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A Preliminary Investigation of Stimulus Control Training for Worry: Effects on Anxiety and Insomnia

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Abstract

For individuals with generalized anxiety disorder, worry becomes associated with numerous aspects of life (e.g., time of day, specific stimuli, environmental cues) and is thus under poor discriminative stimulus control (SC). In addition, excessive worry is associated with anxiety, depressed mood, and sleep difficulties. This investigation sought to provide preliminary evidence for the efficacy of SC procedures in reducing anxiety-, mood-, and sleep-related symptoms. A total of 53 participants with high trait worry were randomly assigned to receive 2 weeks of either SC training (consisting of a 30-min time- and place-restricted worry period each day) or a control condition called *focused worry* (FW; consisting of instructions to not avoid naturally occurring worry so that worry and anxiety would not paradoxically increase). At post-training, SC was superior to FW in producing reductions on measures of worry, anxiety, negative affect, and insomnia, but not on measures of depression or positive affect. Moreover, SC was superior to FW in producing clinically significant change on measures of worry and anxiety. Results provide preliminary support for the use of SC training techniques in larger treatment packages for individuals who experience high levels of worry.

Keywords

generalized anxiety disorder, worry, insomnia, stimulus control, conditioning

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Generalized anxiety disorder (GAD) is characterized by excessive, uncontrollable worry about various topics. GAD affects a large number of individuals, with 12-month and lifetime prevalence rate estimated at 2.7% and 5.7%, respectively (Kessler et al., 2005). Despite the high prevalence rates of GAD, the field's success in identifying efficacious treatments has been relatively limited. Specifically, although cognitive-behavioral therapy (CBT) for chronic worriers has been shown to produce large effect sizes at post-therapy and at follow-up compared with no treatment, nonspecific components, component control conditions, and alternative treatments (Borkovec & Ruscio, 2001), this treatment is associated with high end-state functioning in only 50% of treated clients (Borkovec, Newman, Pincus, & Lytle, 2002). Whereas most anxiety disorders are characterized by fear of discrete stimuli (e.g., public situations for an individual with social anxiety disorder), the lack of an identifiable core fear in worry and instead a broad range of poorly defined stimuli and future-oriented potential negative events limits our ability to design efficacious behavioral exposure-based treatments for GAD. It should be noted that *cognitive* exposure-based treatments such as an imaginal exposure (Craske, Barlow, & O'Leary, 1992) have been shown to be efficacious in larger treatment packages (e.g., intolerance of uncertainty therapy [IUT]; van der Heiden, Muris, & van der Molen, 2012) as well as a stand-alone treatment for GAD (Hoyer et al., 2009). In recent years, several treatment packages for GAD have emerged with promising outcomes (e.g., IUT, Dugas & Ladouceur, 2000; metacognitive therapy [MCT], Wells, 1999); however, these treatment packages contain multiple interventions designed to target areas of functioning that have been identified as maladaptive in the lives of chronic worriers (Behar & Borkovec, 2005). Thus, it is important to examine the efficacy of each intervention that comprises the various treatment packages.

One therapeutic tool designed to target maladaptive behavioral functioning is stimulus control (SC) for worry (Behar & Borkovec, 2005, 2009). For individuals with GAD, excessive worry becomes associated with numerous aspects of daily life (e.g., time of day, environmental cues). As a result, these individuals tend to worry about many different topics, across many different contexts, and are thus described as having poor discriminative SC. Indeed, Lang (1979, 1985) theorized that GAD is characterized by lack of specificity of fear stimuli, which ultimately leads to difficulties in memory network activation (a necessary component of emotional processing; Foa & Kozak, 1986) and thus interferes with successful habituation of fear. SC procedures for the treatment of worry were initially developed by Borkovec, Wilkinson, Folensbee, and Lerman (1983) to help chronic worriers increase specificity

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of fear stimuli and consequently gain greater control over the incidence of worry. In SC for worry, clients are provided with four general rules: (a) identify worrisome and unpleasant thoughts and learn to distinguish those from other more pleasant thoughts, (b) establish a 30-min "worry period" to occur at the same time and in the same location, (c) delay spontaneous worry to the worry period and instead focus on the present moment, and (d) use the 30-min worry period to worry about concerns and problem solve to reduce or eliminate concerns (Borkovec, Wilkinson, et al., 1983).

Unlike the other components of CBT for GAD (e.g., cognitive therapy, self-control desensitization, relaxation; Borkovec et al., 2002), SC for worry has limited empirical support. Only one study has investigated the efficacy of SC procedures among high worriers (Borkovec, Wilkinson, et al., 1983). In this investigation, undergraduate participants who reported worrying at least 50% of the time were randomly assigned to either a SC training condition or to a no-treatment condition. All participants completed a baseline assessment for 1 week, during which they completed daily ratings of the percentage of time they worried or felt tense each day, the severity of tension they experienced, and the degree to which their worry content for that day related to six topics (see Borkovec, Wilkinson, et al., 1983). Following this baseline assessment, participants in the SC training condition were asked to continue completing these measures each day for the 4-week training period and were given instructions for SC treatment of worry as detailed above (Borkovec, Wilkinson, et al., 1983). Participants in the no-treatment condition were not given any additional instructions and were asked to continue completing daily ratings throughout the treatment period. Results indicated that participants in the SC condition reported greater reductions in daily percentage of worry and tension relative to those in the no-treatment condition.

