



Does the judicious use of safety behaviors improve the efficacy and acceptability of exposure therapy for claustrophobic fear?

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ABSTRACT

Exposure therapy is traditionally conducted with an emphasis on the elimination of safety behaviors. However, theorists have recently suggested that the judicious use of safety behaviors may improve the tolerability of this treatment without reducing its efficacy. The present study tested this notion by randomly assigning participants with high claustrophobic fear to receive a single-session intervention with or without access to safety aids during early exposure trials. Improvement was generally equivalent between the treatment conditions, and no reliable benefits or drawbacks were associated with the judicious use of safety behaviors. The theoretical and clinical implications of these findings are discussed.

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1. Introduction

Anxiety disorders are characterized by inaccurate appraisals of threat which often persist despite the habitual non-occurrence of feared outcomes (Clark, 1999). To explain why seemingly irrational fears seldom self-correct over time, cognitive-behavioral theorists (e.g., Salkovskis, 1991) have highlighted the role played by safety behaviors (i.e., actions taken to prevent, avoid, or escape a feared outcome) in the maintenance of pathological anxiety. Safety behaviors are thought to prevent anxious individuals from acquiring accurate threat-relevant information by promoting a misattribution of safety (Salkovskis, 1991) and by diverting attentional resources away from potentially disconfirming information (Sloan & Telch, 2002). To illustrate, an individual with panic disorder who sits down, breathes deeply, and ingests a high-potency benzodiazepine medication upon experiencing palpitations is unable to learn that such actions may not have been necessary to prevent a heart attack. The attention devoted to these behaviors may also rob the individual of the opportunity to observe the dissimilarity between his or her symptoms and those associated with a genuine heart attack.

Consistent with their hypothesized role as a maintenance factor, safety behaviors are often targeted for reduction or elimination in cognitive-behavioral therapy (CBT). Indeed, CBT involving exposure to feared stimuli and the prevention of safety behaviors is considered the treatment of choice for anxiety disorders such as

obsessive-compulsive disorder, panic disorder, and specific phobias (Deacon & Abramowitz, 2004; Otto, Smits, & Reese, 2005). From the perspective of emotional processing theory (e.g., Foa & Kozak, 1986), the goal of treatment is to provide anxious individuals with corrective information that disconfirms their inaccurate threat appraisals. Accordingly, exposure therapy is believed to be maximally effective when contexts that might interfere with threat disconfirmation, such as the utilization of safety behaviors during therapeutic exposures, are minimized or eliminated (see Powers, Smits, Leyro, & Otto, 2007, for a review).

Treatment studies have often found that exposure therapy in which safety behaviors are prohibited is more effective than exposure therapy in which patients are permitted to use safety behaviors (Parrish, Radomsky, & Dugas, 2008). For example, a study comparing variants of exposure therapy for panic disorder with agoraphobia (Salkovskis, Clark, Hackman, Wells, & Gelder, 1999) found that patients who dropped safety behaviors during treatment showed a greater decrease in anxiety and panic-related cognitions than patients who did not receive instructions to drop safety behaviors. Research conducted among individuals with high claustrophobic fear suggests that compared to standard exposure, worse outcomes are obtained when individuals are allowed to use safety behaviors during exposures (Sloan & Telch, 2002), even when the option to do so is declined (Powers, Smits, & Telch, 2004). Alternatively, exposure therapy appears more effective when patients deliberately forego their safety behaviors (Kim, 2005; Morgan & Raffle, 1999; Wells et al., 1995) or even act in an opposite manner by engaging in “fear antagonistic actions” (Wolitzky & Telch, 2009).

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In contrast to the findings reviewed above, several investigations have found that giving patients permission to utilize safety behaviors during treatment does not diminish the benefits of exposure therapy. In an early investigation, Bandura, Jeffrey, and Wright (1974) found that snake phobic participants who were unable to perform an exposure task after it was modeled for them experienced greater fear reduction when they were able to use “response induction aids” (e.g., gloves) during exposures. Rachman and colleagues (Rachman, Craske, Tallman, & Solyom, 1986; de Silva & Rachman, 1984) reported that agoraphobic patients who were allowed to leave the situation (i.e., escape) during in vivo exposures improved to the same extent as those who were not given such permission. Of interest, few patients actually chose to escape during exposures, and escapes were not followed by increases in avoidance or fear but rather by an improved sense of control. More recently, Milosevic and Radomsky (2008) examined the effects of allowing snake fearful participants access to “safety gear” (e.g., gloves, goggles) during a series of progressively more difficult exposures involving a live snake. Compared to participants who were not offered safety gear, those who were experienced large and comparable levels of improvement in fear and catastrophic cognitions. Moreover, participants offered safety gear more rapidly approached the snake. Taken together, these studies suggest that in some circumstances, allowing patients to use safety behaviors during exposure therapy is not associated with decreased efficacy and may even convey some therapeutic benefits.

Drawing on the available clinical research, Rachman, Radomsky, and Shafraan (2008) argued that safety behaviors do not necessarily interfere with the benefits of exposure therapy. They suggested that the “judicious use” of safety behaviors, in which access to safety during exposure tasks is provided in the early stages of treatment but is subsequently faded, may facilitate exposure therapy by increasing its acceptability to patients without diminishing its potency with respect to fear reduction and cognitive change. The possibility that the judicious use of safety behaviors may improve upon traditional methods of conducting exposure therapy has important clinical implications. Despite the well-established efficacy of exposure-based CBT, many individuals with anxiety disorders do not benefit from this approach. For example, approximately 45% of patients with obsessive-compulsive disorder drop out, fail to respond acutely, or relapse following exposure and response prevention (Stanley & Turner, 1995). Modifications to exposure therapy that increase its efficacy, decrease its aversiveness, or both have the potential to increase the percentage of patients who can tolerate and benefit from this treatment.

The present study was conducted to examine the effects of augmenting exposure therapy with the judicious use of safety behaviors. Undergraduate participants with high claustrophobic fear were randomly assigned to undergo exposure therapy either with or without access to safety aids during initial exposure trials. Measures of claustrophobic-specific anxiety, catastrophic cognitions, and self-efficacy were assessed at pretreatment, posttreatment, and one-week follow-up. Ratings of treatment acceptability and aversiveness were obtained following each exposure trial. This methodology permitted us to test the following hypotheses, proposed by Rachman et al. (2008), regarding the effects of the judicious use of safety behaviors on exposure therapy:

1. Safety behaviors will facilitate therapeutic progress.
2. Safety behaviors will increase the acceptability and tolerability of treatment.
3. Safety behaviors will provide an enhanced sense of control.
4. Safety behaviors will be especially useful during the early stages of treatment.

