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The effects of acceptance versus control contexts on avoidance of panic-related symptoms

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Abstract

The present study compared the effects of creating an acceptance versus a control treatment context on the avoidance of aversive interoceptive stimulation. Sixty high anxiety sensitive females were exposed to two 10-min periods of 10% carbon dioxide enriched air, an anxiogenic stimulus. Before each inhalation period, participants underwent a training procedure aimed at encouraging them either to mindfully observe (acceptance context) or to control symptoms via diaphragmatic breathing (control context). A third group was given no particular training or instructions. We hypothesized that an acceptance rather than control context would be more useful in the reduction of anxious avoidance. Compared to control context and no-instruction participants, acceptance context participants were less avoidant behaviorally and reported less intense fear and cognitive symptoms and fewer catastrophic thoughts during the CO_2 inhalations. We discuss the implications of our findings for an acceptance-focused vs. control-focused context when conducting clinical interventions for panic and other anxiety disorders.

Keywords: Acceptance; Control; Context; Experiential avoidance; Carbon dioxide-enriched air; Panic; Anxiety

1. Introduction

Although individuals with anxiety disorders typically avoid situations and stimuli that have been associated with panic (Barlow, 2002), clinical researchers are now

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focusing on experiential avoidance, a more general type of avoidance. Experiential avoidance refers to an individual's attempts and efforts to avoid, suppress, or otherwise alter the form of negatively evaluated private events such as bodily sensations, emotions, thoughts, and memories (Hayes, Wilson, Gifford, Follette, & Strosahl, 1996). For instance, a person with agoraphobia not only avoids public places but also avoids experiencing thoughts and emotions associated with panic in these places (Friman, Hayes, & Wilson, 1998). When avoidance is not or no longer possible, a person may then resort to actual escape behavior (Forsyth & Eifert, 1996). The function of experiential avoidance is to control or minimize the impact of aversive experiences.

Clients typically consider avoidance and escape behavior to be the solution rather than the problem. As a consequence, many clients are apprehensive about cognitive-behavioral exposure-based strategies that target avoidance behavior and encourage clients to approach feared situations and experience fearful emotions (Barlow & Craske, 1994). Client receptivity of this strategy might be enhanced by employing techniques from recently developed acceptance-based approaches in behavior therapy (e.g., Hayes, Strosahl, & Wilson, 1999; Roemer & Orsillo, 2002; Teasdale, Segal, & Williams, 1995). These approaches attempt to alter the impact of fear emotions and cognitions by teaching clients to "let go of their struggle" through the use of techniques aimed at reducing avoidance of *experiencing* anxiety rather than reducing anxiety per se.

Metaphors are one technique to help patients learn to mindfully observe and accept negatively valenced cognitive-affective responses. Metaphors employ figurative language to synthesize emotionally relevant experiences in a noncon-frontative and nonthreatening way. They help people recognize their behavioral and emotional problems and point to possible, frequently unexpected, behavioral alternatives (Heffner, Greco, & Eifert, 2003; McCurry & Hayes, 1992; Otto, 2000). Metaphorical stories may also indirectly suggest contingencies, in which acceptance is reinforced and emotional avoidance and control is punished. For instance, the futility of fighting with one's own thoughts and feelings has been likened to being in a tug of war with oneself where "good" thoughts attempt to fight "bad" thoughts (Hayes et al., 1999; Heffner & Eifert, 2004). The harder one team pulls, the harder the other team pulls back. Such a tug of war is exhausting and can never be won because both teams belong to the client. Rather than continuing this senseless fight, the metaphor suggests an acceptance solution that clients typically do not think of, which is to end the fight in an instant by simply dropping the rope. All team members would still be there and clients could observe and stay with their thoughts and feelings simply watching them come and go.

Preliminary studies indicate that acceptance techniques produce an overall decrease in clinically significant affective disturbance, particularly interoceptive-oriented distress, over short as well as protracted time periods (Linehan, Armstrong, Suarez, Allmon, & Heard, 1991; Strosahl, Hayes, Bergan, & Romano, 1998; Teasdale et al., 1995). One treatment program (Kabat-Zinn et al., 1992) that emphasized mindful observation of symptoms in a group of 22 patients with various

anxiety disorders found positive effects after treatment completion which were maintained three years later (Miller, Fletcher, & Kabat-Zinn. 1995).

An acceptance rationale is also supported by research suggesting that client attempts to control anxiety may have negative paradoxical effects (Ascher, 1989). For example, Wegner (1994) found that attempts to control anxiety in the face of ongoing stress exacerbate physiological arousal. Increased tension during relaxation training was also reported in a study by Heide and Borkovec (1983). Likewise, studies suggest that adding slow diaphragmatic breathing (''BR'') might not increase the effectiveness of interoceptive exposure treatment for PD (Craske, Rowe, Lewin, & Noriego-Dimitri, 1997) and even lead to poorer outcomes compared to treatment without BR (Schmidt et al., 2000).

In a more general way, active coping efforts that attempt to minimize the experience of anxiety may (paradoxically and unintentionally) maintain pathological anxiety and increase the anxiogenic effects of interoceptive stimulation (Craske, Street, & Barlow, 1989). For instance, Spira, Zvolensky, Eifert, and Feldner (2002) found that avoidant coping strategies (e.g., denial, mental disengagement, substance abuse) predicted more frequent and intense CO_2-induced physical and cognitive panic symptoms than acceptance-based coping strategies. These findings are consistent with earlier studies showing that attempts to avoid aversive private events are largely ineffective and may be counterproductive (Cioffi & Holloway, 1993; Pennebaker & Beall, 1986).

