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The effects of safety behavior availability versus utilization on inhibitory learning during exposure

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Abstract

This study re-analyzes data from Sy and colleagues (2011; *Behaviour Research and Therapy, 49*, 305–314) comparing safety behavior availability (SBA) to safety behavior utilization (SBU) during exposure therapy for claustrophobic concerns. The present investigation assessed differential rates of inhibitory learning (i.e., change in danger expectancy and coping self-efficacy) between SBA and SBU before, during, and after a single-session treatment. Thirty-nine participants with marked claustrophobic fear completed six consecutive five-minute exposure trials in a claustrophobia chamber. Participants in the SBA condition exhibited more interference with inhibitory learning relative to the SBU condition. Danger expectancy was significantly higher in the SBA group and decreased at a markedly slower rate across exposure trials relative to SBU. Coping self-efficacy was also significantly lower among participants in the SBA condition, although groups demonstrated similar rates of change across trials. Limitations, clinical implications, and future directions are discussed.

Keywords

Exposure Therapy; Safety Behaviors; Inhibitory Learning Theory

Although exposure therapy is a highly effective treatment for anxiety disorders (Olatunji, Cisler, & Deacon, 2010), there is ongoing debate over how exposure should be delivered to optimize its outcome. One area of contention is the inclusion or exclusion of safety behaviors during exposure. Safety behaviors are actions taken by anxious individuals to prevent or minimize feared outcomes and associated distress (e.g., Telch & Lancaster, 2012).

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Exposure protocols have traditionally called for the rapid elimination of safety behaviors during treatment (e.g., Abramowitz, Deacon, & Whiteside, 2011). This is based on concerns that safety behaviors may reduce the efficacy of exposure therapy by interfering with the acquisition and processing of threat disconfirming information (Salkovskis, 1991; Salkovskis, Clark, Hackmann, Wells, & Gelder, 1999; Sloan & Telch, 2002). A competing view suggests that the "judicious use" of safety behaviors (i.e., the introduction of safety behaviors in the earlier and/or more challenging stages of treatment) does not necessarily interfere with the process of exposure therapy and may in fact facilitate treatment engagement (e.g., Rachman, Radomsky, & Shafran, 2008; Rachman, Shafran, Radomsky, & Zysk, 2011). Clinical trials testing the relative effectiveness of exposure with and without safety behaviors have yielded inconclusive findings (Blakey & Abramowitz, 2016; Meulders, Van Daele, Volders, & Vlaeyen, 2016), and the clinical utility of including safety behaviors in anxiety treatment remains unclear.

Research investigating the *manner* in which safety behaviors are incorporated during exposure may contribute to an improved understanding of their clinical utility. For example, recent research suggests that safety behaviors may be more effective when a newly introduced safety aid is utilized as opposed to a routinely used safety aid (Levy & Radomsky, 2016a), and when safety behaviors are faded by the participant and not the experimenter (Levy & Radomsky, 2016b). An additional, potentially important aspect of safety behavior delivery concerns whether safety aids are simply made available to be used as needed during exposure trials, or alternatively are required to be used. Although this topic has received limited scientific attention, both empirical research (e.g., Sy, Dixon, Lickel, Nelson, & Deacon, 2011) and theoretical accounts (e.g., Blakey & Deacon, 2015) suggest that making safety aids available "just in case" may be problematic in several respects compared to mandating their use.

Although making safety aids available might appear reassuring due to their capacity to neutralize threat, this practice may paradoxically increase the perception of danger during exposure tasks. One reason why, as suggested by Blakey and Deacon (2015), is that the availability of safety aids implies the presence of aid-related threat via the reasoning process "*if a safety aid is present, there must be danger*" (p. 1). This possibility was supported in a study in which participants were required to immerse their hands in a box of contaminants with or without a bottle of hand sanitizer nearby (Blakey & Deacon, 2015). Results showed that contamination-fearful individuals endorsed greater perceived danger, higher distress, and more behavioral avoidance when hand sanitizer was present. They also evidenced greater hypervigilance to contaminants in the box, a result consistent with the notion that the availability of a safety aid fosters a "need to know" when a situation is dangerous enough to warrant its use (Westra & Stewart, 1998). This "need to know" process may promote hypervigilance to threat cues, leading to the increased perception of danger and resultant distress and avoidance. It has also been hypothesized that safety aids may transmit an implicit threat signal that is learned over time (Sloan & Telch, 2002). Through associative learning in anxiety-provoking situations, a safety aid may develop a *threat* signal as a result of being repeatedly paired with the presence of threat (classical conditioning), and may also develop a *safety* signal when repeatedly followed by the non-occurance of a feared outcome (operant conditioning). Thus, a safety aid may come to function as a signal for both safety and threat. In summary, making safety aids available may attenuate the benefits of exposure therapy by fostering the inference of danger and hypervigilance to threat cues. In contrast, the *utilization* of safety behaviors during exposure tasks would not be expected to produce the same degree of inferred danger and hypervigilance. Given that safety behaviors (by definition) are intended to neutralize feared outcomes and their associated distress, concerns about danger and the perceived need to scan for threat cues should be lessened when safety behaviors are used during exposure tasks. Whatever danger may be inferred from the presence of a safety aid (e.g., hand sanitizer) would be expected to lessen once a concerned individual uses that safety aid to mitigate a feared outcome (e.g., contamination by germs).

