A comparative evaluation of acceptance and cognitive restructuring techniques for coping with acute panicogenic distress: an experimental evaluation in an anxious non-clinical sample

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A Comparative Evaluation of Acceptance and Cognitive Restructuring Techniques for Coping with Acute Panicogenic Distress: An Experimental Evaluation in an Anxious Non-Clinical Sample

by

Erica B. Moses

A Dissertation Submitted to the University at Albany, State University of New York in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy

College of Arts & Sciences Department of Psychology

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Abstract

Cognitive-behavioral therapy (CBT), an approach that emphasizes increasing perceptions of control and cognitive change through cognitive restructuring, has proven to be an efficacious treatment for panic disorder. However, significant proportions of patients fail to achieve clinically significant improvement. Acceptance, an alternative contextually-based approach to content- and change-based cognitive strategies, has gained popularity within the field. Research on the utility of acceptance-based strategies for anxiety is promising, particularly in comparison to control-based emotion regulation strategies, such as suppression and distraction. Yet, to date, no studies have rigorously compared acceptance-based strategies to analogs of cognitive-behavioral techniques. The present study is the first to investigate the relative utility of acceptance and cognitive restructuring strategies for coping with acute panicogenic distress. This study used a 15 minute inhalation of 5% CO$_2$-enriched air to slowly induce panic-like symptoms in an anxious, all-female, non-clinical sample ($N = 83$). Participants were randomized to one of three conditions and received both a rationale for, and training in utilizing, either acceptance-based or cognitive restructuring strategies, relative to a no-instruction (self-directed strategies) control condition. Participants were instructed to use the assigned strategy to approach the induced panic symptoms during the panicogenic challenge and recovery period. Skin conductance, subjective self-report, and behavioral avoidance were assessed before, during, and following the challenge procedure. No group differences were found on physiological response or behavioral avoidance. The no-instruction group reported less physical panic symptoms than the acceptance group at post-recovery. Exploratory analyses examined predictive power of emotion regulation...
strategies on outcomes. No strategies significantly predicted skin conductance. Overall, cognitive restructuring use was not predictive of outcomes. Acceptance use was predictive of positive outcomes and suppression use was predictive of negative outcomes on self-report and behavioral avoidance measures. These results support the utility of acceptance techniques over cognitive restructuring techniques for approaching acute panicogenic distress.
Introduction and Overview

Although traditional cognitive-behavioral techniques emphasizing cognitive change have long been the gold standard for the treatment of panic disorder, attention is now turning to the utility of acceptance-based approaches (Arch & Craske, 2009; Block-Lerner, Wulfert, & Moses, 2009; Chambless et al., 1998; Hayes, 2008). Acceptance-based approaches represent a theoretically and strategically unique way of relating to symptoms of panic while upholding empirically-supported therapeutic elements of CBT, such as exposure. Research on one such approach, Acceptance and Commitment Therapy (ACT; Hayes et al., 1999), supports the role of acceptance in terms of therapeutic outcomes and mechanisms of action, and across a wide range of problem areas (Hayes et al., 2006; Öst, 2008). However, the literature investigating acceptance techniques for the treatment of panic disorder is limited.

The aim of the current paper is to review the utility of acceptance-based and traditional cognitive-behavioral strategies for approaching anxiety and panic, theorized and evidence-supported mechanisms of action, and gaps in the literature. One such gap is the lack of direct empirical comparison of acceptance-based and traditional CBT approaches for acute panic. Several studies have used experimentally-induced panic procedures to compare acceptance of panic symptoms to suppression of symptoms (Eifert & Heffner, 2003; Feldner, Zvolensky, Eifert, & Spira, 2003; Levitt, Brown, Orsillo, & Barlow, 2004). However, no studies to date have compared acceptance techniques to empirically-supported cognitive restructuring strategies for symptoms of panic. Such a comparison is important as acceptance has only been compared against non-empirically supported techniques (e.g., suppression) rather than against a valid clinical strategy,
which could inflate its statistical impact. To begin to fill this gap, this project compared two potent intervention strategies (i.e., acceptance and cognitive restructuring) used to approach the symptoms of experimentally-induced panicogenic distress using a 5% CO$_2$-enriched air biological challenge procedure. The impact of the interventions on psychophysiological, behavioral, and subjective domains was assessed both during acute panicogenic distress and post-challenge recovery.

The present experiment was modeled after the methodology of Levitt and colleagues (2004), who compared acceptance with a suppression strategy, but with significant differences, namely replacing suppression with cognitive restructuring and utilizing skin conductance as an additional dependent variable. A sample of moderate-to-high anxiety-sensitive females ($N = 83$) were recruited through the University at Albany subject pool and through campus postings. Participants were randomly assigned to one of three conditions: acceptance strategy, cognitive restructuring strategy, or no-instruction control strategy. Prior to the CO$_2$ challenge, participants viewed one of three videos teaching them a strategy to use during the CO$_2$ challenge, along with its underlying rationale and opportunities to practice applying the strategy (or a neutral narrative video with no strategy suggested). Participants were then instructed to use the strategy during the 15 minute biological challenge and during the post-challenge recovery period while skin conductance and subjective ratings of anxiety, distress, and panic symptomatology were measured. Participants were also offered the opportunity to participate in a subsequent biological challenge study to assess behavioral approach and avoidance.
In sum, this study compared the utility of acceptance and cognitive restructuring for experimentally-induced panic and anxiety outcomes in a sample at risk for the development of panic disorder. This study was the first to rigorously and directly compare two theoretically-supported and clinically-utilized techniques for acute panicogenic distress, providing an important addition to the literature on empirically-supported techniques for coping with panic attacks and panic disorder. The current status of this literature is presented below.

Panic Disorder

Panic disorder (PD) is a debilitating anxiety disorder that affects approximately 3.5 to 5.3% of the U.S. population at some time during their lives, with 12-month prevalence estimated at 2.7% (Kessler, Chiu, Demler, & Walters, 2005; Kessler et al., 1994). PD sufferers experience unexpected panic attacks and then develop excessive anxiety about future attacks, including a change in behavior in an attempt to avoid or minimize them. During a panic attack, individuals with PD frequently experience a constellation of unpleasant physical sensations and cognitions that vary both within and between sufferers. For instance, the panic response involves activation of the sympathetic nervous system, resulting in physiological changes such as heart palpitations, sweating, trembling, feelings of shortness of breath, feelings of choking, chest pain, nausea, dizziness, numbing or tingling, and chills or hot flushes. These sensations may also be accompanied by negative cognitions such as a sense of derealization or depersonalization, fear of losing control, or fear of going crazy (APA, 2000; Barlow, 2002; Forsyth & Eifert, 1998a). In addition to the uncomfortable physical and cognitive symptoms experienced, PD has been demonstrated to result in lowered quality of life,
reduced work productivity, and poor physical and mental health, often meeting or exceeding functional impairments seen in individuals with major depression and physical health problems (Candilis et al., 1999; Hansson, 2002; Markowitz, Weissman, Ouellette, Lish, & Klerman, 1989; Olatunji, Cisler, & Tolin, 2007; Weissman, 1991).

Numerous pharmacological (e.g., selective serotonin reuptake inhibitors) and psychosocial interventions have been developed for panic disorder, including panic with and without agoraphobia (e.g., applied relaxation, breathing retraining). Yet the only psychosocial interventions that have been demonstrated to be “well-established” (see American Psychological Association Division 12 Task Force on Promotion and Dissemination of Psychological Procedures Criteria; Chambless et al., 1998) are cognitive-behavioral therapy (CBT) and other exposure-based treatments (e.g., Exposure Treatment for Agoraphobia; Trull, Nietzel, & Main, 1988). Meta-analyses of the literature have shown repeatedly that CBT for PD is more effective, has lower dropout rates, and produces higher maintenance of treatment gains than pharmacological treatments alone (Butler, Chapman, Forman, & Beck, 2006; Clum, Clum, & Surls, 1993; Gould, Otto, & Pollack, 1995; Mitte, 2005; Olatunji, Cisler, & Deacon, 2010) or in combination with CBT (Barlow, Gorman, Shear, & Woods, 2000). The demonstrated efficacy and widespread dissemination efforts have resulted in CBT being one of the most often-used psychosocial interventions for PD.

CBT for PD

In traditional CBT, cognition is thought to play a causal role in the development and maintenance of psychopathology (Beck, 2005; Ellis, 1991; Meichenbaum, 1977). Cognitive theories of panic (Beck, Emery, & Greenberg, 1985; Clark, 1986, 1988, 1996)
posit that panic disorder develops when an individual catastrophically misinterprets benign bodily sensations and thoughts related to them (e.g., “I am going to die”). These thoughts and anticipation of another attack are then believed to further potentiate physiological arousal, leading to heightened anxiety and behaviors (e.g., avoidance, escape) which enhance distress and reinforce misappraisals, resulting in a self-perpetuating cycle of panic (Arch & Craske, 2009; Clark, 1986).

Based on cognitive theory, traditional CBT conceptualizes the modification of cognitive content as a necessary facet of intervention. When treating anxiety disorders with CBT, the three essential targets for change are 1) the action tendencies associated with fear (i.e., escape, avoidance), 2) real or perceived lack of control, and 3) information processing biases (e.g., the tendency to interpret ambiguous information as threatening; Zinbarg, Barlow, Brown, & Hertz, 1992). Cognitive techniques involved in the treatment of panic, such as cognitive restructuring of catastrophic misinterpretations, are intended to address the information processing biases and associated cognitions. However, it has been observed that individuals may experience panic attacks in the absence of catastrophic cognitions (Bouton et al., 2001); thus, catastrophic thoughts are not deemed necessary nor sufficient for panic attacks.

Although several studies and meta-analyses now undermine the view that cognitions must be changed to produce positive outcomes (e.g., Dimidjian et al., 2006; Foa et al., 2005; Gould, Otto, Pollack, & Yap, 1997; Jacobson et al., 1996; Norton & Price, 2007; Teasdale et al., 2001), cognitive change remains a key component of CBT. Cognitive techniques, referred to in CBT as cognitive restructuring (and, alternatively, cognitive reappraisal), use strategies to encourage patients to identify and challenge
distorted, catastrophic misinterpretations of physical sensations as they occur before, during, and after panic. They also function to undermine the beliefs (e.g., “A bodily sensation is a sign of a physical dysfunction”) on which these misinterpretations are based (Salkovskis & Clark, 1991). The therapist and patient work together to identify and correct “distorted” cognitions and test them using behavioral experiments (Clark & Wells, 1995). In the case of PD, cognitive restructuring is focused on modifying beliefs about the dangerousness of bodily sensations and feared situations. For instance, distorted cognitions may take the form of catastrophizing about heart palpitations and thoughts such as “I’m having a heart attack and may die.” In such instances, cognitive restructuring would be used to modify this thought to incorporate more realistic and less disastrous content (e.g., “I am having heart palpitations, but it is very unlikely that I am having a heart attack”).

Despite the use of cognitive strategies in traditional CBT and theories arguing that changing cognitive content is necessary for good outcomes, the empirical literature on the mediational role of cognitive change in symptom improvement is mixed. Numerous studies investigating the mechanisms of action in CBT for various disorders have failed to support a mediational role for cognitive change as a necessary mechanism underlying symptom improvement (e.g., Burns & Spangler, 2001; Jacobson et al., 1996; see Longmore & Worrell, 2007, for a review). On the other hand, a significant body of research has shown that CBT outcomes in the treatment of PD are mediated by reductions in anxiety-producing cognitions, which may be influenced by cognitive restructuring interventions (Arch & Craske, 2008; Cho, Smits, Powers, Telch, 2007; Forman, Herbert, Moitra, Yeomans, & Geller, 2007; Hofmann et al., 2007; Meulenbeek,
Spinhoven, Smit, van Balkom, & Cuijpers, 2010). Further, cognitive restructuring can be used to target both internal and external feared cues associated with panic, thus reducing fears and providing individuals with an increased feeling of self-efficacy about undergoing interoceptive and in vivo exposures (Otto & Deveney, 2005).

Although cognitive restructuring is a theoretically-supported component of virtually all highly efficacious CBTs, its unique contributions to outcomes remain unclear and controversial. The landmark component analysis study conducted by Jacobson and colleagues (1996) investigated the active elements of CBT. The therapists randomized participants with major depression to one of three treatment conditions: (a) a behavioral activation condition which did not address cognitions, (b) an automatic thoughts condition which did not target behaviors, and (c) a cognitive therapy (CT) condition which included both behavioral and cognitive components. The authors found no significant difference in outcome among conditions, either at end of treatment or at 6-month follow-up, suggesting that an explicit cognitive component is unnecessary in the treatment of depression and perhaps other disorders such as PD.

Indeed, at least three studies have attempted to isolate the effectiveness of cognitive restructuring alone for PD (Beck, Stanley, Baldwin, Deagle, & Averill, 1994; Emmelkamp & Mersch, 1982; Margraf, Barlow, Clark, & Telch, 1993), and outcomes were variable, with the effect size ranging widely from -0.95 to 1.10, with a mean Glass’s delta effect size of 0.18 (i.e., a small effect, Gould et al., 1995). In addition, numerous studies have demonstrated that treatments for PD that do not challenge dysfunctional beliefs are able to produce outcomes on par with those generated by cognitive restructuring, even when controlling for number of treatment sessions (see Arntz, 2002;
Bouchard et al., 1996). Some authors have even made the case that challenging cognitions directly is unnecessary in the treatment of anxiety (Hayes, 2004; Longmore & Worrell, 2007; Teasdale et al., 2001). Researchers from the traditional CBT arena have not pursued component analysis to the extent of those researching newer forms of therapy (e.g., acceptance-based approaches such as ACT). The result is confusion regarding the putative role of cognitive change in anxiety treatment. At present, there is a need for more focal research on proposed mechanisms of action and underlying intervention components entailed in CBT, such as cognitive restructuring, to clarify such issues.

While the role of cognitive change in cognitive-behavioral treatment of PD remains hotly debated, there is little disagreement about the role of exposure as an empirically-supported therapeutic element of CBT for panic (Chambless et al., 1999). Exposure-based treatments for PD are intended to counteract avoidance and extinguish fearful associations linked with bodily sensations and environmental cues and contexts. However, the effectiveness of exposure is limited. Though exposure results in improvement in 60-70% of individuals with PD and agoraphobia who complete treatment (Barlow, 1988), the majority of individuals continue to exhibit symptoms of panic disorder following exposure therapy, and 30-40% receives no benefit from treatment (Zinbarg et al, 1992). In addition, a meta-analysis by Arch and Craske (2009) found attrition rates between 17-27% for CBT for PD. Given the large proportion of individuals for whom CBT is not effective or acceptable, it is necessary that we continue to investigate the efficacy of the individual CBT components and search for new strategies that may be of use in the treatment of PD.
Newer treatments have been developed that attempt to modify the traditional CBT model to incorporate different techniques with those based on cognitive theory in response to the advances in emotion science. For example, Barlow’s Unified Treatment for Emotional Disorders incorporates prevention of emotional avoidance in addition to behavioral avoidance and promotes enhancing emotional exposure during treatment. In addition, it no longer includes components of earlier protocols that emphasized reduction of negative emotions and distress (e.g., breathing retraining and relaxation; Barlow & Cerny, 1988) which are conceptually at odds with emotional engagement (Barlow, Allen, & Choate, 2004; Moses & Barlow, 2006). Others have progressed beyond cognitive theory, retaining effective components of behavior therapy, such as exposure, while removing components focused on cognitive reappraisal (e.g., Functional Analytic Psychotherapy [FAP; Kohlenburg & Tsai; 1991], Dialectical Behavioral Therapy [DBT, Linehan, 1993], ACT). Instead, these newer therapies use acceptance techniques (e.g., mindful awareness), to assist clients with their anxiety.

In sum, while the literature challenges the theorized role of cognitive change in producing therapeutic outcomes, traditional CBT continues to utilize cognitive techniques, such as cognitive restructuring. The recent rise in acceptance use represents a significant departure from traditional cognitive interventions in the field. Though acceptance is not a novel therapeutic technique, it is changing the way therapists approach the treatment of anxiety.

Acceptance in Therapy

Unlike control-based strategies, such as cognitive restructuring, which encourage individuals to actively change their thoughts and feelings in order to better manage
anxiety symptoms, acceptance-based approaches aim to help individuals fully experience their anxiety and engage in valued activities despite their symptoms. Though the term “acceptance” is used in numerous ways within the psychological literature, it literally means “to take what is offered” (see Block-Lerner, Salters-Pedneault, & Tull, 2005; Block-Lerner, Wulfert, & Moses, 2009; Hayes, Strosahl, & Wilson, 1999). Sanderson and Linehan (1999) define acceptance as “the developed capacity to fully embrace whatever is in the present moment” (p. 200). Within ACT, one of the newer acceptance-based therapies, acceptance is being mindful of and fully open to experiencing private events, (e.g., thoughts, feelings, and bodily sensations) without attempting to change the form or frequency in the service of valued ends (i.e., what is thought or felt, Hayes, Wilson, Gifford, Follette, & Strosahl, 1996). The construct validity of this last definition of acceptance has been investigated in an outpatient clinically anxious population using multitrait multimethod analyses (Kollman, Brown, & Barlow, 2009). Its convergent and discriminant validity were established, although the clinical validity of acceptance was not demonstrated in this instance. This suggests that acceptance functions as an independent construct. However, numerous studies have provided support for the clinical utility of psychological flexibility (of which acceptance is one example) as measured by the Acceptance and Action Questionnaire (AAQ, Hayes et al., 2004) across various forms of psychopathology (see Bond et al., in press, and Hayes, Luoma, Bond, Masuda, & Lillis, 2006, for reviews). Moreover, virtually all contemporary accounts of acceptance describe it as an active process of opening up to a variety of private experiences, without defense, and in the present moment. In short, acceptance is fundamentally a form of approach behaviors toward difficult or unpleasant private events and without an agenda
to reduce or control such events. In the treatment of PD, this involves teaching individuals to fully experience the unpleasant cognitive, emotional, and somatic symptoms associated with panic without attempting to alter or escape from their experience, including the cues or contexts that may evoke them (Eifert & Forsyth, 2005). There is no struggle against the physical and cognitive symptoms of panic, attempting to reduce their frequency or intensity; rather, clients are encouraged to lean into what is there to be felt and/or thought.

Acceptance has a long history of use. It is addressed in the traditions of Buddhism, psychoanalytic theory, and humanistic/experiential therapies (Block-Lerner et al., 2009; Hayes, 1994). For example, Rogerian therapy (1961) encourages acceptance of feelings and openness of experience as part of one’s unconditional self-acceptance in order to achieve self-actualization. Beck, Emery, and Greenberg’s (1985) traditional cognitive treatment for anxiety disorders encourages clients to function with anxiety. They are asked to observe rather than change the emotional experience—particularly when doing so is in the service of engaging in exposure—and remain focused on present experiences rather than past events (Beck, 2005; Block-Lerner et al., 2009). However, these clients are then instructed to use cognitive change strategies to manipulate their perspective of the situation in order to reduce symptomatology, thus undermining acceptance with deliberate control-based efforts. As a result, the acceptance efforts become weakened as the change agenda is emphasized.

The acceptance use in therapies may be viewed as existing along a continuum with change. More traditional forms of CBT lie toward the change end of the continuum, heavy on promoting change of thoughts and experiences with minimal encouragement of
acceptance. Newer cognitive-behavioral approaches, such as mindfulness-based
cognitive therapy (Segal, Williams, & Teasdale, 2002), lie closer towards the middle of
the continuum as the emphasis begins to shift from change to acceptance. This
movement towards acceptance in treatments, particularly those for anxiety, is
theoretically supported by more recent understanding of how learning processes in
treatment affect fear. The previous theory that exposure to a feared stimulus causes
extinction through an unlearning and weakening of the relationship between the
previously neutral conditioned stimulus and an inherently fearful unconditioned stimulus
(Foa & McNally, 1996) has been modified to emphasize that extinction involves new
learning, influenced by context, which can inhibit the fearful responding (Bouton, 1993).
Thus, the previous focus on fear reduction during extinction is being replaced with an
emphasis on enhancing learning, particularly safety learning (Craske et al., 2008). As
acceptance directs efforts at remaining engaged in exposure despite experiencing anxiety,
it may be a useful technique for achieving new learning.

Some cognitive-behavioral interventions have already been modified to
incorporate acceptance in order to enhance learning and overcome avoidance while also
retaining cognitive strategies. Newer forms of CBT use cognitive restructuring to “alter
antecedent cognitive reappraisals” (Barlow et al., 2004, p. 217), challenging cognitions
about the feared situation that occur prior to encountering it. This is intended to change
the function of stimuli in order to help the client enter the feared exposure situation, at
which point acceptance techniques may be used to prevent emotional avoidance in order
to optimize learning (Arch & Craske, 2008). As an example, “panic surfing,” may be
used within CBT to increase willingness to experience emotions and halt attempts to
avoid and control unpleasant somatic sensations while also enhancing a client’s ability to challenge their maladaptive responses to panic—a key component of cognitive restructuring (Lamplugh, Berle, Milicevic, & Starcevic, 2008). However, acceptance in CBT is seen as a means to an end, used only to block ineffective emotion regulation attempts (e.g., avoidance and/or suppression) until anxiety is reduced, rather than a goal of therapy (Hofmann & Asmundson, 2008). Alternatively, more recent treatments have made acceptance the central aim of the intervention.

Acceptance is featured prominently in several newer behavioral treatment approaches. For instance, Dialectical Behavior Therapy (DBT; Linehan, 1993) encourages a dialectical balance between acceptance and change, teaching clients mindfulness to encourage awareness and experiential acceptance in the context of promoting self-validation while concurrently teaching clients a number of change strategies and skills.

Acceptance and Commitment Therapy (ACT; Hayes et al., 1999) assumes a more radical stance toward acceptance. Rather than altering the content of private experiences, ACT focuses on changing the function of private events by influencing the context of experience. Thus, instead of changing the content of thoughts and feelings (e.g., from “These physical symptoms mean I am dying” to “I have had these symptoms before and nothing bad has happened to me”), ACT aims to alter the context in which they are experienced. This may include teaching clients to be mindful observers of their own thoughts, feelings, and sensations. Instead of struggling against them, they may be taught to notice thoughts as thoughts, feelings as feelings, sensations as sensations (e.g., “I’m having the thought that I may be dying”). In other words, ACT focuses on changing the
function of thoughts and feelings, compared to traditional CBT’s focus on changing the form, frequency, or situational sensitivity of thoughts and feelings (Zettle, Rains, & Hayes, 2011).

ACT as applied to anxiety disorders attempts to undermine the control agenda (i.e., struggle and control), particularly in cases where it has been unhelpful (Eifert & Forsyth, 2005; Twohig, Masuda, Varra, & Hayes, 2005). Individuals with anxiety often feel as if their anxiety has caused them to lose control that must be regained before they can function effectively. Often clients present to therapy having used a variety of strategies to change what they think, feel, and do, albeit unsuccessfully. However, consistent with the emotion regulation literature showing that struggle and control efforts are often at best ineffective and at worst detrimental (see Gross, 1998; Gross & Levenson, 1993, 1997; Schmidt et al., 2000), ACT views the control of anxiety as often being problematic. ACT therapists help clients to assess whether control-based approaches to anxiety have been beneficial to them, especially in the long-term and in the context of their values. In addition, ACT involves the use of metaphors and experiential exercises to allow clients to experience how attempts to control anxiety are difficult and often produce paradoxical effects for themselves (e.g., The Two Scales Metaphor, Hayes, Strosahl, et al., 1999, p. 133). The acceptance of anxiety is also encouraged by developing the client’s willingness to fully experience anxiety in the service of valued ends. This is particularly applicable to the treatment of PD. Carrascoso Lopez & Valdivia Salas (2009) have conceptualized PD as a disorder of experiential avoidance whereby unpleasant private events (e.g., symptoms of a panic attack, one’s fear of them, and attributions about the self and possible dangerous outcomes) lead to control efforts.
which interfere with values-focused directions. From this viewpoint, ACT may serve to undermine the idea that these private events must be met with rigid control efforts and enhance flexible responses in line with valued paths.