We recently examined the effects of suppression versus acceptance on response to an anxiety-producing CO_2 challenge in persons scoring either high or low on a measure of emotional avoidance (Feldner, Zvolensky, Eifert, & Spira, 2003). Half of the participants were instructed to inhibit the challenge-induced aversive emotional state, whereas the other half was instructed to simply observe their emotional response. Individuals high in emotional avoidance responded with greater levels of anxiety and affective distress, but not physiological arousal, when attempting to suppress compared to observing bodily sensations. No such difference was found in the low emotional avoidance group. Further strong evidence that experiential avoidance exacerbates aversive emotional responses and may constitute a risk factor in the development and maintenance of anxiety disorders comes from a recent experiment by Karekla, Forsyth, and Kelly (in press). After several trials of inhaling CO_2 enriched air, individuals high in experiential avoidance endorsed more panic symptoms, more severe cognitive symptoms, and more fear, panic, and uncontrollability than their less avoidant counterparts. Interestingly, as in all our studies, the magnitude of autonomic responses did not discriminate between groups.

Based on the acceptance rationale that was examined in a pain context (Hayes, Bissett, Korn, Zettle, & Rosenfarb, 1999), we wanted to assess whether creating an acceptance context compared to a control context leads to less behavioral avoidance and self-reported anxiety in highly anxiety sensitive individuals. Anxiety sensitivity is an individual difference dimension referring to the fear of arousal-related bodily sensations based on the belief that such sensations have negative somatic or social consequences (Reiss, Peterson, Gursky, & McNally, 1986). For example, if persons believe bodily sensations are a sign of imminent personal harm, they will likely

experience elevated levels of anxiety when confronted with somatic perturbation. We chose to examine highly anxiety sensitive individuals because a diminished sense of control over terminating bodily sensations is particularly anxiety-provoking for individuals that already fund such somatic sensations aversive (Zvolensky, Eifert, & Lejuez, 2001). Studies also indicate that anxiety sensitivity may act as a specific vulnerability variable in the development of panic attacks (Donnell & McNally, 1990; Schmidt, Lerew, & Jackson, 1999), is elevated among persons with panic disorder (Taylor, Koch, & McNally, 1992), predicts anxious responding to biological challenge independent of other risk variables (Zvolensky & Eifert, 2001), and has been associated with greater avoidance in individuals with pain-related fear (Asmundson & Taylor, 1996).

In the current study, we focused on avoidance because it is a core aspect of anxiety disorders and can be readily measured in terms of duration and frequency (Eifert & Wilson, 1991). We measured avoidance as latency to begin inhaling CO_2-enriched air. Inhalation of CO_2-enriched air functions as an unconditioned stimulus that individuals work to avoid (Lejuez, O'Donnell, Wirth, Zvolensky, & Eifert, 1998) and reliably produces episodes of autonomic arousal including shortness of breath, tachycardia, sweating, and dizziness (Forsyth, Eifert, & Thompson, 1996) As such, it is suitable as an experimental panic provocation strategy and anxiety analogue (Zvolensky & Eifert, 2001).

We hypothesized that creating an acceptance context, rather than a context emphasizing symptom control, would lead to less avoidance and subjective anxious responding. Although there is not much research suggesting specific differences between control context versus uninstructed participants, we suspected that attempts to control essentially uncontrollable symptoms might have paradoxical negative effects (Ascher, 1989; Hayes et al., 1996), and increase avoidance and anxiety in control context compared to no-instructions participants. Physiological measures were included as a "manipulation check" to ensure that all groups experienced similar and sufficient levels of physiological responding.

2. Method

2.1. Participants

We screened 482 female undergraduates by administering the Anxiety Sensitivity Index (ASI). We also administered a medical screening questionnaire routinely employed in our laboratory (Forsyth & Eifert, 1998). This questionnaire asks participants to indicate whether they had any medical problems such as heart disease, epilepsy or a seizure disorder, hypertension, or lung disorders (e.g., emphysema). We also asked them to report any personal history of psychopathology, including panic attacks and use of psychotropic medication. We excluded males because females report higher levels of anxiety and are more frequently diagnosed with panic disorder (Cleary, Burns, & Nycz, 1990). We then identified 79 females with an ASI score greater than 27, which is one standard deviation above the mean

for college females (Peterson & Reiss, 1992). We excluded 12 potential participants for medical reasons and seven of the remaining 67 females declined to participate when contacted. We randomly assigned the final sample of 60 participants to an acceptance context, control context, or no-instruction condition, with 20 participants in each group. There were no significant between-group differences in age ($M = 19.4$, $SD = 1.84$), race (95% Caucasian), or smoking behavior (23% cigarette smokers). Participants were tested individually for 90 min and received optional psychology course extra credit.

2.2. Measures

2.2.1. Screening measure

The ASI (Reiss et al., 1986) is a 16-item instrument in which respondents indicate on a five-point Likert-type scale (0 = very little to 4 = very much) the degree to which they are concerned about possible negative consequences of anxiety symptoms. The ASI score is derived by summing all responses with total scores ranging from 0 to 64, with higher scores reflecting greater anxiety sensitivity. The ASI manual reports a mean of 18.2 with a standard deviation of 8.8 for college females in a nonclinical sample. The ASI has high levels of internal consistency in clinical and nonclinical populations (range of alpha coefficients: 0.79–0.90) and good test-retest reliability ($r = 0.75$ for two weeks to $r = 0.70$ for three years; Peterson & Reiss, 1992). Research also supports the criterion validity of the ASI and suggests that ASI properties are not shared by measures of general (trait) anxiety (McNally, 1994).