Two studies have examined the relative effects of safety behavior availability (SBA) versus safety behavior utilization (SBU) on exposure therapy outcomes. Powers and colleagues (2004) randomized fearful individuals to undergo 30 minutes of exposure in a claustrophobia chamber while utilizing safety behaviors (SBU), with safety behaviors made available (SBA) but with instructions to only use them if necessary (none did), or without access to safety (i.e., exposure only). Results demonstrated that the SBA and SBU conditions were less effective than exposure only and did not significantly differ from each other on domains of suffocation and restriction concerns or peak fear during a behavioral approach task (BAT). However, the authors did not measure two important types of outcomes: (a) key mechanisms of inhibitory learning in exposure therapy, namely expectancy violation (i.e., reduced danger estimates) and increased self-efficacy in fear toleration (Craske et al., 2008; 2014), and (b) the aforementioned safety behavior-related cognitive mechanisms of inferring danger from the presence of safety aids and hypervigilance toward threat. A replication and extension of this study conducted by Sy, Dixon, Lickel, Nelson, and Deacon (2011) partially addressed these limitations. Contrary to findings from Powers et al. (2004), Sy and colleagues found that SBU outperformed both the SBA and exposure-only groups on pre-post measures of symptom reduction. Specifically, in the comparison of safety behavior conditions the authors found that SBA was significantly less effective than SBU in reducing danger expectancies in the chamber and was marginally less effective in increasing self-efficacy. Treatment process analyses revealed that SBA participants spent significantly more time in the chamber thinking about actions they could take to mitigate feared outcomes and reduce anxiety, and that inferences of danger from the presence of safety aids during the final exposure trial were associated with reduced improvement on all outcome measures.

There have been two significant developments since Sy and colleagues' (2011) test of safety behavior availability versus utilization during exposure therapy. First, inhibitory learning theory (Craske et al., 2008; 2014) has grown in popularity and emphasizes learning-based indicators of treatment success (i.e., reduced threat expectancy and increased self-efficacy) rather than anxiety reduction. Second, inferences of danger and hypervigilance have been highlighted as two cognitive processes driving the unique detrimental effects of safety availability (Blakey & Abramowitz, 2016; Blakey & Deacon, 2015; Telch, Smits, Brown, Dement, Powers, Lee, & Pai, 2010). In light of these recent developments, there are several ways in which Sy and colleagues' analyses can be expanded to further examine the differential effects of safety availability and utilization on key exposure processes and indicators of outcome. To start, their group means analyses did not assess for change in threat expectancy and self-efficacy on a trial-by-trial basis. A multilevel modeling approach would provide an account of differential rates of inhibitory learning over the course of exposure trials. They also did not properly operationalize their three-item measure of cognitive avoidance during exposure tasks, as it captured two different attention constructs. One item measured attention *away* from threat ("distracting yourself [thinking about other things]), while the other two items measured attention *toward* threat (i.e., time spent thinking about "actions you could take to prevent your feared prediction from occurring," and "actions you could take to reduce your anxiety,") and together provide a better representation of hypervigilance. Reformulating this measure to include just the two hypervigilance items would allow an opportunity to confirm findings from Blakey and Deacon (2015) suggesting safety availability exacerbates hypervigilance during exposure. Finally, they did not examine effects of the pre-treatment description of safety availability versus utilization as part of the condition-specific manipulation process on expectation for the initial exposure trial.

The clinical utility of including or excluding safety behaviors during exposure therapy remains unclear. Testing the *manner* in which safety behaviors are incorporated into exposure has the potential to move this clinical debate forward. The present study re-examined Sy and colleagues' data to explore how the manner in which safety behaviors are incorporated into exposure therapy (i.e., merely available versus utilized) affects key cognitive processes and indicators of outcome. In addition to informing the safety behavior debate, this study contributes novel information to the growing inhibitory learning literature about processes that affect in-session learning.

The specific goals of this study were to (a) examine the effect of safety manipulation on initial expectations for exposure, (b) reformulate a measure of hypervigilance, and (c) assess trial-by-trial change in indicators of inhibitory learning and key cognitive process variables. We hypothesized that following a treatment-specific rationale participants in the SBA group would report greater danger expectancy and decreased self-efficacy relative to participants in the SBU group. We also hypothesized that danger expectancy and coping self-efficacy ratings would improve at a slower rate across trials among those in the SBA group relative to the SBU group. Lastly, we hypothesized that inferences of danger and hypervigilance toward threat would improve at a slower rate in the SBA group as compared to the SBU group.