A major methodological limitation of the Borkovec, Wilkinson, et al.'s (1983) investigation is that it failed to include a credible control condition, introducing numerous rival hypotheses to explain observed differences between the SC and no-treatment conditions (e.g., attention to the problem, expectancy for change, therapeutic relationship, demand characteristics). Thus, the present study sought to improve on Borkovec, Wilkinson, et al.'s investigation by including a second credible training condition to systematically control for all major threats to internal validity and thus provide a more rigorous test of the efficacy of SC procedures for worry. To this end, we compared SC training with a condition in which worry was not subject to discrimination training, but rather was allowed to occur throughout the day without limitations regarding time or place.

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In addition to the impact of chronic worry on anxiety and mood (Andrews & Borkovec, 1988), worry is also closely associated with sleep disturbance. Insomnia is highly comorbid with a number of psychological conditions, especially anxiety and depression (Ree & Harvey, 2004). Individuals with insomnia often report the inability to fall asleep as a result of excessive worry while trying to engage in sleep (Harvey, 2002). Furthermore, Mellinger, Balter, and Uhlenhuth (1985) found that among patients with severe sleep disturbance, 42% reported elevated anxiety symptoms and 13% of those patients with sleep disturbance reported symptoms typical of GAD. Interestingly, the inspiration for employing SC training with chronic worriers originated with Bootzin's (1972) SC treatment for insomnia. This procedure's presumed applicability to the treatment of GAD was developed based on theoretically similar classical conditioning processes (i.e., like sleep difficulties, worry is likely conditioned to environmental stimuli). Given these similar processes and the frequent experience of worry during sleep attempts in insomnia, SC for worry may also be effective in reducing sleep disturbance.

The present study was a replication and extension of Borkovec, Wilkinson, et al.'s (1983) original investigation of SC training. The goal of this study was to provide preliminary empirical support for the efficacy of SC training for worry by comparing it with a credible control condition. Specifically, we examined the efficacy of SC for worry[1] among high trait worriers on measures of worry, anxiety, and depression. In addition, we sought to evaluate the efficacy of SC training for worry on general emotionality given the strong association between negative affect (NA) and worry (Borkovec, Robinson, Pruzinsky, & DePree, 1983), as well as on insomnia given the association between worry and insomnia (Harvey, 2002). We compared SC training with a credible control training procedure (called *focused worry* [FW]) to control for common factors and threats to internal validity (Behar & Borkovec, 2003). We hypothesized that compared with the FW condition, SC training would lead to greater ameliorations in subjective reports of worry, anxiety, depression, NA, and insomnia, as well as enhanced positive affect (PA).

Method

Participants

A total of 53 introductory psychology students from a large urban university were included in this investigation. The Penn State Worry Questionnaire (PSWQ; Meyer, Miller, Metzger, & Borkovec, 1990) was initially administered

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to a group of 800 students as part of a group screening procedure. Individuals scoring at least a 67 on the PSWQ (shown to distinguish GAD individuals from nonanxious individuals; Molina & Borkovec, 1994) were initially invited to participate and were retained in the investigation if their PSWQ score at the baseline assessment session was at least a 53 (one standard deviation above the mean for nonselected samples; Gillis, Haaga, & Ford, 1995). On average, participants' scores on the PSWQ decreased slightly from the group screening session to the baseline assessment ($M = -4.00$, $SD = 6.44$); however, participants still evidenced elevated PSWQ scores at the baseline assessment ($M = 67.85$, $SD = 5.78$). One participant was excluded from the investigation because he no longer met this inclusionary criterion at the baseline assessment session. Six additional participants' data were excluded from analyses because they did not provide enough data (more than 30% missing data, $n = 4$ [3 in SC and 1 in FW]) 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). The sample was ethnically diverse and comprised 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, $t(50) = -0.98$, $p = .33$; sex, $\chi^2(1) = 0.00$, $p = .97$; ethnicity, $\chi^2(1) = 1.62$, $p = .20$; or race, $\chi^2(7) = 7.33$, $p = .40$. Race, ethnicity, and gender were equivalent across the two experimental conditions; however, age was not equivalent, SC: $M = 21.00$, $SD = 5.00$; FW: $M = 18.74$, $SD = 1.45$, $t(44) = -2.08$, $p = .04$. Two participants in SC condition were outliers with respect to age; when these individuals were excluded from the analyses, results did not differ. Thus, data analyses included these participants, and we entered age as a covariate in all analyses. Participants were randomly assigned (using a computerized random number generator) to either the SC ($n = 23$) or FW ($n = 23$) condition. The purpose and hypotheses of the study were masked throughout the experiment. All participants received course credit as compensation for participation in the experiment.

Measures of Symptomatic Functioning

Participants were asked to complete a battery of measures during the pre- and posttraining sessions to assess trait levels of worry, anxiety, depression, PA and NA, and insomnia.

PSWQ. The PSWQ (Meyer et al., 1990) is a 16-item self-report questionnaire that assesses the frequency and intensity of worry. The PSWQ has

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demonstrated favorable reliability and validity for clinical and nonclinical populations (Brown, Antony, & Barlow, 1992). It has good sensitivity (0.75) and specificity (0.86) in distinguishing GAD samples from nonanxious controls and from other anxiety groups (Behar, Alcaine, Zuellig, & Borkovec, 2003; see also Brown et al., 1992). In this study, the PSWQ had acceptable to good internal consistency (.72 at pre-training and .90 at post-training).

Beck Anxiety Inventory (BAI). The BAI (Beck, Epstein, Brown, & Steer, 1988) is a 21-item self-report questionnaire that measures severity of anxiety. The BAI has favorable retest reliability (0.75), as well as good convergent (0.51) and discriminant validities (0.15-0.48; Beck, Epstein, et al., 1988). In this study, the BAI had good internal consistency (.84 at pre-training and .86 at post-training).