2.2.2. Behavioral measures

We employed three behavioral measures in this study. (1) *Latency*. Each CO_2 administration began when the participant used the mouse to click the "next trial" button on the computer. The computer recorded the latency to begin each of three trials in seconds. (2) *Willingness to return*. At the end of the session, we asked participants to indicate whether they were willing to return for another CO_2 study for extra credit. Participants who endorsed willingness to return were contacted four weeks post session and asked to return for a one-hour CO_2 session. We recorded the number of return participants. These participants received extra credit and were told their further participation was no longer needed. (3) *Drop-out*. We counted the number of participants who withdrew before both CO_2 trials were completed.

2.2.3. Self report measures

The Anxiety Control Questionnaire (ACQ; Rapee, Craske, Brown, & Barlow, 1996) is a 30-item self-report instrument designed to assess perceived control over anxiety-related events. Participants indicate on a six-point Likert-type scale (0 = strongly disagree to 5 = strongly agree) the degree to which they agree with a particular statement. The ACQ is scored by summing all responses (reverse scoring when appropriate) with total scores ranging from 0 to 150. Lower scores indicate less perceived control. The ACQ has excellent internal consistency in clinical and

nonclinical populations (total scale alpha: 0.87) and good test-retest reliability ($r = 0.88$ for 1 week to $r = 0.82$ for 1 month; Rapee et al., 1996).

Participants rated their level of discomfort before and during the CO_2 inhalation on a Subjective Units of Distress scale (SUDS; Wolpe, 1982) ranging from zero (no discomfort) to 10 (extreme discomfort). Participants also rated the unpleasantness of the CO_2 on a scale from 0 (not unpleasant) to 10 (extremely unpleasant). SUDS and unpleasantness ratings were displayed on the computer monitor, and participants responded via the attached keyboard.

The Diagnostic Symptoms Questionnaire (DSQ) is a 16-item measure to assess physiological reactivity to the CO_2 (Rapee, Brown, Antony, & Barlow, 1992). The DSQ measures the presence and intensity of 12 somatic and three cognitive panic symptoms. Intensity ratings for each endorsed symptom are made on a 9-point Likert-type scale ranging from 0 (not at all) to 8 (very strongly felt). The DSQ yields the following composite measures: total number of physical symptoms, catastrophic and non-catastrophic thoughts, and mean intensity of physical sensations, cognitive symptoms, and experienced fear.

The Acceptance and Action Questionnaire (AAQ; Hayes et al., in press) is a 9-item self-report measure that assesses emotional avoidance and emotion-focused inaction. Participants indicate on a 7-point Likert-type scale the degree to which a particular statement applies to them (1 = never true to 7 = always true). Sample items include "Anxiety is bad," "I'm not afraid of my feelings". High scores correspond to high experiential avoidance and low scores indicate acceptance and commitment to action. Research suggests a single factor structure for the AAQ and shows strong positive correlations with several measures of depression and anxiety (Hayes et al., in press).

At one-month follow-up, participants in the intervention conditions were phoned and asked to recall the strategy they had been taught in the intervention phase. Responses were recorded verbatim and subsequently coded to determine the amount of detail recalled.

We used five criteria to determine whether participants remembered the key components of each strategy based upon explanations and other instructions participants had received during the intervention. For instance, acceptance participants had to remember the use of the finger trap, the effects of pushing fingers in, the effects of pulling fingers out, that pushing in was more effective than pulling out, and use the word "acceptance" or a synonym. Control participants had to remember focusing on breathing, breathing from the stomach, taking slow breaths, thinking "relax" when exhaling, and use the word "control" or a synonym (e.g., master). This resulted in a score from 0 to 5 depending on the number of points recalled (criteria met). Inter-rater reliability (number of agreements divided by number of agreements plus disagreements) of two trained independent raters scoring the responses was 0.89. In cases of disagreement, a third rater read the participant's response and made the final decision.

2.3. Manipulation check assessment

2.3.1. Exit questionnaire

As in the pain study by Hayes et al. (1999), we assessed the possibility that the treatment conditions generated different demand characteristics. An exit questionnaire measured whether the participant attempted to use the therapeutic strategy (yes or no), how effective she found the strategy (1 = very helpful to 5 = very unhelpful), how much she enjoyed participating in the study (1 = very much to 5 = not at all), and how willing she was to return for a similar CO_2 study (yes or no).

2.3.2. Physiological measures

We used physiological measures (heart rate and skin conductance) as a manipulation check. A Coulbourn Modular recording system assessed physiological responding at a sample rate of 10 samples per second across all channels (± 5 V). All channels were calibrated online prior to sampling. Heart rate was sampled in beats/per minute (bpm) using a digital Coulbourn tachometer fed through a S75-01 bioamplifier and assessed via Medi-Trace pre-gelled Ag/AgCl electrodes. Heart rate placement followed standard bilateral positioning on either side of the participant's rib cage, with a third electrode below the collar bone on the participant's left side serving as a ground. Skin conductance was assessed in microsiemens using a Coulbourn S71-23 isolated skin conductance coupler. Electrode placement followed a standard bipolar palmar configuration on the participant's less-dominant hand using disposable 8-mm diameter Ag/AgCl electrodes coated with a 0.05 molar concentration of NaCl. Disposable concentric adhesive collars were used to attach the electrodes to the skin surface.

2.4. Materials and apparatus

2.4.1. Setting

All sessions were conducted in a 2-m × 6-m research lab in the West Virginia University Psychology Department. Participants were seated at a desk with a Pentium microcomputer, SVGA color monitor, mouse, and keyboard. An intercom allowed the participant to communicate with the experimenter. A one-way mirror allowed observation of session events.