5. Safety behaviors will not preclude cognitive change.
6. Safety behaviors will be more effective for individuals with more severe fears.

2. Method

2.1. Participants

Study participants ($N = 33$) were undergraduate students at the University of Wyoming. Participants were recruited from a large pool of introductory psychology students ($N = 395$) and were selected via a two-stage screening process (see below). Students received partial course credit for their participation. The sample was comprised primarily of women (84.8%) and ranged in age from 18 to 23 years ($M = 19.51$; $SD = 1.35$). Nearly all participants (97.0%) described themselves as Caucasian. Full *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; *DSM-IV*; American Psychiatric Association, 1994) criteria for claustrophobia were met by 39.4% of participants; an additional 36.4% met all *DSM-IV* criteria except the functional impairment/marked distress criterion.

2.2. Experimental design

Eligible participants were randomly assigned to one of two conditions: (a) exposure only (EO), or (b) exposure with judicious use of safety behaviors (E + SB). All participants received an identical cognitive-behavioral rationale and subsequently participated in six exposure trials in a “claustrophobia chamber” (see below). Assessments were conducted at pretreatment, immediately following each exposure trial, at posttreatment, and at one-week follow-up.

2.3. Measures

2.3.1. Structured clinical interview for DSM-IV (SCID)

The specific phobia section of the Structured Clinical Interview for DSM-IV-TR Axis I Disorders, non-patient version (SCID-IV; First, Spitzer, Gibbon, & Williams, 2002) was used to determine whether participants meet *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; *DSM-IV*; American Psychiatric Association, 1994) criteria for claustrophobia. The SCID has demonstrated high discriminant validity and inter-rater reliability for DSM-IV anxiety disorder diagnoses (Carlbring et al., 2002). All study experimenters were doctoral clinical psychology students who had completed coursework in clinical interviewing and demonstrated competency with the SCID-IV.

2.3.2. The credibility/expectancy questionnaire (CEQ)

The CEQ is a well-established measure of treatment expectancy and acceptance of treatment rationale. It possesses good test-retest reliability and internal consistency (Deville & Borkovec, 2000). The CEQ consists of two sections, asking participants to report how much improvement they *think* will occur as well as how much improvement they *feel* will occur. This measure was administered immediately following the treatment rationale but before treatment was initiated.

2.3.3. Behavioral approach test (BAT)

Participants were invited, but not required, to complete up to eight BAT steps of progressively increasing difficulty. The BAT was designed to elicit claustrophobia-related suffocation and restriction concerns in a setting independent of the treatment context, and as such served as a measure of the extent to which treatment gains generalized to a novel setting. The eight BAT steps were additive

and consisted of: (a) entering a small (2.4 m × 3.1 m), windowless room and closing the door, (b) lying down on one's back and entering a fully unzipped sleeping bag (a slim, 20-degree-rated, mummy-style model) on the floor, (3) zipping the sleeping bag up to one's waist, (4) zipping the sleeping bag up to one's neck, (5) placing a large (123 cm × 228 cm) blanket over one's entire body, including the face, (6) placing a second identical blanket over one's entire body, (7) placing a third identical blanket over one's entire body, and (8) placing a pair of handcuffs on one's wrists. The experimenter was present in the room with the participant at all times. Each BAT step lasted for 30 s. Immediately following each completed step, participants provided verbal ratings of peak fear during the step on a 0–100 scale (0 = *no fear*; 100 = *extreme fear or panic*). An index of peak fear for each participant was determined by the fear rating for the highest completed step. All eight BAT steps were completed by 28 participants (84.8%) at pretreatment, 30 (90.9%) at posttreatment, and 31 (93.9%) at follow-up.

2.3.4. The claustrophobia questionnaire (CLQ)

The CLQ, developed by Rachman and Taylor (1993) and revised by Radomsky, Rachman, Thordarson, Mclsaac, and Teachman (2001), consists of 26 items assessing claustrophobic fears and is divided into two subscales: Suffocation Fear (CLQ-SS; 14 items) and Restriction Fear (CLQ-RS; 12 items). Respondents rate how anxious they would feel in a number of situations involving potential restriction or suffocation on a 5-point Likert scale ranging from 0 (*not at all anxious*) to 4 (*extremely anxious*). CLQ total and subscale scores have good predictive and discriminant validity, internal consistency, and test-retest reliability (Radomsky et al., 2001). In the present study, pretreatment internal consistency was adequate for the CLQ-SS ($\alpha = 0.83$) and excellent for the CLQ-RS ($\alpha = 0.91$).

2.3.5. The claustrophobia coping self-efficacy scale (CCSES)

The CCSES assesses perceived control over four personal reactions specific to claustrophobia chamber exposures on a 0–100 scale (0 = *no confidence*; 100 = *extreme confidence*). Sample items include, "Estimate your confidence in being able to reduce your fear to a manageable level while in the chamber," and "Estimate your confidence in being able to control fearful thoughts or images while in the chamber." The CCSES has demonstrated good incremental, predictive, and discriminant validity as well as high internal consistency (Valentiner, Telch, Petruzzi, & Bolte, 1996). The CCSES demonstrated excellent internal consistency ($\alpha = 0.91$) at pretreatment in the current study.

2.3.6. The claustrophobic concerns questionnaire (CCQ)

The CCQ assesses eight catastrophic cognitions specific to the chamber exposures (e.g., "I might be trapped," "I might run out of air"). Participants are asked to endorse how relevant each concern is on a 0–100 scale (0 = *no concern*; 100 = *extreme concern*). The CCQ has demonstrated high internal consistency and predictive validity (Valentiner et al., 1996), and evidenced excellent internal consistency ($\alpha = 0.90$) in the present study at pretreatment.

2.3.7. Anxiety sensitivity index-3 (ASI-3)

The ASI-3 measures the fear of anxiety reactions based on beliefs about their harmful consequences (Taylor et al., 2007). Respondents rate their agreement with each of 18 items on a 5-point scale ranging from 0 (*very little*) to 4 (*very much*). The ASI-3 has been shown to have excellent convergent, discriminant and criterion-related validity (Taylor et al., 2007). Previous research has implicated anxiety sensitivity as an important cognitive bias associated with claustrophobia (Valentiner et al., 1996). In the present study, the ASI-3 evidenced excellent internal consistency at pretreatment ($\alpha = 0.90$).