Acceptance-Based Therapy Outcomes

Acceptance-based therapies show promising results in terms of treatment efficacy, though continued research is necessary to determine whether these approaches can meet industry standards for clinical endorsement, such as the APA Division 12 standard criteria for empirical support. DBT is the most researched of the acceptance-based therapies and has met the Division 12 Task Force Criteria to be classified as a “well-established treatment” for borderline personality disorder (Chambless et al., 1998). The cognitive-behavioral community’s reliance on this criteria and its model of treatment development creates a hurdle for newer, less researched interventions to meet in order to be widely recognized. Research on ACT is still in its infancy compared to the decades of research already completed on more traditional CBTs. Yet, ACT is now classified by APA Division 12 as a “probably efficacious treatment” for applications of depression and chronic pain. Moreover, ACT is also recognized by the Substance Abuse and Mental Health Service Administration’s (SAMHSA) National Registry of Evidence-Based Programs and Practices, and the literature is still growing. The number of published randomized controlled trials (RCTs) of disorders in which ACT or ACT-based approaches are compared to a control group or another active treatment has increased dramatically in the last decade. These have been reviewed in a handful of quantitative published reviews of ACT (e.g., Hayes et al., 2006; Öst, 2008; Powers, Zum Vörde Sive Vörding, & Emmelkamp, 2009; Ruiz, 2010). According to the studies included in these
reviews, ACT has been utilized in the treatment of a wide-range of clinical concerns (e.g., depression, substance dependence, generalized anxiety disorder, obsessive compulsive disorder, psychosis, diabetes, and epilepsy, to name a few). More recently ACT has been utilized for multiple sclerosis (Sheppard, Forsyth, Hickling, & Bianchi, 2010).

Meta-analyses evaluating the utility of ACT have generally been favorable. For instance, Öst (2008) and Hayes et al.’s (2006) reviews of studies comparing ACT to a variety of structured intervention conditions have yielded similar effect sizes of 0.68 and 0.66, respectively, thereby supporting a moderate effect size for ACT. In addition, a fail-safe analysis determined that 65 unpublished ACT studies would be needed to reduce ACT’s effect size to an insignificant level and, as Öst (2008) argued, this seems unlikely. The meta-analysis conducted by Powers et al. (2009), which included more randomized controlled trials than other meta-analyses, found ACT to be superior to waitlists and psychological placebos when considering all the studies with their broad treatment targets which were included in the analyses (effect size 0.68). However, when analyzed only for those studies targeting anxiety and/or depression ACT was not found to be significantly more effective than established treatments, and ACT was found to be significantly less effective than control conditions (i.e., treatment as usual, psychological placebo, and waitlist).

Specific to anxiety, only 2 published RCTs have investigated the utility of ACT compared to another active condition for a clinical anxiety disorder, namely obsessive compulsive disorder (compared to Progressive Relaxation Training, Twohig, 2007; Twohig et al., 2010). ACT was found to be superior to comparison groups on outcomes, and analyses of these studies support the role of increased acceptance (or decreased
experiential avoidance) as mediating reduced anxiety pathology and increased quality of life (Ruiz, 2010). Notably, ACT did not include an explicit “exposure” component. Though limited, these studies support the utility of ACT, and acceptance techniques specifically, in the treatment of anxiety disorders.

An effectiveness study comparing ACT with Beck and colleagues’ (Beck, Emery, & Greenberg, 1985) traditional CT for the treatment of anxiety and depression in 101 participants at an outpatient university counseling clinic found equivalent improvement in areas of depression, anxiety, functioning difficulties, and quality of life (Forman, Herbert, Moitra, Yeomans, & Geller, 2007). Participants met criteria for moderate to severe levels of anxiety or depression as assessed using the Beck Anxiety Inventory (BAI; Beck, Epstein, Brown, & Steer, 1988) and the Beck Depression Inventory-II (BDI-II; Beck, Steer, Ball, & Ranieri, 1996; Beck, Steer, & Brown, 1996). Although the methodology of the study prevented the authors from conducting formal mediational analyses, they found that outcomes for the CT group appeared mediated by changes in “observing” and “describing” experiences, as assessed by a mindfulness scale, whereas outcomes for the ACT group appeared mediated by “experiential avoidance,” “acting with awareness,” and “acceptance.” This study suggests that ACT may be equally effective as CT for the treatment of anxiety and depression, although each intervention appears to influence outcomes through differing mechanisms.

Another effectiveness study compared ACT and CBT (Lappalainen et al., 2007) on a general outpatient population treated at a university clinic. The 28 participants included in the study were subjected to no inclusion or exclusion criteria and were seeking treatment for a range of psychological problems, including anxiety and
depression. Results suggested that ACT produced better outcomes than CBT in this population. Although the authors were not able to conduct formal mediational analyses, evaluation of change processes showed increases in acceptance (only for ACT) and self-confidence (only for CBT, which often targets negative self-evaluations), suggesting differing mechanism of action for ACT and CBT.

Other lines of research provide further support for the theorized ACT mechanisms of action in relation to treatment outcome. Studies formally investigating ACT mediators related to positive therapeutic outcome have implicated the process variables of acceptance and psychological flexibility, defusion, values, and mindfulness (see Hayes, Luoma, Bond, Masuda, & Lillis, 2006, for a review). Again, the focus of treatment in these studies ranged across a number of difficulties and populations, both psychopathological (e.g., depression, psychosis) and non-psychopathological (e.g., worksite stress, diabetes management). However, increases in the targeted ACT components mediated improvements in the populations (e.g., cognitive defusion predicted reductions in depression, Zettle & Hayes, 1986; acceptance of diabetes was associated with increases in behavioral management, Gregg, 2004). Thus, it appears that the components of ACT, in particular acceptance, promote beneficial therapeutic progress.

Only two case studies could be found describing a full course of ACT for the treatment of panic disorder, but in both cases the treatment had significant positive effects on both the client’s physiological and cognitive responses, as well as escape and avoidance behaviors while experiencing panic, suggesting effectiveness of the treatment (Carrascoso Lopez, 2000; Eifert et al., 2009).
While the results of the above studies represent a preliminary step in understanding ACT’s efficacy and mechanisms of action, many studies have methodological flaws (e.g., failure to establish temporal precedence for mediation) which limit the persuasiveness of their findings (Öst, 2008). The ACT community of researchers has acknowledged several of these limitations which are common to newer researched treatment approaches that do not yet receive funding equivalent to studies investigating empirically supported treatments (e.g., poor representativeness of samples, lesser therapist training and experience, and lower numbers of therapists involved in the studies; see Gaudiano, 2009) Further, the appropriateness of comparisons between ACT and other therapies, such as traditional CBT, often is limited due to the common use of symptom reduction as an outcome measure of efficacy. However, ACT’s explicit goal is not symptom reduction but rather reduction of avoidance, enhancement of quality of life, and values-based outcomes.

For an intervention still in its infancy in comparison to traditional CBT approaches, ACT is amassing an impressive body of empirical literature which supports its utility for a range of target problems. ACT interventions for depression and chronic pain have already been recognized by APA Division 12 as having established modest research support, and SAMHSA has recognized ACT an evidence-based approach. Meta-analyses support moderate effect sizes for ACT compared to other interventions, and there is empirical support for its theorized mechanisms of action, such as acceptance. In addition, the literature on ACT has continued to grow rapidly beyond these published meta-analyses. There is only preliminary evidence for the utility of ACT for anxiety, but
several component studies have lent support to the utility of acceptance in approaching anxiety.

Laboratory-Based Component Analyses of Acceptance on Panicogenic Outcomes

Acceptance as a stand-alone strategy for approaching anxiety symptoms has been investigated empirically in experimental psychopathology studies using biological challenge procedures to induce acute panicogenic distress. It should be noted that inhalation of CO2-enriched air, an anxiogenic stimulus, uniquely mimics the interoceptive sensations experienced by an individual during a panic attack, allowing it to serve as an analog for the symptoms experienced by those with PD (see Levitsky, 1995). Moreover, research has found that more symptoms are produced through CO2 inhalations than through infusions of sodium lactate (van den Hout & Griez, 1984). The physical and cognitive reactions often evoked by inhalations of CO2-enriched air include dyspnea; palpitations; chest pain/discomfort; choking/smothering sensations; dizziness, vertigo, or unsteadiness; feelings of unreality; numbing, hot/cold flashes; sweating; faintness; trembling/shaking; and fear of dying, going crazy, or losing control (Eifert, Forsyth, Zvolensky, & LeJuez, 1999; Forsyth, Eifert, & Canna, 2000; Schmidt, Forsyth, Santiago, & Trakowski, 2002; van den Hout & Griez, 1984). The similarity to a panic attack has even led the biological challenge to be used successfully as an interoceptive exposure treatment for PD (Beck & Shipherd, 1997; Griez & van den Hout, 1983, 1986; Zvolensky & Eifert, 2001). Thus, the CO2 biological challenge procedure is an exceptional and well-established tool for inducing panicogenic distress in an experimental setting that closely mimics the experiences of an actual panic attack. As a result, it has been used in several experiments investigating the impact of acceptance on coping with acute panic.
In one such study, healthy, undergraduate participants high and low in pre-experimental experiential avoidance (EA) were exposed to a 20% carbon dioxide challenge and monitored for their subjective and physiological responses (Karekla, Forsyth, & Kelly, 2004). EA was assessed using the Acceptance and Action Questionnaire (AAQ; Hayes et al., 2004). The authors found that individuals high in EA reported more panic symptoms, more severe cognitive symptoms, and endorsed more fear, panic, and uncontrollability than participants low in EA. Magnitude of physiological response did not differ between groups. This suggests that pre-existing tendencies to avoid private experiences may increase aversive emotional responding to anxiogenic stimuli and, thus, may serve as a risk factor for anxiety disorders such as PD.

Working with a similar sample, Feldner, Zvolensky, Eifert, and Spira (2003) exposed non-clinical participants either high or low in pre-experimental (EA) to a 20% carbon dioxide challenge and instructed them to either inhibit (suppress) or simply observe (accept) the resulting aversive emotional state. Individuals high in EA reported less anxiety in the acceptance condition, whereas individuals low in EA reported less anxiety when using suppression strategies. Eifert and Heffner (2003) also found acceptance to be useful in an anxious sample. They trained high anxiety sensitive females to respond to panic symptoms using either acceptance (i.e., mindfully observing), or control-based strategies (i.e., diaphragmatic breathing), relative to a no-instruction control condition. The participants were then exposed to two 10-minute periods of 10% CO₂-enriched air. The participants in the acceptance condition exhibited no behavioral avoidance; all acceptance participants completed both trials, whereas 20% of participants in the group taught diaphragmatic breathing and 25% in the no-instruction group dropped
out of the study before completing the CO$_2$ inhalation. The acceptance participants also reported lower fear intensity, fewer cognitive symptoms, and fewer catastrophic thoughts during the inhalations.

These results were replicated in a study conducted by Levitt and colleagues (2004), in which patients with PD were merely instructed to accept or suppress without explicit training in these approaches during a 20% carbon dioxide challenge. Once again, acceptance participants did not differ from control participants on intensity of physiological arousal, yet self-reported anxiety discriminated between conditions, with the most anxiety reported in the suppression group. This suggests that acceptance does not necessarily reduce panic symptomatology or autonomic arousal associated with panic but alters participants’ subjective relationship with their anxiety. Interestingly, acceptance use outperformed suppression in predicting more willingness to participate in the challenge a second time (Levitt, Brown, Orsillo, & Barlow, 2004).

Also using a clinical sample, Campbell-Sills, Barlow, Brown, and Hofmann (2006) randomized a group of participants with anxiety and mood disorders into two groups, with one group receiving a rationale for suppressing emotions and another receiving a rational for accepting emotions. The participants were then exposed to an emotion-provoking film, and their subjective distress and physiological responses were monitored before, during, and after. Both groups reported similar levels of subjective distress during the film. Yet, the acceptance group reported a significantly greater decrease in negative affect and heart rate than the suppression group following the film, whereas the suppression group’s heart rate had increased and their negative affect had persisted to a greater extent. Overall, these laboratory-based studies demonstrate that
acceptance is superior to suppression not only for anxious individuals in non-clinical settings but for patients with anxiety disorders as well.

Collectively, most studies to date suggest that acceptance strategies reduce avoidance, physiological arousal, and symptomatology in the face of negative emotions compared to control-based strategies. However, with the exception of Eifert and Heffner (2003), the comparison strategy against which acceptance was tested was suppression, which is known to be an unhelpful cognitive strategy for dealing with emotions. Indeed, suppression often results in a paradoxical increase in negative physical, somatic, and cognitive symptoms, including increased sympathetic activation (Gross, 1998; Gross & Levenson, 1993, 1997; Najmi, Wegner, & Nock, 2007; Richards & Gross, 1999; Roemer & Borkovec, 1994; Wegner, Erber, & Zanakos, 1993; Wegner, Schneider, Carter, & White, 1987) and has been demonstrated to be positively associated with anxiety psychopathology (Aldao, Nolen-Hoeksema, & Schweizer, 2010). Even the diaphragmatic breathing strategy employed in Eifert and Heffner (2003), which may also be conceptualized as a control strategy, has been shown to be unnecessary for treatment of PD and sometimes works against positive treatment outcome (Schmidt et al., 2000). Thus, it is unsurprising that acceptance was demonstrated in these studies to be the superior technique relative to forms of suppression and control.

To date, only one experimental study has compared the effect of acceptance to an empirically-supported cognitive technique, namely cognitive re-appraisal (Hofmann, Heering, Sawyer, & Asnaani, 2009). Cognitive reappraisal is a form of cognitive restructuring whereby an individual “reappraises or cognitively reevaluates a potentially emotion-eliciting situation in terms that decrease its emotional impact” (Gross, 2001, p.
216) and can be used to lessen positive or negative emotions. Cognitive restructuring, on the other hand, is a collection of strategies (including reappraisal) in which individuals are taught to identify their thoughts and their impact on their emotions, objectively evaluate both the reality and utility of their thoughts, and select the thoughts which are most realistic and adaptive to replace those inaccurate thoughts causing unnecessary distress. The authors recruited a non-clinical sample and randomized them to reappraisal, suppression, or an acceptance instruction group. Participants in each group were provided with instructions (i.e., reappraise, suppress, or accept) to use during delivery of an impromptu speech in front of a video camera, but were not given a rationale for why these approaches would be helpful. The authors found that the suppression group demonstrated the greatest increase in heart rate, and the acceptance and reappraisal groups showed no difference in physiological arousal. The suppression group also reported more anxiety than the reappraisal group, but the difference in anxiety between the suppression and acceptance groups was statistically indistinguishable. There was no difference between conditions on behavioral avoidance (as measured by premature termination of the speech), or the length of time spent engaged in the speech task. However, there were several limitations to the study.

First, there was no assessment of participants’ everyday use of different emotion regulation strategies or their familiarity and practice with particular strategies. Second, there was no manipulation check utilized. Thus, it cannot be said with certainty whether the participants adequately understood how to use the instructed techniques or even whether they chose to employ their instructed strategy during the speech task. Future studies with more stringent methodology are necessary to understand the relative effects
of acceptance and cognitive restructuring techniques, such as reappraisal, on anxiety. The current study strives to do just that.

Summary and Aims of the Current Research

Panic disorder is an anxiety disorder that affects 3.5 to 5.3% of the population and results in significant distress and impairment in functioning (Kessler et al., 2005; Markowitz et al., 1989). CBT, an approach that emphasizes increasing feelings of control and cognitive change through cognitive restructuring and exposure-based strategies, has proven to be an efficacious treatment for PD (Chambless et al., 1998). However, many patients fail to achieve clinically significant improvement or any benefit from CBT (Zinbarg et al., 1992). Acceptance, an alternative approach to control-based cognitive techniques, has gained popularity within the field and has even begun to be incorporated into newer versions of CBT (Arch & Craske, 2008). Preliminary research on the utility of acceptance for approaching symptoms of anxiety is promising, but additional research with more appropriate comparison groups and stringent methodology is necessary (Öst, 2008). Given the rising popularity of acceptance techniques in the treatment of PD and the continued use of cognitive techniques, it would be prudent to compare their respective utility in the treatment of panic disorder.

Thus, the aim of the present study was to compare two strategies commonly used to approach the symptoms of panic: acceptance and cognitive restructuring. Following the methods of Levitt and colleagues (2004), this study used low concentrations of CO₂-enriched air to slowly induce panic-like symptoms but in a moderately-to-highly anxious, all-female, non-clinical sample ($N = 83$), recruited and pre-screened to assure a relatively clean biobehavioral history (see Eifert & Heffner, 2003). By using a non-clinical sample,
there was a greater likelihood that participants would not have previous clinical exposure
to the therapeutic techniques and concomitant pre-existing expectancies about their utility. The sample only included women with moderate-to-high anxiety sensitivity, as females are more frequently diagnosed with panic disorder (Cleary, Burns, & Nycz, 1990) and higher levels of anxiety sensitivity (AS) are a panic vulnerability factor.

Anxiety sensitivity theory (McNally, 1994; Reiss, 1991) purports that certain individuals possess a dispositional tendency to be fearful of fear itself, and thus believe that anxiety and related symptoms may have detrimental effects on their mental, social, and physical status. Consequently individuals may be fearful of bodily sensations without obvious catastrophic misinterpretations of them (Bouton et al., 2001). Several studies have lent support to the role of AS as a risk factor for the development of panic (e.g., Schmidt, Lerew, & Jackson, 1997, 1999). However, AS alone does not appear to be sufficient for the development of panic, as several studies have demonstrated that many individuals high in anxiety sensitivity have never experienced a panic attack (Asmundson & Norton, 1993; Cox, Endler, Norton, & Swinson, 1991). AS has also been demonstrated to be a predictor of robust panic response (physical and cognitive symptoms) during biological challenge, above and beyond other vulnerability variables (Barlow, 2002; Feldner, Zvolensky, Eifert, & Spira, 2003; Karekla et al., 2004; Kashdan, Barrios, Forsyth, & Steger, 2006; Kutz, Marshall, Bernstein, & Zvolensky, 2010; Maller & Reiss, 1992; McNally & Eke, 1996; Reiss, Peterson, Gursky, & McNally, 1986; Schmidt & Zvolensky, 2007). Use of a moderate-to-high-AS sample increases the likelihood that the sample responds strongly and in a similarly fearful way to the biological challenge. This response was also expected to increase participant motivation
to use strategies to cope with the procedure itself. In addition, females are a population of interest as they are approximately 2.5 times more likely to suffer from PD than males, a figure which continues to increase with age (Eaton, Kessler, Wittchen, & Magee, 1994; Sheikh, Leskin, & Klein, 2002). Women also appear to exhibit more severe and chronic forms of PD than males (Yonkers et al., 1998).

Participants were given a rationale for and were trained to use one of two strategies, acceptance or cognitive restructuring, during the CO\textsubscript{2} biological challenge in response to the induced panic symptoms. A third no-instruction (self-directed strategies) condition also underwent the biological challenge and served as a control group. Only skin conductance was used as a measure of physiological arousal, but heart rate and end-tidal CO\textsubscript{2} were monitored on-line to ensure the safety of participants and to provide feedback to the experimenter on the response of participants to the CO\textsubscript{2} inhalation (Levitt et al., 2004). Psychophysiological response (i.e., skin conductance) and subjective self-report of anxiety-related variables (e.g., intensity of symptoms, fearfulness, panic symptomatology) were assessed before, during, and after the biological challenge. In addition, participants were given the option to leave the study at any time without penalty and to participate in an additional challenge, thus assessing for willingness to engage in the procedure a second time (a measure of avoidance).

Hypotheses

It was expected that the current study would replicate the findings of other biological challenge studies that have compared acceptance strategies to suppression or a no-instruction control. Participants in no-instruction control conditions have been found to use significantly more suppression than acceptance conditions (e.g., Levitt et al.,
However, as this is the first study to compare acceptance to cognitive restructuring, hypotheses necessitated extrapolation from findings gleaned from the non-biological challenge literature to predict response.

**Hypothesis 1:** There will be no difference between conditions on physiological response during the inhalations or recovery phase.

Biological challenge studies comparing acceptance and suppression techniques (Campbell-Sills et al., 2006; Eifert & Heffner, 2003; Feldner et al., 2003; Levitt et al., 2004) consistently find that physiological measures, including skin conductance (when measured), does not vary by technique, indicating that equivalent physiological arousal was achieved during the challenge in all participants. This holds true when skin conductance was measured during the post-challenge period as well, suggesting that these results are not due to a ceiling effect that could be produced when physiological response is assessed during the challenge. An alternative explanation is that skin conductance is an insensitive measure in relation to these techniques. Research on cognitive restructuring strategies, such as reappraisal, has shown that they do not affect physiological responding (see Gross, 1999). Thus, it is expected that all groups will be equivalent on electrodermal responding.

**Hypothesis 2:** The no-instruction group will report more subjective anxiety than the acceptance or cognitive restructuring groups, which will not differ significantly from one another.

Biological challenge studies tend to show that acceptance strategies yield less subjective anxiety and negative affect than suppression strategies (Campbell-Sills et al.; Eifert & Heffner, 2003; Levitt et al.), including less behavioral avoidance (Eifert &
Heffner, 2003; Levitt et al.). Cognitive restructuring, however, has not previously been tested using a biological challenge procedure. Research has demonstrated that instructions that enhance a participant’s perception of control during a biological challenge tend to result in less reported anxiety than instructions that do not enhance perceptions of control (Rapee, 1995; Sanderson, Rapee, & Barlow, 1989; Zvolensky & Eifert, 2001; Zvolensky, Lejuez, & Eifert, 1998). Cognitive restructuring strategies, such as reappraisal, have been shown to decrease negative emotion by changing evaluations of a situation early in the emotion-generative process (see Gross, 1999). Cognitive reappraisal was also found to result in less subjective anxiety during an anxiety-eliciting task than both suppression and acceptance (Hofmann et al., 2009). Alternatively, because cognitive restructuring emphasizes deliberate control, it may yield an increase in distress and fear relative to acceptance. This would be consistent with the findings from the emotion regulation literature showing control-based strategies, such as suppression, fare less well relative to acceptance-based strategies (Gross, 1998; Gross & Levenson, 1993, 1997; Najmi et al., 2007; Richards & Gross, 1999; Roemer & Borkovec, 1994; Wegner et al., 1987, 1993). Thus, it is expected the cognitive restructuring and acceptance groups will not differ from one another but will yield greater benefits, as indexed by lower subjective anxiety, than the no-instruction control.

*Hypothesis 3: Individuals in the acceptance group will be less behaviorally avoidant, thus demonstrating lower dropout rates, longer time engaged in inhalation, and more willingness to participate in a subsequent biological challenge compared with the cognitive restructuring and no-instruction groups.*
Biological challenge studies (Eifert & Heffner, 2003; Levitt et al.) have shown that use of acceptance strategies predicts less behavioral avoidance than use of suppression, as measured by latency to begin inhalation (Eifert & Heffner, 2003), lower dropout rates (Eifert & Heffner, 2003), or willingness to participate in a future biological challenge (Levitt et al.). However, Hofmann and colleagues (2009) compared the utility of emotion regulation strategies during an anxiety-eliciting task (non-CO$_2$ challenge) and did not find differences between the acceptance, cognitive reappraisal, and suppression conditions on behavioral avoidance (i.e., escape behavior) as measured by length of time spent engaged in the task. Given that cognitive restructuring, much like suppression, emphasizes control, it is possible that the cognitive restructuring group will respond in a similar manner as suppression groups have responded in past CO$_2$ challenges, namely with more behavioral avoidance than acceptance groups. Thus, it was expected that the individuals in the acceptance condition would be less behaviorally avoidant than both comparison groups, with the comparison groups not differing significantly from one another.