2.4.2. Arousal-inducing stimulus and gas delivery apparatus

The arousal-inducing stimulus was 10% carbon dioxide-enriched air (10% CO_2, 31% O_2, 59% N_2) administered twice for 10 min. This concentration was lower than concentrations used in some of our previous studies (e.g., Forsyth & Eifert, 1998; Zvolensky, Eifert, Lejuez, & McNeil, 1999). Lower concentrations might be more suitable when experimental manipulations require participants to experience panic-like symptoms for several minutes rather than seconds. The application of lower concentrations might also mimic more closely the course of symptoms in naturally occurring panic attacks where symptoms reach their peak within a period of 3–4 min

rather than 45 s (Barlow, Brown, & Craske 1994; for a thorough review of CO_2 challenge procedures, see Zvolensky & Eifert, 2001).

Participants wore a continuous positive pressure Downs C-Pap Mask (Vital Signs Inc., Model No. 9000). The CO_2 was stored in a 101 cm cylinder and fed through a 5 cm × 5 cm hole via aerosol tubing from the experimenter room to a positive-pressure downs C-pap mask worn by the participant. A Visual Basic program on the participant's computer controlled CO_2 delivery. An automated apparatus, described by Lejuez, Forsyth, and Eifert (1998), allowed delivery of either room air or 10% CO_2-enriched air.

2.5. Experimental conditions and procedure

Upon arrival at the research lab, informed consent was obtained, and the participant completed the demographic questionnaire, ACQ, and AAQ. All participants were reminded they would be breathing air containing more carbon dioxide than normal, and they might feel their heart racing and/or experience sweaty palms as well as some dizziness and breathlessness. Following this general disclosure, the directions and intervention differed for each of the conditions.

Acceptance context participants were taught the Chinese finger trap metaphor, adapted from Hayes et al. (1999). The finger trap is a woven straw tube, which is 15 cm long and 1 cm in diameter. First, a person must slide both index fingers into the woven straw tube, one finger at each end. If the person attempts to pull the fingers out, the tube catches and tightens causing discomfort. The only way to get out of the trap is to push the fingers in *first* and *then* slide them out. Even if they do not slide them out, pushing the finger in will give persons more space to maneuver (literally some "wiggle room"). In contrast to the procedure described by Hayes et al. (1999), we not only presented the metaphor verbally, but also allowed the participant to experience it with an actual finger trap. This experiential component could serve to enhance the credibility and effectiveness of the metaphor. Our goal was to let participants discover that attempting to reduce and control essentially uncontrollable symptoms, while seemingly logical and understandable (like pulling out of the finger trap), only more tension and perpetuates the struggle: the harder you pull, the more the trap tightens, resulting in more discomfort and pain. In contrast, doing something counterintuitive, observing and "leaning into the symptoms" (pushing the fingers *in* rather than *out*), will end the struggle and give the individual space to move.

Control context participants were taught a 10-min standard diaphragmatic breathing strategy. The core features included breathing with the diaphragm, focusing attention on rate and depth of breathing, and thinking "relax" on exhale. We told participants that this breathing strategy might help them gain control over symptoms they may experience during the subsequent CO_2 administration. Our goal was to create a context of control during a period of aversive interoceptive stimulation similar to what many panic patients find themselves in when they attempt to reduce the impact, intensity, and duration of aversive interoceptive distress during a panic attack.

No-instruction participants received no further instructions but waited 10 min to control for time while the investigator was in the adjacent room. Then they received the same CO_2 administration as participants in the other two groups.

After receiving the appropriate instructions and intervention, participants moved to a seat in front of the computer screen. The experimenter ensured the electrodes and C-pap mask were fitted properly. We told participants in all three groups that they would first be breathing normal room air, followed by three periods of CO_2 delivery, each several minutes long. There would be a rest period before each trial, and a trial would not start until they clicked the start-trial button on the computer screen. The length of time they spent resting would not affect the intensity or duration of the CO_2 inhalations.

The initial computer screen prompted the participant to make a SUDS rating and predict the unpleasantness of the CO_2 trial. The next computer screen prompted the participant to begin the CO_2 trial by clicking the start-trial button with the mouse. The computer recorded the time between presentation of this screen and the click of the button. The mouse click immediately turned the computer screen blank and began the 10-min 10% CO_2 delivery. At the offset of the CO_2, the computer prompted the participant to click the mouse to begin the second trial and recorded the latency between this screen presentation and the participant's start-trial mouse click. Then the computer prompted to rate SUDs and unpleasantness of Trial 1.

Before Trial 2 actually began, the experimenter re-entered the experimental room for a 5-min period to review the intervention procedure and instructions. Acceptance context participants completed the Chinese finger trap exercise and again discussed the meaning of the metaphor. Control context participants once again practiced the diaphragmatic breathing procedure. In the no-instruction condition, participants simply waited for 5 min. Then the second 10-min CO_2 inhalation period occurred, which was immediately followed by the prompt to click the mouse to begin Trial 3. The computer recorded the latency between the offset of CO_2 and the click of the "next trial" button. Then participants made SUDS and unpleasantness ratings for the previous Trial 2. A subsequent computer screen informed participants that Trial 3 would be aborted because enough data had been collected. Thus, all subjects were only given two CO_2 inhalation trials. The reason we led them to believe there would be a third trial was simply so that we could obtain another latency measure after Trial 2. The experimenter removed the C-pap mask and asked participants to remain in their chair for another 10 min to collect physiological baseline data. Finally, all electrodes were removed and participants completed the DSQ and the exit questionnaire.