2.3.8. Treatment process

Immediately following each chamber exposure, participants rated their peak fear during the trial on a 0–100 scale where 0 = *no fear* and 100 = *extreme fear or panic*. Participants also completed the CCQ, CCSES, and provided ratings of treatment acceptability ("At this point, how acceptable is this treatment to you?"), treatment aversiveness ("At this point, how unpleasant is this treatment to you?"), and desire to stop treatment ("At this point, how strongly do you wish to stop this treatment?") on a 100-point scale ranging from 0 (*not at all*) to 100 (*extremely*). These measures were included to assess perceptions of the exposure intervention and the pace of improvement during the chamber trials.

2.3.9. Use of covert safety behaviors in the chamber

Prior to the first treatment trial, participants selected from a list the one negative outcome that most concerned them about the forthcoming chamber exposures. The most frequently endorsed feared outcomes were not being able to escape (48.5%) and running out of air/suffocation (45.5%). Following the intervention, participants were asked whether or not they utilized any actions to prevent their feared outcome from occurring in the chamber that could not be readily observed by the experimenter, and to describe how each specified action prevented the outcome from occurring. Responses were recorded verbatim by the experimenter.

Qualitative content analysis of these responses indicated three categories of covert safety behaviors that were distinguishable based on their intended function. The authors met together and coded responses from each participant; disagreements were resolved via group consensus. Each covert action was classified into one of three categories: (a) distraction, defined as behaviors intended to help one concentrate on matters unrelated to the chamber and one's reactions to it (e.g., "imagining I was somewhere else"); (b) reassurance, consisting of behaviors intended to convince oneself that one is not in danger (e.g., "reminding myself that I could get out"); and (c) neutralization, comprised of actions intended to directly prevent the occurrence of feared outcomes (e.g., "leaving the chamber early when I felt I was running out of air").

2.4. Procedure

Following Powers et al. (2004), the screening process was comprised of two stages (see Fig. 1). In the first stage, introductory psychology students completing a mass testing questionnaire packet rated the extent to which they feared enclosed spaces on a 5-point Likert scale (0 = *no fear*, 1 = *mild fear*, 2 = *moderate fear*, 3 = *severe fear*, 4 = *extreme fear*). Those who reported at least moderate fear were invited via e-mail to participate in a second screening task. The purpose of the second screener was to verify the severity of participants' claustrophobic fear and establish their suitability for, and ability to benefit from, treatment for this problem.

The 51 potential participants who passed the stage 1 screener and agreed to participate in the study were asked to enter the claustrophobia chamber, a 183 cm (length) × 61 cm (width) × 51 cm (height) wooden structure, with a hinged top and visible latches on three sides. This structure was constructed to match the specifications of the chamber used in six claustrophobia treatment studies by Telch and colleagues (Kamphuis & Telch, 2000; Powers, Smits, Whitley, Bystritsky, & Telch, 2008; Powers et al., 2004; Sloan & Telch, 2002; Telch, Valentiner, Ilai, Petruzzi, & Hehmsoth, 2000; Telch et al., 2004). For the second screening task, participants were instructed to lie down in the chamber with the top closed and remain there for as long as possible. Length of time in the chamber was limited to two minutes, but participants were not made aware of this time limit in advance. Immediately after exiting the chamber, participants rated their peak level of fear on a 100-point scale (0 = *no fear*, 100 = *very*

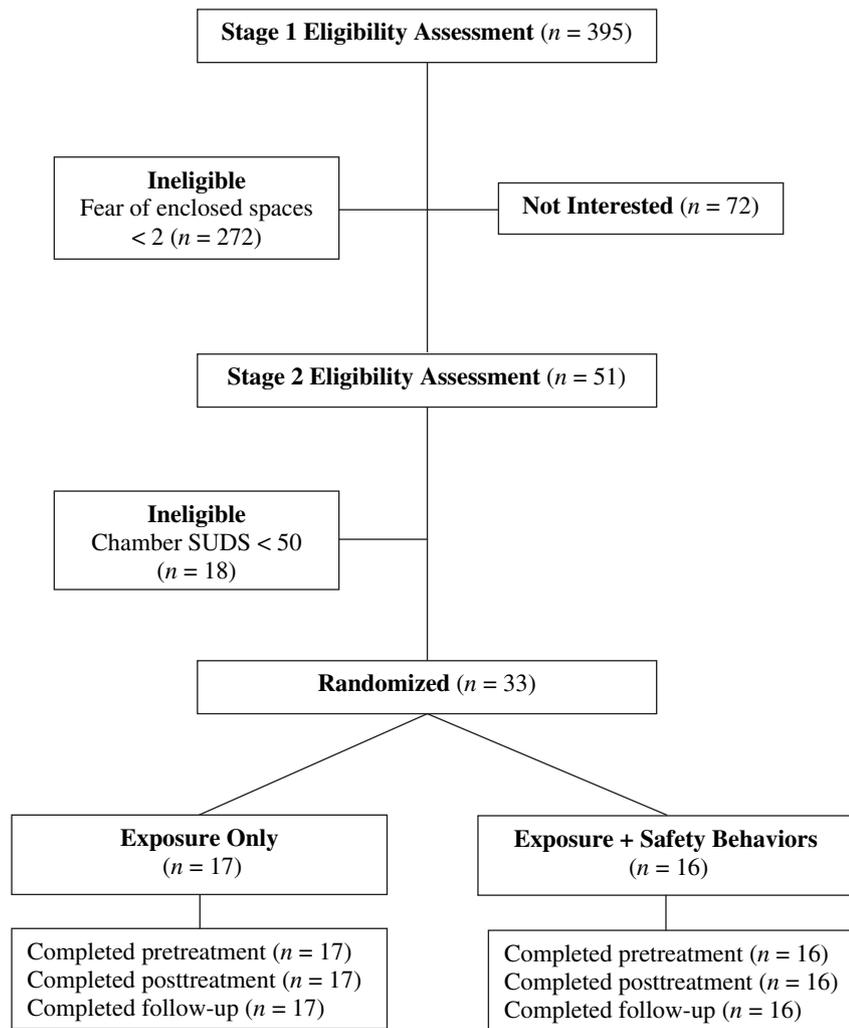


Fig. 1. Participant flow.

severe fear). Following the procedure of Telch and colleagues in the above studies, individuals whose peak fear was below 50 ($n = 18$), or who refused to enter the chamber ($n = 0$), were excluded from participation. Individuals who passed this second screener ($n = 33$) were invited to participate; each provided written informed consent and completed all study procedures and assessments. This study was approved by the University of Wyoming institutional review board.