Method

Participants

Undergraduate female volunteers ($N = 284$) were recruited from the University at Albany subject pool and general student population, and those who qualified and participated ($N = 83$) were run in the experimental procedure. The mean age of participants in the experimental portion of the study was 19.45 years ($SD = 1.59$; range = 17 to 26). The breakdown of ethnicity of participants was 65% Caucasian, 12% African-American, 5% Asian, 5% Latino, 1% Native American, and 12% other. Fifty-seven percent ($n = 47$) of participants were recruited through the University at Albany, SUNY,
research pool and received course credit for their participation, and 43% (n = 36) were recruited through on-campus flyers and paid twenty dollars for their participation.

All study candidates were pre-screened for medical and psychiatric conditions prior to participation using a modified brief version of the Anxiety Disorders Interview Schedule-IV (Brown, DiNardo, & Barlow, 1994) and a comprehensive medical interview (see Appendix A). Study candidates were excluded if they reported a history of any of the following conditions: (a) cardiac or pulmonary disease, (b) asthma, (c) epilepsy, (d) hypertension, (e) stroke, (f) migraine headaches, (g) HIV/AIDS, (h) renal disease, or (i) the possibility of being pregnant. These criteria served to ensure the safety of participants by excluding anyone with medical conditions that may be exacerbated by the CO2 challenge procedure (Acheson et al., 2007; Eifert & Heffner, 2003; Forsyth & Eifert, 1998; Karekla et al., 2004). Further, participants were excluded if their responses to interview questions suggested that they met diagnostic criteria for a psychotic disorder, substance dependency, or suicidality. In addition, participants were excluded if they were currently on medication to address an anxiety disorder or currently engaged in psychotherapy as this may have interfered with their experience of the CO2 challenge or influenced their use of strategies during the challenge.

Participant demographic information was collected, including age, year in school, and race/ethnicity. Participants were then screened by administering the Anxiety Sensitivity Index (described below, see Methods). Participants with a score within one standard deviation of the mean for panic disorder (i.e., a score of 16 or higher; Gardenswartz & Craske, 2001) met criteria for moderate-to-high AS and were included in the study (Eifert & Heffner, 2003; Peterson & Reiss, 1992).
Of the 284 individuals who contacted the study and participated in the phone screen, 176 (62%) did not meet inclusion criteria either due to scoring below the ASI cutoff or were ruled out for medical or psychological conditions, and 25 (9%) either declined to participate in the experimental portion of the study or did not show up for their scheduled appointment. Three participants asked to leave the study prior to administration of the first manipulation check due to reported anxiety, 3 asked to leave during the inhalation phase, and 8 failed to correctly answer both questions on their second attempt at the manipulation check and were asked to leave. In addition, the physiological data of 2 participants was lost due to computer malfunction.

Materials and Apparatus

*Pre-experimental self-report measures.* A battery of well-established and psychometrically sound anxiety-related measures were administered immediately before the experiment to ensure equivalency across conditions on indicators of pre-existing anxiety and CO₂ challenge-related fear (see Appendix B): (a) the Anxiety Sensitivity Index (ASI; Peterson & Reiss, 1993; Reiss, Peterson, Gursky, & McNally; 1986) is a 16-item questionnaire designed to assess fear of anxiety-related symptoms. Each item is rated on a 5-point scale of 0 = *very little* to 4 = *very much*. The ASI has a high degree of internal consistency (alpha coefficients from .82 to .91; Peterson & Reiss, 1993) and stable test-retest reliability over a three-year period (r = .71; Maller & Reiss, 1992); (b) the Suffocation Fear Scale (SFS; Rachman & Taylor, 1994), a 16-item scale that assesses fears related to situations in which one’s air supply is threatened. Respondents rate on a 5-point Likert-type scale ranging from 1 = *not at all anxious* to 5 = *extremely anxious* how they would feel in situations such as swimming while wearing a nose plug. The
internal consistency of the SFS is good (alpha coefficients = .78; Zvolensky, Lejuez & Eifert, 1998) and the instrument is an accurate predictor of fearful responding to autonomic activity (McNally & Elke, 1996); (c) the Anxiety Control Questionnaire (ACQ-R; Brown, White, Forsyth & Barlow, 2004), is a 15 – item measure designed to assess perceptions of control over potentially threatening internal and external events and situations associated with anxious responding (alphas from .80 to .89; test-retest, $r = .88$; Rapee et al., 1996); and (d) the Spielberger State-Trait Anxiety Inventory Form – Y (STAI-S-T; Spielberger, Gorsuch, Lushene, Vagg & Jacobs, 1983), consists of two 20-item questionnaires that are designed to assess state and trait levels of anxiety (alphas = .86 to .95 in adult and college student samples; test-retest reliability ranges from $r = .71$ to .86; Spielberger et al., 1983) and has been used extensively in anxiety research with clinical and non-clinical populations. Only the trait form was used in the present study.

The following additional questionnaires were used to assess pre-experimental tendencies to engage in various emotion regulation strategies (see Appendix B):

The 22 item version of the Acceptance and Action Questionnaire (AAQ; Hayes, 2000; Hayes et al., 2003; Hayes et al., 2004) was administered to establish pre-existing tendencies to engage in experiential avoidance and as an index of psychological flexibility. All four validated versions of the AAQ can be derived from the 22-item AAQ. Using a 7-point Likert-type scale, anchored from 1 = never true to 7 = always true, respondents are asked to rate the degree to which each statement is true of them (e.g., "anxiety is bad" "I am not afraid of my feelings"). The AAQ was developed from a theoretically-driven iterative analysis using structural equation modeling on data from clinical and nonclinical samples (Hayes et al., 2003), yielding a single factor solution
(alpha = .70; Hayes, Strosahl, et al., 2004; Zvolensky & Forsyth, 2002) measuring features of experiential avoidance (e.g., excessive negative evaluations of private experiences, the use of suppression strategies and other unproductive forms of emotional control, and the ability or inability to take action in the face of negatively evaluated private events; see Hayes et al., 2003). Higher scores on the AAQ represent greater predispositions toward emotional avoidance and inaction, whereas lower scores represent more emotional acceptence and action. High AAQ scores consistently covary with emotional distress (e.g., depression and anxiety), general psychopathology, specific fears, trauma, and a lower quality of life (Forsyth, Parker, & Finlay, 2003; Hayes et. al., 2006; Marx & Sloan, 2002; Zvolensky & Forsyth, 2002). The AAQ also appears to assess a predisposition distinct from other psychological predispositions associated with panic and anxious responding (e.g., trait anxiety, anxiety sensitivity; see Kelly & Forsyth, 2009; Stewart, Zvolensky, & Eifert, 2001; Zvolensky & Forsyth, 2002).

The Emotion Regulation Questionnaire (ERQ; Gross & John, 2003) is a 10 – item measure designed to assess individual differences in the habitual use of two emotion regulation strategies: cognitive reappraisal and expressive suppression. Only the Reappraisal subscale of the ERQ was used (alphas from .75-.82; test-retest, \( r = .69 \); Gross & John, 2003) as a different measure was used to assess suppression beyond expressive suppression.

The Mindful Awareness and Attention Scale (MAAS; Brown & Ryan, 2003) is a 15 - item measure designed to assess individual differences in the frequency of mindful states over time (alphas from .80-.87; test-retest \( r = .81 \); Brown & Ryan, 2003).
The White Bear Suppression Inventory (WBSI; Wegner & Zanatos, 1994) is a 15–item measure designed to assess individual differences in the tendency to suppress unwanted thoughts (alphas from .84-.89, test-retest $r = .80$; Muris, Merkelbach, & Horselenberg, 1996).

_Panicogenic stimulus_. The panicogenic stimulus consisted of one 15-minute inhalation of 5% carbon dioxide-enriched air (5% CO$_2$, 21% O$_2$, 74% N$_2$)--a similar dose and length of administration as used in Levitt et al. (2004). This lower concentration allowed the anxiogenic effect to be produced gradually, giving the participants time to employ the given strategies. The inhalation is only moderately interoceptively averse and lower than most biological challenge CO$_2$ concentrations (Karekla et al., 2004; Levitt et al., 2004; Rapee, Brown, Antony, & Barlow, 1992; Zvolensky & Eifert, 2001). The gas inhalation was administered through a continuous positive air pressure Hans Rudolph® mouth-breathing-only respiratory mask with head strap. The respiratory mask is attached to 1.8 m of 22 mm aerosol tubing connected to one free port of Pneumatic 3-way Sliding Type directional control valve (Hans Rudolph, Inc, 6000 Series). The tubing is connected to a 60-1 non-diffusing gas collection bag via another port of the valve using a large 35 mm bore with flexible O-ring. The bag is inflated with the gas mixture supplied from a nearby tank using a .25 inch stem and Tygon tubing. One free port is left unattached to feed normal room air from the laboratory atmosphere. Participants breathed the air directly from the bag to minimize detection of changes in air pressure in the mask. The directional control valve is activated by a 4285 Series automated controller (Hans Rudolph, Inc.), which allows for precise switching between normal room air and non-pressurized CO$_2$-enriched air and is activated by depressing a foot pedal switch. This
ensures uninterrupted breathing of the CO₂ gas, precise switching back and forth between the gas mix and normal room air, and prevents the gases from being combined (see Lejuez, Forsyth & Eifert, 1998). The apparatus used to deliver the anxiogenic stimulus was situated in a sound-attenuated room adjacent to the participant chamber.

**Electrodermal response and physiological monitoring.** A Coulbourn Modular Polygraph, interfaced with Datawave Experimenter Workbench software, was used for continuous monitoring of physiological responses. Skin conductance (SC) level was measured using two 8-mm diameter Ag/AgCl electrodes filled with a 0.05-M concentration of Unabase cream (see Fowles et al., 1981). The electrodes were affixed to the thenar and hypothenar eminences of the participants non-dominant hand using concentric adhesive collars. SC level and responses were directly recorded in microsiemens (μS) in the AC coupling mode with a Coulbourn V71-23 isolated skin conductance coupler that provides constant 0.5 V across the electrodes. Non-invasive continuous monitoring of expired levels of CO₂ (ETCO₂), oxygen saturation (SPO₂) in the blood, and heart rate were sampled and monitored throughout the experiment to ensure participant safety using a Novametrix CO₂/SMO Capnograph interfaced with the Coulbourn V-Series Modular Polygraph.

*Instructional videos.* Participants viewed a video teaching emotion regulation strategies to be used during the challenge (i.e., acceptance, cognitive restructuring, or no-instruction control video; see Appendix C for script). All videos were 10 minutes in length. The acceptance and cognitive restructuring videos contained similar examples, and the phrasing and organization of the messages were similar.
The acceptance video closely followed the script used by Levitt and colleagues (2004). The main message of the acceptance intervention was that attempts to suppress, control, or change emotions and thoughts may be futile (e.g., “direct attempts to control our internal experience [things like thoughts and feelings] don’t usually work for very long, if they work at all”), while learning to be with your experience, gently and just as it is, and engaging in behavior change in valued directions is a more functional way of living (e.g., “In the end, you will have more control over your life if you stop trying to control your anxiety and let yourself live life according to what is important to you”). It did not attempt to normalize or decatastrophize symptoms of panic or imply that panic symptoms are not dangerous or threatening. Participants were instructed “…pay attention to your feelings. You may experience a range of emotions; anxiety, excitement, relaxation…I’d like you to experience them all fully and not try to make any of them go away.”

The cognitive restructuring video encouraged participants to gain control over their thoughts and feelings by changing their negative thoughts and emotions to more appropriate and realistic ones (e.g., “During this exercise I would like you to pay attention to your thoughts. You may experience a range of thoughts related to your physical sensations. I’d like you to evaluate the reality of these thoughts and not try to make them go away…I’d like you to replace them with more realistic thoughts”).

Each instructional video contained a number of examples and situations in which the given strategy could be useful. The instruction groups were told to use the given strategy to address symptoms of anxiety that might arise during the challenge. The scripts of both instructional videos were evaluated by doctoral-level experts in CBT and
ACT, respectively, to ensure that they accurately and adequately communicated the desired intervention. The no-instruction control group was shown a video presenting content from an article about emperor penguins (Milius, 2005). The video described only information about penguins and did not mention anything about strategies to use during the CO₂ challenge.

Experimental self-report measures. See Appendix D for all experimental self-report measures. Participants completed an author-constructed manipulation check questionnaire (modified from Levitt et al., 2004). The questionnaire consisted of multiple-choice answer questions, with several questions assessing participants’ understanding of the strategies presented in the video, another assessing how useful the participant expected these strategies to be for them during the challenge, and an additional question asking the participant how much they typically use the approach they learned about in the video. The no-instruction control group only received multiple-choice questions related to the neutral video that they viewed.

Use of these manipulation checks allowed the experimenter to evaluate whether participants adequately understood how to use the instructed techniques and their familiarity with them. If the participants did not fully understand how to implement the strategies that they were asked to use during the biological challenge, then it could not be said with certainty that they would be able to use that strategy during the challenge. This has been a shortcoming in the methodology of previous studies (e.g., Hofmann et al., 2009). If participants failed to correctly answer all questions assessing their understanding of the instructions, they were re-administered the video and questionnaire.
If they did not correctly answer all questions a second time, their participation in the study was terminated at that time.

During the CO₂ inhalation portion of the experiment, participants completed five visual analogue scales similar to the paper-and-pencil visual analogue scales developed by Wolpe (1958). These scales assessed subjective distress (SUDS, 0 mm = not at all distressed to 100 mm = extremely distressed), urge to escape (0 mm = no urge to 100 mm = strong urge), intensity of bodily reactions (0 mm = not at all intense to 100 mm = extremely intense), upsetting content of thoughts (0 mm = not at all upsetting to 100 mm = extremely upsetting), and fearfulness (0 mm = not at all fearful to 100 mm = extremely afraid). Similar scales have been previously used in studies employing a biological challenge (e.g., Acheson, Forsyth, Prenoveau, & Bouton, 2007; Karekla et al., 2004; Kelly & Forsyth, 2007; Prenoveau, Forsyth, Kelly, & Barrios, 2006). Participants made these evaluations before, during (beginning every three minutes after the start of the inhalation), and following the inhalation.

The Diagnostic Symptoms Questionnaire (DSQ; Rapee, Sanderson, McCauley, & DiNardo, 1992) is a 15-item self-report measure that is designed to assess the frequency and severity of 15 somatic and cognitive DSM-IV panic symptoms (American Psychiatric Association, 1994). Intensity ratings for each endorsed symptom are recorded onto a 9-point Likert-type scale (0 = not at all felt to 8 = very strongly felt). The DSQ is widely used in biological challenge research of this type (Forsyth et al, 1996; Forsyth & Eifert, 1998b; Kelly & Forsyth, 2007). The DSQ provides information on the total number and severity of panic symptoms, both physical and cognitive, experienced, which
are sensitive to the biological challenge procedure. DSQ responses were assessed following the inhalation and following the final recovery period.

Finally, a second author-constructed manipulation check measure (modified from Levitt et al., 2004) was created to assess strategies that were used during the CO₂ challenge in order to determine the extent to which participants made use of the strategies that they viewed in the video, to assess perceived utility of the strategies for coping with anxiety during the challenge, and to determine which strategies were utilized by the no-strategy control group. These items reflected suppression strategies, acceptance strategies, and cognitive restructuring strategies.

Procedure

Participants meeting inclusion criteria were randomly assigned to one of three experimental conditions: acceptance strategy (n = 24), cognitive restructuring strategy (n = 30), and no-instruction control (n = 27). Two subjects left the experiment prior to the video and are not included in these numbers. Participants first completed the pre-experimental questionnaires and a consent form describing the experimental procedure (Appendix B). Following this, participants were led to a dimly lit, sound-attenuated experimental chamber (3m X 1.5m) where they were seated in a comfortable recliner chair. Once seated, they were fitted with the skin conductance electrodes, a respiratory mask with head strap, and a nose clip to reduce olfactory detection of the CO₂ and to maximize ventilation (cf. Forsyth & Eifert, 1998b).

During the first part of the experimental procedure, participants were asked to sit quietly for a five-minute adaptation period while baseline measures of skin conductance were recorded. Participants were then read a script (see Appendix C) presenting a
detailed description of the procedure including a description of several of the possible transitory side effects of breathing CO₂ (e.g. mild tachycardia, breathlessness, difficulty breathing, symptoms of anxiety, and the possibility of panic). The instructions served to (a) fully inform participants of the potential aversive consequences of the procedure, (b) control for expectancy effects across participants, and (c) maximize the aversive value of the CO₂ stimulus (cf. Forsyth et al., 1996; Forsyth & Eifert, 1998b). As with previous research (see Forsyth et al., 1996, 2000; Forsyth & Eifert, 1998b), participants were not told about the amount or timing of the CO₂ administration (Karekla et al., 2004). Participants were simply told that they would receive an inhalation of carbon dioxide-enriched air.

Participants then viewed a video presenting an introduction to one of two possible emotion-regulation interventions (i.e., cognitive restructuring or acceptance) or selected content adapted from an article about emperor penguins (Milius, 2005). Participants in the acceptance and cognitive restructuring conditions were told that they would be viewing a video describing strategies that might help them cope with any symptoms that they might experience during the CO₂ challenge. They were told to watch the video carefully, as they would be given a brief quiz on the main ideas. All three videos were presented on a computer screen placed on a desk in front of the participant’s chair and lasted 10 minutes. When the videos were finished, participants completed the respective post-video content quiz on the instructions and their experience with them (or on the non-instructional content presented), and then began the CO₂ challenge.

Participants were then instructed to begin using the strategies presented in the video and were administered the 5% CO₂-enriched air for 15 minutes. During the
inhalation, participants made ratings of their level of distress, intensity of bodily reactions, upsetting content of thoughts, urge to escape, and fearfulness at 3 minute intervals. Immediately following the procedure, they completed the DSQ to report on panicogenic symptoms experienced during the challenge.

Following the DSQ, participants underwent a 5-minute post-challenge recovery period during which they were asked to continue to use their strategies without concurrent exposure to the CO2-enriched air. At the end of the recovery period, participants again completed the DSQ and were invited to participate in a second inhalation procedure. It was explained they would receive the same compensation if they participated or not, and they would remain in the chair for same amount of time either way. Those who agreed to the second challenge were told that the experimenter had, in fact, enough data and did not need them to participate.

Participants then begin a second 5-minute recovery period, followed by a 5-minute resting period where physiological measures were obtained. This additional recovery period before additional measures were administered allowed participants who may have experienced anxious anticipation of participating in a second challenge to return to normal resting levels. All physiological monitoring equipment was then removed, and participants were debriefed, compensated, and allowed to leave.

Data Reduction and Statistical Analyses

A one-way ANOVA tested whether the groups differed in their use of acceptance, cognitive restructuring, and suppression strategies during the CO2 challenge. An acceptance score was computed as the sum of the three acceptance items on the manipulation check measure (range = 0-24), a cognitive restructuring score was
computed as the sum of the three cognitive restructuring items (range = 0-20), and a suppression score was computed as the sum of the three suppression items (range = 0-19). These were then divided by the sum total reported use of all strategies to calculate the percentage that each strategy was used in order to standardize ratings across participants.

A t-test was used to compare the acceptance and cognitive restructuring groups on how useful they felt their instructed strategy was for coping with the anxiety that they were experiencing. A usefulness score was computed as the sum of the three instructed strategy (i.e., acceptance or cognitive restructuring, respectively) items on the manipulation check measure (range 1-24).

After screening for outliers due to sampling error (e.g., participant movement), average SC values were calculated for each 45 second inhalation measurement period (sampled at minutes 1, 2, 4, 5, 7, 8, 10, 11, 13, and 14 of the CO₂ challenge) and during the recovery phase (sampled at the initiation of and during minutes 1, 3, and 4 of the recovery phase). To correct for skewness/kurtosis, a logarithmic correction was applied to SC values. No outliers were identified following the transformation.

Baseline SC was calculated by averaging the last 45 seconds of the continuously recorded 5 minute sample. SC values were averaged first by epoch and then by phase across the inhalation period and the recovery period, respectively. Separate repeated measures ANOVAs were conducted using the baseline SC value as timepoint 1 and the inhalation or recovery period SC as timepoint 2. This allowed the analyses to reflect change from pre-challenge baseline levels to emphasize physiological response during the challenge and detect Condition x Phase interaction effects. This data reduction
technique maximizes power due to inclusion of fewer timepoints and has been used frequently with similar challenge procedures (e.g., Eifert & Heffner, 2003; Levitt et al., 2004).

In order to explore the data, more fine-grained (albeit likely underpowered) repeated measures ANOVAs examining epochs over time were conducted using 5 block-averaged inhalation data points and 4 recovery data points incorporating change over baseline. Although main effects of time were found, these additional exploratory analyses yielded no significant group or time by group interaction effects.

Evaluative ratings were hand-scored (in mm) using a metric ruler. To correct for skewness/kurtosis, logarithmic corrections were applied. No outliers were identified following the transformation. Baseline evaluative ratings were the first evaluative ratings sampled prior to the start of the CO₂ inhalation. Evaluative ratings were averaged across the inhalation period and the recovery period, respectively. Separate repeated measures ANOVAs were conducted using the baseline evaluative rating as timepoint 1 and the inhalation or recovery period evaluative rating as timepoint 2. This allowed the analyses to reflect change from pre-challenge baseline levels and detect Condition x Phase interaction effects, much as with the above SC analyses.

As with SC, repeated measures ANOVAs examining epochs over time were conducted using 5 inhalation data points and 2 recovery data points incorporating change over baseline. Again, these yielded no significant group or time by group interaction effects.

For all ANOVAs, follow-up comparisons were conducted as appropriate to elucidate the nature of specific effects. Greenhouse-Geisser degrees of freedom
adjustments were applied to correct for violations of sphericity that often occur in repeated-measures ANOVAs. Partial eta square (\(\eta_p^2\); Cohen, 1988) was used as an index of effect size for significant results to provide an approximation of the proportion of variance accounted for by the experimental manipulations; large effects, \(\eta_p^2 > .14\); medium effects, \(\eta_p^2 > .06\); and small effects, \(\eta_p^2 > .01\). Bonferroni corrections were applied to all post-hoc comparisons when appropriate.

Frequency and severity of DSM-IV panic symptoms were calculated based on post-inhalation and post-recovery DSQ responses. One-way ANOVAs were conducted to analyze number of DSM-IV panic symptoms and symptom severity. Where appropriate, Tukey’s HSD post-hoc tests were conducted to clarify main effects.

Results

Random Assignment

To determine if random assignment was successful at equating the three instruction groups (acceptance, cognitive restructuring, and no-instruction control) at baseline, an ANOVA was used to compare the groups on pre-experimental questionnaire scores (see Table 1), baseline anticipatory anxiety (as measured by skin conductance; see Table 2), and initial evaluative ratings (see Table 2). There were no group differences on any of the measures. These results indicate that random assignment was successful in producing equivalent groups on assessed pre-experimental evaluation domains of anxiety and use of emotion regulation strategies.