Although we typically collect baseline data before CO_2 trials (e.g., Feldner et al., 2002; Zvolensky et al., 2001), we chose to collect post-task baseline data in this study because we did not want a pre-task baseline waiting period to interfere with the latency/avoidance measure, which was one of our major dependent variables. We were concerned that if participants sat for 10 min waiting while we collected baseline data, they would want to begin the CO_2 trial right away to escape boredom, which could have confounded this latency measure. Baseline measures taken after the experiment have the drawback of being a return to baseline rather than a true

baseline. However, pre-experimental baselines may also not be "true baselines" when participants anticipate an aversive event and consequently experience elevated basal levels of skin conductance or HR. Although one could argue that residual effects of the CO_2 inhalation might have contaminated the post-task baseline, previous studies in our lab (e.g. Feldner et al., 2003; Spira et al., 2002; Zvolensky et al., 1999) have shown that the typical response to CO_2 inhalation is short-lived and that participants quickly return to normal level of physiological responding. Also, even if there was such contamination it should have been equal across groups. On balance, it seemed an extensive baseline resting period at the end of the study would serve the purposes of this study better than a typical pre-task baseline of a shorter duration.

3. Results

3.1. Data analytic strategy

3.1.1. Behavioral avoidance measures

We analyzed the latency to begin each trial using group × time analysis of variance (ANOVA). All significant interaction effects were tested by examining simple effects using the Bonferroni correction procedure to control for family wise error rate (0.05/number of comparisons, Keppel, 1991). The other avoidance measures (drop-out, return visit) were analyzed separately using a Chi-square statistic.

3.1.2. Self-report measures

Using ANOVA we first examined pre-experimental questionnaire data to determine whether the participants in the three experimental conditions differed in terms of self-reported anxiety. We then analyzed self-reported SUDS and Unpleasantness ratings for the first and second CO_2 inhalations using a group × time ANOVA. We analyzed self-reported intensity of physiological, cognitive, and experienced fear symptoms reported on the DSQ with ANOVAs using the Bonferroni correction procedure to control for family wise error rate. ANOVAs were also conducted to determine group differences in the number of catastrophic thoughts reported by each group on the DSQ as well as group differences for key individual items. Finally, we used ANOVA to examine between-group differences on the 4-week recall measure.

3.1.3. Physiological measures

After screening for outliers due to sampling error (e.g., participant movement), we selected 15 random seconds from every minute of each 10-min phase (Trial 1, Trial 2, post-task baseline) and calculated the mean of these 150 measures as the heart rate (bpm) and skin conductance (*m*S) for that phase. We then used a mixed 3 (group) × 3 (phase) ANOVA to assess physiological responsiveness.

3.1.4. Estimates of effect size

Effect size was indexed via η^2 to evaluate approximate variance accounted for by a specific effect according to the following ranges: large effects $\eta^2 \geqslant 0.45$, medium effects $\eta^2 = 0.13$ to 0.44, and small effects $\eta^2 = 0.02$ to 0.12 of variance (Cohen, 1988).

3.2. Pre-experimental and manipulation check data

3.2.1. Pre-experimental questionnaires

Table 1 shows the pre-experimental questionnaire scores for the three conditions. ANOVAs revealed that the groups did not differ pre-experimentally on self-reported anxiety sensitivity, perception of control, experiential avoidance, predicted unpleasantness, or subjective unit of discomfort ratings.

3.2.2. Physiological responding

Table 1 presents mean heart rate and skin conductance change scores for the three groups. For both measures, mixed 3 (group) × 3 (trial) ANOVAs yielded a main effect for trial, (heart rate: $F(2, 32) = 28.45$, $p < 0.001$, $\eta^2 = 0.61$; skin conductance: $F(2, 33) = 4.85$, $p < 0.01$, $\eta^2 = 0.23$). This pattern of results reveals that heart rate was higher during Trial 1 ($M = 7.50$, $SD = 2.79$) and Trial 2 ($M = 6.98$, $SD = 6.33$) than during the post-task baseline. Skin conductance was also higher during Trial 1 ($M = 0.12$, $SD = 0.21$) and Trial 2 ($M = 0.07$, $SD = 0.18$) than during the post-task resting period. There were no physiological response differences between groups during the inhalation trials as indicated by the lack of an interaction between trial and group for both measures.

We performed a one-way ANOVA with follow-up Bonferonni post-hoc comparisons for both heart rate and skin conductance post-task baseline data. As expected, we found no differences between the baseline heart rate scores of the acceptance ($M = 108.82$) control context ($M = 111.33$) and no-instruction ($M = 105.87$) groups ($F(2, 37) = 1.140$, *ns*). There were also no differences between the mean post-task skin conductance scores of the acceptance context ($M = 1.42$), control context ($M = 1.35$), and no-instruction ($M = 1.46$) groups ($F(2, 38) = 0.97$, *ns*).

3.2.3. Exit questionnaire

Table 1 shows that all participants in both active conditions reported using the described strategy. There were no differences on ratings of helpfulness of the strategy or enjoyment of the study.

3.3. Experimental results

3.3.1. Behavioral responding

Fig. 1 shows the mean latency for each of the three trials across all conditions. A mixed 3 (trial) × 3 (group) ANOVA yielded a main effect for trial, ($F(2, 46) = 8.10$, $p < 0.001$, $\eta^2 = 0.26$). The interaction between trials and group also was significant,