2.5. Treatment conditions

2.5.1. Procedures common to both conditions

Participants in both study conditions received an identical treatment rationale that emphasized the role of avoidance and inaccurate threat beliefs in the maintenance of claustrophobic fear, and the potency of exposure in reducing this fear. Immediately following the rationale, participants completed the CEQ. Participants were then provided with a list describing five progressively more difficult steps for conducting the exposure trials in the claustrophobia chamber. The list included the following steps: (1)

chamber with the top closed and unlatched, (2) chamber with the top closed and latched, (3) chamber with the top latched and a white dust mask worn over one's mouth, (4) chamber with top latched, dust mask, and a scarf worn around one's neck, and (5) chamber with top latched, dust mask, scarf, and handcuffs placed on one's wrists. Participants were asked to select a particular step from this list prior to each exposure trial. They were instructed to push themselves to face their fear as much as possible, and were informed that progression through each of the five steps by the end of the sixth exposure trial was ideal, but also that the choice of which step to attempt was entirely their own. Participants engaged in six consecutive exposure trials, each lasting up to five minutes, yielding a maximum of 30 min of exposure inside the chamber. Participants were not informed of this time limit, and individuals who remained in the chamber for the full five minutes were asked to exit after this time had expired. Following each trial, assessments of peak fear, claustrophobic cognitions, claustrophobic coping self-efficacy, and treatment acceptability and aversiveness were conducted. Following completion of these assessments, the subsequent trial was immediately initiated.

2.5.2. Exposure plus safety behaviors (E + SB)

Participants assigned to the E + SB condition were told that three coping aids were available to them to use during the first four exposure trials. Following Powers et al. (2004), the coping aids were (a) opening a 15 cm × 15 cm door in the side of the chamber that faced a small fan blowing fresh air, (b) communicating with the experimenter via two-way radio, and (c) having the experimenter unlatch the top of the chamber for the duration of the trial. Participants were told, “You are free to use any, all, or none of the coping aids during the first four exposure trials in the chamber. Note, however, that you will not have the option to use any of the coping aids during the final two chamber exposures.”

2.5.3. Exposure only (EO)

Participants in the EO condition were not given access to or made aware of the coping aids described in the E + SB condition.

2.5.4. Experimenter training

Experimenters administered the study according to a detailed, standardized protocol. Experimenter training consisted of didactic instruction provided by the first author, observation of assessment and treatment procedures, and supervised role plays with trained experimenters. All experimenters demonstrated proficiency with the protocol prior to running participants through the study.

3. Results

3.1. Preliminary analyses

3.1.1. Baseline equivalence of groups

Participants in the EO and E + SB conditions did not differ significantly with respect to age, $t(31) = 0.57$, $p = 0.57$, or sex, $\chi^2(1) = 1.91$, $p = 0.19$. To confirm that the two experimental groups were comparable regarding baseline levels of claustrophobic concerns, we conducted a series of independent samples t -tests examining between-group differences on pretreatment BAT peak fear ratings and scores on the CLQ-SS, CLQ-RS, CCSES, CCQ, and ASI-3. None of the tests were significant, indicating that our randomization procedure resulted in comparable groups.

3.1.2. Treatment credibility and expectancy

Mean credibility ratings for participants in the EO condition ($M = 5.85$, $SD = 1.50$) and the E + SB condition ($M = 5.59$, $SD = 1.67$) did not significantly differ, $t(31) = 0.47$, $p = 0.64$, $d = 0.16$. Likewise, mean ratings of treatment expectancy for the EO condition ($M = 52.42$, $SD = 23.53$) and the E + SB condition ($M = 60.22$, $SD = 23.40$) were not significantly different, $t(31) = 0.96$, $p = 0.35$, $d = 0.33$.

3.1.3. Duration of chamber exposures

The mean duration of time spent in the chamber during the six exposure trials did not significantly differ among participants in the two conditions, $t = 0.30$, $p = 0.77$, $d = 0.10$. Neither did the percentage of participants in each condition who remained in the chamber for the full 5 min duration of all six trials, $\chi^2(1) = 1.41$, $p = 0.24$, 70.6% in the EO condition; 87.5% in the E + SB condition.

3.1.4. Safety aid utilization and treatment outcome

Half ($n = 8$) of the participants in the E + SB condition used a coping aid during one or more of the first four exposure trials. Coping aid utilization was as follows: opening the window ($n = 8$; 50%), communicating with the experimenter with the two-way radio ($n = 4$; 25%), and unlatching the top of the chamber ($n = 1$; 6.2%). Use of one or more coping aids was associated with significantly higher pretreatment scores on the CCQ, $t(14) = 2.11$,

$p = 0.05$, $d = 1.05$, and marginally higher pretreatment BAT peak fear ratings, $t(14) = 1.97$, $p = 0.07$, $d = 0.99$. A series of 2×3 (coping aid utilization × time) mixed ANOVAs was conducted to examine the effect of coping aid utilization on improvement in the E + SB condition. After controlling for pretreatment CCQ scores, a significant coping aid utilization × time interaction was evident on BAT peak fear, $F(2, 24) = 3.80$, $p = 0.04$, partial $\eta^2 = 0.24$. Follow-up t -tests indicated that participants who used one or more coping aids experienced less improvement on BAT peak fear than those who did not from pre-to-post treatment, $t(14) = 4.26$, $p = 0.001$, $d = 2.20$, and from posttreatment to follow-up, $t(14) = 2.03$, $p = 0.06$, $d = 1.03$. Coping aid utilization was not significantly associated with improvement on the CLQ-SS, CLQ-RS, CCSES, or ASI-3 (all p 's > 0.10) after controlling for pretreatment CCQ scores.

3.1.5. Covert safety behavior utilization and treatment outcome

The majority of participants in both the E + SB (81.2%) and EO (76.5%) conditions reported using one or more covert safety behaviors during the exposure trials. Distraction strategies were utilized by 25.0% and 29.4% of participants in the E + SB and EO conditions, respectively, $\chi^2(1) = 0.08$, $p = 0.54$; reassurance strategies were used by 56.2% and 29.4% of participants in the E + SB and EO conditions, respectively, $\chi^2(1) = 2.43$, $p = 0.11$; and neutralization strategies were used by 56.2% and 35.3% of participants in the E + SB and EO conditions, respectively, $\chi^2(1) = 1.46$, $p = 0.20$. Use of distraction and reassurance strategies was unrelated baseline severity on measures of claustrophobic concerns (all p 's > 0.20). Conversely, participants who reported using neutralization strategies during the chamber exposures demonstrated significantly greater baseline severity on all measures than those who did not (all p 's < 0.05). Independent samples t -tests indicated that utilization of distraction, reassurance, and neutralization strategies was not significantly associated with improvement on any measure of claustrophobic concerns after controlling for pretreatment CCQ scores (all p 's > 0.10).