In order to determine whether there were any significant differences between participants recruited for course credit \((n = 47)\) and for payment \((n = 36)\), independent
Table 1

*Means and Standard Deviations of Responses to Pre-Experimental Questionnaires by Condition*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Acceptance</th>
<th>Cognitive Restructuring</th>
<th>No-Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>Pre-experimental Measure</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>ASI total</td>
<td>31.52</td>
<td>11.04</td>
<td>31.10</td>
</tr>
<tr>
<td>SFS total</td>
<td>17.13</td>
<td>10.46</td>
<td>16.21</td>
</tr>
<tr>
<td>ACQ total</td>
<td>43.93</td>
<td>14.00</td>
<td>42.15</td>
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<tr>
<td>STAI-T total</td>
<td>45.43</td>
<td>4.52</td>
<td>44.77</td>
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<tr>
<td>AAQ-16 total</td>
<td>61.83</td>
<td>14.96</td>
<td>61.74</td>
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<tr>
<td>ERQ Reappraisal</td>
<td>23.52</td>
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<td>24.80</td>
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<td>MAAS</td>
<td>61.65</td>
<td>10.54</td>
<td>62.25</td>
</tr>
<tr>
<td>WBSI</td>
<td>46.52</td>
<td>17.36</td>
<td>45.70</td>
</tr>
</tbody>
</table>

*Note.* ASI = Anxiety Sensitivity Index (N = 66); SFS = Suffocation Fear Scale (N = 65); ACQ = Anxiety Control Questionnaire (N = 62); STAI-T = Spielberger State and Trait Anxiety Scale – Trait Form (N = 64); AAQ-16 = Acceptance and Action Questionnaire (N = 65); ERQ Reappraisal = Emotion Regulation Questionnaire Reappraisal Subscale (N = 66); MAAS = Mindfulness Attention Awareness Scale (N = 66); WBSI = White Bear Suppression Inventory (N = 66). Partial or incomplete responses resulted in variable sample sizes across measures.
Table 2

Means and Standard Deviations for Evaluative Ratings and Skin Conductance Across Phases.

<table>
<thead>
<tr>
<th>Variable</th>
<th></th>
<th>Experimental Phase</th>
<th></th>
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</tr>
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<tr>
<td></td>
<td></td>
<td>Baseline</td>
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<td>Recovery</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
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<td>Subjective distress</td>
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<td></td>
</tr>
<tr>
<td>Acceptance</td>
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<td>29.54</td>
<td>21.83</td>
</tr>
<tr>
<td>Cognitive Restructuring</td>
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<td>26.09</td>
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<tr>
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<td>24.55</td>
<td>27.38</td>
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</tr>
<tr>
<td>Intensity of reactions</td>
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<td></td>
<td></td>
</tr>
<tr>
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<td>30.91</td>
<td>20.07</td>
</tr>
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</tr>
<tr>
<td>No Instruction</td>
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<td>20.69</td>
<td>28.76</td>
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</tr>
<tr>
<td>Upsetting thoughts</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Acceptance</td>
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<td>20.45</td>
<td>20.18</td>
<td>20.68</td>
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<tr>
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</tr>
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<td>Fear</td>
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</tr>
<tr>
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<td>28.76</td>
<td>27.98</td>
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</tr>
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<td>Urge to escape</td>
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<td>Acceptance</td>
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<td>26.55</td>
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<tr>
<td>No Instruction</td>
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<td>29.09</td>
<td>38.09</td>
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<td>Skin Conductance</td>
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</tr>
<tr>
<td>Acceptance</td>
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<td>4.01</td>
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</tr>
<tr>
<td>Cognitive Restructuring</td>
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<td>No Instruction</td>
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<td>4.08</td>
<td>9.60</td>
<td>4.20</td>
</tr>
</tbody>
</table>
groups \( t \)-tests were conducted to compare the groups on pre-experimental questionnaires and pre-experimental anticipatory anxiety (as measured by skin conductance; see Table 3). There were no group differences on the measures or the baseline skin conductance. These results suggest that participants recruited for course credit and those that received payment were equivalent.

**Manipulation Checks**

*Quiz on video instructions.* The acceptance, cognitive restructuring, and no-instruction control group were compared on their ability to provide accurate responses to the quiz items using \( \chi^2 \) analyses. These analyses were undertaken to determine whether there were group differences in comprehension of the instructional videos. There were significant group differences on the percentage of participants who had difficulty with video comprehension, as indicated by a failure to correctly answer both questions that comprised the quiz on video information. Participants in the cognitive restructuring group had a greater percentage of failure to accurately answer both questions on the manipulation check and had to retake the measure than both other groups, \( \chi^2 (2, N = 80) = 17.70, p < .001 \).

*Expectancy.* An independent samples \( t \)-test was used to compare the acceptance and cognitive restructuring groups on the expectancy question (i.e., “How useful do you expect the instructions in the video will be for you during the upcoming breathing exercise?”). No significant differences were found, \( t(41) = .43, p > .05 \), indicating that the groups expected the instructions to be equally useful. On average, both the acceptance and cognitive restructuring groups expected the instructions to be “very
### Table 3

**Means and Standard Deviations of Responses to Pre-Experimental Questionnaires and Baseline Skin Conductance by Recruitment Strategy**

<table>
<thead>
<tr>
<th>Variable</th>
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<th>Paid</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
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<tr>
<td>Pre-experimental Measure</td>
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<tr>
<td>ASI total</td>
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<td>ACQ total</td>
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<td>STAI-T total</td>
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<td>61.83</td>
<td>14.96</td>
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<tr>
<td>MAAS</td>
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<tr>
<td>WBSI</td>
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</tr>
<tr>
<td>Skin conductance</td>
<td>8.42</td>
<td>4.72</td>
</tr>
</tbody>
</table>

*Note.* ASI = Anxiety Sensitivity Index (N = 66); SFS = Suffocation Fear Scale (N = 65); ACQ = Anxiety Control Questionnaire (N = 62); STAI-T = Spielberger State and Trait Anxiety Scale – Trait Form (N = 64); AAQ-16 = Acceptance and Action Questionnaire (N = 65); ERQ Reappraisal = Emotion Regulation Questionnaire Reappraisal Subscale (N = 66); MAAS = Mindfulness Attention Awareness Scale (N = 66); WBSI = White Bear Suppression Inventory (N = 66). Partial or incomplete responses resulted in variable sample sizes across measures.
useful,” (i.e., $M = 2.65$, $SD = .72$, range = 1-4; higher scores = greater expected usefulness).

**Everyday use of strategies.** An independent samples $t$-test was also used to compare the acceptance and cognitive restructuring groups on the extent to which they reported typically using the strategies they were taught in the video in their everyday lives. No significant differences were found, $t(35) = .045$, $p > .05$, indicating that the groups reported equivalent everyday use of their respective instructed strategies. On average, both groups reported everyday use that fell between “some of the time” and “frequently,” (i.e., $M = 3.19$, $SD = 1.58$, range = 0-7; higher scores = greater expected usefulness).

**Use of strategies during the challenge.** Figure 1 illustrates use of emotion regulation strategies during the challenge by group. As expected, significant differences were found between the groups on percentage of time acceptance was used during the challenge, $F(2, 58) = 4.67$, $R^2 = .14$, $p < .05$. A priori contrasts were set to compare the means of the acceptance and cognitive restructuring instruction groups and the acceptance and no-instruction control groups. Simple effects showed that the acceptance group ($M = 0.52$, $SD = 0.18$) had greater scores on percentage acceptance used than the cognitive restructuring group ($M = 0.37$, $SD = 0.081$), $t (38) = 3.21$, $p < .01$, and the no-instruction control group, ($M = 0.36$, $SD = 0.24$), $t (41) = 2.36$, $p < .05$.

Contrary to expectation, no significant differences were found between groups on percentage of time using cognitive restructuring strategies during the challenge, $F(2, 58) = 1.67$, $p > .05$. Significant differences were found between the groups on the percentage of time engaged in suppression, $F(2, 58) = 4.35$, $R^2 = .13$, $p < .05$. A priori
Figure 1

Reported Emotion Regulation Strategy Use by Group

Means with different superscripts differ ($p < .05$) for within series comparisons by group (e.g., acceptance use x group)
contrasts revealed that the acceptance group \((M = 0.22; SD = 0.14)\) scored significantly lower on percentage of time using suppression than the no-instruction control group \((M = 0.36, SD = 0.12)\), \(t(41) = 2.36, p < .05\), but there was no significant difference between percentage of time using suppression between the no-instruction control group and the cognitive restructuring group \((M = 0.30, SD = 0.091)\), \(t(37) = 0.13, p > .05\).

The acceptance and cognitive restructuring groups were also compared on their percentage of time using the strategy they were instructed to use in the video (acceptance and cognitive restructuring, respectively). The acceptance group \((M = 0.52, SD = 0.18)\) was found to report a significantly higher percentage of time using the instructed strategy than the cognitive restructuring group \((M = 0.33, SD = 0.07)\), \(t(38) = 4.16, p < .001\).

*Usefulness of instructed strategy during the challenge.* The acceptance and cognitive restructuring groups were also compared on their perceived usefulness of their instructed strategy (acceptance and cognitive restructuring, respectively) for coping with anxiety during the CO2 breathing exercise. The acceptance group \((M = 13.95, SD = 5.09)\) was found to report significantly higher perceived usefulness of their instructed strategy than the cognitive restructuring group \((M = 10.42, SD = 4.13)\), \(t(36) = 2.35, p < .05\).

In summary, these analyses demonstrate that participants in the cognitive restructuring groups had greater difficulty with their comprehension of the videos than those in the other groups. The acceptance and cognitive restructuring groups reported equivalently high pre-challenge expectancies of usefulness of the instructions presented in the video during the biological challenge and equivalent everyday use of the instructed strategies.
Although participants in the acceptance condition reported significantly greater levels of acceptance use during the challenge than the other conditions, participants in the cognitive restructuring condition did not report engaging in cognitive restructuring at significantly greater levels than participants in the acceptance condition, and suppression strategies were not significantly different between the cognitive restructuring and no-instruction control groups.

Despite failure to achieve statistically significant differences by group for the cognitive restructuring strategy, all group means were in the expected directions (i.e., mean percentage use of acceptance was highest for the acceptance group, mean percentage use of cognitive restructuring was highest for the cognitive restructuring group, and mean percentage use of suppression was highest for the no-instruction group). Overall, these results indicate that participants in the acceptance and cognitive restructuring conditions used the appropriate instructed strategy during the CO₂ challenge. In addition, the acceptance group reported greater percentage of time using the instructed strategy than the cognitive restructuring group. Further, the acceptance group perceived use of their instructed strategy (i.e., acceptance) to be more useful for coping with anxiety during the challenge than the cognitive restructuring group perceived their instructed strategy (i.e., cognitive restructuring) to be for coping with anxiety during the challenge.

*Analyses of Physiological (Skin Conductance) Challenge Response*

It was hypothesized that there would be no difference between conditions on physiological response during the inhalation or recovery phase. A repeated-measures ANOVA was conducted on electrodermal response, with repeated measures
corresponding to phase (i.e., average skin conductance at baseline and during the inhalation phase, and average skin conductance at baseline and during the recovery phase) to test for a significant Condition x Phase interaction. Mean skin conductance levels across conditions during baseline and challenge phases can be seen in Table 2.

Inhalation phase. The ANOVA yielded a main effect for phase over baseline (F[1, 63] = 116.02, p < .001) but, as expected, there was no significant interaction effect, indicating no physiological response differences between groups over baseline during the inhalation phase, \( F (2, 63) = 0.46, p > .05 \). Due to the nonsignificant findings, no additional contrasts were conducted.

Recovery phase. The ANOVA again yielded a main effect for phase over baseline (F[1, 63] = 91.91, p < .001) but no significant interaction effect, indicating no physiological response differences between groups during the recovery phase, \( F (2, 63) = 0.080, p > .05 \). Due to the nonsignificant findings, no additional contrasts were conducted.

In summary, no differences were found between groups on physiological response as measured by skin conductance during either the inhalation phase or recovery phase, supporting the initial hypothesis regarding skin conductance.

Analyses of Subjective (Self-Report) Challenge Response

It was hypothesized that the no-instruction group would report more subjective anxiety than both other groups, and that the acceptance and cognitive restructuring groups would be equivalent on subjective response.

Evaluative ratings. A repeated measures ANOVA was conducted on the five VAS evaluative ratings with repeated measures corresponding to baseline VAS rating
and average rating during the experimental phase to test for a significant Condition x Phase interaction. Mean VAS ratings across conditions during baseline, inhalation, and recovery phases can be seen in Table 2. Contrary to expectations, subjective distress, intensity of bodily reactions, upsetting thoughts, fear, and urge to escape did not differentiate between conditions during the inhalation \((Fs < 1.96)\) or recovery \((Fs < .78)\) periods.

**DSM-IV report of panic.** ANOVAs were conducted on the two DSQs administered post-inhalation and post-recovery as well as their subscales. Reports of panic symptom frequency and severity across conditions post-inhalation and post-recovery can be seen in Table 4. Total frequency of all panic symptoms and panic symptom severity failed to distinguish between conditions post-inhalation \((Fs < .70)\) or post-recovery \((Fs < 2.51)\). Moreover, total frequency of physical panic symptoms did not discriminate between conditions post-inhalation, \(F(2, 63) = 0.93, p > .05\), but they did discriminate between conditions post-recovery, \(F(2, 63) = 3.23, p < .05, \eta^2_p = .09\). Post-hoc tests showed that the no-instruction condition reported significantly fewer physical panic symptoms relative to the acceptance condition, \(t = 2.62, p < .05\), but no other between-group differences were observed \(ps > .05\). Lastly, total frequency of cognitive symptoms did not discriminate between conditions post-inhalation, \(F(2, 63) = 0.08, p > .05\), or post-recovery, \(F(2, 63) = 0.20, p > .05\).

In summary, the results did not fully support the hypothesis regarding self-report symptoms. There were no group differences on the VAS evaluative ratings during either inhalation or recovery. DSQ reports of panic symptoms did differ between groups during the recovery phase only. During recovery, the no-instruction group reported less physical
Table 4

Means and Standard Deviations of DSM-IV Panic Across Conditioning Phases

<table>
<thead>
<tr>
<th>DSQ</th>
<th>Experimental Phase</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Post-Inhalation</td>
<td>Post-Recovery</td>
</tr>
<tr>
<td></td>
<td></td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Panic Symptom Frequency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acceptance</td>
<td>4.74</td>
<td>2.94</td>
<td>3.83</td>
</tr>
<tr>
<td>Cognitive Restructuring</td>
<td>4.45</td>
<td>3.44</td>
<td>3.10</td>
</tr>
<tr>
<td>No-Instruction</td>
<td>3.96</td>
<td>2.44</td>
<td>2.13</td>
</tr>
<tr>
<td>Panic Symptom Severity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acceptance</td>
<td>3.72</td>
<td>3.70</td>
<td>3.19</td>
</tr>
<tr>
<td>Cognitive Restructuring</td>
<td>4.83</td>
<td>7.27</td>
<td>3.28</td>
</tr>
<tr>
<td>No-Instruction</td>
<td>3.16</td>
<td>1.69</td>
<td>2.68</td>
</tr>
<tr>
<td>Physical Panic Symptom Frequency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acceptance</td>
<td>4.00</td>
<td>2.26</td>
<td>3.39</td>
</tr>
<tr>
<td>Cognitive Restructuring</td>
<td>3.75</td>
<td>2.61</td>
<td>2.60</td>
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<td>No-Instruction</td>
<td>3.13</td>
<td>1.77</td>
<td>1.78</td>
</tr>
<tr>
<td>Cognitive Panic Symptom Frequency</td>
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<td></td>
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<tr>
<td>Acceptance</td>
<td>0.74</td>
<td>1.21</td>
<td>0.43</td>
</tr>
<tr>
<td>Cognitive Restructuring</td>
<td>0.70</td>
<td>1.08</td>
<td>0.50</td>
</tr>
<tr>
<td>No-Instruction</td>
<td>0.83</td>
<td>0.98</td>
<td>0.35</td>
</tr>
<tr>
<td>Physical Panic Symptom Severity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acceptance</td>
<td>3.51</td>
<td>3.00</td>
<td>3.02*</td>
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<tr>
<td>Cognitive Restructuring</td>
<td>4.41</td>
<td>5.33</td>
<td>3.12</td>
</tr>
<tr>
<td>No-Instruction</td>
<td>3.20</td>
<td>1.79</td>
<td>2.68*</td>
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<tr>
<td>Cognitive Panic Symptom Severity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acceptance</td>
<td>1.21</td>
<td>1.94</td>
<td>0.44</td>
</tr>
<tr>
<td>Cognitive Restructuring</td>
<td>1.70</td>
<td>2.36</td>
<td>1.28</td>
</tr>
<tr>
<td>No-Instruction</td>
<td>1.86</td>
<td>2.30</td>
<td>0.87</td>
</tr>
</tbody>
</table>

Note. Means with different superscripts differ (alpha level of p < .05) for within phase comparisons between experimental conditions. DSQ = Diagnostic Symptom Questionnaire. DSM-IV = Diagnostic and Statistical Manual of Mental Disorders, 4th ed.
panic symptoms than the acceptance group, but there was no significant difference between the acceptance and cognitive restructuring groups, as expected.

Analyses of Behavioral Avoidance and Willingness

It was hypothesized that individuals in the acceptance group would be less behaviorally avoidant and thus demonstrate lower dropout rates, longer time engaged in inhalation, and more willingness to participate in a subsequent biological challenge compared with the cognitive restructuring and no-instruction groups. There were not enough participants who dropped out of the study to analyze length of time engaged in inhalation or dropout rates. Contrary to expectation, there was no difference between groups on willingness to engage in another biological challenge. An ANOVA showed no group differences on level of willingness to participate in another biological challenge, F(2, 63) = 0.29, p > .05. On average, groups reported they were “mostly willing” to participate in another challenge, (i.e., M = 1.72, SD = 1.21, range = 0-4; higher scores = greater willingness). In addition, a chi-square test indicated no difference between groups on their willingness to participate in another biological challenge at that moment, \( \chi^2 (2, N = 66) = 4.27, p > .05 \). Thus, the hypothesis that acceptance would yield greater willingness over cognitive restructuring and the no-instruction control groups was not supported.

Exploratory Analyses

A series of regression analyses were conducted to analyze predictors of challenge response across groups. Participant ratings of use of emotion regulatory responses during the challenge were examined as predictors in a series of hierarchical multiple regressions. Baseline values of outcome variables were entered in Step 1 as covariates in order to
partial out the effects of these variables. The outcome variables included skin conductance and evaluative ratings on the VAS which were examined both for inhalation and recovery periods. Tests for multicollinearity, univariate and multivariate normality, and univariate and multivariate outliers were conducted. DSQ responses assessing panic symptoms post-inhalation and post-recovery and willingness to participate in a future challenge were also used as outcome variables in simple regression analyses as these variables did not have baseline values. In addition, perceived usefulness of the strategy instructed in the video was evaluated in a simple regression analysis as a predictor of use of the instructed strategy during the challenge.

Physiological response. Baseline skin conductance was entered in the first step of each hierarchical regression analysis as a covariate with average skin conductance during inhalation or recovery phase as the outcome variable. Percentage use of an emotion regulation strategy (acceptance, cognitive restructuring, and suppression, respectively) was entered in the second step. The use of emotion regulation strategy failed to significantly predict skin conductance. However, a hierarchical F-test revealed a significant trend supporting a main effect of suppression use on skin conductance during recovery, even when controlling for baseline skin conductance (see Table 5). A positive standardized coefficient indicated that an increase in suppression use resulted in an increase in skin conductance during recovery.

Evaluative ratings. All hierarchical multiple regressions were significant after the first step as baseline values of the outcome variables significantly predicted the outcome variables at inhalation and recovery phases. Only those regressions with a significant
### Table 5

*Hierarchical Regression Analyses Evaluating Suppression Use as a Predictor of Skin Conductance During Inhalation and Recovery Phases*

<table>
<thead>
<tr>
<th>Phase</th>
<th>Variable</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inhalation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steps 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Baseline skin conductance</td>
<td>0.89</td>
<td>0.057</td>
<td>.90**</td>
</tr>
<tr>
<td>Steps 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Baseline skin conductance</td>
<td>0.89</td>
<td>0.057</td>
<td>.90**</td>
</tr>
<tr>
<td></td>
<td>Suppression use</td>
<td>0.089</td>
<td>0.065</td>
<td>0.080</td>
</tr>
<tr>
<td><strong>Recovery</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steps 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Baseline skin conductance</td>
<td>0.90</td>
<td>0.062</td>
<td>.88**</td>
</tr>
<tr>
<td>Steps 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Baseline skin conductance</td>
<td>0.91</td>
<td>0.061</td>
<td>.89**</td>
</tr>
<tr>
<td></td>
<td>Suppression use</td>
<td>0.13</td>
<td>0.069</td>
<td>.11*</td>
</tr>
</tbody>
</table>

*Note.* For inhalation phase: $R^2 = .80$ for Step 1; $\Delta R^2 = .006$ for Step 2, $p > .05$. $N = 61$. For recovery phase: $R^2 = .78$ for Step 1; $\Delta R^2 = .012$ for Step 2, $p = .070$. $N = 61$. $^*p < .10$, $^{**}p < .001$. All regressions controlled for baseline skin conductance.
change or trend in predictive power after the entry of the emotion regulation use predictor variable in the second step are represented in tables (see Tables 6-11).

Subjective distress. Baseline evaluative rating of subjective distress was entered in the first step of each hierarchical regression analysis as a covariate with average rating of subjective distress during inhalation or recovery phase as the outcome variable. Percentage use of an emotion regulation strategy (acceptance, cognitive restructuring, and suppression, respectively) was entered in the second step. Again, use of emotion regulation strategies failed to significantly predict subjective distress. However, hierarchical $F$-tests revealed trends of significant main effects of acceptance use on subjective distress during both inhalation and recovery, even while controlling for baseline subjective distress (see Table 6). Negative standardized coefficients indicated that an increase in acceptance use resulted in a decrease in subjective distress. All cognitive restructuring use and suppression use $ts < 1.45$.

Intensity of bodily reactions. Baseline evaluative rating of intensity of bodily reactions was entered in the first step of each hierarchical regression analysis as a covariate with average rating of intensity during inhalation or recovery phase as the outcome variable. Percentage use of an emotion regulation strategy (acceptance, cognitive restructuring, and suppression, respectively) was entered in the second step. No emotion regulation strategy significantly predicted intensity of bodily reactions. However, the hierarchical $F$-tests revealed a trend supporting a significant main effect of cognitive restructuring use on intensity during recovery, but not during inhalation, even while controlling for baseline intensity (see Table 7). Interestingly, positive standardized coefficients indicated that an increase in cognitive restructuring use resulted in an
Table 6

Hierarchical Regression Analyses Evaluating Acceptance Use as a Predictor of Subjective Distress During Inhalation and Recovery Phases

<table>
<thead>
<tr>
<th>Phase</th>
<th>Variable</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
</tr>
</thead>
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<tr>
<td>Inhalation</td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Baseline subjective distress</td>
<td>0.55</td>
<td>0.11</td>
<td>.54**</td>
</tr>
<tr>
<td></td>
<td>Acceptance use</td>
<td>-0.52</td>
<td>0.29</td>
<td>-.20*</td>
</tr>
<tr>
<td>Recovery</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Baseline subjective distress</td>
<td>0.52</td>
<td>0.13</td>
<td>.49***</td>
</tr>
<tr>
<td></td>
<td>Acceptance use</td>
<td>-0.52</td>
<td>0.31</td>
<td>-.20*</td>
</tr>
</tbody>
</table>

Note. For inhalation phase: $R^2 = .29$ for Step 1; $\Delta R^2 = .037$ for Step 2, $p = .078$. $N = 61$. For recovery phase: $R^2 = .24$ for Step 1; $\Delta R^2 = .038$ for Step 2, $p = .098$. $N = 56$. *$p < .10$, **$p < .01$, ***$p < .001$. All regressions controlled for baseline subjective distress.
Table 7

Hierarchical Regression Analyses Evaluating Cognitive Restructuring Use as a Predictor of Intensity of Bodily Reactions During Inhalation and Recovery Phases

<table>
<thead>
<tr>
<th>Phase</th>
<th>Variable</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
</tr>
</thead>
<tbody>
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<td>Inhalation</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Step 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Baseline intensity</td>
<td>0.65</td>
<td>0.098</td>
<td>.65**</td>
</tr>
<tr>
<td></td>
<td>Step 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Baseline intensity</td>
<td>0.67</td>
<td>0.10</td>
<td>.67**</td>
</tr>
<tr>
<td></td>
<td>Cognitive restructuring use</td>
<td>2.41</td>
<td>1.90</td>
<td>.13</td>
</tr>
<tr>
<td>Recovery</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Step 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Baseline intensity</td>
<td>0.46</td>
<td>0.13</td>
<td>.43**</td>
</tr>
<tr>
<td></td>
<td>Step 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Baseline intensity</td>
<td>0.50</td>
<td>0.13</td>
<td>.47**</td>
</tr>
<tr>
<td></td>
<td>Cognitive restructuring use</td>
<td>4.43</td>
<td>2.32</td>
<td>.23*</td>
</tr>
</tbody>
</table>

Note. For inhalation phase: $R^2 = .43$ for Step 1; $\Delta R^2 = .016$ for Step 2, $p > .05$. $N = 61$.
For recovery phase: $R^2 = .19$ for Step 1; $\Delta R^2 = .052$ for Step 2, $p = .062$. $N = 56$.
*p < .10, **p < .001. All regressions controlled for baseline intensity of bodily reactions.
increase in intensity of bodily reactions during recovery. All acceptance use and suppression use $ts < 1.54$.