Beck Depression Inventory (BDI). The BDI (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961) is a 21-item self-report questionnaire that measures severity of depression in clinical and nonclinical samples. In an undergraduate sample, the BDI had good stability (0.83) and favorable discriminant validity (Beck, Steer, & Garbin, 1988). In this study, the BDI had excellent internal consistency (.90 at pre-training and .93 at post-training).

Positive and Negative Affect Schedule–General (PANAS-General). The PANAS (Watson, Clark, & Tellegen, 1988) is a 20-item self-report measure that assesses PA and NA. In the present study, we asked participants to indicate how they "generally feel." The PANAS demonstrates good reliability for PA (0.86-0.90) and NA (0.84-0.87) as well as good external validity (Watson et al., 1988). In this study, the PANAS evidenced good internal consistency for PA (.88 at pre-training and .93 at post-training) and NA (.86 at pre-training and .87 at post-training).

Insomnia Severity Index (ISI). The ISI (Bastien, Vallieres, & Morin, 2001) 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 concurrent validity at baseline (0.32-0.55) and following CBT, pharmacotherapy, or combination treatment (0.50-0.91; Bastien et al., 2001). In addition, the ISI has good internal reliability at baseline (0.76) and follow-up (0.78; Bastien et al., 2001). In this study, the ISI had good internal consistency (.82 at pre-training and .87 at post-training).

Procedure

Pre-training. Following participants' consent to take part in the study, they were asked to complete all pre-training measures (PSWQ, BAI, BDI, PANAS, and ISI). The first author met with each participant individually for one session to explain the training conditions. All instructions were scripted to ensure

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consistency of information across participants and minimize risk of experimenter bias. Participants were asked to complete the Credibility and Expectancy Questionnaire (CEQ; 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 training elicited expectancy for improvement. This questionnaire contained six items about credibility and four items about expectancy regarding participants' perceptions and anticipated benefits of the training procedures. Each item utilized a 1 to 9 Likert-type scale with higher numbers indicating greater credibility or expectancy. Participants were asked to complete one CEQ regarding their perceptions of the effects of training on worry (CEQ-Worry), and a separate CEQ regarding their perceptions of the effects of training on insomnia (CEQ-Sleep). Participants were also provided with written materials that reiterated the rationale for the training procedure and all instructions that had been delivered by the first author, and were asked to review these materials periodically to ensure proper implementation of all training procedures. Participants used all training procedures over the course of a 14-day period.[2]

Training conditions. Participants in both conditions were first informed that they had been selected to participate in this study based on their high levels of worry in their everyday lives and that as part of the study, they would learn and subsequently engage in procedures specifically designed to help them reduce their worry.

In the SC training condition, the experimenter first provided participants with the rationale for the intervention. Participants were told that when worry occurs throughout the day, it can become associated with many places, times, and situations, such that over time mere exposure to those places, times, and/or situations can come to elicit spontaneous worry. The goal of SC is thus to reduce the frequency of worry 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 and its associated emotional experiences. Participants were given the same four instructions as outlined earlier from Borkovec, Wilkinson, et al. (1983). Specifically, participants were taught to identify their worrisome thoughts and were asked to identify a specific and consistent 30-min worry period and location each day, during which they would focus on these worries. In helping participants to identify a 30-min worry period, the first author ensured that the period was at least 3 hrs prior to participants' bedtimes so that the worry process would not interfere with their 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). Participants were instructed to worry as they normally do during their

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prescribed worry period, to do so as intensely as possible, and to keep the focus of their attention on the worry process. They were instructed to postpone spontaneous worry during the day to the worry period and instead to focus on the present-moment experience when they noticed themselves worrying outside of their prescribed worry periods. Finally, they were instructed to use the worry period to worry about their concerns and problem solve when appropriate.

In the FW condition, we sought to provide participants with a rationale that would encourage them to engage in worry as they normally do, and to expect that this practice would lead to a reduction in worry and its associated emotions. Compared with nonanxious individuals, individuals with GAD are more susceptible to experiencing paradoxical increases in worry while trying to suppress worrisome thoughts (Becker, Rinck, Roth, & Margraf, 1998). Thus, participants in this 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 its associated emotional experiences. The goal of the training program was thus to help them *not* avoid spontaneous worry, but rather to allow it to naturally occur to decrease the frequency and intensity of paradoxical increases in anxious thoughts and emotions. Participants were instructed to worry as they normally do anytime they noticed such thoughts occurring, to make this worry as intense as possible, and to keep the focus of their attention on the worry process. Although participants in this condition did not have a prescribed amount of time during which they were to engage in worrying each day, and thus may have engaged in more worry relative to participants in the SC training condition, it is important to note that chronic worriers report worrying for the majority of the day (60% of the day, as compared with 18% for nonanxious individuals; Craske, Rapee, Jackel, & Barlow, 1989). Thus, we anticipated that a credible intervention would most likely lead to reductions (as opposed to further increases) in overall levels of daily worry. It should be noted that the FW condition contained some elements of existing treatment packages. For example, the instructions to not avoid spontaneous worry are similar to the experiential exercises taught in acceptance and commitment therapy (ACT; Hayes, 2004; Hayes, Luoma, Bond, Masuda, & Lillis, 2006). Similarly, the instruction to focus attention on the process of worry is consistent with mindfulness techniques that have been shown to reduce worry among individuals with GAD (Roemer, Orsillo, & Salters-Pedneault, 2008).

Post-training. At the post-training session, participants were asked to complete the same measures that were given at the pre-training session. On completion, they were given a debriefing statement that informed them about the purpose of the two training conditions.

