, K., Reul-Verlaan, R., & Thayer, J.F. (in press). Pretreatment of worry enhances the effects of stress management therapy: A randomized clinical trial. *Psychotherapy and Psychosomatics*. doi: 10.1159/000320328.

UNIVERSITY OF ILLINOIS
AT CHICAGO

Office for the Protection of Research Subjects (OPRS)
Office of the Vice Chancellor for Research (MC 672)
203 Administrative Office Building
1737 West Polk Street
Chicago, Illinois 60612-7227

**Approval Notice
Initial Review (Response To Modifications)**

August 13, 2009

Sarah Kate McGowan, BA
Psychology
1007 W Harrison Street B117
M/C 285
Chicago, IL 60612
Phone: (312) 962-1408

**RE: Protocol # 2009-0617
“Efficacy of a Behavioral Training for Worry”**

Dear Ms. McGowan:

Your Initial Review (Response To Modifications) was reviewed and approved by the Expedited review process on August 6, 2009. You may now begin your research

Please note the following information about your approved research protocol:

Protocol Approval Period: August 6, 2009 - August 5, 2010

Approved Subject Enrollment #: 90

Additional Determinations for Research Involving Minors: These determinations have not been made for this study since it has not been approved for enrollment of minors.

Performance Sites: UIC

Sponsor: None

Research Protocol(s):

- a) Efficacy of a Behavioral Training for Worry; Version 1; 07/09/2009

Recruitment Material(s):

- a) Psychology Subject Pool Recruitment Procedures will be Followed

Informed Consent(s):

- a) Debriefing Statement; Version 2; 07/29/2009
- b) Consent Form; Version 3; 08/05/2009

Parental Permission(s):

- a) A waiver of parental permission has been granted under 45 CFR 46.116(d) and 45 CFR 46.408(c); however, as per UIC Psychology Subject Pool policy, as least one parent must sign the Blanket Parental Permission document prior to the minor subject's participation in the UIC Psychology Subject Pool.

Your research meets the criteria for expedited review as defined in 45 CFR 46.110(b)(1) under the following specific categories:

(6) Collection of data from voice, video, digital, or image recordings made for research purposes., (7) Research on individual or group characteristics or behavior (including but not limited to research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

Please note the Review History of this submission:

Receipt Date	Submission Type	Review Process	Review Date	Review Action
07/10/2009	Initial Review	Expedited	07/27/2009	Modifications Required
07/29/2009	Response To Modifications	Expedited	08/03/2009	Modifications Required
08/05/2009	Response To Modifications	Expedited	08/06/2009	Approved

Please remember to:

→ Use your **research protocol number** (2009-0617) on any documents or correspondence with the IRB concerning your research protocol.

→ Review and comply with all requirements on the enclosure,
"UIC Investigator Responsibilities, Protection of Human Research Subjects"

Please note that the UIC IRB has the prerogative and authority to ask further questions, seek additional information, require further modifications, or monitor the conduct of your research and the consent process.

Please be aware that if the scope of work in the grant/project changes, the protocol must be amended and approved by the UIC IRB before the initiation of the change.

We wish you the best as you conduct your research. If you have any questions or need further help, please contact OPRS at (312) 996-1711 or me at (312) 996-9299. Please send any correspondence about this protocol to OPRS at 203 AOB, M/C 672.

Sincerely,

Marissa Benni-Weis, M.S.
 IRB Coordinator, IRB # 2

Subjects

Enclosure(s):

1. UIC Investigator Responsibilities, Protection of Human Research Subjects

2. Informed Consent Document(s):

a) Debriefing Statement; Version 2; 07/29/2009

b) Consent Form; Version 3; 08/05/2009

cc: Gary E. Raney, Psychology, M/C 285
Evelyn Behar, Psychology, M/C 285

VITA

SARAH KATE MCGOWAN

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University of Illinois at Chicago
Department of Psychology
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1007 West Harrison Street (M/C 285)
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EDUCATION