Table 1
Means (and standard deviations) of measures for all three conditions

	Acceptance-context	Control-context	No instruction
Pre-experimental			
Anxiety sensitivity index	32.1 (6.2)	31.0 (5.3)	32.1 (6.3)
Anxiety control questionnaire	92.7 (17.4)	84.3 (22.9)	87.2 (17.2)
Acceptance & action questionnaire	34.9 (6.1)	37.2 (8.9)	36.0 (7.1)
SUDS rating	2.9 (1.8)	2.4 (1.9)	3.4 (2.0)
Predicted unpleasantness rating	6.1 (1.9)	5.9 (2.1)	6.1 (2.1)
Experimental			
Unpleasantness rating			
Trial 1	4.2 (2.1)	4.8 (2.3)	5.9 (2.3)
Trial 2	3.6 (2.6)	3.7 (2.7)	4.5 (3.2)
SUDS rating			
Trial 1	4.1 (1.7)	4.6 (1.9)	5.4 (2.1)
Trial 2	3.3 (2.2)	3.4 (2.8)	4.3 (3.1)
Heart rate (bpm change score)			
Trial 1	7.0 (5.9)	7.6 (6.6)	7.7 (9.5)
Trial 2	6.3 (5.7)	6.6 (6.9)	7.9 (6.6)
Skin conductance (*m*S change score)			
Trial 1	0.17 (0.31)	0.08 (0.15)	0.1 (0.1)
Trial 2	0.08 (0.21)	0.05 (0.08)	0.1 (0.2)
Post-experimental			
Diagnostic symptoms questionnaire			
Fear of losing control	$0\%^{a}$	$42\%^{b}$	$28\%^{b}$
All catastrophic thoughts	0.5^{a} (0.8)	1.7^{b} (1.5)	1.6^{b} (2.0)
Behavioral measures			
Willing to return for points	$95\%^{a}$	$63\%^{b}$	$75\%^{b}$
Actual return for points	$63\%^{a}$	$33\%^{b}$	$8\%^{b}$
Drop-out rate	$0\%^{a}$	$20\%^{b}$	$25\%^{b}$
Attempt to use strategy	100%	100%	
Helpfulness of strategy (1–5)	1.8 (0.6)	1.9 (0.7)	
Enjoyment of experiment (1–5)	2.1 (1.2)	1.8 (1.2)	1.7 (1.3)
Recall of strategy	2.5^{a} (1.4)	1.7^{b} (0.5)	

Note: Scores that have different superscripts are significantly different from each other ($p<0.05$). Scores that share the same superscript are not significantly different from each other.

($F(2,47) = 3.74$, $p<0.03$, $\eta^2 = 0.14$). Although the groups did not differ on the latency measure for Trials 1 and 2, the control context group took significantly longer to begin Trial 3 than the acceptance group, ($F(1,33) = 7.46$, $p<0.01$, $\eta^2 = 0.18$). The no-instruction group did not differ from either acceptance or control context groups on the third latency measure.

Further analysis suggests that the control context group sensitized to the CO_2 effects. A Repeated Measures ANOVA shows that participants in this group took progressively longer to begin the trials, with a longer latency to begin Trials 2 and 3 compared to Trial 1, ($F(2,14) = 4.54$, $p<0.02$, $\eta^2 = 0.23$). We also found a significant trial effect for latency differences in the acceptance group

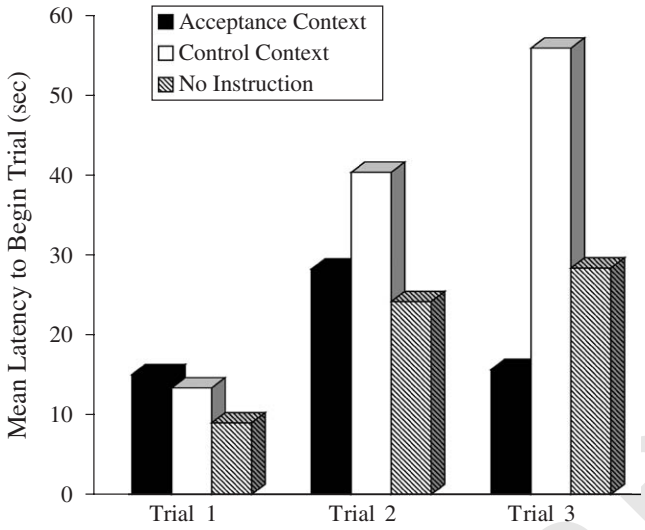

Fig. 1. Mean latency, in seconds, to begin each CO_2 trial for all three conditions.

($F(2,17) = 3.55$, $p < 0.05$, $\eta^2 = 0.29$). Specifically, latency to begin Trial 2 was longer compared to Trials 1 and 3, which were not significantly different from each other. There was no effect for trial for the no-instruction group ($F(2,13) = 3.30$, $p < 0.07$, $\eta^2 = 0.34$).

There were significant differences in the dropout rates between our groups ($\chi^2(2) = 5.50$, $p < 0.06$, $\eta^2 = 0.09$). A total of 9 participants (4 control context, 5 no-instruction) withdrew from the study prior to completion of both trials, whereas all acceptance participants completed both trials (see Table 1). Acceptance context participants were less likely to dropout than participants in the control context ($\chi^2(1) = 4.44$, $p < 0.03$, $\eta^2 = 0.11$) and no-instruction condition ($\chi^2(1) = 5.71$, $p < 0.02$, $\eta^2 = 0.14$). Acceptance context participants expressed more willingness to return for another session than control context or no-instruction participants ($\chi^2(2) = 7.8$, $p < 0.02$, $\eta^2 = 0.07$). Compared to no-instruction participants, acceptance participants were also more likely to actually return for another session ($\chi^2(2) = 10.35$, $p < 0.006$, $\eta^2 = 0.20$), whereas control context participants did not differ from the other groups on this measure.

3.3.2. Self report

Table 1 shows the SUDS and unpleasantness ratings for the two trials. There were no significant group differences in SUDS ratings for Trial 1 ($F(2,54) = 2.54$, $p < 0.08$) and Trial 2 ($F(2,48) = 0.69$). Likewise, there were no differences in unpleasantness ratings for Trial 1 ($F(2,54) = 2.90$, $p < 0.06$) and Trial 2 ($F(2,48) = 0.52$).