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Table 1. Means (and *SD*s) for Each Outcome Measure at Pre- and Post-Training With Effect Sizes

	Pre-training	Post-training	Pre- to post-training within-participants effect sizes (Cohen's *d*)	Post-training between-participants effect size (Cohen's *d*)
	M (*SD*)	*M* (*SD*)		
PSWQ				
Stimulus control	68.48 (5.24)	53.22 (10.74)	1.81	0.72
Focused worry	67.22 (6.34)	60.61 (9.91)	0.79	
BAI				
Stimulus control	22.54 (8.38)	11.71 (6.36)	1.46	0.71
Focused worry	19.48 (9.78)	17.65 (9.90)	0.19	
BDI				
Stimulus control	22.96 (9.57)	11.85 (10.53)	1.10	0.62
Focused worry	18.97 (9.66)	16.35 (11.75)	0.24	
PANAS-NA				
Stimulus control	29.00 (7.43)	17.57 (5.00)	1.81	0.55
Focused worry	25.52 (8.21)	21.43 (8.60)	0.49	
PANAS-PA				
Stimulus control	24.13 (6.48)	27.52 (9.69)	0.41	0.48
Focused worry	23.30 (7.71)	23.09 (8.73)	0.03	
ISI				
Stimulus control	14.09 (5.76)	8.64 (5.90)	0.93	0.51
Focused worry	11.75 (4.86)	11.62 (5.88)	0.02	

Note: PSWQ = Penn State Worry Questionnaire; BAI = Beck Anxiety Inventory; BDI = Beck Depression Inventory; PANAS = Positive and Negative Affect Schedule (NA = negative affect, PA = positive affect); ISI = Insomnia Severity Index.

Results

Preliminary Analyses

Equivalence of symptomatic functioning at pre-training. Preliminary analyses sought to ensure equivalent pre-training levels of symptomatic functioning across the two training conditions. A series of univariate ANOVAs examining between-groups differences on each measure of symptomatic functioning (PSWQ, BAI, BDI, ISI, PA, and NA) indicated that participants across the two experimental conditions did not differ at pre-training on any of these measures (all *p*s are *ns*). Thus, random assignment to condition successfully produced equivalent scores on these measures across the two training conditions. Table 1 presents participant functioning on all symptom measures at pre- and post-training.

Credibility and expectancy. We also 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.

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We conducted two separate sets (for the CEQ-Worry and CEQ-Sleep) of univariate ANOVAs, with Condition as the between-participants variable, for credibility and expectancy ratings. For the CEQ-Worry analyses, results indicated equivalent levels of credibility across the SC ($M = 23.83$, $SD = 5.47$) and FW ($M = 23.48$, $SD = 5.98$) training conditions, $F(1, 43) = 0.05$, $p = .83$, $\eta^2_p = .00$; however, participants in the SC condition reported greater expectancy for change ($M = 11.87$, $SD = 3.20$) than did participants in the FW condition ($M = 9.48$, $SD = 3.46$), $F(1, 43) = 5.57$, $p = .02$, $\eta^2_p = .12$. As a result, we controlled for expectancy for change in worry symptoms across all subsequent analyses. For the CEQ-Sleep analyses, results indicated that there were equivalent levels of credibility, SC: $M = 23.09$, $SD = 6.34$; FW: $M = 23.70$, $SD = 5.64$; $F(1, 43) = 0.06$, $p = .81$, $\eta^2_p = .00$, and expectancy, SC: $M = 11.09$, $SD = 3.62$; FW: $M = 9.61$, $SD = 4.00$; $F(1, 43) = 1.82$, $p = .18$, $\eta^2_p = .04$, across the two training conditions.

Training compliance. We sought to ensure that participants in both conditions evidenced adequate and equivalent compliance to their training. Compliance was measured by calculating the number of days (ranging from 0 to 14) that each participant completed 60% or more of their daily questionnaires.[2] Participants evidenced good compliance in SC ($M = 13.14$, $SD = 1.28$) and FW ($M = 13.43$, $SD = 1.04$) conditions, and compliance did not differ across the two groups, $t(42) = 0.84$, $p = .41$. In addition, participants in the SC condition evidenced good compliance to engaging in their worry periods throughout the 14-day training ($M = 87.50\%$, $SD = 16.85\%$).[3]

Symptom Measures

A 2 (Condition: SC, FW) × 2 (Time: pre-training, post-training) repeated measures MANCOVA was run on the three primary outcome measures (PSWQ, BAI, and BDI). Given that these three dependent variables were moderately correlated ($.37 \leq r\text{s} \leq .49$), we interpreted the Roy–Bargmann stepdown analyses instead of the univariate analyses.[4] Results indicated that there was a multivariate main effect of Time, $F(3, 41) = 5.87$, $p = .002$, which was qualified by a multivariate Condition × Time interaction, $F(3, 41) = 4.67$, $p = .007$. The results of the Roy–Bargmann stepdown analyses indicated that the Condition × Time interaction was significant for the PSWQ, $F(1, 43) = 6.90$, $p = .012$, and for the BAI, $F(1, 42) = 5.34$, $p = .026$, but not for the BDI, $F(1, 41) = 1.06$, $p = .310$.