- 2008-present **University of Illinois at Chicago**, Chicago, IL
Graduate Student, Clinical Division, Department of Psychology
- 2008 **Northwestern University**, Evanston, IL
B.A. Psychology (with Honors)
- Fall 2006 **University of London, Queen Mary College**, London, England
Coursework included Architecture, Literature, and History

PUBLICATIONS

Behar, E., **McGowan, S.K.**, McLaughlin, K.A., Borkovec, T.D., Goldwin, M., & Bjorkquist, O. (submitted)
Concreteness of positive, negative, and neutral repetitive thinking about the future.

PROFESSIONAL CONFERENCE POSTER PRESENTATIONS

- McGowan, S.K.**, Stanfill, S., & Behar, E. (November, 2010). Efficacy of a Stimulus Control Treatment for Worry.
Poster presented at the 44th Annual Association for Behavioral and Cognitive Therapies, San Francisco, CA.
- Campbell, M.L., Shankman, S.A., Nelson, B. D., Robison-Andrew, E. J., Altman, S.E., Sarapas, C., **McGowan, S.K.**
(October, 2010). Personality correlates of startle habituation: An examination in three separate samples. Poster
presented at the 24th Annual Society for Research in Psychopathology, Seattle, WA.
- McGowan, S.K.**, Goldwin, M., Bjorkquist, O., Bohacz, B., Behar, E., McLaughlin, K., & Borkovec, T.D. (November,
2009). The effects of positive, negative, and neutral perseverative thinking on abstractness and concreteness of
thought content. Poster presented at the 43rd Annual Association for Behavioral and Cognitive Therapies, New
York, NY.
- Goldwin, M., **McGowan, S.K.**, Sibrava, N.J., Behar, E., & Borkovec, T.D. (November, 2009). Emotional experiences
during recall of negative events. Poster presented at the 43rd Annual Association for Behavioral and Cognitive
Therapies, New York, NY.
- McGowan, S.K.**, Durbin, C.E., Hespos, S. (2008). Patterns of Regional Brain Activity During Emotion
Eliciting Tasks in Young Children. Poster presented at Northwestern University Undergraduate Research
Symposium, Chicago, IL.
- McGowan, S.K.**, & Rapp, D.N. (2007). Spoiler alert: Increasing and decreasing psychological experiences of
suspense. Poster presented to the annual meeting of the Midwestern Psychological Association, Chicago, IL.

PROFESSIONAL CONFERENCE SYMPOSIA

McGowan, S.K., Durbin, C.E., Hespos, S. (2008). Patterns of Regional Brain Activity During Emotion Eliciting Tasks in Young Children. Paper presented at 17th Annual UCLA Psychology Undergraduate Research Conference (PURC), Los Angeles, CA.

INVITED ADDRESSES

The Assessment and Treatment of Insomnia. University of Illinois, Chicago graduate-level Interviewing class, Chicago, IL (November 2009, 2010).

The Etiology, Maintenance, and Treatment of Insomnia. Rush University Medical Center monthly meeting of the Cognitive Therapy Conference, Chicago, IL (February 2009).