3.2. Hypothesis #1: Safety behaviors will facilitate therapeutic progress

To test this hypothesis, a series of 2×3 (condition × time) mixed ANOVAs was conducted for the following indices of claustrophobic fear: BAT peak fear, the CLQ-SS, and the CLQ-RS. Means and standard deviations for the EO and E + SB conditions on these measures at pretreatment, posttreatment, and follow-up are presented in Table 1. A significant within-subjects effect of time was evident on each measure at the $p < 0.001$ level, indicating substantial improvement over time averaged across all study participants. There were no significant between-group effects (all p 's > 0.30). The interaction for BAT peak fear was not significant, $F(2, 60) = 0.18$, $p = 0.84$, partial $\eta^2 = 0.01$, indicating comparable improvement across the study assessments on this measure. On the CLQ-SS, a marginally significant interaction term was found, $F(2, 62) = 2.89$, $p = 0.06$, partial $\eta^2 = 0.09$, indicating greater improvement in the E + SB condition on this measure. Similarly, a statistically significant advantage of the E + SB condition was evident on the CLQ-RS, $F(2, 62) = 3.29$, $p = 0.04$, partial $\eta^2 = 0.11$. Follow-up t -tests of between-group differences on CLQ-SS and CLQ-RS change scores from pre-to-post treatment were nonsignificant, both p 's > 0.90. In contrast, improvement from posttreatment to follow-up was significantly greater in the E + SB condition than the EO condition for the CLQ-SS, $t(31) = 2.67$, $p = 0.01$, $d = 0.92$, and the CLQ-RS, $t(31) = 2.85$, $p = 0.008$, $d = 0.99$.

Following guidelines by Jacobson and Truax (1991), participants were classified as showing clinically significant change if their BAT

Table 1
Descriptive statistics on measures of claustrophobic concerns at pretreatment, posttreatment, and follow-up for each treatment condition.

Measure	Treatment condition					
	Exposure only (n = 17)			Exposure + safety behaviors (n = 16)		
	Pre	Post	FU	Pre	Post	FU
BAT peak fear						
M	70.59	40.53	30.35	71.31	42.69	35.33
SD	17.83	29.30	27.64	16.74	29.30	29.12
CLQ-RS						
M	19.35	11.71	10.76	21.13	13.38	8.13
SD	7.66	8.51	8.13	8.30	7.20	6.13
CLQ-SS						
M	22.18	13.41	12.24	23.94	15.00	9.13
SD	8.95	9.76	9.32	9.59	8.02	6.67
CCSES						
M	217.35	335.62	314.71	193.75	304.33	304.06
SD	65.02	59.02	63.95	75.95	68.71	76.42
CCQ						
M	536.47	271.86	280.00	565.63	305.33	258.75
SD	113.79	185.19	195.67	156.42	212.26	189.77
ASI-3						
M	20.65	13.24	10.12	23.13	15.88	11.5
SD	12.23	12.77	9.41	10.95	11.56	9.14

Note. BAT = behavioral approach task; CLQ-RS = Claustrophobia questionnaire – Restriction subscale; CLQ-SS = Claustrophobia questionnaire – Suffocation subscale; CCSES = Claustrophobia coping self-efficacy scale; CCQ = Claustrophobic concerns questionnaire; ASI-3 = Anxiety sensitivity index – 3.

peak fear ratings at posttreatment and follow-up showed reliable change and were two or more standard deviations below the pretreatment mean. At posttreatment, 9 participants (52.9%) in the EO condition and 7 in the E + SB condition (43.8%) had achieved clinically significant change. At follow-up, 11 participants (64.7%) in the EO condition and 8 in the E + SB condition (50.0%) had achieved clinically significant change. Chi-square analyses of differences between the two conditions in the proportion of participants demonstrating clinically significant change at posttreatment and follow-up were not significant (both p 's > 0.30).

3.3. Hypothesis #2: Safety behaviors will increase the acceptability and tolerability of treatment

Between-group differences in ratings of treatment acceptability, treatment aversiveness, and the wish to stop treatment throughout the exposure intervention were analyzed using hierarchical linear modeling (HLM; Raudenbush & Bryk, 2002). HLM is useful in analyzing repeated measures data (Level 1 data) nested within subjects (Level 2 data; Bryk, Raudenbush, & Congdon, 1996). HLM was used to examine the degree to which treatment acceptability, treatment aversiveness, and the wish to stop treatment changed across chamber trials during the intervention, as well as whether temporal changes in these measures were significantly different between participants in the EO and E + SB conditions.

In the first HLM, chamber trial number (1 through 6) was entered as a Level 1 predictor of treatment acceptability. This analysis tests the degree to which the change in treatment acceptability ratings across the six trials was significantly different from zero. The HLM yielded a highly significant change slope, $\beta = 2.53$, $t(196) = 4.09$, $p < 0.001$, indicating higher ratings of treatment acceptability following consecutive trials in the chamber. Contrary to the hypothesis, no effect of treatment condition was evident on changes in treatment acceptability ratings, $\beta = 1.34$, t

(194) = 1.11, $p = 0.27$. Mean treatment acceptability ratings were 63.0 (SD = 20.8) following trial 1 and 75.6 (SD = 21.7) at trial 6.

Treatment aversiveness ratings declined significantly across the six chamber trials, $\beta = 5.28$, $t(196) = 6.50$, $p < 0.001$, from an average of 57.6 (SD = 19.8) following trial 1 to 30.9 (SD = 28.7) following trial 6. As with treatment acceptability, the change slope for aversiveness ratings was not significantly different between the treatment conditions, $\beta = 0.66$, $t(194) = 0.41$, $p = 0.68$. Lastly, a HLM conducted on ratings of the wish to stop treatment yielded a significant decrease across chamber trials, $\beta = 1.82$, $t(196) = 2.17$, $p = 0.04$, but failed to demonstrate a significant difference between treatment conditions in the change slope of this variable across trials, $\beta = 1.14$, $t(194) = 0.66$, $p = 0.51$. Mean ratings of the wish to stop treatment declined from 31.8 (SD = 25.4) to 24.1 (SD = 31.5) during the six chamber trials.