Follow-up analyses for the PSWQ and BAI findings involved conducting 2 (Condition) × 2 (Time) mixed model ANCOVAs on each dependent variable, with Condition as a between-participants variable and Time as a repeated measures variable. Both sets of analyses yielded significant results. For the

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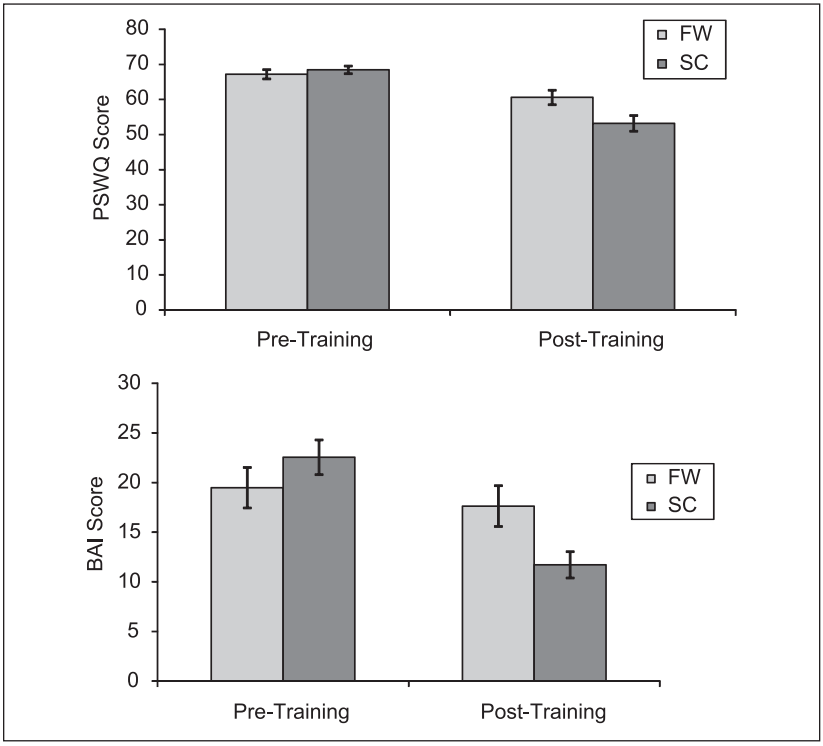

Figure 1. Pre- to post-training changes in PSWQ scores for the FW and SC conditions (top) and pre- to post-training changes in BAI scores for the FW and SC conditions (bottom)
Note: PSWQ = Penn State Worry Questionnaire; FW = focused worry; SC = stimulus control; BAI = Beck Anxiety Inventory.

PSWQ analysis, results indicated a main effect of Time, $F(1, 42) = 44.05$, $p = .000$, $\eta^2_p = .51$, which was qualified by a Condition × Time interaction, $F(1, 42) = 6.99$, $p = .011$, $\eta^2_p = .143$ (see Figure 1, top). Simple effects analyses indicated that although participants in both the SC, $F(1, 20) = 33.19$, $p = .000$, $\eta^2_p = .62$, and FW, $F(1, 20) = 10.04$, $p = .005$, $\eta^2_p = .33$, conditions evidenced significant reductions in PSWQ scores from pre- to post-training, this decrease was larger for participants in the SC condition. Furthermore, between-groups differences at post-training evidenced a medium effect ($d = 0.72$). For the BAI analysis, results indicated a main effect of Time, $F(1, 42) = 24.86$, $p = .000$, $\eta^2_p = .37$, which was qualified by a Condition × Time interaction, $F(1, 42) = 8.78$, $p = .005$, $\eta^2_p = .173$ (see Figure 1, bottom). Simple

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effects analyses indicated that participants in the SC condition evidenced significant reductions in BAI scores from pre- to post-training, $F(1, 20) = 32.48$, $p = .000$, $\eta^2_p = .62$; however, participants in the FW condition did not evidence significant reductions in BAI scores from pre- to post-training, $F(1, 20) = 0.80$, $p = .381$, $\eta^2_p = .04$. Furthermore, between-groups differences at post-training evidenced a medium effect ($d = 0.71$).

General Affect Measures

To examine the two secondary general affect measures (NA and PA), we conducted two separate 2 (Condition: SC, FW) × 2 (Time: pre-training, post-training) mixed model ANCOVAs. For the NA analysis, results indicated a main effect of Time, $F(1, 42) = 45.63$, $p = .000$, $\eta^2_p = .52$, which was qualified by a Condition × Time interaction, $F(1, 42) = 6.35$, $p = .016$, $\eta^2_p = .13$. Simple effects analyses indicated that although participants in SC, $F(1, 20) = 36.67$, $p = .000$, $\eta^2_p = .65$, and FW, $F(1, 20) = 7.33$, $p = .014$, $\eta^2_p = .27$, conditions evidenced significant reductions in NA scores from pre- to post-training, this decrease was larger for participants in the SC condition. Furthermore, between-groups differences at post-training evidenced a medium effect ($d = 0.55$). Analyses conducted on PA did not yield significant effects related to either Condition or Time.

Insomnia

To examine the effect of training on insomnia, we ran a 2 (Condition: SC, FW) × 2 (Time: pre-training, post-training) mixed model ANCOVA on the ISI. Results indicated a main effect of Time, $F(1, 42) = 14.23$, $p = .001$, $\eta^2_p = .25$, which was qualified by a Condition × Time interaction, $F(1, 43) = 12.94$, $p = .001$, $\eta^2_p = .24$. Simple effects analyses indicated that participants in the SC condition evidenced significant reductions in ISI scores from pre- to post-training, $F(1, 20) = 26.55$, $p = .000$, $\eta^2_p = .57$; however, participants in the FW condition did not evidence significant reductions in ISI scores from pre- to post-training, $F(1, 20) = 0.028$, $p = .87$, $\eta^2_p = .001$. Furthermore, between-groups differences at post-training evidenced a medium effect ($d = 0.51$).