RESEARCH EXPERIENCE

- 2010-present **Research Assistant**, Department of Psychology, University of Illinois at Chicago, Chicago, IL
Roles: Administering diagnostic screening phone calls and Structured Clinical Interviews for the DSM (SCID) for research examining the putative psychophysiological markers for several emotional/motivational processes for individuals with depression and panic disorder.
Supervisor: Stewart Shankman, Ph.D.
- 2010-present **Research Assistant**, Institute of Juvenile Research, Department of Psychiatry, University of Illinois at Chicago, Chicago, IL
Roles: Test administrator for research examining a child and family-focused cognitive behavioral therapy for the treatment of pediatric bipolar disorder.
Supervisor: Amy West, Ph.D.
- 2008-present **Masters Thesis**, Department of Psychology, University of Illinois at Chicago, Chicago, IL
Roles: Testing effects of a stimulus control training for worry and sleep quality; using Experience Sampling Program on PDAs. Created training program and conducted literature searches and statistical analyses.
Supervisor: Evelyn Behar, Ph.D.
- 2007-2008 **Honors Research Thesis**, Department of Psychology, Northwestern University, Evanston, IL
Roles: Data collection for a research study that examined brain correlates of emotion in children. Primary experimenter and general study design management that included: development of experimental design and procedures, development of a successful recruitment system, experience using Hitachi optical imagine machine (NIRS), coding and analysis of data (SPSS), and preparing a manuscript for conference presentation.
Supervisors: C. Emily Durbin, Ph.D. and Susan Hespos, Ph.D.
- 2007-2008 **Lab Coordinator/Research Assistant**, Department of Psychology, Northwestern University, Evanston, IL
Roles: **Primary experimenter; IQ test administration (WPPSI and PPVT), office management (recruitment and obtaining consent), coding and compiling/maintaining databases.**
Supervisor: C. Emily Durbin, Ph.D.
- 2007 **Independent Directed Research Project**, Department of Psychology, Northwestern University, Evanston, IL
Roles: Self initiated independent research study examining the effects of prior warning on anomalous suspense while reading fictional stories.

Design and implementation experimental material, proficiency in Super Lab software, analysis of data and completion of manuscript and conference presentation.

Supervisor: David Rapp, Ph.D.

- 2006 **Research Assistant**, Department of Psychology, Northwestern University, Evanston, IL
Roles: Measured the effects of suppression on delayed pain responses.
Ran participants through experimental protocol (proficiency with skin conductance and heart monitoring machine).
Supervisor: Richard Zinbarg, Ph.D.
- 2005 **Research Assistant**, Department of Psychology, Northwestern University, Evanston, IL
Roles: Examined heterosexual and homosexual orientation based on childhood behavioral data obtained from family videos.
Ran participants through experimental protocol, assisted in recruitment, compiling/maintaining databases, preparing video for coding and advertising research.
Supervisor: Michael Bailey, Ph.D.

CLINICAL EXPERIENCE

- 2008-present **Clinician**, Office of Applied Psychological Services (OAPS), University of Illinois at Chicago, Chicago, IL.
Roles: Provide individual treatment and conduct intake interviews with patients presenting with a variety of anxiety and mood disorders.
Conduct psychological assessments with patients presenting with learning disabilities, ADHD, and other psychological disorders.
Supervisors: Nancy Dassoff, Ph.D. and Audrey Ruderman, Ph.D.
- Summers 2003, 2004, 2005 **Teacher**, Neuropsychiatric Institute, University of California, Los Angeles, Los Angeles, CA
Roles: Taught autistic children utilizing an intensive therapeutic model in an outpatient hospital school setting; coded observational data.
Supervisor: Stephanie Feldman, Ph.D.
- 2000-2004 **Teen-Line Listener**, National Crisis/Suicide Prevention Hotline, Cedar-Sinai Medical Center, Los Angeles, CA
Roles: Completed intensive 13-week training process; weekly commitment for a national telephone/online crisis intervention hotline for adolescents.
Participated in community outreach and in the development of videos on depression and suicide prevention.
Supervisor: Elaine Leader, Ph.D.

HONORS AND AWARDS

- 2007 Honors Research Thesis, Northwestern University
2007 Weinberg College of Arts and Sciences Research Grant, Northwestern University
(Total awards = \$3,000)

AD HOC REVIEWER FOR SCIENTIFIC JOURNALS

*Behavior Therapy**

*conducted under the supervision of Evelyn Behar, Ph.D.

CONTINUING EDUCATION

Beck Institute Cognitive Therapy Workshop – August 9-11, 2010
Wechsler Adult Intelligence Scale - IV (WAIS-IV) Workshop – December 9, 2008

LANGUAGES

American Sign Language (conversational)