*Upsetting thoughts.* Baseline evaluative rating of upsetting thoughts was entered in the first step of each hierarchical regression analysis as a covariate with average rating of upsetting thoughts during inhalation or recovery phase as the outcome variable. Percentage use of an emotion regulation strategy (acceptance, cognitive restructuring, and suppression, respectively) was entered in the second step. Emotion regulation strategy failed to significantly predict upsetting thoughts (all $ts < 1.44$).

*Fear.* Baseline fear was entered in the first step of each hierarchical regression analysis as a covariate with average fear ratings during inhalation and recovery phase as the outcome variable. Percentage use of an emotion regulation strategy (acceptance, cognitive restructuring, and suppression, respectively) was entered in the second step. After controlling for baseline fear, hierarchical $F$-tests revealed significant main effects of acceptance use on fear during both inhalation and recovery (see Table 8). Negative standardized coefficients indicated that an increase in acceptance resulted in a decrease in fear both during inhalation and recovery.

In addition, a hierarchical $F$-test revealed a trend toward a significant main effect of suppression use on fear during inhalation while also controlling for baseline fear (see Table 9). Positive standardized coefficients indicated that an increase in suppression use resulted in an increase in fear during inhalation, but not during recovery. Cognitive restructuring use was not predictive of fear (both $ts < 1.45$).

*Urge to escape.* Baseline evaluative rating of urge to escape was entered in the first step of each hierarchical regression analysis as a covariate with average rating
Table 8

Hierarchical Regression Analyses Evaluating Acceptance Use as a Predictor of Fear During Inhalation and Recovery Phases

<table>
<thead>
<tr>
<th>Phase</th>
<th>Variable</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inhalation</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Step 1</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Baseline fear</td>
<td>0.64</td>
<td>0.10</td>
<td>.65**</td>
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<tr>
<td>Step 2</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Baseline fear</td>
<td>0.59</td>
<td>0.10</td>
<td>.59**</td>
<td></td>
</tr>
<tr>
<td>Acceptance use</td>
<td>-0.59</td>
<td>0.26</td>
<td>-.22*</td>
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<tr>
<td>Recovery</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Step 1</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Baseline fear</td>
<td>0.54</td>
<td>0.12</td>
<td>.51**</td>
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<tr>
<td>Step 2</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline fear</td>
<td>0.47</td>
<td>0.13</td>
<td>.44**</td>
<td></td>
</tr>
<tr>
<td>Acceptance use</td>
<td>-0.66</td>
<td>0.30</td>
<td>-.26*</td>
<td></td>
</tr>
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</table>

Note. For inhalation phase: $R^2 = .42$ for Step 1; $\Delta R^2 = .048$ for Step 2, $p < .05$. $N = 61$.
For recovery phase: $R^2 = .26$ for Step 1; $\Delta R^2 = .060$ for Step 2, $p < .05$. $N = 56$.
*p < .05, **p < .001. All regressions controlled for baseline fear.
Table 9

Hierarchical Regression Analyses Evaluating Suppression Use as a Predictor of Fear
During Inhalation and Recovery Phases

<table>
<thead>
<tr>
<th>Phase</th>
<th>Variable</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inhalation</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 1</td>
<td>Baseline fear</td>
<td>0.64</td>
<td>0.098</td>
<td>.65**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 2</td>
<td>Baseline fear</td>
<td>0.59</td>
<td>0.10</td>
<td>.59**</td>
</tr>
<tr>
<td></td>
<td>Suppression use</td>
<td>0.55</td>
<td>0.32</td>
<td>.18*</td>
</tr>
<tr>
<td>Recovery</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 1</td>
<td>Baseline fear</td>
<td>0.54</td>
<td>0.12</td>
<td>.51**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 2</td>
<td>Baseline fear</td>
<td>0.50</td>
<td>0.13</td>
<td>.47**</td>
</tr>
<tr>
<td></td>
<td>Suppression use</td>
<td>0.37</td>
<td>0.38</td>
<td>.12</td>
</tr>
</tbody>
</table>

Note. For inhalation phase: $R^2 = .42$ for Step 1; $\Delta R^2 = .029$ for Step 2, $p = .088$. $N = 61$. For recovery phase: $R^2 = .26$ for Step 1; $\Delta R^2 = .013$ for Step 2, $p > .05$. $N = 56$. *$p < .10$, **$p < .001$. All regressions controlled for baseline fear.
of urge to escape during inhalation or recovery phase as the outcome variable.
Percentage use of an emotion regulation strategy (acceptance, cognitive restructuring, and suppression, respectively) was again entered in the second step. After controlling for baseline urge to escape, hierarchical $F$-tests revealed significant main effects of acceptance use on urge to escape during both inhalation and recovery (see Table 10). Negative standardized coefficients indicated that an increase in acceptance resulted in a decrease in urge to escape during both inhalation and recovery.

Likewise, after controlling for baseline urge to escape, hierarchical $F$-tests showed a significant main effect of cognitive restructuring on urge to escape during both inhalation and recovery (see Table 11). Positive standardized coefficients indicated that an increase in cognitive restructuring use resulted in an increase in urge to escape during both inhalation and recovery. Both suppression use $ts < 1.41$.

In summary, emotion regulation strategy use did not always predict evaluative ratings (e.g., upsetting thoughts). However, several significant trends were observed linking emotion regulation strategy in predicting subjective distress and intensity of bodily reactions. Emotion regulation strategy significantly predicted evaluative ratings of fear and urge to escape during both inhalation and recovery phases. Overall, increases in acceptance use predicted lower anxious evaluative ratings. Greater use of cognitive restructuring, on the other hand, was associated with greater evaluative distress. Suppression use did not significantly predict evaluative ratings.

*DSM-IV report of panic.* On the post-inhalation DSQ, use of emotion regulation strategy failed to predict overall panic symptom severity (all $ts < 0.15$). However, there were trends supporting main effects of acceptance and suppression use (see Table 12) in
### Table 10

*Hierarchical Regression Analyses Evaluating Acceptance Use as a Predictor of Urge to Escape During Inhalation and Recovery Phases*

<table>
<thead>
<tr>
<th>Phase</th>
<th>Variable</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inhalation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 1</strong></td>
<td>Baseline urge to escape</td>
<td>0.79</td>
<td>0.087</td>
<td>.76***</td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td>Baseline urge to escape</td>
<td>0.75</td>
<td>0.083</td>
<td>.72***</td>
</tr>
<tr>
<td></td>
<td>Acceptance use</td>
<td>-0.66</td>
<td>0.22</td>
<td>-.24**</td>
</tr>
<tr>
<td><strong>Recovery</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 1</strong></td>
<td>Baseline urge to escape</td>
<td>0.68</td>
<td>0.12</td>
<td>.61***</td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td>Baseline urge to escape</td>
<td>0.64</td>
<td>0.12</td>
<td>.57***</td>
</tr>
<tr>
<td></td>
<td>Acceptance use</td>
<td>-0.73</td>
<td>0.30</td>
<td>-.25*</td>
</tr>
</tbody>
</table>

*Note.* For inhalation phase: $R^2 = .58$ for Step 1; $\Delta R^2 = .057$ for Step 2, $p < .01$. $N = 61$.  
For recovery phase: $R^2 = .37$ for Step 1; $\Delta R^2 = .062$ for Step 2, $p < .05$. $N = 56$.  
*p < .05, **p < .01, ***p < .001.  All regressions controlled for baseline urge to escape.
Table 11

*Hierarchical Regression Analyses Evaluating Cognitive Restructuring Use as a Predictor of Urge to Escape During Inhalation and Recovery Phases*

<table>
<thead>
<tr>
<th>Phase</th>
<th>Variable</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inhalation</td>
<td>Step 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Baseline urge to escape</td>
<td>0.79</td>
<td>0.087</td>
<td>.76**</td>
</tr>
<tr>
<td></td>
<td>Step 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Baseline urge to escape</td>
<td>0.80</td>
<td>0.081</td>
<td>.78**</td>
</tr>
<tr>
<td></td>
<td>Cognitive restructuring use</td>
<td>1.12</td>
<td>0.37</td>
<td>.24*</td>
</tr>
<tr>
<td>Recovery</td>
<td>Step 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Baseline urge to escape</td>
<td>0.68</td>
<td>0.12</td>
<td>.61**</td>
</tr>
<tr>
<td></td>
<td>Step 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Baseline urge to escape</td>
<td>0.70</td>
<td>0.11</td>
<td>.63**</td>
</tr>
<tr>
<td></td>
<td>Cognitive restructuring use</td>
<td>1.39</td>
<td>0.50</td>
<td>.28*</td>
</tr>
</tbody>
</table>

Note. For inhalation phase: $R^2 = .58$ for Step 1; $\Delta R^2 = .057$ for Step 2, $p < .01$. $N = 61$. For recovery phase: $R^2 = .37$ for Step 1; $\Delta R^2 = .080$ for Step 2, $p < .01$. $N = 56$. *$p < .01$, **$p < .001$. All regressions controlled for baseline urge to escape.
Table 12

Regression Analyses Evaluating Emotion Regulation Strategy Use as a Predictor of Total Number of Panic Symptoms at Post-Inhalation and Post-Recovery Timepoints

<table>
<thead>
<tr>
<th>Variable</th>
<th>Timepoint</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acceptance use</td>
<td>Post-Inhalation</td>
<td>-3.58</td>
<td>1.90</td>
<td>-.24</td>
<td>.057*</td>
</tr>
<tr>
<td></td>
<td>Post-Recovery</td>
<td>-1.70</td>
<td>1.76</td>
<td>-.13</td>
<td>.016</td>
</tr>
<tr>
<td>Cognitive restructuring use</td>
<td>Post-Inhalation</td>
<td>1.37</td>
<td>3.38</td>
<td>.053</td>
<td>.003</td>
</tr>
<tr>
<td></td>
<td>Post-Recovery</td>
<td>1.87</td>
<td>3.05</td>
<td>.080</td>
<td>.006</td>
</tr>
<tr>
<td>Suppression use</td>
<td>Post-Inhalation</td>
<td>4.26</td>
<td>2.22</td>
<td>.24</td>
<td>.059*</td>
</tr>
<tr>
<td></td>
<td>Post-Recovery</td>
<td>1.47</td>
<td>2.06</td>
<td>.092</td>
<td>.009</td>
</tr>
</tbody>
</table>

predicting overall number of panic symptoms endorsed. A negative standardized coefficient indicated an inverse relationship between acceptance use and number of symptoms reported, and a positive standardized coefficient indicated a direct relationship between suppression use and number of symptoms reported. There was also a trend supporting a main effect of suppression use on predicting frequency of cognitive panic symptoms reported post-inhalation (see Table 13). A positive standardized coefficient indicated than an increase in suppression use resulted in an increase in cognitive symptoms post-inhalation. There was also a trend supporting acceptance use in predicting physical panic symptoms (see Table 14). A negative standardized coefficient indicated an inverse relationship between acceptance use and physical symptom report.

Emotion regulation strategy use emerged as a significant predictor of cognitive symptom severity and physical symptom severity. There were significant main effects of acceptance use and suppression use predicting cognitive symptom severity (see Table 15). A negative standardized coefficient indicated an inverse relationship between acceptance use and cognitive symptom severity, whereas a positive standardized coefficient indicated a direct relationship between suppression use and cognitive symptom severity. While the above analyses were also conducted for post-recovery reports of panic on the DSQ, no emotion regulation strategy use significantly predicted any of the DSQ outcome variables.

In summary, emotion regulation strategy use was a modest predictor on the post-inhalation DSQ for number of panic symptoms reported and rose to a level of a robust predictor for cognitive and physical symptom severity post-inhalation. Overall, increased
Table 13

Regression Analyses Evaluating Emotion Regulation Strategy Use as a Predictor of Number of Cognitive Panic Symptoms at Post-Inhalation and Post-Recovery Timepoints

<table>
<thead>
<tr>
<th>Variable</th>
<th>Timepoint</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acceptance use</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Post-</td>
<td>-1.14</td>
<td>0.73</td>
<td>-.21</td>
<td>.040</td>
</tr>
<tr>
<td></td>
<td>Inhalation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Post-</td>
<td>-0.75</td>
<td>0.53</td>
<td>-.18</td>
<td>.033</td>
</tr>
<tr>
<td></td>
<td>Recovery</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cognitive restructuring use</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Post-</td>
<td>0.21</td>
<td>1.28</td>
<td>.021</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Inhalation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Post-</td>
<td>0.28</td>
<td>0.93</td>
<td>.040</td>
<td>.002</td>
</tr>
<tr>
<td></td>
<td>Recovery</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suppression use</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Post-</td>
<td>1.46</td>
<td>0.85</td>
<td>.22</td>
<td>.048*</td>
</tr>
<tr>
<td></td>
<td>Inhalation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Post-</td>
<td>0.89</td>
<td>0.62</td>
<td>.18</td>
<td>.034</td>
</tr>
<tr>
<td></td>
<td>Recovery</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 14

*Regression Analyses Evaluating Emotion Regulation Strategy Use as a Predictor of Number of Physical Panic Symptoms at Post-Inhalation and Post-Recovery Timepoints*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Timepoint</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acceptance use</td>
<td>Post-Inhalation</td>
<td>-2.44</td>
<td>1.45</td>
<td>-.22</td>
<td>.046*</td>
</tr>
<tr>
<td></td>
<td>Post-Recovery</td>
<td>-0.96</td>
<td>1.49</td>
<td>-.083</td>
<td>.007</td>
</tr>
<tr>
<td>Cognitive restructuring use</td>
<td>Post-Inhalation</td>
<td>1.17</td>
<td>2.55</td>
<td>.060</td>
<td>.004</td>
</tr>
<tr>
<td></td>
<td>Post-Recovery</td>
<td>1.59</td>
<td>2.57</td>
<td>.080</td>
<td>.006</td>
</tr>
<tr>
<td>Suppression use</td>
<td>Post-Inhalation</td>
<td>2.80</td>
<td>1.69</td>
<td>.21</td>
<td>.044</td>
</tr>
<tr>
<td></td>
<td>Post-Recovery</td>
<td>0.58</td>
<td>1.74</td>
<td>.043</td>
<td>.002</td>
</tr>
</tbody>
</table>

*Note. N = 61. *p < .10.*
Table 15

*Regression Analyses Evaluating Emotion Regulation Strategy Use as a Predictor of Cognitive Panic Symptom Severity at Post-Inhalation and Post-Recovery Timepoints*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Timepoint</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acceptance use</td>
<td>Post-Inhalation</td>
<td>-2.86</td>
<td>1.42</td>
<td>-.25</td>
<td>.064*</td>
</tr>
<tr>
<td></td>
<td>Post-Recovery</td>
<td>-1.91</td>
<td>1.25</td>
<td>-.20</td>
<td>.038</td>
</tr>
<tr>
<td>Cognitive restructuring use</td>
<td>Post-Inhalation</td>
<td>-1.73</td>
<td>2.52</td>
<td>-.089</td>
<td>.008</td>
</tr>
<tr>
<td></td>
<td>Post-Recovery</td>
<td>0.89</td>
<td>2.19</td>
<td>.053</td>
<td>.003</td>
</tr>
<tr>
<td>Suppression use</td>
<td>Post-Inhalation</td>
<td>4.69</td>
<td>1.60</td>
<td>.36</td>
<td>.13**</td>
</tr>
<tr>
<td></td>
<td>Post-Recovery</td>
<td>2.20</td>
<td>1.46</td>
<td>.19</td>
<td>.037</td>
</tr>
</tbody>
</table>

*Note. N = 61. *p < .05, **p < .01.*
acceptance use was associated with a decrease in panic symptom frequency, particularly for physical panic symptoms, and cognitive symptom intensity. Increased suppression use was associated with an increase in cognitive panic symptom frequency and cognitive panic symptom intensity. Interestingly, cognitive restructuring use was not significantly predictive of any panic symptom report variables, and emotion regulation strategy use was not predictive of post-recovery reports of panic symptoms.

*Analysis of willingness.* Emotion regulation strategy use was found to significantly predict participant report of willingness to participate in another biological challenge. There were significant main effects of acceptance use and suppression use predicting willingness (see Table 16). A positive standardized coefficient indicated a direct relationship between acceptance use and willingness, while a negative standardized coefficient indicated an inverse relationship between suppression use and willingness. Interestingly, cognitive restructuring use did not predict willingness.

*Analysis of perceived utility of instructed emotion regulation strategy predicting use of instructed strategy.* A follow up regression analysis, limited to the acceptance and cognitive restructuring groups, was undertaken to clarify some of the group differences in emotion regulation strategy previously found. Specifically, the acceptance group felt their instructed strategy was more useful during the challenge for coping with anxiety and reported greater use of their instructed strategy compared to the cognitive restructuring group. The present analysis was intended to explore if this group difference in perceived utility of the instructed strategy might have affected use of the instructed strategy during the challenge. Results showed that perceived utility of the instructed emotion regulation
Table 16

*Regression Analyses Evaluating Emotion Regulation Strategy Use as a Predictor of Willingness to Participate in Another Biological Challenge*

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acceptance use</td>
<td>2.03</td>
<td>0.75</td>
<td>.33</td>
<td>.11*</td>
</tr>
<tr>
<td>Cognitive restructuring use</td>
<td>-0.70</td>
<td>1.36</td>
<td>-.066</td>
<td>.004</td>
</tr>
<tr>
<td>Suppression use</td>
<td>-2.45</td>
<td>0.88</td>
<td>-.34</td>
<td>.12*</td>
</tr>
</tbody>
</table>

*Note. N = 61. *p < .01.*
Table 17

Regression Analyses Evaluating Perceived Utility of Instructed Emotion Regulation Strategy for Coping with Anxiety During Challenge as a Predictor of Instructed Emotion Regulation Strategy Use During Challenge

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived utility of instructed strategy</td>
<td>0.013</td>
<td>0.004</td>
<td>0.45</td>
<td>0.21*</td>
</tr>
</tbody>
</table>

*Note. N = 37. *$p < .01$. 


strategy (i.e., acceptance or cognitive restructuring) significantly predicted use of that instructed strategy during the challenge (see Table 17). As one might expect, a positive standardized coefficient indicated a direct relationship between perceived utility of the strategy and use of the strategy. The analyses exploring group differences in physiological and subjective self-report challenge response were re-run using ANCOVA with perceived utility as a covariate, but no group differences were found.

Discussion

Cognitive intervention components, such as cognitive restructuring, which aim to modify cognitive content are theoretically supported for the treatment of anxiety-related disorders (Barlow, 2002; Beck et al., 1985; Clark, 1986, 1988, 1996; Ellis, 1991; Emmelkamp & Mersch, 1982; Zinbarg et al., 1992). However, several studies and meta-analyses have shown that cognitive change may not be a necessary component for successful anxiety treatment (Arntz, 2002; Dimidjian et al., 2006; Foa et al., 2005; Gould et al., 1997; Jacobson et al., 1996; Norton & Price, 2007; Teasdale et al., 2001). The debate regarding the utility of cognitive restructuring, though hardly new within the field of behavior therapy, has intensified in parallel with the development of newer acceptance-based behavior therapies. Acceptance has emerged in the modern field of psychology as an alternative to such control and change-based efforts. The literature on acceptance supports its utility over other control-based emotion regulation strategies, such as suppression, particularly for anxiety outcomes (e.g., Campbell-Sills et al., 2006; Eifert & Heffner, 2003; Levitt et al., 2004). While one intervention utilizing acceptance, ACT (Hayes et al., 1999), continues to amass support by clinicians, psychological
organizations (e.g., APA, SAMHSA), and in the empirical literature (e.g., Hayes, 2006; Öst, 2008), it remains in its infancy as compared to traditional CBT. More research is necessary, specifically direct comparisons of cognitive restructuring and acceptance interventions, to clarify which strategy is more beneficial for approaching panic specifically and anxiety at large.

Unlike other studies which have compared acceptance to suppression, a strategy known to be ineffective for dealing with anxiety, this study was the first to directly and rigorously compare acceptance to an empirically supported cognitive change technique, namely cognitive restructuring, for acute panicogenic distress. The present study recruited a moderate-to-high anxiety sensitive undergraduate female sample, a population at risk for the development of panic attacks and panic disorder. The interventions were presented in video format to ensure consistency across participants, and a no-instruction control group was used for purposes of comparison. Manipulation checks were used to assess participant comprehension and implementation of instructions. In addition, the use of emotion regulation strategies (i.e., acceptance, cognitive restructuring, and suppression) as reported by participants was analyzed to investigate how well they predict anxiety outcomes (i.e., physiological response, self-report of evaluative anxiety and panic symptoms, and behavioral avoidance).

While the acceptance group reported using their instructed strategy of acceptance more often through the procedure than both other groups, the cognitive restructuring group did not report using their instructed strategy of cognitive restructuring more often than the other groups. This was despite equivalent pre-challenge expectations between the acceptance and cognitive restructuring groups of usefulness and reported previous
everyday use. Moreover, the cognitive restructuring group did not significantly differ from the no-instruction control group on use of suppression during the procedure.

These results could be interpreted as that the cognitive restructuring group had greater difficulty implementing their instructions than the acceptance group. However, it must be considered that the cognitive restructuring group reported less perceived utility of cognitive restructuring for coping with anxiety experienced during the challenge than the acceptance group. It is unclear whether the lower perceived utility in the cognitive restructuring group was driven by group difficulty in understanding how to implement the instructions or due to the strategy of cognitive restructuring actually having less utility than acceptance during the challenge. However, the exploratory analyses examining emotion regulation strategies as predictors of outcome variables across groups showed that cognitive restructuring use was less predictive of positive outcomes (i.e., less useful) during the challenge than acceptance use (and, indeed, predictive of some negative outcomes). This suggests that the lower use of the instructed strategy in the cognitive restructuring group may have been due to actual lower utility of their instructed strategy as compared to the acceptance group and not just difficulty implementing their strategy.

In addition, a regression including only the acceptance and cognitive restructuring groups demonstrated that perceived utility of the instructed strategy during the challenge predicted use of the instructed strategy during the challenge. Thus, as participants in the cognitive restructuring group reported that cognitive restructuring was less useful during the challenge (compared to how useful the acceptance group reported that acceptance was during the challenge), it is possible that they began to use other emotion regulation
strategies to cope with the anxiety. This could explain why the cognitive restructuring group did not differ significantly from the no-instruction group on use of the various emotion regulation strategies. Thus, it cannot be stated with certainty whether the cognitive restructuring group had greater difficulty than the acceptance group implementing their instructed emotion regulation strategy or whether they began to use their instructed strategy, perceived it as not useful for coping with their anxiety, and decided to try using other strategies. However, the results provide stronger evidence for the latter explanation.