Clinically Significant Change

Consistent with recommendations by Jacobson and colleagues (Jacobson, Follette, & Ravenstorf, 1984; Jacobson & Truax, 1991), we assessed clinically significant change by calculating the proportion of participants in each

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Table 2. Percentage of Participants Evidencing Clinically Significant Change at Post-Training

	Stimulus control	Focused worry	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.
*$p < .10$. **$p < .05$.

group who scored two standard deviations below the pre-training group mean for the PSWQ, BAI, BDI, and ISI (see Table 2). Results indicated that for the PSWQ, 65.2% of participants in SC and 30.4% of participants in FW evidenced clinically significant change; this difference was statistically significant, $\chi^2(1) = 5.58$, $p = .018$. For the BAI, 21.7% of participants in SC and none of the participants in FW evidenced clinically significant change; this difference was also statistically significant, $\chi^2(1) = 5.61$, $p = .018$. For the BDI, 13% of participants in SC and none of the participants in FW evidenced clinically significant change; this difference represented a nonsignificant trend, $\chi^2(1) = 3.21$, $p = .07$. For the ISI, 8.7% of participants in SC and none of the participants in FW evidenced clinically significant change; however, the two groups did not statistically differ, $\chi^2(1) = 2.09$, $p = .148$.

Discussion

We examined the efficacy of SC training for individuals with high trait levels of worry. Participants were randomly assigned to receive 2 weeks of either SC training or a credible control training condition (FW) in which they were asked not to engage in avoidance of worrying, which otherwise leads to paradoxical increases in worry activity and its associated emotions. Results indicated that although participants in both training conditions evidenced significant decreases in trait worry and anxiety from pre- to post-training, this decrease was more pronounced among participants who received SC training. Thus, SC was efficacious in reducing worry suggesting that it is a viable treatment option for individuals who experience high levels of worry. Although these results warrant replication in a clinical sample, they provide preliminary support for the utility of incorporating SC procedures for worry

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into more comprehensive treatment packages for individuals with chronic worry. SC for worry has been cited as a potentially useful behavioral technique (Behar & Borkovec, 2005, 2009; Borkovec, Newman, & Castonguay, 2004). In addition to providing empirical support for this claim, our results further demonstrate that this technique can be obtained after a single treatment session and 2 weeks of practice (in contrast to Borkovec, Wilkinson, et al., 1983, who found beneficial effects after 4 weeks of practice). Thus, SC for worry is a relatively simple treatment to disseminate that helps individuals reduce their levels of worry and anxiety.

One plausible mechanism of change in SC training is increased stimulus specificity. Lang's (1979, 1985) bioinformational 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 on 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. He proposed that at one end of the continuum are specific phobias, wherein 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 GAD, 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. In addition, Otto et al. (2007) found that trait worry predicts heightened fear conditionability, suggesting that individuals who experience high levels of worry in their everyday lives may also become more easily conditioned to external situations that elicit anxiety. Evidence suggests that individuals with GAD do indeed experience worry across multiple contexts (Craske et al., 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 (Foa & Kozak, 1986). SC training may reduce symptoms in part by increasing the specificity of situations that will elicit worry. Greater specificity in turn may increase emotional processing of fear cues, so that habituation of fear is more likely to occur.

Contrary to our hypotheses, neither conditions produced significant decreases in symptoms of depression. This is surprising given high rates of comorbidity between depression and GAD (see Mineka, Watson, & Clark, 1998), the strong association between worry and depressive symptoms (Andrews & Borkovec, 1988), and the tendency for symptoms of depression

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to abate in tandem with reductions in worry (Borkovec, Abel, & Newman, 1995). The lack of improvement in depressive symptoms likely points to the specificity of SC procedures in targeting a unique area of functioning. Unlike other treatments that show general improvements in symptomatic functioning, including reductions in depressive symptoms following treatment for worry (e.g., Borkovec & Costello, 1993; Butler, Fennell, Robson, & Gelder, 1991), SC training is targeted at reducing worry specifically by reducing the number of contexts with which it is associated. Furthermore, investigations finding decreases in comorbid depression following psychotherapy for GAD have incorporated various therapeutic tools (e.g., cognitive restructuring) that are likely to target mechanisms that are implicated transdiagnostically (e.g., maladaptive cognitions, core schemas) and are thus likely to influence symptoms other than worry. In contrast, SC training likely targets a much more circumscribed mechanism (i.e., conditioning of worry) and is thus unlikely to affect symptoms unrelated to that mechanism. Thus, although our results point to the potential specificity of SC training in targeting conditioning-relevant mechanisms and symptoms, its use in isolation may have limited value in achieving reduction of comorbid symptoms of depression. Rather, a more comprehensive cognitive-behavioral intervention is recommended for more generalized symptom reduction. It is important to note, however, that changes in depression symptoms may simply have not been evident at post-training. As the BDI asks participants to retrospectively report their depression ratings over the past 2 weeks (the same duration as the training period), more time might be necessary for the accurate examination of changes in symptoms of depression.

Given the strong association between worry and NA (Borkovec, Robinson, et al., 1983; Zebb & Beck, 1998), we also examined the impact of SC training on this construct. As hypothesized, SC training led to greater decreases in NA compared with FW training, but there was no significant change in PA for either training condition. This is not surprising, given that reduced PA is uniquely implicated in depression (Clark, Watson, & Mineka, 1994) but not in GAD (Brown, Chorpita, & Barlow, 1998), whereas increases in NA are implicated in both conditions (Brown et al., 1998). Furthermore, the SC condition's lack of impact on PA is consistent with its lack of impact on symptoms of depression.