Fig. 2 shows intensity of physiological, cognitive, and experienced fear symptoms, as reported on the DSQ. A Multiple Analysis of Variance (MANOVA) was

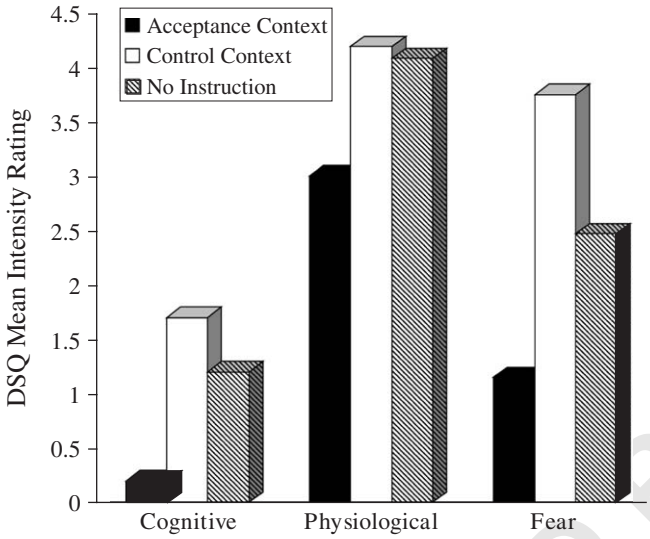

Fig. 2. Mean intensity of physical and cognitive symptoms and experienced fear as reported on the diagnostic symptoms questionnaire.

performed with 3 dependent variables: cognitive, physical, and fear symptoms. As this MANOVA was significant ($F(6, 108) = 2.46$, $p < 0.03$), we performed follow-up ANOVAs with Bonferroni post-hoc tests. These follow-up analyses revealed that acceptance participants reported less intense cognitive symptoms and experienced less fear than control context participants, but acceptance participants did not report less intense physiological symptoms than control context participants. No-instruction participants were not significantly different from either acceptance or control participants on intensity of cognitive, physiological, and experienced fear symptoms.

Catastrophic thoughts, as measured by the DSQ, correlated with avoidance behavior in terms of drop out ($r = 0.43$, $p < 0.01$) and willingness to return for another session ($r = -0.50$, $p < 0.01$). Thus, participants who engaged in catastrophic thinking during the trials were more avoidant than those who did not engage in catastrophic thinking. The groups differed on self-reported number of catastrophic thoughts during the CO_2 trials, ($F(2, 54) = 3.93$, $p < 0.03$, $\eta^2 = 0.13$). Acceptance participants reported fewer catastrophic thoughts than control context ($F(1, 37) = 9.98$, $p < 0.003$, $\eta^2 = 0.21$) and no-instruction participants ($F(1, 36) = 5.12$, $p < 0.03$, $\eta^2 = 0.13$). Control context participants did not differ from no-instruction participants on number of endorsed catastrophic thoughts. Specifically, acceptance participants endorsed two of the six catastrophic thought items less often than the other participants: "I am going to lose control" ($\chi^2(2) = 10.18$, $p < 0.01$, $\eta^2 = 0.18$) and "I need help" ($\chi^2(2) = 8.23$, $p < 0.01$, $\eta^2 = 0.14$). None of the acceptance participants endorsed "I am going to lose control," whereas 42% in the control context ($\chi^2(1) = 10.59$, $p < 0.001$, $\eta^2 = 0.27$)

and 28% in the no-instruction conditions ($\chi^2(1) = 6.4$, $p < 0.01$, $\eta^2 = 0.17$) endorsed this item. Likewise, none of the acceptance participants endorsed "I need help", whereas 32% of control context ($\chi^2(1) = 7.46$, $p < 0.01$, $\eta^2 = 0.19$) and 33% of no-instruction participants ($\chi^2(1) = 7.92$, $p < 0.01$, $\eta^2 = 0.21$) endorsed this item. Control context and no-instruction participants did not differ on the endorsement of any of the catastrophic thought items.

Table 1 shows the percent recall of participants four weeks post-session. Acceptance participants recalled their strategy better than control context participants ($F(1, 33) = 4.64$, $p < 0.04$, $\eta^2 = 0.12$).

4. Discussion

The aim of this study was to compare the effects of creating an acceptance versus control context during aversive interoceptive stimulation. Consistent with our hypothesis, acceptance context participants, compared to control context participants, began the final CO_2 trial sooner and were more likely to return for a similar study. Control context participants took progressively longer to begin the trials. In fact, control context participants may have taken progressively longer to initiate trials because they used delay as a means of control. Hence, taking longer may not only be an avoidance strategy, but rather a control-based strategy for such participants. Acceptance participants reported fewer and less intense cognitive and fear symptoms, engaged in less catastrophic thinking, and reported no fear of losing control or needing help. Overall, our results support creating an acceptance context during anxiety interventions and suggest that attempts to control physiological and cognitive components of anxiety, in the face of ongoing essentially uncontrollable stress, may exacerbate anxiety and distress. Similar findings were obtained in studies by Hayes and associates (1999) and Forsyth, Roche, and Maher (2003) where acceptance rather than control strategies led to greater pain tolerance during a cold pressor task and less focus on negative thoughts and feelings.