3.4. Hypothesis #3: Safety behaviors will provide an enhanced sense of control

To examine this hypothesis, a 2×3 (condition \times time) mixed ANOVA was conducted to compare between-group changes in claustrophobia coping self-efficacy during the study. Table 1 presents descriptive statistics on the CCSES for each condition at pretreatment, posttreatment, and follow-up. This analysis yielded a statistically significant main effect of time, $F(2, 58) = 58.79$, $p < 0.001$, partial $\eta^2 = 0.67$, indicating substantial improvement in CCSES scores throughout the study. A nonsignificant between-group effect was obtained ($p = 0.33$). Lastly, the critical test of the interaction between condition and time was not significant, $F(1, 29) = 0.20$, $p = 0.66$, partial $\eta^2 = 0.01$, indicating comparable improvement in participants' perceptions of control over their reactions in the chamber in each treatment condition.

3.5. Hypothesis #4: Safety behaviors will be especially useful during the early stages of treatment

This hypothesis was tested via a series of HLM analyses in which between-group differences in the progression of exposure steps and the pace of improvement during the chamber trials were examined. Specifically, the speed at which participants progressed through the five possible exposure steps was compared between the EO and E + SB conditions. In addition, group differences in the pace of improvement across the six chamber trials in peak fear, claustrophobic cognitions, and claustrophobia coping self-efficacy were examined.

With respect to how rapidly participants approached feared stimuli in the chamber, a HLM demonstrated a significantly increasing progression through the exposure steps for the total sample during treatment, $\beta = 0.35$, $t(196) = 6.48$, $p < 0.001$. Contrary to the hypothesis, the change slope of exposure steps during the six chamber trials was not significantly different between treatment conditions, $\beta = 0.10$, $t(194) = 1.03$, $p = 0.30$. The rate at which participants in each condition progressed through the exposure steps is shown in Fig. 2.

A second series of HLM analyses examined the pace of improvement in peak fear, CCQ, and CCSES scores during treatment. Fig. 2 depicts scores on these measures following each chamber trial for participants in both treatment conditions. Significant improvement across chamber trials, averaged across all participants, was evident on peak fear, $\beta = 4.64$, $t(196) = 4.81$, $p < 0.001$, the CCQ, $\beta = 39.22$, $t(196) = 5.82$, $p < 0.001$, and the CCSES, $\beta = 14.58$, $t(196) = 7.78$, $p < 0.001$. No significant between-group differences were evident in the pace of improvement on peak fear, $\beta = 1.44$, $t(194) = 0.76$, $p = 0.45$, the CCQ, $\beta = 11.01$, $t(194) = 0.83$, $p = 0.40$, or the CCSES, $\beta = 1.27$, $t(194) = 0.34$, $p = 0.73$.

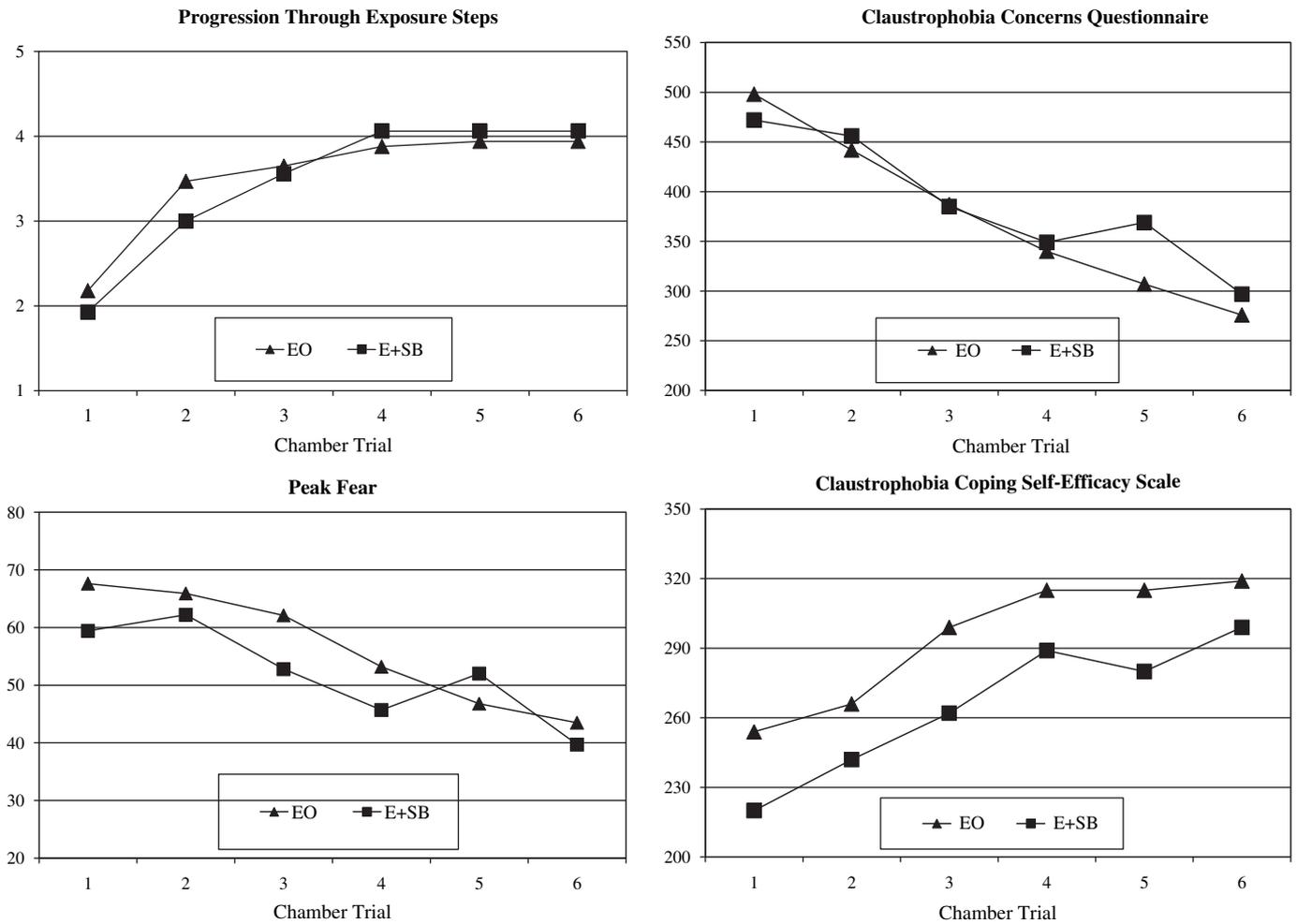


Fig. 2. Progression through exposure steps, and improvement in peak fear, catastrophic cognitions, and self-efficacy, during the six chamber trials for each exposure condition note. EO = Exposure only condition; E + SB = Exposure plus safety behaviors condition.