The cognitive restructuring group did appear to try to implement the instructed strategy, as indicated by their greater mean use of cognitive restructuring strategies than the no-instruction group, but they tended to use similar amounts of acceptance and suppression strategies as the no-instruction group. Thus, it is unsurprising that differences were not found on any of the measures between the cognitive restructuring and no-instruction control groups. However, it is surprising that differences were not found on outcomes between the acceptance group and the other groups as the acceptance group used significantly more acceptance than the other groups. Thus, it might have been expected that if acceptance produces differential effects from the other strategies (as demonstrated in the exploratory regression analyses) then this would have been reflected in the outcomes.

As hypothesized, psychophysiological response as measured by skin conductance did not discriminate between emotion regulation strategy groups. There was a main effect of phase over baseline, indicating that the CO₂ challenge was effective at producing a panicogenic distress response that increased over time as the inhalation
continued and decreased post-inhalation during the recovery phase. These results are consistent with those of other CO₂ challenge studies showing that CO₂ potentiates physiological arousal as well as emotion regulation component studies that often failed to show physiological differences as a function of emotion regulation strategy (Eifert & Heffner, 2003; Feldner et al., 2003; Karekla et al., 2004).

The only work (in non-CO₂ challenge studies) where emotion regulation strategy was shown to produce group differences in skin conductance is the work of Gross and colleagues (Gross, 1998; Gross & Levenson, 1993, 1997), who found that individuals who engaged in expressive suppression (i.e., not allowing emotions to appear visibly on the face) had an increase in skin conductance above those allowed to visibly express their emotion while watching an emotion-provoking film. Indeed, expressive suppression appears to potentiate physiological response over covert suppression. As the suppression group participants in the present study were not asked to suppress their emotions in an expressive manner, it is not surprising that potentiated physiological responding was not observed. It may be that expressive suppression involves more motor activity which translates physiologically into an increase in skin conductance. In addition, the social contingencies of knowing one’s facial expressions will be evaluated may make this effect more potent, although the participants in Gross’s studies were monitored by a camera placed behind darkened glass. In any event, future work ought to compare covert and overt suppression (and possibly expression) in the context of component analyses of acceptance and more traditional CBT strategies.

In the exploratory analyses, emotion regulation strategy use did not significantly predict skin conductance, although there was a trend linking suppression use during the
challenge with delayed return to baseline during the recovery period. These results suggest that differential emotion regulation strategy use does not robustly affect physiological response as measured by skin conductance (see also Campbell-Sills et al., 2006; Eifert & Heffner, 2003; Feldner et al., 2003; Levitt et al., 2004).

The hypothesis that the no-instruction group would report more subjective anxiety than both other groups and the cognitive restructuring group and the acceptance group would not differ from one another was partially supported. There was no difference between groups on evaluative ratings. In addition, there was no difference between the cognitive restructuring and acceptance groups on reported *DSM-IV* panic symptoms, although the no-instruction group reported significantly fewer physical panic symptoms than the acceptance condition during the recovery phase. This may be due to the fact that the acceptance group was taught to focus on their physical sensations, making them more acutely aware of these experiences, while the no-instruction group reported more suppression use, which may have distracted them from their symptoms.

Interestingly, there was no difference on cognitive symptoms for the cognitive restructuring group compared to the other groups. Given that cognitive restructuring is a cognitive strategy, it would be expected that cognitive restructuring would reduce cognitive symptoms. The failure of the cognitive restructuring group to have fewer cognitive symptoms than the other groups may be due to the fact that the cognitive restructuring group did not report significantly greater use of cognitive restructuring than the other groups. Alternatively, cognitive restructuring may not be an effective tool for reducing cognitive symptoms of panic during an acute panicogenic experience.
To clarify these effects, exploratory analyses examining the predictive power of assessed emotion regulation strategies for subjective anxiety variables were conducted. These analyses still showed that use of cognitive restructuring was not a significant predictor of reduced cognitive panic symptoms or upsetting thoughts during either phase. Rather, use of cognitive restructuring significantly predicted an increased urge to escape during the challenge at both phases. Thus, the results do not support the purported beneficial effects of cognitive restructuring on acute panic, namely, reduction of frequency or intensity of upsetting cognitions through cognitive change. The results suggest that cognitive restructuring may not be an effective strategy for dealing with acute panic and may even produce paradoxical increases in thoughts promoting avoidance. The results are not entirely surprising if cognitive restructuring is viewed as an effort to regulate the form or frequency of unpleasant private events. The emotion regulation literature has shown that such control-based strategies, such as suppression or diaphragmatic breathing, often do not enhance treatment effects and can even produce deleterious results (Gross, 1998; Gross & Levenson, 1993, 1997; Hayes, Bissett, Korn, & Zettle, 1999; Schmidt et al., 2000). Future research will be needed to more thoroughly investigate the effects of cognitive restructuring on therapeutic outcomes.

Consistent with expectations, acceptance use was predictive of positive outcomes (Campbell-Sills et al., 2006; Eifert & Heffner, 2003; Feldner et al., 2003; Levitt et al., 2004). Acceptance use significantly predicted decreases in fear and urges to escape during both the inhalation and recovery phases, and acceptance use trended as a predictor of decreases in distress during both phases. During the post-inhalation phase, acceptance significantly predicted a decrease in number of panic symptoms reported, a decrease in
cognitive symptoms severity, and trended in predicting a decrease in number of physical symptoms reported. Acceptance was also significantly predictive of more positive evaluative and panic symptom report outcomes than suppression or cognitive restructuring. Thus, the results suggest that acceptance may be a beneficial strategy for approaching acute panic, consistent with the extant literature (Campbell-Sills et al., 2006; Eifert & Heffner, 2003; Feldner et al., 2003; Levitt et al., 2004).

Also as expected, suppression use was predictive of poorer outcomes (Campbell-Sills et al., 2006; Eifert & Heffner, 2003; Feldner et al., 2003; Levitt et al., 2004). Suppression use was not significantly predictive of evaluative ratings but trended as a predictor of increased fear during the inhalation phase. During the post-inhalation phase, suppression use significantly predicted increased report of panic symptoms and increased cognitive panic symptom severity (see also Eifert & Heffner; Karekla et al. 2004). There were also non-significant trends supporting suppression as a predictor of increased cognitive panic symptoms. These results support a large body of existing literature showing that suppression is an ineffective strategy for dealing with acute panic, and in fact tends to increase anxiety symptomatology (Gross, 1998; Gross & Levenson, 1993, 1997; Najmi et al., 2007; Richards & Gross, 1999; Roemer & Borkovec, 1994; Wegner et al., 1987, 1993).

Contrary to expectation, groups did not differ on behavioral avoidance, as indexed by willingness to participate in a subsequent biological challenge. In fact, participants were generally willing to undergo a subsequent challenge. However, the exploratory analyses showed that acceptance use significantly predicted an increase in willingness to participate in a subsequent challenge, and suppression use significantly predicted a
decrease in willingness. Again, this later finding is consistent with theory and evidence showing that acceptance promotes psychological flexibility and behavioral engagement (Hayes et al., 2005), whereas suppression is associated with avoidance and disengagement. Further, use of acceptance has experimentally been associated with increased behavioral engagement (Eifert & Heffner, 2003; Levitt et al., 2004), although not always (Hofmann et al., 2009). Again, use of cognitive restructuring did not predict willingness to undergo a subsequent procedure.

In summary, emotion regulation strategy use was not predictive of physiological response, while acceptance use was predictive of less anxious self-report and more willingness and suppression use was predictive of more anxious self-report and reduced willingness. Cognitive restructuring use was rarely predictive of outcomes, but when it was, as in the case of urge to escape, its use predicted negative outcomes. Beyond these findings, however, the results provide additional reasons for why acceptance seems to have greater utility for acute panic than cognitive restructuring.

It appears from the results that acceptance was an easier strategy to comprehend than cognitive restructuring. The acceptance group had significantly less difficulty communicating their understanding of the video instructions on the first manipulation check questionnaire by correctly answering the questions than the cognitive restructuring group, who had significantly more participants who needed to watch the video a second time to fully understand the instructions. Despite equivalent reports of previous experience with their instructed strategies and expectations of usefulness during the challenge, the acceptance group also reported significantly greater use of their instructed strategy than the cognitive restructuring group and greater perceived utility of their
instructed strategy for coping with anxiety experienced during the challenge than the cognitive restructuring group. Furthermore, while the acceptance group reported significantly more acceptance use than both other groups and less suppression use than the no-instruction control group, the cognitive restructuring group reported using both cognitive restructuring and suppression at statistically equivalent rates on par with the no-instruction control group (despite greater mean cognitive restructuring use). Indeed, there is no statistically significant evidence that the cognitive restructuring group implemented different strategies than what people do naturally (i.e., the no-instruction control group). These findings suggest that acceptance as a strategy was easier for participants to learn and implement following a brief 10-minute intervention and when faced with acute panic than cognitive restructuring. Also, it appears that acceptance use may have helped participants to not engage in suppression strategies. Unlike the cognitive restructuring use, the acceptance group used significantly less suppression than the no-instruction control group. Previous research has shown that participants tend to use suppression when not given an explicit strategy (e.g., Levitt et al., 2004), which produces deleterious effects. As a result, acceptance appears to be the superior strategy as compared to cognitive restructuring for facing acute panicogenic distress.

Beyond experimental manipulations, these results suggest that acceptance may be of greater clinical utility in the cognitive-behavioral treatment of panic than cognitive restructuring. Exposure-based interventions are recognized as “well-supported” treatments for panic disorder by APA Division 12 (Chambless et al., 1998), as in these interventions new corrective learning occurs (Bouton et al., 1993; Craske et al., 2008). It follows that therapeutic techniques that assist client exposure through promotion of
behavioral engagement and reduction of avoidance would be helpful adjuncts in treatment. In the present study, acceptance use was found to predict decreased urge to escape, whereas the reverse was true for cognitive restructuring (i.e., predicted increased urges to escape). Thus, it seems than acceptance-based strategies may be useful in promoting engagement in exposure exercises, especially as they appear to directly counter avoidance. Cognitive restructuring, by contrast, may increase urges to escape a feared situation and thus may hamper rather than assist the behavioral engagement process. Though arguably speculative and awaiting further empirical evaluation, these notions fit well with extant work suggesting that direct cognitive change is neither necessary nor sufficient in the treatment of depression (Jacobson et al., 1996) and anxiety disorders (Arntz, 2002; Bouchard et al., 1996). Likewise, acceptance use was predictive of increased willingness to engage in future CO₂ challenges, which suggests that it is associated with reduced behavioral avoidance, while cognitive restructuring was not predictive of this variable. These results support the intention behind some newer CBTs which now incorporate acceptance in order to promote engagement in exposure (Arch & Craske, 2008; Block-Lerner et al., 2009; Barlow et al., 2004; Hayes et al., 1999).

Overall, the findings suggest that acceptance is a strategy that may prove to have significant clinical utility in the treatment of panic disorder.

Limitations

The present findings should be viewed in light of several limitations. First, the sample used, while an at-risk population for the development of panic attacks and panic disorder, was not a clinical sample, nor were the participants distressed enough by their anxiety to be currently engaged in psychosocial treatment. The main criterion for
inclusion was moderate-to-high anxiety sensitivity (i.e., anxiety below clinically distressing or impairing levels). However, participants were not excluded if they had a previous or current diagnosis of an anxiety disorder, so participants with clinically significant anxiety may have been included in the study. Given the non-clinical nature of the sample, it is possible that the participants may already have been utilizing effective emotion regulatory skills and psychological flexibility, so the intervention may have had less of an effect on strategy use than if provided to a clinical sample. Also, participants were all undergraduate college students, which likely confers a difference in socioeconomic demographics from a community clinic population. Thus, the participants’ response to the CO₂ challenge and the effect of the emotion regulation strategies may differ from a similar procedure conducted with a clinically anxious community sample. In addition, the sample size was modest, albeit larger than other similarly designed studies (e.g., Eifert & Heffner, 2003; Levitt et al., 2004). It is possible that several of the observed non-significant trends may become more robust in a larger sample or in a clinical population.

Second, the intervention provided was brief--only 10 minutes long. While this amount of time appeared adequate for instruction on rationale and implementation for acceptance strategies, this may have been insufficient for appropriate applications of cognitive restructuring strategies. There was also no explicit opportunity for participants to practice using the strategy prior to starting the CO₂ challenge which can be helpful for developing skills. It is possible that, had the participants been introduced to the strategies in a different format (e.g., as modeled by a therapist rather than directed by a video) or for a longer period of time, the cognitive restructuring group might have increased their
used of the instructed strategy. In addition, strategy use and perceived utility of the strategy for coping with the anxiety experienced during the challenge was only assessed once, at the end of the experiment. It is not clear whether participants might have begun to use one strategy but decided to switch to enough after failing to achieve the desired reduction in aversive response. Future research might investigate the effect of differing intervention delivery methods on comprehension and implementation of strategy, as well as assessing for strategy use and perceived utility of strategies continuously during the challenge.

Third, the CO2 challenge is an analog of an actual panic attack. While it has been shown to produce many of the sensations and cognitions experienced during a panic attack (Eifert et al., 1999; Forsyth et al., 2000; Levitsky, 1995; Schmidt et al., 2002; van den Hout & Griez, 1984), the participants are aware that the panic is experimentally induced and controlled. In the procedure of the present experiment, participants were not informed of the length of the CO2 challenge in order to retain some of the unpredictability associated with an actual panic attack, but participants were informed when the challenge would begin. In addition, social concerns related to having a panic attack observed by others can increase the panic response, but the CO2 challenge minimizes the social aspect (i.e., negative consequences) of experiencing acute panic as the participant is not in view of peers while undergoing the challenge and the experimenter is primarily in another room out of sight. Furthermore, the mask and accompanying physiological recording equipment worn by the participant is unnatural, distracting, and restricts participant movement. This has resulted in some participant reports of irritation, discomfort, and anxiety, which may either enhance the panic
experienced during the challenge or distract from the challenge. Careful screening, as used in the present study, is necessary to minimize the effect of pre-existing claustrophobic concerns in the recruited sample.

Fourth, the results of the hierarchical regression analyses are not from a randomized sample. The use of emotion regulation strategy in the exploratory analyses was analyzed across rather than by groups in order to clarify the results of the planned group ANOVAs. Thus, the findings must be tempered by the acknowledgement that the participants watched different videos prior to the challenge. It is interesting that the results of the group ANOVAs did not mimic the outcomes suggested by the exploratory analyses of emotion regulation strategies. This is likely due to the cognitive restructuring group' not using their instructed strategy at the level of the acceptance group which would likely have produced greater group differences. Further research is necessary to examine individual differences that might cause participants to elect to use varying emotion regulation strategies when faced with acute panic. For example, investigators might examine predictors of strategy use in participants, such as prior therapy, pharmacotherapy, or panic attacks.

Finally, the interventions used in the present study are merely analogs of larger treatment components. They are presented outside of the context of a larger treatment goal. The effects seen here should not be confused with the effects of traditional CBT or ACT, which are delivered over a longer period of time and combined with additional therapeutic elements, such as therapeutic rapport or values-driven motivation. For example, acceptance in ACT is always used in the context of workability in the service of valued ends. It is not uniformly given to everyone unless there is a reason to offer this as
an alternative to ineffective and unworkable control/avoidance strategies. The present study did not assess participant satisfaction with, and perceived utility of, pre-experimental strategies for coping with anxiety. Future work could perhaps recruit individuals who are elevated in domains that would be amenable to acceptance (e.g., those with high experiential avoidance) or cognitive restructuring (e.g., catastrophic thinking).

Conclusions

Given the significant distress and impairment caused by PD and the limited effectiveness of current therapeutic approaches, it is necessary that the psychological community continue to evaluate and amend their therapeutic interventions for this disorder. Currently, the mechanisms of action of traditional CBT, including the theoretically-supported technique of cognitive restructuring, remain in debate due to a paucity of empirical examination. Likewise, the efficacy of ACT has not been repeatedly and rigorously evaluated for anxiety at large and not at all for panic disorder specifically. It is imperative that researchers and clinicians continue to question those strategies that have conventionally been used and those that are coming into use. As clinical research has shown that previously theoretically-supported components of CBT, such as diaphragmatic breathing, are not effective and may hamper treatment progress (Schmidt et al., 2000), the field should continue to investigate and explore the components widely used in treatment as well as more recently adopted techniques that show promise, such as acceptance, in the hopes of boosting treatment effectiveness.

The present study was intended to address the current gap in research of directly comparing active and theoretically-driven approaches for panic--in this case, cognitive
restructuring and acceptance. The results showed that acceptance was superior overall in terms of clinical utility for approaching acute panicogenic distress compared to cognitive restructuring. However, these results are not necessarily indicative of the utility of the interventions from which these approaches stem, namely traditional CBT and ACT, and additional research is needed to clarify these effects across samples and mode of instruction. Future research in this area, particularly studies investigating the mechanisms of action of traditional CBT and the efficacy of newer acceptance-based approaches for anxiety, is necessary to expand and strengthen the literature.
References


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M. Orsillo & L. Roemer (Eds.) *Acceptance and Mindfulness-Based Approaches to Anxiety: Conceptualization and Treatment* (pp. 71-99). New York: Springer.


Appendix A:

Medical and Psychological Pre-Screening Risk Assessment
Subject Name: _________________________________

Home Phone: (     ) ____ - ____  Work Phone: (     ) ____ - ____  

Date: ____ / ____ / ____  Interviewer: ________________________

GENERAL BACKGROUND QUESTIONS

Age: ______  Approximate Height: ___' ___"  Approximate Weight: _____ lbs

Are you Fluent in Written English?: Y  N  (Note: IF NO, STOP)

Sex:  □ Male  □ Female  Race:  □ Caucasian  □ African American  □ Native American  □ Asian American

□ Latino  □ Other (specify): ____________________

Marital Status:  □ Single  □ Married  □ Widowed  □ Divorced  □ Cohabiting  □ Separated  □ Other (specify): ____________________

Year in College:  □ Freshman  □ Sophomore  □ Junior  □ Senior

MEDICAL HISTORY QUESTIONS

The first questions I’m going to ask you are about your medical history. Please wait until I have finished speaking and then simply answer “yes” or “no.” Also, keep in mind that your responses to all questions will be completely anonymous. Do you have any questions? If not, then let’s begin. Have you been diagnosed with, or do you presently suffer from, any of the following?

1. Heart disease
2. Any Heart condition/Problems
3. Asthma
4. Respiratory Disease
5. Renal (Kidney) Disease
6. Serious Concussion/Head Injury
7. HIV/AIDS
8. Persistent or chronic anemia
9. Stroke
10. Epilepsy
11. Seizure Disorders
12. Diabetes
13. Hypertension (High BP)
14. Migraine Headaches
15. Sleep Apnea
16. Females Only: Are you currently pregnant, or do you suspect you may be pregnant?

Interviewer: If the subject answers YES to items 1-8 above, continue to ask at least three more items from 9-16 and then STOP and read them the Exclusion Script.

Interviewer: If the subject answers NO to all of the above, CONTINUE.

15. Are you currently being treated for any physical disease or condition? Y  N  (Note: if the medical treatment is related to any of the problems on the above list, STOP, otherwise continue)

If YES, then for what problem(s)? ____________________

16. Are you currently taking any medications for a medical condition, aside from allergy medications, or birth control? Y  N  (Note: if medication use is related any of the problems on the above list, continue to ask at least three more questions and then STOP and read them the Exclusion Script, otherwise continue)

PSYCHOLOGICAL EMOTIONAL HISTORY

Ok, we’re ready to move on to the next series of questions. These questions deal with your psychological or emotional history. Some of these questions may or may not apply to you. Again, you can simply answer “yes” or “no.”

1. Have you ever sought treatment for psychological or emotional difficulties? Y  N
2. Are you currently being treated for psychological or emotional difficulties? Y  N  IF YES, STOP!
3. Have you ever been hospitalized for a psychological or emotional problem? Y  N
4. Have you ever been prescribed medications for a psychological or emotional problem? Y  N
5. Are you currently taking medications for a psychological or emotional problem? Y  N  IF YES, STOP!
6. Have you ever had strange or unusual experiences such as: Hearing voices or conversations when no one was around, or seeing things no one else saw? Y  N  IF YES, STOP!
7. Have you been having any thoughts about hurting yourself or killing yourself or others? Y  N  IF YES, STOP!

FYI: CDPC 24-hour hotline is 447-9650

Interviewer: If the subject says YES to any items with an Y, then continue to ask at least three more questions and then STOP and read them the Exclusion Script.

Interviewer: If subject says NO to items with Y, then CONTINUE.

OBSERVATION LEARNING EXPERIENCES (NOT USED FOR SUBJECT EXCLUSION)

Have you ever witnessed or observed someone:

Faint  □ Yes  □ No  Have a stroke  □ Yes  □ No
Have a Panic “Anxiety” Attack  □ Yes  □ No  Have a Heart Attack  □ Yes  □ No

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MEDICAL-PSYCHIATRIC HISTORY SCREENING INTERVIEW (2 of 3)

Acceptance and Cognitive Restructuring Techniques for Coping with Panic: Investigating Relative Efficacy Using an Analog of Panic Disorder

September 28, 2009

Now I am going to ask you some more questions about specific kinds of problems that may or may not apply to you. As I read each question, please keep in mind that an answer of “yes” means that you have the symptoms or experiences in the extreme, that they are particularly distressing and/or bothersome to you, and that they interfere with important aspects of your life. This is important because many of the questions I will be asking are commonly reported by most people in mild-to-moderate degrees. Again, it is extremely important that you think carefully about each question and answer openly and honestly so that you may avoid possible risks of participating in the later portions of this study. As with all other portions of this study, your responses will be kept strictly confidential.

**PANIC DISORDER**

1. Have you ever had, or do you currently have times when you feel a sudden rush of intense fear or discomfort that comes from “out of the blue,” for no apparent reason, or in situations where you did not expect them to occur? □ Yes □ No

**AGORAPHOBIA**

1. Do you currently feel panic in any situations or avoid them because you might feel panic? Again, here we are talking about extreme, personally distressing, and life disrupting symptoms and behaviors. □ Yes □ No

**SOCIAL PHOBIA**

1. Currently, in social situations where you might be observed or evaluated by others or when you are meeting new people, do you feel fearful, anxious, or nervous? Again, think extreme! □ Yes □ No

**PTSD/ACUTE STRESS DISORDER**

1a. Have you ever experienced or witnessed a traumatic or life-threatening even such as an assault, rape, seeing someone badly injured or killed, combat, accidents, or natural or man-made disasters? □ Yes □ No If YES, then ask:

1a. Does the memory of such events and/or experiences disrupt (think extreme), or otherwise interfere with your life now (e.g., frequent nightmares, poor sleep, recurrent memories, flashbacks, or avoidance of reminders)? □ Yes □ No If YES, STOP!