Our results support findings from the emotional processing literature (Foa & Kozak, 1986) showing that anxious individuals do best under conditions in which they make no attempt to escape from or otherwise reduce the effects of fear experienced during exposure (Craske et al., 1989; Kamphuis & Telch, 2000). In contrast to control efforts, and by avoiding "false safety aids" such as breathing control (Schmidt et al., 2000), the acceptance context is more likely to foster optimal emotional processing resulting in less fear and catastrophic thinking. Although an earlier study (Kabat-Zinn et al., 1992; Miller et al., 1995) demonstrated the beneficial effects of mindful observation and acceptance of interoceptive symptoms during treatment of panic and generalized anxiety disorder, that study did not directly compare acceptance versus control contexts. Our study provided a direct comparison and included multiple measures of behavioral avoidance.

There are a number of caveats that warrant consideration when interpreting our results. As we encouraged control context participants to engage in diaphragmatic breathing, these participants could have inhaled more CO_2 than participants in the

other groups. If that had been the case, however, control participants should have experienced greater physiological arousal and reported more intense physical symptoms. Our results show that this was not the case. There were no heart rate or skin conductance differences between groups for either trial, and there were no between-group differences on self-reported intensity of physiological symptoms. These findings are in line with previous studies using CO_2 challenges also showing no between-group differences in *physiological* responsiveness to the CO_2 challenge (Karekla et al., in press; Levitt, Brown, Orsillo, & Barlow, in press; Zvolensky et al., 1999; Zvolensky, Lejuez, & Eifert, 2000), which is probably due to the unconditioned stimulus characteristics of the CO_2 procedure (Forsyth et al., 1996). Nonetheless, future studies should monitor CO_2 levels by using a capnograph to ensure that CO_2 levels in all conditions.

Although there were no differences on self-reported intensity of physiological symptoms, control participants reported more intense cognitive and subjective fear symptoms than acceptance context participants. Control participants engaged in more catastrophic thinking, possibly because they expected to be able to reduce symptoms by using the breathing technique. Yet when symptoms persisted, they might have feared they had lost control over the situation, which could have resulted in even more catastrophic thinking. Both the physiological and relevant self-report data suggest that diaphragmatic breathing did not produce stronger physiological arousal among control context participants that could account for the *subjective experience* of greater fear and cognitive symptoms compared to acceptance context participants.

There was no clear pattern to the no-instruction group's responding. On some measures, the no-instruction group differed from acceptance but not control context group responding (e.g., drop-out rate, catastrophic thought endorsement). On other measures (e.g., Trial 3 latency, DSQ), no-instruction participants did not differ from either of the active groups. No-instruction participants were not taught to use a specific coping strategy, so we do not know what particular strategy, if any, they used during the provocations. Future studies should make specific efforts to assess what participants do during CO_2 provocations. An exit questionnaire and/or interview should specifically assess to what extent participants tried to control/reduce symptoms and how they attempted to do that.

Our study was not conducted in a double-blind fashion, and the first author who conducted the intervention was aware of the hypothesis and may have appeared more convincing when delivering the acceptance strategy. On the other hand, acceptance participants did not perceive their strategy as more helpful than control participants, and both groups rated their respective strategy equally effective. Likewise, there were no group differences in terms of enjoyment of participation.

We used the exit questionnaire to evaluate demand characteristics related to potential differences in the way the techniques were delivered. However, this questionnaire may not have been so much a measure of credibility as it was a measure of technique satisfaction. Credibility is usually assessed after the technique is described but before participants actually apply it. So future studies should include a questionnaire administered to participants after instruction and training, but

before they apply the technique during exposure, to assess for understanding of the instructions, credibility of intervention, and expectation for control over panic symptoms. Questions regarding satisfaction and helpfulness of the technique should continue to be assessed after participants apply the technique.

The two active conditions not only differed in terms of how to deal with symptoms but also may have created somewhat different expectancies ("I will be able to reduce aversive sensations" versus "I will not be able to control aversive sensations so I should try to stop fighting them"). On the other hand, participants in both active conditions were implicitly led to believe that their particular technique would be helpful to them, and we found no post-experimental differences on perceived helpfulness of the two strategies. Moreover, our primary intention was not to influence or change expectations but to encourage a particular class of behavior (acceptance vs. control) during an aversive experience. Nonetheless, future research could systematically vary context/strategies and outcome expectations to determine their relative impact on anxiety and avoidance.

As we selected individuals merely on the basis of high anxiety sensitivity levels, it is unclear whether our findings and conclusions can be generalized to individuals with actual panic disorder. We are encouraged, however, by the results of a recent study examining the effects of accepting versus suppressing the effects of a CO_2 challenge in clients with panic disorder (Levitt et al., in press). This study found an almost identical pattern of results as we did. The acceptance group was significantly less anxious and less avoidant than the suppression or no-instruction control groups but the groups did not differ in terms of self-reported panic symptoms or physiological responses. Clients in that study were simply instructed to either accept or suppress their responses to the CO_2 challenge. Future studies will have to examine whether the additional use of metaphors is more beneficial than simply instructing clients what to do. Future research also must determine whether having clients act out the metaphor as in our study is more salient and effective than delivering the metaphor verbally as reported by Hayes et al. (1999).

Finally, we should note that acceptance and control techniques are not mutually exclusive and are already combined in existing empirically supported panic treatments (Barlow & Craske, 1994). It may be crucial for patients to learn, however, that control and acceptance are probably most useful at different stages of the "panic cycle". Breathing control and relaxation techniques may serve to reduce high baseline arousal to *prevent* a panic attack, but they are not particularly effective for reducing symptoms in the middle of an attack. Once a panic attack has started, it is likely to run its course—attempts to control and eliminate symptoms at that stage only tend to make matters worse (Zvolensky et al., 2000). At that point, acceptance strategies would actually be a better coping strategy for patients to deal with the aversive, but basically harmless, panic attack symptoms. Although our findings provide encouraging support for creating a more explicit acceptance treatment context, it is now necessary to compare the effects of a control vs. acceptance context with a clinical sample.

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