3.6. Hypothesis #5: Safety behaviors will not preclude cognitive change

The magnitude of cognitive change associated with the exposure intervention was examined with a series of 2 × 3 (condition × time) mixed ANOVAs conducted on measures of claustrophobia-related catastrophic cognitions (i.e., CCQ and ASI-3 scores). Means and standard deviations on the CCQ and ASI-3 at each assessment timepoint for both conditions are presented in Table 1. Significant improvement over time, averaged across all participants, was evident on the CCQ, $F(2, 58) = 76.39, p < 0.001, \text{partial } \eta^2 = 0.73$, and ASI-3, $F(2, 62) = 51.31, p < 0.001, \text{partial } \eta^2 = 0.62$. Nonsignificant ($p > 0.50$) between-groups effects were evident on both measures. Lastly, condition × time interactions terms were not significant for the ASI-3, $F(2, 62) = 0.19, p = 0.83, \text{partial } \eta^2 = 0.01$, and the CCQ, $F(2, 58) = 0.27, p = 0.76, \text{partial } \eta^2 = 0.01$, indicating a comparable degree of improvement in claustrophobia-related cognitions among participants in both treatment conditions.

3.7. Hypothesis #6: Safety behaviors will be more effective for individuals with more severe fears

To identify participants with more severe fears, CLQ-RS and CLQ-SS subscale scores were first summed to form a total CLQ score. Second, a median split of this variable was computed, and each

participant was classified as either low ($n = 15$) or high ($n = 18$) in claustrophobic fear. The proportion of participants with high claustrophobic fear was 58.8% in the EO condition and 50.0% in the E + SB condition. Third, a series of 2 × 2 × 3 (severity of claustrophobic fear × condition × time) mixed ANOVAs were conducted on BAT peak fear and scores on the CCSES, CCQ, and ASI-3. The critical test of this hypothesis was the three-way interaction between claustrophobic severity, condition, and time. In each analysis, this interaction was not statistically significant, (all p 's > 0.20), indicating comparable improvement in each condition for participants with low vs. high levels of claustrophobic fear. Moreover, severity of pretreatment claustrophobic fear was not associated with differential improvement (averaged across all study participants) as evidenced by nonsignificant claustrophobic fear × time interaction terms (all p 's > 0.30) for each measure.

4. Discussion

The present study was conducted to investigate the effects of the judicious use of safety behaviors on the efficacy and acceptability of exposure therapy. The results provide mixed support for the potential benefits of this practice as hypothesized by Rachman et al. (2008). Consistent with the notion that the judicious use of safety behaviors does not preclude therapeutic progress and cognitive change, exposure therapy in which participants were given access to

safety aids during initial trials was found to be as efficacious as exposure therapy in which safety aids were prohibited. Conversely, this study failed to demonstrate any of the hypothesized advantages of augmenting exposure with the judicious use of safety behaviors, including greater treatment acceptability, an enhanced sense of control, facilitation of treatment in the early stages, or greater efficacy for individuals with more severe fears.

Consistent with predictions offered by [Rachman et al. \(2008\)](#), participants who received exposure characterized by the judicious use of safety behaviors demonstrated substantial improvement in measures of claustrophobic fear and catastrophic cognitions. The magnitude of clinical change was generally similar in both treatment conditions. Large decreases in BAT peak fear ratings following treatment in both exposure conditions indicate that improvement in claustrophobic fear generalized to a novel, untreated context. Notably, the judicious use of safety behaviors did not preclude the disconfirmation of inaccurate threat appraisals. Indeed, reductions in catastrophic cognitions were large and essentially equivalent among participants receiving both treatments. The present results are consistent with those of [Milosevic and Radomsky \(2008\)](#) in demonstrating the generally equivalent efficacy for exposure therapy conducted with or without access to safety aids. Taken together, these findings indicate that the judicious use of safety behaviors does not necessarily diminish the efficacy exposure therapy, and may facilitate as much clinical improvement as exposure in which safety behaviors are prohibited.

How can the present findings be reconciled with other research demonstrating a detrimental effect of safety behaviors on the efficacy of exposure therapy (e.g., [Salkovskis et al., 1999](#))? One possibility lies in the manner in which safety behaviors are made available to fearful individuals during exposure tasks. Studies in which participants have access to safety aids throughout the duration of treatment typically report substandard outcomes in comparison to exposure in which safety behaviors are prohibited. For example, [Powers et al. \(2004\)](#) found that participants with high claustrophobic fear improved significantly less when given access to safety aids during each exposure trial. Compared to participants in the Powers et al. study, those in the present study received a highly similar intervention in an identical claustrophobia chamber and were permitted access to the same safety aids during treatment. Notably, the safety aids in these studies (e.g., opening a window in the chamber to access fresh air blown by a fan) appear particularly problematic owing to their likelihood of fostering a misattribution of safety in some participants (e.g., by appearing to prevent suffocation). The principal methodological difference between the Powers et al. study and the present investigation was that access to safety aids was withdrawn during treatment in this study. Thus, the most likely explanation for the discrepant findings obtained by Powers et al. and the present study is that the harmful effects of safety behaviors on exposure therapy may depend, in part, on whether or not access to them is withdrawn during treatment. Concurrently, it is possible that even safety behaviors with the clear potential to interfere with learning in the early stages of treatment may not exert long-lasting harmful effects so long as their availability is eliminated in subsequent exposure trials.

Participants in the exposure plus safety behaviors condition in the present study were made aware prior to the first exposure trial that their access to safety aids would be withdrawn during treatment. This represents another salient difference between the safety behavior condition in the present study and that employed by [Powers et al. \(2004\)](#). Knowing at the outset of treatment that access to safety is temporary may create a different psychological experience for patients in exposure therapy than the knowledge that safety is present at all times. Individuals may elect to push themselves harder to face their fears and tolerate discomfort during

initial exposure trials in order to prepare for the impact of subsequent trials in which safety aids will not be available. In contrast, constant access to safety may result in comparatively less anxiety and approach behavior during exposures, both of which have the potential to inhibit emotional processing and the acquisition of disconfirmatory information.

In addition to the beneficial therapeutic effects of safety behavior fading observed in the present study, clinical improvement may occur via exposure in which access to certain types of safety aids is present at all times. [Milosevic and Radomsky \(2008\)](#) found no deleterious effects of offering snake fearful participants access to safety gear during the entirety of a 45 min exposure to a live snake. Likewise, [Rachman and colleagues \(Rachman et al., 1986; de Silva & Rachman, 1984\)](#) reported substantial improvement among agoraphobics who were allowed to escape from feared situations through each of eight weekly in vivo exposure sessions. One possible explanation for these findings is that the actual degree of safety behavior utilization among participants in these studies was low. Alternatively, augmenting exposure therapy with safety behaviors may be less problematic when the safety aids promote approach behavior, allow participants to acquire disconfirmatory information, and do not foster the misattribution of safety ([Parrish et al., 2008](#)). Additional research on the circumstances in which certain types of safety behaviors promote therapeutic change, rather than hinder improvement, would be helpful in guiding the delivery of optimally effective exposure-based interventions for individuals with anxiety disorders.