2. Have you ever had a life threatening swimming, scuba diving, or drowning experience? □ Yes □ No If YES, STOP!

**GENERALIZED ANXIETY DISORDER**

1. Over the last several months, have you been continually and excessively worried or anxious about a number of events or activities in your daily life aside from general concerns related to academic/college work? □ Yes □ No

2. And, have you found this excessive worry difficult to control, personally distressing, and disruptive to your life? □ Yes □ No

**OBSESSIVE COMPULSIVE DISORDER**

1. Currently, are you excessively bothered by thoughts, images, or impulses that keep recurring to you that seem inappropriate or nonsensical but that you can’t stop from coming into your mind? □ Yes □ No

1a. Currently, do you feel driven to repeat some behavior or to repeat something in your mind over and over again to try and feel less uncomfortable? Again, we are talking about behaviors that are extreme, distressing, and difficult to control. □ Yes □ No

**SPECIFIC PHOBIA**

1. Currently, do you have an extreme fear or strong need to avoid such things as:
   a. Animals (snakes, spiders, dogs, bees/insects) □ Yes □ No
   b. Natural Environment
      - Heights □ Yes □ No
      - Storms □ Yes □ No
      - Water □ Yes □ No
e. Blood/Injection/Injury: self or other
      - Blood from a minor cut □ Yes □ No
      - Receiving injections □ Yes □ No
      - Having blood drawn □ Yes □ No
      - Seeing blood or medical procedures □ Yes □ No
d. Situational
      - Elevators/small enclosed spaces □ Yes □ No If YES, STOP!
      - Driving □ Yes □ No
e. Other
      - Choking □ Yes □ No
      - Vomiting □ Yes □ No
      - Contracting an illness □ Yes □ No
      - Bodily sensations related to arousal □ Yes □ No

**PTSD/ACUTE STRESS DISORDER**

1a. Does the memory of such events and/or experiences disrupt (think extreme), or otherwise interfere with your life now (e.g., frequent nightmares, poor sleep, recurrent memories, flashbacks, or avoidance of reminders)? □ Yes □ No If YES, STOP!

2. Have you ever had a life threatening swimming, scuba diving, or drowning experience? □ Yes □ No If YES, STOP!
MAJOR DEPRESSION
1. Currently, have you been feeling depressed, sad, empty, or have you lost interest or pleasure in almost all of your usual activities? Here again we are talking about emotions that are extreme, personally distressing, and disruptive.  
☐ Yes ☐ No  If YES, STOP!

DYSTHYMIC DISORDER
1. Over the past two years, have you frequently had days when you felt down, blue, or depressed most of the day? Here frequently and most of the day is key.  
☐ Yes ☐ No  If YES, STOP!

HYPOCHONDRIASIS
1. Over the past several months, have you continually feared or believed that you might have a serious physical disease or illness (cancer, heart disease, AIDS, etc.) despite information that suggests otherwise?  
☐ Yes ☐ No  If YES, STOP!

SOMATIZATION DISORDER
1. Have you had a lot of different physical problems in your life?  
☐ Yes ☐ No  If YES, STOP!
2. Over the past several years, have these physical problems prompted you to see the doctor on many occasions or have they significantly interfered with your life (e.g., job, social activities, school)?  
☐ Yes ☐ No  If YES, STOP!

NONORGANIC PSYCHOSIS/CONVERSION SYMPTOMS
1. Have you ever experienced a sudden loss or change in your physical functioning such as paralysis or seizures?  
☐ Yes ☐ No  If YES, STOP!

Interviewer:  
If subject presents with no exclusionary criteria (negative on major psychopathology), go one to schedule an appointment. Note the date and time of the appointment here and in the appropriate lab scheduling log.

Scheduled Experiment Date: ___/___/___  Scheduled Experiment Time: From ______ to _______
Appendix B:

Consent Forms and Pre-Experimental Self-Report Questionnaires
INTRODUCTION: I, _________________________________, have been invited to participate in this research study looking at how people respond to breathing high concentrations of carbon dioxide-enriched air. The study has been explained to me by Erica Moses, M.A. (Graduate Student, SUNYA), John P. Forsyth, Ph.D. (Associate Professor of Clinical Psychology, SUNYA), or one of the other associated project staff.

PURPOSE OF THE STUDY: The purpose of this study is to examine how people's thoughts, feelings, and bodily responses are influenced by strategies while breathing room air which is mixed with larger than normal concentrations of carbon dioxide (CO$_2$). This study is part of ongoing research designed to better understand the nature and treatment of fear and anxiety-related problems.

RISKS AND DISCOMFORTS: I can expect some discomfort that may be caused at those times when breathing room air which is premixed with larger than normal concentrations of carbon dioxide. The effects of breathing carbon dioxide-enriched room air may mimic feelings of anxiety and include racing heart sensations, increased breathing rate, shortness of breath, dizziness, and the possibility of fainting or having a panic attack. These effects are normal and are expected to disappear quickly when returning to breathing normal room air. I understand that persons with asthma, cardiac problems, respiratory diseases, high blood pressure, epilepsy, seizure disorders, sleep apnea, kidney disease, morbid obesity, or those that might be pregnant should not participate in this study. Should you experience abnormally high physiological arousal or distress, such as rapidly increasing heart rate or reported discomfort, we will immediately terminate the study. In the unlikely event that you experience an adverse reaction to the experimental procedures, we will provide you with additional information about anxiety disorders and referral information for treatment to local mental health providers in the community with expertise in anxiety/mood disorders.

DESCRIPTION OF PROCEDURES: I understand that my participation in this portion of the research study will involve filling in a number of brief questionnaires. The questionnaires will take about 15 minutes to complete. I also understand that after completing the questionnaires, the next stage of the experiment will involve having my heart rate, breathing rate, palm sweating, and expired carbon dioxide levels recorded. My bodily responses will be continuously monitored by a trained research assistant throughout the procedure using electrodes that will be attached to my skin using adhesive tape by this same research assistant. Heart rate will be monitored by placing two electrodes on either side of my upper chest (just below the clavicle) and one below my rib serving as a ground, and two electrodes will be placed on the palm of my non-dominant hand to measure sweat gland activity. Throughout the procedure I will be wearing a breathing mask over my mouth and nose, and I will breathe either normal room air only or both normal room air and room air that is premixed with larger than normal concentrations of carbon dioxide (up to 5.5% carbon dioxide mixed with 94.5% balanced room air). During this portion of the procedure, I will again be asked to fill out a couple of questionnaires. This portion of the research will take roughly two hours to complete.

WITHDRAWAL PROCEDURES: I understand that I am free to withdraw my consent to
participate in this study at any time and that I may stop taking part in this study at any time. In order to withdraw during the questionnaire portion of the study, I only need to stop filling out the questionnaire and inform a member of the laboratory staff. During the portion of the study when I will be wearing the breathing mask, I will be observed by a member of the laboratory staff at all times and should notify them if I would like to withdraw from the experiment.

BENEFITS: The results of this study will not benefit me directly, but the knowledge gained may help us understand factors related to why some people become bothered and fearful over certain bodily sensations. The results may also help to develop better treatments for people who suffer from anxiety-related disorders.

VOLUNTARY PARTICIPATION: I understand that my participation in this research is completely voluntary. I understand that I am free to discontinue my participation at any time without penalty or loss of benefits to which I may otherwise have been entitled and refusal to participate or withdrawal will not affect my grades or my class standing. I also understand that I may also choose not to answer any questions that I do not wish to for any reason. I have been given the opportunity to ask questions about the research, and I have received answers concerning areas I did not understand. One copy of this document will be kept together with the research records of the study. Also, I will be given a copy to keep.

CONFIDENTIALITY: I understand that any information about me obtained as a result of my participation in this research will be kept as confidential as legally possible. All information obtained in this study is strictly confidential unless disclosure is required by law. In addition, the Institutional Review Board, the sponsor of the study (e.g., NIH, FDA, etc.), and University or government officials responsible for monitoring this study may inspect these records. I also understand that my research records, just like hospital records, may be subpoenaed by court order or may be inspected by federal regulatory authorities. I understand that my name and any identifying information will not appear in any publications that may result from this research.

CONTACT PERSONS: If I have any questions or concerns regarding this research, I may contact any of the above noted investigators at 442-4862. If you have any questions concerning your rights as a research participant that have not been answered by the investigator or if you wish to report any concerns about the study, you may contact the University at Albany's Office of Regulatory Research Compliance at 518-442-9050 or orrc@uamail.albany.edu.

I have read, or been informed of, the information about this study. I hereby consent to participate in this study.

Signature of Subject  Date

Signature of Investigator or Investigator’s Representative  Date
INTRODUCTION: I, _________________________________, have been invited to participate in this research study looking at how people respond to breathing high concentrations of carbon dioxide-enriched air. The study has been explained to me by Erica Moses, M.A. (Graduate Student, SUNYA), John P. Forsyth, Ph.D. (Associate Professor of Clinical Psychology, SUNYA), or one of the other associated project staff.

PURPOSE OF THE STUDY: The purpose of this study is to examine how people's thoughts, feelings, and bodily responses are influenced by strategies while breathing room air which is mixed with larger than normal concentrations of carbon dioxide (CO\textsubscript{2}). This study is part of ongoing research designed to better understand the nature and treatment of fear and anxiety-related problems.

RISKS AND DISCOMFORTS: I can expect some discomfort that may be caused at those times when breathing room air which is premixed with larger than normal concentrations of carbon dioxide. The effects of breathing carbon dioxide-enriched room air may mimic feelings of anxiety and include racing heart sensations, increased breathing rate, shortness of breath, dizziness, and the possibility of fainting or having a panic attack. These effects are normal and are expected to disappear quickly when returning to breathing normal room air. I understand that persons with asthma, cardiac problems, respiratory diseases, high blood pressure, epilepsy, seizure disorders, sleep apnea, kidney disease, morbid obesity, or those that might be pregnant should not participate in this study. Should you experience abnormally high physiological arousal or distress, such as rapidly increasing heart rate or reported discomfort, we will immediately terminate the study. In the unlikely event that you experience an adverse reaction to the experimental procedures, we will provide you with additional information about anxiety disorders and referral information for treatment to local mental health providers in the community with expertise in anxiety/mood disorders.

DESCRIPTION OF PROCEDURES: I understand that my participation in this portion of the research study will involve filling in a number of brief questionnaires. The questionnaires will take about 15 minutes to complete. I also understand that after completing the questionnaires, the next stage of the experiment will involve having my heart rate, breathing rate, palm sweating, and expired carbon dioxide levels recorded. My bodily responses will be continuously monitored by a trained research assistant throughout the procedure using electrodes that will be attached to my skin using adhesive tape by this same research assistant. Heart rate will be monitored by placing two electrodes on either side of my upper chest (just below the clavicle) and one below my rib serving as a ground, and two electrodes will be placed on the palm of my non-dominant hand to measure sweat gland activity. Throughout the procedure I will be wearing a breathing mask over my mouth and nose, and I will breathe either normal room air only or both normal room air and room air that is premixed with larger than normal concentrations of carbon dioxide (up to 5.5% carbon dioxide mixed with 94.5% balanced room air). During this portion of the procedure, I will again be asked to fill out a couple of questionnaires. This portion of the research will take roughly two hours to complete.

WITHDRAWAL PROCEDURES: I understand that I am free to withdraw my consent to
participate in this study at any time and that I may stop taking part in this study at any time. In order to withdraw during the questionnaire portion of the study, I only need to stop filling out the questionnaire and inform a member of the laboratory staff. During the portion of the study when I will be wearing the breathing mask, I will be observed by a member of the laboratory staff at all times and should notify them if I would like to withdraw from the experiment.

BENEFITS: The results of this study will not benefit me directly, but the knowledge gained may help us understand factors related to why some people become bothered and fearful over certain bodily sensations. The results may also help to develop better treatments for people who suffer from anxiety-related disorders.

PAYMENTS TO SUBJECT FOR PARTICIPATION IN THE STUDY: For participation in this laboratory portion of the study, you will receive $20. If you choose to withdraw from this portion of the study prior to its completion, you will still receive this payment.

VOLUNTARY PARTICIPATION: I understand that my participation in this research is completely voluntary. I understand that I am free to discontinue my participation at any time without penalty or loss of benefits to which I may otherwise have been entitled and refusal to participate or withdrawal will not affect my grades or my class standing. I also understand that I may also choose not to answer any questions that I do not wish to for any reason. I have been given the opportunity to ask questions about the research, and I have received answers concerning areas I did not understand. One copy of this document will be kept together with the research records of the study. Also, I will be given a copy to keep.

CONFIDENTIALITY: I understand that any information about me obtained as a result of my participation in this research will be kept as confidential as legally possible. All information obtained in this study is strictly confidential unless disclosure is required by law. In addition, the Institutional Review Board, the sponsor of the study (e.g., NIH, FDA, etc.), and University or government officials responsible for monitoring this study may inspect these records. I also understand that my research records, just like hospital records, may be subpoenaed by court order or may be inspected by federal regulatory authorities. I understand that my name and any identifying information will not appear in any publications that may result from this research.

CONTACT PERSONS: If I have any questions or concerns regarding this research, I may contact any of the above noted investigators at 442-4862. If you have any questions concerning your rights as a research participant that have not been answered by the investigator or if you wish to report any concerns about the study, you may contact the University at Albany’s Office of Regulatory Research Compliance at 518-442-9050 or orrc@uamail.albany.edu.

I have read, or been informed of, the information about this study. I hereby consent to participate in this study.

____________________________________________
Signature of Subject    Date

____________________________________________
Signature of Investigator   Date
or Investigator’s Representative
**ANXIETY SENSITIVITY INDEX**

Circle the one number that best represents the extent to which you agree with the item. If any of the items describe something that is not part of your experience (e.g., “it scares me when I feel shaky” when you’ve never trembled or been shaky), answer on the basis of how you might feel if you had such an experience. Otherwise, answer all of the items on the basis of your own experience.

<table>
<thead>
<tr>
<th>Very Little</th>
<th>A Little</th>
<th>Some</th>
<th>Much</th>
<th>Very Much</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

1. It is important to me not to appear nervous
2. When I cannot keep my mind on a task, I worry that I might be going crazy
3. It scares me when I feel shaky
4. It scares me when I feel faint
5. It is important to me to stay in control of my emotions
6. It scares me when my heart beats rapidly
7. It embarrasses me when my stomach growls
8. It scares me when I am nauseous
9. When I notice my heart is beating rapidly, I worry that I might have a heart attack
10. It scares me when I become short of breath
11. When my stomach is upset, I worry that I might be seriously ill
12. It scares me when I am unable to keep my mind on a task
13. Other people notice when I feel shaky
14. Unusual body sensations scare me
15. When I am nervous, I worry that I might be mentally ill
16. It scares me when I am nervous
SFS Subject #: ________

Please rate how anxious you would feel in the following places or situations by circling the most appropriate number:

<table>
<thead>
<tr>
<th>0 = not at all anxious</th>
<th>1 = slightly anxious</th>
<th>2 = moderately anxious</th>
<th>3 = very anxious</th>
<th>4 = extremely anxious</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Swimming while wearing a nose plug</td>
<td>O 1 2 3 4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Working under a sink for 15 minutes</td>
<td>O 1 2 3 4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Standing in an elevator on the ground floor with the doors closed</td>
<td>O 1 2 3 4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Trying to catch your breath during vigorous exercise</td>
<td>O 1 2 3 4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Having a bad cold and finding it difficult to breathe through your nose</td>
<td>O 1 2 3 4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Snorkeling in a safe practice tank for 15 minutes</td>
<td>O 1 2 3 4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Using an oxygen mask</td>
<td>O 1 2 3 4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Using on a bottom bunkbed</td>
<td>O 1 2 3 4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Standing in the middle of the 3rd row at a packed concert realizing that you will be unable to leave until the end of the show</td>
<td>O 1 2 3 4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. In the center of a full row at a cinema</td>
<td>O 1 2 3 4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Working under a car for 15 minutes</td>
<td>O 1 2 3 4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. At the furthest point from an exit on a tour of an underground mine shaft</td>
<td>O 1 2 3 4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. In back of a small 2-door car with a person either side of you, and all the windows fogged up</td>
<td>O 1 2 3 4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Lying in a sauna for 15 minutes</td>
<td>O 1 2 3 4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Waiting in a plane on the ground with the door closed for 15 minutes</td>
<td>O 1 2 3 4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. In a barber's or hairdresser's chair</td>
<td>O 1 2 3 4</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Subject: ________________  
ACQ

Listed below are a number of statements describing a set of beliefs. Please read each statement carefully and, on the 0-5 scale given, indicate how much you think each statement is typical of you.

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Strongly Disagree</td>
<td>Moderately Disagree</td>
<td>Slightly Disagree</td>
<td>Slightly Agree</td>
<td>Moderately Agree</td>
<td>Strongly Agree</td>
</tr>
</tbody>
</table>

  1. I am usually able to avoid threat quite easily.
  2. How well I cope with difficult situations depends on whether I have outside help.
  3. When I am put under stress, I am likely to lose control.
  4. I can usually stop my anxiety from showing.
  5. When I am frightened by something, there is generally nothing I can do.
  6. My emotions seem to have a life of their own.
  7. There is little I can do to influence people's judgements of me.
  8. Whether I can successfully escape a frightening situation is always a matter of chance with me.
  9. I often shake uncontrollably.
 10. I can usually put worrisome thoughts out of my mind easily.
 11. When I am in a stressful situation, I am able to stop myself from breathing too hard.
 12. I can usually influence the degree to which a situation is potentially threatening to me.
 13. I am able to control my level of anxiety.
 14. There is little I can do to change frightening events.
 15. The extent to which a difficult situation resolves itself has nothing to do with my actions.
 16. If something is going to hurt me, it will happen no matter what I do.
 17. I can usually relax when I want.
 18. When I am under stress, I am not always sure how I will react.
 19. I can usually make sure people like me if I work at it.
 20. Most events that make me anxious are outside my control.
 21. I always know exactly how I will react to difficult situations.
 22. I am unconcerned if I become anxious in a difficult situation, because I am confident in my ability to cope with my symptoms.
 23. What people think of me is largely outside of my control.
 24. I usually find it hard to deal with difficult problems.
 25. When I hear that someone has a serious illness, I worry that I am next.
 26. When I am anxious, I find it difficult to focus on anything other than my anxiety.
 27. I am able to cope as effectively with unexpected anxiety as I am with anxiety that I expect to occur.
 28. I sometimes think, "Why even bother to try to cope with my anxiety when nothing I do seems to affect how frequently or intensely I experience it?"
 29. I often have the ability to get along with "difficult" people.
 30. I will avoid conflict due to my inability to successfully resolve it.
STAI-T Form Y-2

**DIRECTIONS:** A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate **how you generally feel**. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you **generally feel**.

<table>
<thead>
<tr>
<th></th>
<th>Not at All</th>
<th>Somewhat</th>
<th>Moderately So</th>
<th>Very Much So</th>
</tr>
</thead>
<tbody>
<tr>
<td>21. I feel pleasant</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>22. I feel nervous and restless</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>23. I feel satisfied with myself</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>24. I wish I could be as happy as others seem to be</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>25. I feel like a failure</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>26. I feel rested</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>27. I am “calm, cool, and collected”</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>28. I feel that difficulties are piling up so that I cannot overcome them</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>29. I worry too much over something that really doesn’t matter</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>30. I am happy</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>31. I have disturbing thoughts</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>32. I lack self-confidence</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>33. I feel secure</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>34. I make decisions easily</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>35. I feel inadequate</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>36. I am content</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>37. Some unimportant thought runs through my mind and bothers me</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>38. I take disappointments so keenly that I can’t put them out of my mind</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>39. I am a steady person</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
40. I get in a state of tension or turmoil as I think over my recent concerns and interests

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
The Acceptance and Action Questionnaire –
All Validated Versions of the AAQ I

Below you will find a list of statements. Please rate the truth of each statement as it applies to you. Use the following scale to make your choice.

1---------2-----------3----------4---------5---------6---------7
Never true very seldom seldom sometimes frequently almost always always true true true true true true true true

1. I am able to take action on a problem even if I am uncertain what is the right thing to do.
2. When I feel depressed or anxious, I am unable to take care of my responsibilities.
3. I try to suppress thoughts and feelings that I don’t like by just not thinking about them.
4. It’s OK to feel depressed or anxious.
5. I rarely worry about getting my anxieties, worries, and feelings under control.
6. In order for me to do something important, I have to have all my doubts worked out.
7. I’m not afraid of my feelings.
8. I try hard to avoid feeling depressed or anxious.
9. Anxiety is bad.
10. Despite doubts, I feel as though I can set a course in my life and then stick to it.
11. If I could magically remove all the painful experiences I’ve had in my life, I would do so.
12. I am in control of my life.
13. If I get bored of a task, I can still complete it.
14. Worries can get in the way of my success.
15. I should act according to my feelings at the time.
16. If I promised to do something, I’ll do it, even if I later don’t feel like it.
17. I often catch myself daydreaming about things I’ve done and what I would do differently next time.
18. When I evaluate something negatively, I usually recognize that this is just a reaction, not an objective fact.
19. When I compare myself to other people, it seems that most of them are handling their lives better than I do.
20. It is unnecessary for me to learn to control my feelings in order to handle my life well.
21. A person who is really “together” should not struggle with things
the way I do.

22. There are not many activities that I stop doing when I am feeling depressed or anxious
Emotion Regulation Questionnaire (ERQ)

Instructions and Items

We would like to ask you some questions about your emotional life, in particular, how you control (that is, regulate and manage) your emotions. The questions below involve two distinct aspects of your emotional life. One is your emotional experience, or what you feel like inside. The other is your emotional expression, or how you show your emotions in the way you talk, gesture, or behave. Although some of the following questions may seem similar to one another, they differ in important ways. For each item, please answer using the following scale:

1------------2------------3------------4------------5------------6------------7
strongly disagree neutral strongly agree

1. ___ When I want to feel more positive emotion (such as joy or amusement), I change what I’m thinking about.

2. ___ I keep my emotions to myself.

3. ___ When I want to feel less negative emotion (such as sadness or anger), I change what I’m thinking about.

4. ___ When I am feeling positive emotions, I am careful not to express them.

5. ___ When I’m faced with a stressful situation, I make myself think about it in a way that helps me stay calm.

6. ___ I control my emotions by not expressing them.

7. ___ When I want to feel more positive emotion, I change the way I’m thinking about the situation.

8. ___ I control my emotions by changing the way I think about the situation I’m in.

9. ___ When I am feeling negative emotions, I make sure not to express them.

10. ___ When I want to feel less negative emotion, I change the way I’m thinking about the situation.
**MAAS**

Please indicate the degree to which you agree with each of the following items using the scale below. Simply circle your response to each item.

<table>
<thead>
<tr>
<th>Almost Always</th>
<th>Very Frequently</th>
<th>Somewhat Frequently</th>
<th>Somewhat Infrequently</th>
<th>Very Infrequently</th>
<th>Almost Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

1. I could be experiencing some emotion and not be conscious of it until some time later……………………… 1 2 3 4 5 6
2. I break or spill things because of carelessness, not paying attention, or thinking of someone else……… 1 2 3 4 5 6
3. I find it difficult to stay focused on what’s happening in the present……………………………………………….. 1 2 3 4 5 6
4. I tend to walk quickly to get where I’m going without paying attention to what I experience along the way….. 1 2 3 4 5 6
5. I tend not to notice feelings of physical tension or discomfort until they really grab my attention………….. 1 2 3 4 5 6
6. I forget a person’s name almost as soon as I’ve been told it for the first time…………………………………1 2 3 4 5 6
7. It seems I am “running on automatic” without much awareness of what I’m doing……………………………………1 2 3 4 5 6
8. I rush through activities without being really attentive to them…………………………………………………………1 2 3 4 5 6
9. I get so focused on the goal I want to achieve that I lose touch with what I am doing right now to get there…… 1 2 3 4 5 6
10. I do jobs or tasks automatically, without being aware of what I’m doing……………………………………………….. 1 2 3 4 5 6
11. I find myself listening to someone with one ear, doing something else at the same time…………………………1 2 3 4 5 6
12. I drive places on “automatic pilot” and then wonder why I went there……………………………………………….. 1 2 3 4 5 6
13. I find myself preoccupied with the future or the past….. 1 2 3 4 5 6
14. I find myself doing things without paying attention…….. 1 2 3 4 5 6
15. I snack without being aware that I’m eating……………… 1 2 3 4 5 6
WBSI

Please indicate the degree to which you agree with each of the following items using the scale below. Simply circle your response to each item.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree Somewhat</th>
<th>Neither Agree Nor Disagree</th>
<th>Agree Somewhat</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

1. There are things I prefer not to think about …………… 1 2 3 4 5
2. Sometimes I wonder why I have the thoughts I do …….. 1 2 3 4 5
3. I have thoughts that I cannot stop .......................... 1 2 3 4 5
4. There are images that come to mind that I cannot erase. 1 2 3 4 5
5. My thoughts frequently return to one idea……………….. 1 2 3 4 5
6. I wish I could stop thinking of certain things……………… 1 2 3 4 5
7. Sometimes my mind races so fast I wish I could stop it. 1 2 3 4 5
8. I always try to put problems out of mind…………………. 1 2 3 4 5
9. There are thoughts that keep jumping into my head….. 1 2 3 4 5
10. Sometimes I stay busy just to keep thoughts from intruding on my mind…………………………….. 1 2 3 4 5
11. There are things that I try not to think about………….. 1 2 3 4 5
12. Sometimes I really wish I could stop thinking………….. 1 2 3 4 5
13. I often do things to distract myself from my thoughts. 1 2 3 4 5
14. I often have thoughts that I try to avoid………………….. 1 2 3 4 5
15. There are many thoughts that I have that I don’t tell anyone………………………………………… 1 2 3 4 5
Appendix C:

Scripts
ALL CONDITIONS:
“Earlier it was explained to you that during this study you will be breathing in air that has more carbon dioxide than normal, and that you may experience some physical sensations such as a racing heart, shortness of breath, and dizziness. Emotionally, you may experience an increase in relaxation, anxiety, or excitement.”