Given high rates of comorbidity between worry and insomnia (see Harvey, 2002), and given that worry is a common complaint among clients with sleep disturbance (Monti & Monti, 2000), we also hypothesized that SC training would lead to decreases in insomnia symptoms. As expected, there was a larger decrease in insomnia symptoms from pre- to post-training

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for participants receiving the SC intervention compared with participants receiving the FW intervention. It is noteworthy that the theoretical rationale for SC procedures for worry and insomnia are identical (i.e., to achieve increased specificity of stimuli that will elicit the maladaptive response), and SC procedures for worry were developed directly from Bootzin's (1972) SC procedures for insomnia (Behar & Borkovec, 2009). In addition, for many chronic worriers, the bedroom is another external context associated with worry, which often leads to difficulty sleeping. Thus, as clients gain greater control over the incidence of their worry, it is likely that the association between worry and their bedroom will become weakened, thereby producing improvements in insomnia symptoms. Moreover, it is possible that instructions regarding worry postponement led participants to delay the worry that often occurs prior to sleep onset, thereby eliminating one process (worry) that interferes with the ability to fall asleep. These results point to the potential utility of including SC for worry in larger treatment packages for insomnia to target comorbid worry symptoms and potentially enhance the efficacy of Bootzin's SC interventions that specifically target sleep.

In addition to finding that SC training was statistically superior to the FW condition on various measures, we also found that relative to the FW condition, a larger percentage of participants in the SC condition evidenced clinically significant change on measures of trait worry and anxiety. Although the percentage of participants evidencing clinically significant change in symptoms of anxiety (21.7%) and worry (65.2%) was modest to large, the rate of clinically significant change for depression (13%) and insomnia (8.7%) were small. These relatively low rates of clinically significant change in depression and insomnia symptoms provide further support for the specificity of SC for worry in targeting symptoms of worry and anxiety.

This investigation has several limitations that should be improved on in future studies. First, participants were not formally diagnosed with GAD, but rather they were recruited using cutoff scores on a self-report measure of trait worry (i.e., the PSWQ). Although we utilized a cutoff score that ensured that our participants had high levels of trait worry and that the mean of our sample had similar trait worry 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 studies should examine the efficacy of SC training among diagnosed individuals. Second, the current investigation did not include follow-up assessments. Although the SC condition demonstrated superiority of worry, anxiety, and sleep-related symptoms at post-training,

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future studies should include follow-up assessments to examine whether such treatment gains are maintained over the course of time. Third, the present study was unable to control for the overall time spent worrying, thereby introducing the possibility that participants receiving FW training worried for more time per day relative to participants receiving SC training, and thus potentially accounting for greater severity of reported symptoms on measures of functioning.

Fourth, the FW condition contained some elements of existing treatment packages. Specifically, it contained an element consistent with mindfulness techniques. In addition, the instructions of the FW condition were similar in theory to a tenet of ACT, experiential avoidance (Hayes et al., 2006). The FW condition was not intentionally modeled after an ACT framework and did not include other aspects of ACT (i.e., cognitive diffusion, discussing values). As such, we do not suggest that the present study provided an empirical test of ACT or mindfulness techniques. Rather, the inclusion of these elements in the FW condition may have accounted in part for observed reductions in worry and NA among participants in this condition.

Fifth, although our results support the efficacy of SC training for worry, the multiple components comprising this intervention introduce rival hypotheses to explain the beneficial effects of the training procedure. Specifically, participants receiving SC training were instructed to delay worry to a later period, focus on the present moment, and worry actively in a prescribed place and time. It is therefore unclear whether treatment effects were due to the postponement of worry, the employment of mindfulness, or to the controlled incidence (i.e., SC) of worry. Because of the well-documented success of SC 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 et al., 1998), it is likely that the positive effects of this intervention on worry symptoms can similarly be attributed to the SC procedures themselves. However, a recent investigation (Verkuil, Brosschot, Korrelboom, Reul-Verlaan, & Thayer, 2011) found that participants who engaged in worry postponement for 2 weeks prior to receiving stress management therapy (SMT) evidenced greater decreases in anxiety and somatoform symptoms following SMT when compared with a waitlist control condition. Similarly, mindfulness-based procedures such as focusing on the present moment have been shown to lead to reductions in chronic worry and anxiety (Roemer et al., 2008).

Finally, a rival hypothesis for the relative success of SC condition is that use of the multiple components increased the efficacy of this intervention. Whereas the FW condition contained a single treatment component (focusing on worry),

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the SC condition contained four components. It is thus possible that the disparate number of treatment components could account for differences between groups. It is especially important that future investigations identify the active components of SC training by utilizing dismantling designs (e.g., SC vs. postponement of worry vs. SC + postponement of worry) to determine the exact components of SC training that are causative of symptom reduction.

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Notes

1. Stimulus control (SC) procedures usually entail systematically controlling stimuli, which lead to greater or lower incidence of a particular behavior. The SC condition in the present study also included elements of worry postponement, mindfulness, and problem solving. The purposes of these inclusions were to replicate and extend the procedures of SC as outlined by Borkovec, Wilkinson et al. (1983). However, given that this condition did not examine SC techniques in isolation, we caution the reader to recognize that change resulting from this training procedure could be due to either SC or to one of the other components of the training condition.
2. Participants were prompted to complete five daily questionnaires measuring affect, worry content, and nightly sleep patterns using personal data assistant (PDA) technology. Those data are not presented in this article, but are available from the first author on request.
3. Compliance to engaging in the worry period was measured by calculating the percentage of days that each participant completed his or her worry period as evidenced by having made ratings on the PDA. There was no equivalent compliance measure for participants in the focused worry (FW) condition.
4. The Roy-Bargmann stepdown analysis give the first dependent variable entered its full unique and shared variance; all subsequent dependent variables are only allocated their unique variance beyond what has been previously entered into the

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model. 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 (Tabachnick & Fidell, 2001). 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 Penn State Worry Questionnaire (PSWQ) was entered into the MANCOVA first. Because the Beck Anxiety Inventory (BAI) measures current anxiety symptoms, which is theoretically closely related to symptoms of worry, it was entered second. Finally, because the Beck Depression Inventory (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 MANCOVA last.