Contrary to hypotheses proposed by [Rachman et al. \(2008\)](#), the judicious use of safety behaviors was not associated with more favorable perceptions of exposure therapy in this study. The present findings are inconsistent with arguably the most central hypothesized benefit of augmenting exposure therapy with the judicious use of safety behaviors, namely improved treatment tolerability and compliance ([Rachman et al., 2008](#)). It is likely that our use of a non-treatment-seeking sample, combined with the single-session intervention format, dramatically reduced the probability of participant attrition and non-compliance relative to the levels that might be observed in a clinical sample receiving treatment under more representative conditions. Conversely, it can be argued that dimensional assessment of treatment acceptability, compared to categorical measurement of drop-out and refusal rates, may be more sensitive to differences in participants' perceptions of exposure therapy as a function of safety behavior availability. The present results are thus inconclusive in regard to the effects of judicious safety behavior use on the acceptability of exposure therapy, and we recommend that future studies in this area conduct both categorical and dimensional assessments of how well individuals tolerate this treatment.

The present findings failed to support the hypothesized benefits of the judicious use of safety behaviors with regard to an enhanced sense of control, quicker pace of improvement during early trials, and increased efficacy of exposure therapy for more fearful individuals. The current empirical basis for these hypotheses is limited, with one study demonstrating an advantage of access to safety during exposure in terms of perceptions of control ([Rachman et al., 1986](#)), and a second study finding more rapid approach behavior during early exposure trials ([Milosevic & Radomsky, 2008](#)). As with treatment acceptability and tolerability, future research is needed to determine whether the hypothesized benefits of the judicious use of safety behaviors are evident in a more severely anxious sample receiving a more prolonged and anxiety-evoking exposure intervention.

It is possible that some of the potential advantages of combining exposure with the judicious use of safety behaviors might be attenuated by the manner in which fearful individuals interpret the

mere presence of safety aids. The sight of hand sanitizer dispensers, face masks, and rubber gloves implies the presence of harmful bacteria. A dog wearing a muzzle appears more dangerous than a dog not wearing one. Although these safety aids ostensibly prevent danger, their presence may increase fear instead of reducing it. Telch et al. (under review) found that the presence of a defibrillator during a panic challenge task increased participants' anxiety and perceptions of dangerousness. In the present study, one might have predicted that the presence of safety aids would have made the chamber exposures less anxiety provoking and less aversive, and produced an increase in perceived coping self-efficacy. This was not the case. It is possible that the hypothesized advantages of the judicious use of safety behaviors in these domains were counteracted to some degree by the effects of safety aids on perceptions of the chamber's dangerousness. This explanation is speculative and was not assessed in this study; future research might investigate the extent to which participants infer danger from the presence of safety aids and the associated consequences for the efficacy and acceptability of exposure therapy.

Strengths of the present study include a well-validated treatment protocol, assessment of clinical change at multiple timepoints during and after the treatment, and use of a novel BAT that measured claustrophobic fear in an untreated context. This study also has several limitations in addition to those described above. Because this study did not employ a control group, we cannot rule out the possible influence of expectancies, test sensitization, and regression to the mean on the study measures. The one-session intervention was highly standardized and brief, and despite its considerable efficacy (e.g., Powers et al., 2004) is not representative of the typical course of exposure-based CBT provided to individuals with anxiety disorders. The intervention also did not allow for the examination of additional hypotheses proposed by Rachman et al. (2008), such as the prediction that the benefits of augmenting exposure with the judicious use of safety behaviors will be enhanced when followed by self-directed practice. Additional research conducted with a treatment-seeking sample of anxiety disorder patients will provide a more powerful test of the hypotheses examined in the present study.

A related concern is that the relatively small sample size in this study limited our ability to detect significant differences between the treatment conditions. A larger sample size may have allowed the detection of additional, significant between-group differences in treatment efficacy. Similarly, we note that the risk of Type I error is inflated in this study due to the large number of outcomes examined. As recommended by Perneger (1998), we elected not to apply a Bonferroni correction to avoid inflation of Type II error, and presented estimates of effect size to minimize the impact of sample size on the interpretation of our findings. We note that despite the large number of treatment outcome analyses conducted in this study (and the resultant inflated family-wise error rate), very few between-group comparisons approached statistical significance, and very few analyses suggested a trend for significant group differences in outcome. As a result, the inclusion of additional participants would have had little effect on most of our findings. To illustrate, in order to have 80% power to detect a statistically significant ($p = 0.05$) difference between the exposure conditions on improvement in BAT peak fear from pre-to-post treatment, data would have to have been collected from 500 participants. Together with the results of de Silva and Rachman (1984), Rachman et al. (1986), and Milosevic and Radomsky (2008), the present findings suggest that differences in efficacy between exposure therapy conducted with and without the judicious use of safety behaviors may be negligible.

Our findings have important implications for the practice of exposure therapy. At present, exposure-based CBT is typically

conducted with instructions for patients to eliminate their use of safety behaviors, and therapists often strive to remove access to safety aids at the outset of treatment. The present study contributes to a small but growing body of research which suggests that allowing individuals to engage in safety behaviors during exposure therapy, in some circumstances, is not counter-therapeutic. If future research produces comparable results, exposure therapists may consider the judicious use of safety behaviors with at least some of their patients, especially those who appear at risk of attrition or non-compliance due to concerns about the acceptability or tolerability of exposure. On a cautionary note, numerous studies have documented a harmful effect of safety behavior availability on exposure therapy (e.g., Salkovskis et al., 1999), and the circumstances under which therapists may safely provide patients with access to safety aids are not yet understood with sufficient clarity to generate guidelines for clinical practice. In addition, whereas the present findings suggest that the judicious use of safety behaviors does not reduce the efficacy of exposure, there is scant evidence that access to safety enhances the therapeutic benefits of this treatment. We recommend additional research on the theoretical propositions offered by Rachman et al. (2008) and Parrish et al. (2008) regarding the potential benefits of the judicious use of safety behaviors. This important area of study may lead to improvements in the tolerability and efficacy of the most effective treatment for anxiety disorders.

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