TWO INSTRUCTION CONDITIONS:
“You will now watch a video on which you will hear a description of how I would like you to approach the next phase of the experiment. I want you to listen carefully, and try to approach it in the manner described in the video. After you watch the video, you will be given a brief quiz on the main ideas contained in these instructions, so please watch carefully and try to remember the gist of the information.”

CONTROL GROUP INSTRUCTIONS:
“You will now watch a video showing a clip from a documentary. I want you to watch the video carefully. After the video is finished, you will be given a brief quiz on the content, so please watch carefully and try to remember the gist of the information.”

VIDEO SCRIPT FOR ACCEPTANCE CONDITION:
This video will now present a way that you can approach the coming task and your symptoms of anxiety in general. I would like you to watch as this approach is described to you and consider whether this fits with your experience.

What I would like to suggest to you is that the very thing we try to do when we are anxious, try to control our anxiety, is actually what makes us feel worse.

Frequently people wish to avoid negative emotions such as anxiety. If there is any way to turn the anxiety off, or lessen it (such as by avoiding situations or distracting ourselves), we will usually try to do this. On one level this makes sense…of course we don’t like to experience anxiety—it’s uncomfortable and frightening—why wouldn’t we want to turn it off or get rid of it?

Well, the problem is, direct attempts to control our internal experience (things like thoughts and feelings) don’t usually work for very long, if they work at all. We can tell ourselves to “stop thinking about this,” but oftentimes it’s not as easy as it might seem. When you start to feel anxious, you might have thoughts like “Oh no, I don’t want to feel like this…this is unbearable…I have to stop feeling this way…maybe if I try to focus on something else…” But research has shown us, and you probably know from your own experiences, that the more you try to stop yourself from thinking about things, the more likely these thoughts are to come up and really affect you. The more you try to hold back your thoughts and feelings, the stronger they come.

Have you ever tried really hard to fall asleep, only to discover that you just can’t? The more pressure you put on yourself to sleep, the harder it gets, until sleeping becomes almost impossible. Well, it works the same way with anxiety. The harder you try to control it, the stronger it feels.
Now, this issue of control is an interesting one. You might wonder, what does this mean, are you saying that I don’t have control over my life? Well, no, that’s not what I’m suggesting at all. To the contrary, we know that all of us have control over our own behavior, and in most cases, controlling your behavior means having control over your life. Think of some of the accomplishments you have achieved in your life…such as your educational accomplishments that brought you here to college. Now think about how you achieved those goals. Probably through hard work, right? Usually good things happen to us when we work hard and exercise discipline, training, and control. So, we clearly have control over our own behavior, and this control is what makes us successful in everyday life.

However, it doesn’t quite work this way in the internal realm, the realm of thoughts and feelings. Remember what I said earlier about efforts to get rid of anxious thoughts and feelings? While we may certainly have control over our own behavior, and this may help us to accomplish our goals, we often do not have direct control over our own thoughts and feelings. And trying to apply these same control rules to our thoughts and feelings can really backfire.

Consider this: You suddenly start feeling anxious, the first thing you do is try to control the anxiety, try to get rid of it. But, like I said, this just makes the feelings stronger and more frequent. So then, because you trying to control your anxiety and failed in your effort, you feel even worse, like you’ve personally failed in some way, or like you are out of control. This leads to a vicious cycle of trying even harder to control your thoughts and feelings until you are left feeling overwhelmed and helpless.

There is a saying that goes along with this, “if you’re not willing to have it, then you’ve got it.” That is, if you are not willing to experience anxiety, you’re stuck with it. The harder you try to make the anxious feelings go away, the more they stay. Have you noticed this? It isn’t that you aren’t trying hard enough. You’re probably trying very hard to control your anxiety. Instead, it’s that the harder you try to push those feelings away, the stronger they come on.

The thing is, it is part of human experience that we will feel anxious or sad, or uncomfortable at times. Where this process goes awry is when we get in our own way by forcefully trying to make the emotions go away. Even worse, sometimes our sense of happiness becomes dependent on our ability to control these things, and then when we find that we can’t we end up feeling worse and worse. You see, it is really your effort to push your anxiety away that is the enemy, it is not the anxiety itself.

So, now I will offer you an alternative to this struggle with control. You might be wondering, “If I can’t control my thoughts and feelings, does that mean that I have to give up? That I will not be able to do the things in life that I want to do?” No, this is not the case. In face, as I mentioned before, the good news is that we actually can control a number of things in our life because we can control our behavior.

I would like to suggest that what you do right now is change your focus a bit. It’s like you are in this massive tug of war with a monster---your anxiety. In between you and the monster is a pit and, so far as your can see, it is bottomless. If you lose and fall into this pit you will be destroyed. So, you pull and pull, but the harder you pull, the harder the monster pulls (just like the harder you try to control your anxiety, the more anxious you get). So you keep pulling, and it seems like you just keep edging closer and closer to the pit. The hardest thing to see here is that your job is not to win the tug of
(slowly) Your job is just to drop the rope. Give up the internal struggle and let the symptoms of anxiety just be. Let yourself feel whatever you feel, and quit fighting with your emotions. Now I’m going to give you a minute to think about that. (pause a few extra seconds). What I am suggesting is that you allow yourself to feel whatever emotions come up for you. Stop trying to control your negative emotions, just let them be.

There is a kid’s game that illustrates the point I am trying to make. It is the Chinese Finger Trap. It’s a tube of woven straw that you pick up and insert each of your index fingers into the ends. Then, once your fingers are in, you try to pull them out, but they get stuck. As you try to yank them out, the straw catches and tightens. The harder you pull, the smaller the tube gets and the tighter the grasp on your fingers. In fact, the only way to escape this trap is to push your fingers in, which widens the tube, and then you can slide your fingers out.

So, how does this trap relate to the issue of mental control, and the upcoming task? You see, attempting to reduce and control essentially uncontrollable symptoms, like those you might experience during the challenge, while seemingly logical and understandable, only creates more symptoms. Just like the finger trap, the harder you pull, the more the trap tightens, resulting in more pain and discomfort. In contrast, leaning into the symptoms, like pushing your fingers in, is the only way out of the trap. The harder you try not to feel anxious, the more anxious you get, so why not give up the struggle against your anxiety? Drop the rope in the internal tug of war, accept your feelings, and see what happens. (pause)

If what I have said so far makes some sense to you, you might be thinking now that giving up control is a way to manage your anxiety. So you think, “since trying to control my thoughts and feelings only makes anxiety worse, giving up the struggle will definitely make things better for me, and ultimately make the anxiety go away.” But, that is not what I am getting at. If you try and lean into your experience in the hope that it will make you less anxious, that is just another sneaky form of control. It looks like you have given up control, but you are still trying to win the battle over your anxiety. Instead, I am suggesting that being willing to experience your thoughts and feelings, good and bad, can free you up to focus on what really matters in your life. If you are willing to feel happy, sad, anxious, unsure, joyful, and any other emotions that come up for you, you can choose your directions in life, instead of letting your fear of anxious thoughts and feelings make those choices for you. In the end, you will have more control over your life if you stop trying to control your anxiety and let yourself live life according to what is important to you.

In a few minutes we are going to begin the breathing exercise that I mentioned earlier. During this exercise I would like you to pay attention to your feelings. You may experience a range of emotions; anxiety, excitement, relaxation…I’d like you to experience them all fully and not try to make any of them go away. Instead of trying actively to control them or push them away, I’d like you to try to lean into them, embrace them, and give up the struggle. Remember, the harder you try to “Not feel anxious” the more anxious you will get. Instead of battling with your anxiety, try to take a step back from the struggle, drop the rope, and see what happens.
VIDEO SCRIPT FOR COGNITIVE RESTRUCTURING CONDITION:
This video will now present a way that you can approach the coming task and your symptoms of anxiety in general. I would like you to watch as this approach is described to you and consider whether this fits with your experience.

What I would like to suggest to you is that the very thoughts we tend to think when we are anxious, such as “something is wrong” or “I am in danger”, is actually what makes us feel worse.

Frequently people tend to respond to feelings of anxiety with overly negative and unrealistic thoughts. Everyone has experienced the fight or flight response, our body’s reaction to danger which readies us for action. However, if we experience the same unusual physical symptoms in the absence of true danger, our brains invent a reason, such as “There must be something wrong with me” and we often try to push them away. On one level this makes sense…of course we don’t like to experience these thoughts and feelings that come with anxiety—it’s uncomfortable and frightening—why wouldn’t we want to find an explanation for it or try to escape from it?

Well, the problem is, negative thoughts about our experiences and direct attempts to avoid our internal experience (things like thoughts and feelings) don’t usually work for very long, if they work at all. When you start to feel anxious, you might have thoughts like “Oh no, I don’t want to feel like this…this is unbearable…I have to stop feeling this way…maybe if I try to focus on something else…” But research has shown us, and you probably know from your own experiences, that disastrous explanations for your symptoms tend to, perhaps not surprisingly, result in even more anxious symptoms. In addition, we can tell ourselves to “stop thinking about this,” but oftentimes it’s not as easy as it might seem. The more you try to stop yourself from thinking about things, the more likely these thoughts are to come up and really affect you. The more you try to hold back your thoughts and feelings, the stronger they come.

Have you ever seen a bee fly around you, become scared of being stung, and begun to fearfully swat at it in an effort to make it go away? This behavior actually makes you more likely to be stung than if you reacted calmly, realized the bee is not likely trying to sting you, and decided to wait for it to fly away. Well, it works the same way with anxiety. If you consider the true reality of the situation, not the immediate thoughts you have when anxious, and bring your thoughts in line with this reality, you are more likely to behave in a way that will improve your situation.

Now, this issue of realistic thinking is an interesting one. You might wonder, what does this mean, are you saying that I’m not in touch with reality? Well, no, that’s not what I’m suggesting at all. To the contrary, we know that we are adept at understanding the reality of a given situation. Think of some of the accomplishments you have achieved in your life…such as your educational accomplishments that brought you here to college. Now think about how you achieved those goals. Probably by recognizing realistically what work you needed to complete and what standardized tests you needed to take in order to qualify for college. So, we clearly are in touch with reality to be able to direct our behavior toward completing tasks that make us successful in everyday life.

However, it doesn’t quite work this way in the internal realm, the realm of thoughts and feelings. Remember what I said earlier about efforts to get rid of anxious thoughts and feelings? While we are often realistic about what behavior may help us to
accomplish our goals, we often do not have the complete ability to be realistic about the meaning of our own thoughts and feelings. And blindly accepting the content of our thoughts and feelings as true or trying to escape from them can really backfire.

Consider this: You suddenly start feeling your heart beating more rapidly than normal. Perhaps the first thing you do is think “I’m having a heart attack. I have to get out of here.” But, like I said, this reaction just makes the feelings stronger and more frequent. So then, because your body is producing more anxiety-related symptoms, you become even more anxious and your thoughts start becoming even more negative, which leads you to feel like you are out of control. This leads to a vicious cycle of physical symptoms leading to negative thoughts, which results in feelings of panic and efforts to escape, which leads to even more physical symptoms until you are left feeling overwhelmed and helpless.

There is a saying that goes along with this, “Real difficulties can be overcome; it is only the imaginary ones that are unconquerable.” That is, if you allow yourself to believe whatever negative thoughts you experience without questioning them, you will likely feel as if you have lost control or must escape and cannot win. The harder you try to make the anxious feelings go away, the more they stay. Have you noticed this? It isn’t that you aren’t trying hard enough. You’re probably trying very hard to gain control over your situation. Instead, without a realistic view of what is happening, you can’t have a clear plan for how to approach it.

The thing is, it is part of human experience that we will feel anxious or sad, or uncomfortable at times. Where this process goes awry is when those feelings lead to thoughts that are not in touch with reality. Even worse, when we buy into these thoughts, we start to believe that we cannot control our own lives and feel unable to act. We sometimes even get in our own way by forcefully trying to make the emotions go away rather than questioning them. You see, it is really your unquestioning belief in the catastrophic thoughts that is the enemy, it is not the anxiety itself.

So, now I will offer you an alternative to this struggle with your thoughts. You might be wondering, “If I can’t trust my immediate thoughts and feelings, does that mean that I have to give up? That I will not be able to do the things in life that I want to do?” No, this is not the case. In face, as I mentioned before, the good news is that we actually can gain control of our lives by questioning and challenging our automatic thoughts.

I would like to suggest that what you do right now is change your focus a bit. It’s like you are being chased by a monster—your anxiety. He is coming straight for you and you are terrified. You turn and run as fast as you can, trying to escape, sometimes pausing behind trees to try and hide, but he knows where you are and just seems to keep gaining on you. The monster seems so big and fast that you can’t imagine ever being able to get out of this alive. The faster you run, the faster the monster runs (just like the more you try to escape from your anxiety symptoms, the more they increase). So you keep running, and it seems like he just keeps getting closer and closer. The hardest thing to do is stop running long enough to turn around and get a good look at him. Give up the race and truly take in and face what you’re dealing with. Maybe it’s not a giant monster after all. Maybe it’s actually a puppy following you home, and by acting on your first thoughts telling you that you were in danger and to run, you weren’t able to see it for what it was. Now I’m going to give you a minute to think about that. (pause a few extra seconds). What I am suggesting is that you allow yourself to fully evaluate the reality of
your situation and your thoughts before deciding how to act. Stop jumping to conclusions before you think.

There is a kid’s game that illustrates the point I am trying to make. It is the Chinese Finger Trap. It’s a tube of woven straw that you pick up and insert each of your index fingers into the ends. Then, once your fingers are in, you try to pull them out, but they get stuck. As you try to yank them out, the straw catches and tightens. The harder you pull, the smaller the tube gets and the tighter the grasp on your fingers. In fact, the only way to escape this trap is to push your fingers in, which widens the tube, and then you can slide your fingers out.

So, how does this trap relate to the issue of mental control, and the upcoming task? You see, acting on your initial fear caused by the sensation of being trapped, much as you might experience fear related to sensations you might experience during the challenge, without evaluating the reality of your situation will cause you to keep trying to yank yourself out of the situation, which creates more symptoms. Just like the finger trap, the harder you pull, the more the trap tightens, resulting in more pain and discomfort. In contrast, if you take the time to figure out how the trap works, by pushing your fingers in, you can now make the decision to act in a way that, while not initially logical, will actually improve your situation. Take a moment, ask yourself “What is the reality of this situation?” bring your thoughts in line with this reality, and make informed decisions. (pause)

If what I have said so far makes some sense to you, you might be thinking now that thinking rationally is a way to manage your anxiety. So you think, “since acting on my immediate thoughts and feelings only makes anxiety worse, thinking rationally will definitely make things better for me, and ultimately make the anxiety go away.” But, that is not what I am getting at. If you try and lean into your experience in the hope that it will make you less anxious, that is just another sneaky form of irrational thinking. It looks like you are thinking rationally, but you are still trying to win the battle over your anxiety. Instead, I am suggesting that being willing to challenge your thoughts and feelings, good and bad, can free you up to focus on what really matters in your life. If you are willing to investigate the reality of your thoughts when you feel happy, sad, anxious, unsure, joyful, and any other emotions that come up for you, you can choose your directions in life, instead of letting your fear of anxious thoughts and feelings make those choices for you. In the end, you will have more control over your life if you stop simply accepting your thoughts as fact.

In a few minutes we are going to begin the breathing exercise that I mentioned earlier. During this exercise I would like you to pay attention to your thoughts. You may experience a range of thoughts related to your physical sensations. I’d like you to evaluate the reality of these thoughts and not try to make them go away…I’d like you to replace them with more realistic thoughts. Remember, the more impulsively you buy into and respond to your automatic thoughts, the more anxious you will get. Instead of trying to escape from the anxiety, face the anxiety and realistically evaluate it for what it is, and see what happens.
Appendix D:
Experimental Self-Report Measures
Quiz on Instructions for CO₂ Challenge—Acceptance/Cognitive Restructuring

Please answer the following questions based on your understanding of the directions you just viewed in the video.

1. During the upcoming task, if I experience unpleasant feelings or emotions, I will:
   a. Try to get rid of them by focusing on them and pushing them away.
   b. Try not to focus on the symptoms by distracting my attention.
   c. Try to evaluate the true danger of the situation and bring my thoughts in line with this.
   d. Tell myself that it will be over soon.
   e. Focus on the sensations, embrace them, accept them, and let them be.

2. According to the directions in the video, when I feel anxious unexpectedly, I should:
   a. Accept my emotions and focus my attention on my feelings.
   b. Stay in control of my emotions at all times by pushing the anxious feelings away.
   c. Get out of the situation immediately.
   d. Try to determine why the situation is resulting in my anxiety and whether this reaction is reasonable.
   e. Try to distract myself from feeling anxious by focusing on other things.

3. How useful do you expect the instructions in the video will be for you during the upcoming breathing exercise?
   a. Not at all useful
   b. A bit useful
   c. Somewhat useful
   d. Very useful
   e. Extremely useful
Read each question below and rate your answer by placing a mark (/) anywhere along the line for each question. Base your answers on the sensations that you are CURRENTLY experiencing.

How distressed do you feel?
Not at all ___________________________ Extremely
Distressed ___________________________ Distressed

How intense are your bodily reactions?
Not at all ___________________________ Extremely
Intense ___________________________ Intense

How upsetting are your thoughts?
Not at all ___________________________ Extremely
upsetting ___________________________ Upsetting

How fearful/anxious are you?
Not at All ___________________________ Extremely
Fearful ___________________________ Afraid

How strong is your urge to escape the situation?
No ___________________________ Extreme
Urge ___________________________ Urge
Below is a list of symptoms which various people have noticed during the type of procedure you just underwent. These experiences are very individual: some people notice almost all the symptoms, others notice hardly any. For each symptom listed below indicate if you experienced it just now by circling either “yes” or “no”: If you did experience a symptom, rate how strongly you felt the symptoms using any of the numbers from 0 to 8 from the scale below.

<table>
<thead>
<tr>
<th>Not noticed</th>
<th>Slightly Felt</th>
<th>Moderately Felt</th>
<th>Strongly Felt</th>
<th>Very Strongly Felt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rating: ___</td>
<td>___</td>
<td>___</td>
<td>___</td>
<td>___</td>
</tr>
</tbody>
</table>

1. Chest tightness or chest pain
   - yes no
   - Rating: ___
2. Pounding or racing heart
   - yes no
   - Rating: ___
3. Dizziness, lightheadedness, or unsteadiness
   - yes no
   - Rating: ___
4. Trembling or shaking
   - yes no
   - Rating: ___
5. Breathlessness or smothering sensation
   - yes no
   - Rating: ___
6. Faintness
   - yes no
   - Rating: ___
7. Numbness or tingling in face or extremities
   - yes no
   - Rating: ___
8. Choking
   - yes no
   - Rating: ___
9. Sweating
   - yes no
   - Rating: ___
10. Hot flushes or cold chills
    - yes no
    - Rating: ___
11. Feeling unreal or in a dream
    - yes no
    - Rating: ___
12. Nausea or abdominal distress
    - yes no
    - Rating: ___
13. Fear of dying
    - yes no
    - Rating: ___
14. Fear of going crazy
    - yes no
    - Rating: ___
15. Fear of losing control
    - yes no
    - Rating: ___
16. Sensation of panic or fear
    - yes no
    - Rating: ___

Please rate how safe you felt throughout the procedure (Circle one number):

<table>
<thead>
<tr>
<th>Not at all</th>
<th>Slightly Safe</th>
<th>Moderately Safe</th>
<th>Very Safe</th>
<th>Completely Safe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rating: ___</td>
<td>___</td>
<td>___</td>
<td>___</td>
<td>___</td>
</tr>
</tbody>
</table>

Please rate how much control you felt you had over the sensations during the procedure (circle one number):

<table>
<thead>
<tr>
<th>No Control</th>
<th>Slight Control</th>
<th>Moderate Control</th>
<th>Much Control</th>
<th>Complete Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rating: ___</td>
<td>___</td>
<td>___</td>
<td>___</td>
<td>___</td>
</tr>
</tbody>
</table>

Please rate how anxious you felt during the procedure (circle one number):

<table>
<thead>
<tr>
<th>Not at all Anxious</th>
<th>Slightly Anxious</th>
<th>Moderately Anxious</th>
<th>Very Anxious</th>
<th>Completely Anxious</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rating: ___</td>
<td>___</td>
<td>___</td>
<td>___</td>
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</table>

When you first noticed the symptoms which you listed above, did you have any of the following thoughts?:

- I feel relaxed
- I feel like I might be dying
- This is dangerous
- There is nothing to fear
- This is quite pleasant
- I am going to lose control
- I am going to faint or fall
- This is exciting
- I need help
- I am safe here
- Something is wrong
- This isn’t so bad

<table>
<thead>
<tr>
<th>I feel relaxed</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>I feel like I might be dying</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>This is dangerous</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>There is nothing to fear</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>This is quite pleasant</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>I am going to lose control</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>I am going to faint or fall</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>This is exciting</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>I need help</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>I am safe here</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Something is wrong</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>This isn’t so bad</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>
### Strategies Used During the CO₂ Challenge

Using the scale below, please indicate how much you used each of these strategies during the carbon dioxide breathing exercise. Please do not take into account how much you were asked to use each strategy. Rather, record how much you actually did the following during the breathing exercise.

<table>
<thead>
<tr>
<th>Scale</th>
<th>Never</th>
<th>Some of the time</th>
<th>Frequently</th>
<th>Most of the time</th>
<th>All of the time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>

During the exercise, how much did you:

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Tell yourself to not feel anxious.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Ask yourself if your thoughts are accurate.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Observe your feelings without trying to change them.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Try to objectively evaluate your situation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Think of a pleasant event to change how you were feeling.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Allow yourself to experience whatever emotions came up for you.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Try to control your physical and emotional response to the anxiety-producing gas without changing your thoughts.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Lean into your symptoms, allowing yourself to feel them fully.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Change the content of your negative thoughts to be more realistic.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Considering the approach that you were taught in the video, how much do you typically use this approach in your everyday life?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Column B: Please return to the questions above and, if you used that strategy, rate how useful it was for coping with the anxiety you were experiencing on the following scale:

<table>
<thead>
<tr>
<th>Scale</th>
<th>Not at all useful</th>
<th>Somewhat useful</th>
<th>Moderately useful</th>
<th>Very useful</th>
<th>Extremely useful</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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<td></td>
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</table>