References

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.

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.

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.

Becker, E. S., Rinck, M., Roth, W. T., & Margraf, J. (1998). Don't worry and beware of white bears: Thought suppression in anxiety patients. *Journal of Anxiety Disorders, 12*, 39-55. doi:10.1016/S0887-6185(97)00048-0

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. (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, NY: Wiley.

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, NY: Guilford.

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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). New York, NY: Springer.

Bootzin, R. R. (1972). A stimulus control treatment for insomnia. *Proceedings of the American Psychological Association, 7*, 395-396.

Borkovec, T. D., Abel, J. L., & Newman, H. (1995). Effects of psychotherapy on comorbid conditions in generalized anxiety disorder. *Journal of Consulting and Clinical Psychology, 63*, 479-483.

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., & 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. *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., & Ruscio, A. M. (2001). Psychotherapy for generalized anxiety disorder. *Journal of Clinical Psychiatry, 62*, 37-42.

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., Fennell, M., Robson, P., & Gelder, M. (1991). Comparison of behavior therapy and cognitive behavior 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.

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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., Barlow, D. H., & O'Leary, T. A. (1992). *Mastery of your anxiety and worry*. Albany, NY: Graywind Publications.

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., & Ladouceur, R. (2000). Treatment of generalised anxiety disorder: Targeting intolerance of uncertainty in two types of worry. *Behavioral Modification, 24*, 635-658.

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.

Gillis, M. M., Haaga, D. A. F., & Ford, G. T. (1995). Normative values for the Beck Anxiety Inventory, Fear Questionnaire, Penn State Worry Questionnaire, and Social Phobia and Anxiety Inventory. *Psychological Assessment, 7*, 450-455.

Harvey, A. G. (2002). A cognitive model of insomnia. *Behaviour Research and Therapy, 40*, 869-893.

Hayes, S. C. (2004). Acceptance and commitment therapy, relational frame theory, and the third wave of behavior therapy. *Behavior Therapy, 35*, 639-665.

Hayes, S. C., Luoma, J. B., Bond, F., Masuda, A., & Lillis, J. (2006). Acceptance and commitment therapy: Model, processes and outcomes. *Behavior Research and Therapy, 44*, 1-25.

Hoyer, J., Beesdo, K., Gloster, A. T., Runge, J., Höfler, M., & Becker, E. S. (2009). Worry exposure versus applied relaxation in the treatment of generalized anxiety disorder. *Psychotherapy and Psychosomatics, 78*, 106-115.

Jacobson, N. S., Follette, W. C., & Ravenstorf, D. (1984). Psychotherapy outcome research: Methods for reporting variability and evaluating clinical significance. *Behavior Therapy, 15*, 336-352.

Jacobson, N. S., & Truax, P. (1991). Clinical significance: A statistical approach to defining meaningful change in psychotherapy research. *Journal of Consulting and Clinical Psychology, 59*, 12-19.

Kessler, R. C., Berglund, P., Delmer, O., Jin, R., Merikangas, K. R., & Walters, E. E. (2005). Lifetime prevalence and age-of-onset distributions of *DSM-IV* disorders in the National Comorbidity Survey replication. *Archives of General Psychiatry, 62*, 593-602.

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.

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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.

Mellinger, G. D., Balter, M. B., & Uhlenhuth, E. H. (1985). Insomnia and its treatment: Prevalence and correlates. *Archives of General Psychiatry, 42*, 225-232.

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.

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* (pp. 265-283). Oxford, UK: John Wiley.

Monti, J. M., & Monti, D. (2000). Sleep disturbance in generalized anxiety disorder and its treatment. *Sleep Medicine Review, 4*, 263-276.

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.

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, UK: 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., Orsillo, S. M., & Salters-Pedneault, K. (2008). Efficacy of an acceptance-based behavior therapy for generalized anxiety disorder: Evaluation in a randomized controlled trial. *Journal of Consulting and Clinical Psychology, 76*, 1083-1089.

Tabachnick, B. G., & Fidell, L. S. (2001). *Using multivariate statistics*. New York, NY: HarperCollins.

van der Heiden, C., Muris, P., & van der Molen, H. T. (2012). Randomized controlled trial on the effectiveness of metacognitive therapy and intolerance-of-uncertainty therapy for generalized anxiety disorder. *Behaviour Research and Therapy, 50*, 100-109.

Verkuil, B., Brosschot, J. F., Korrelboom, K., Reul-Verlaan, R., & Thayer, J. F. (2011). Pretreatment of worry enhances the effects of stress management therapy: A randomized clinical trial. *Psychotherapy and Psychosomatics, 80*, 189-190.

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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.

Wells, A. (1999). A metacognitive model and therapy for generalized anxiety disorder. *Clinical Psychology and Psychotherapy, 6*, 86-95. doi:10.1002/(SICI)1099-0879(199905)6:2<86::AID-CPP189>3.0.CO;2-S

Zebb, B., & Beck, J. G. (1998). Worry versus anxiety: Is there really a difference? *Behavior Modification, 22*, 45-61.

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