Method

Participants

Participants were recruited through a two-stage screening process. Undergraduates who endorsed at least a "moderate" level of claustrophobia concern on a single-item online survey used by Powers et al. (2004) were invited to the laboratory. They were considered eligible if they reported peak fear of at least 50 on a 0 to 100 scale during a claustrophobia chamber behavioral approach task (BAT) or escaped the chamber in less than two minutes (see Sy et al., 2011, for details). A total of 39 participants were included in this study (SBA; $n = 21$, SBU; $n = 18$). Approximately half the sample (46.2%) met full Diagnostic and Statistical Manual of Mental Disorders (4th ed.; DSM-IV; American Psychiatric Association, 1994) criteria for claustrophobia, while an additional 20.5% of participants met all criteria except the functional impairment/marked distress criterion. The sample was mostly female (84.6%) and between 18 and 26 years old (M = 19.41, SD = 1.15). Participants received course credit for their participation.

Measures

Learning Outcomes—Danger expectancy was measured with the 8-item Claustrophobic Concerns Scale (CCQ). Individuals rate their concerns in two domains related to feeling trapped or suffocating (e.g., "I might be trapped," or "I might run out of air") during the claustrophobia chamber exposure using a 0 (*No concern)* to 100 (*Extreme concern*) scale. Self-efficacy in coping with the exposure situation was measured using the Claustrophobia Coping Self-Efficacy Scale (CCSES) (e.g., "Estimate your confidence in being able to control fearful thoughts or images while in the chamber"). The CCSES is a 4-item questionnaire which uses the same 0 (*No confidence)* to 100 (*Extreme confidence*) scale as the CCQ. Both the CCQ and CCSES were administered at baseline, after presentation of the treatment rationale, after each treatment trial, and at posttreatment. These measures have shown high internal consistency and predictive validity (Valentiner, Telch, Petruzzi, & Bolte, 1996).

Process Variables—Inferences of danger were assessed using a 2-item scale adapted from Telch and colleagues (2010). Individuals rated the extent to which they inferred danger from the presence of the three coping aids (e.g., "The presence of the coping aids made me question the safety of the chamber") on a 0 (*Not at all)* to 100 (*Completely)* scale. A similar 2-item measure was adapted from Sy and colleagues (2011) cognitive avoidance scale to assess for hypervigilance toward threat during exposure. Participants rated the percentage of time they thought about "actions you could take to prevent your feared prediction from occurring," and "actions you could take to reduce your anxiety." Both the inference of danger and hypervigilance scales were administered after each exposure trial and demonstrated adequate internal consistency across trials ($\alpha s \geq .85$).

Procedure

Procedures common to each condition—After providing baseline CCQ and CCSES ratings, participants received brief psychoeducation about claustrophobia. Participants were informed that avoidance of enclosed spaces and specific beliefs of harm maintain claustrophobic fears, and that they must approach feared situations to reduce their fear. Next, participants received a condition-specific safety manipulation (see below). Participants then completed six exposure trials lasting up to five minutes each in a claustrophobia chamber (see Sy et al., 2011 for a description of the chamber), resulting in up to 30 minutes of total in-vivo exposure time. Exposure trials involved lying in the closed chamber for up to five minutes while the experimenter remained in an adjacent room. Before each trial participants provided pre-trial CCQ and CCSES ratings. Following each trial, participants were given 10 minutes to provide ratings on the Inference of Danger and Hypervigilance scales.

Safety behavior utilization (SBU) condition—Participants in the SBU condition were offered three coping aids to assist them during their exposures: (a) opening a small door on the side of the chamber to let in air blowing from a fan, (b) having the chamber door unlocked, and (c) communicating with the experimenter via a two-way radio. To ensure that SBU participants utilized safety behaviors, participants were instructed to request that the chamber door be unlocked after two minutes had passed during each trial. Participants were also instructed to open the small door on the side of the chamber to let in air blowing from a fan at the beginning of each trial. Experimenters also asked "Everything okay?" via two-way radio at thirty-second intervals throughout the trials.

Safety behavior availability (SBA) condition—At the beginning of each trial, participants were provided access to the three safety aids described in the SBU condition above, but discouraged from using them. The experimenter told participants, "In order to assist you in coping with your fear while in the chamber, three coping aids will be available to you. However, please only use these aids if you feel you must." A small portion of individuals in the SBA condition did use a safety behavior ($n = 4$), all of whom opted to open the chamber window. Given that these were isolated instances in the context of repeated exposure sessions these individuals were included in data analyses.

Results

Baseline equivalence

The two conditions did not significantly differ in regard to age, sex, or baseline ratings of danger expectancy (CCQ) and self-efficacy (CCSES) in claustrophobic situations (ps > .05) (for details refer to Table 1 in Sy et al., 2011).

Changes from baseline to pretreatment

To test the hypothesis that levels of danger expectancy and self-efficacy would improve more following the condition-specific treatment description (i.e., from baseline to immediately pretreatment) in the SBU condition than the SBA condition, 2 × 2 (condition x time) repeated measures ANOVAs were conducted on the CCQ and CCSES. The interaction for CCQ scores was significant, $F(1, 37) = 5.33$, $p = .03$, partial $\eta^2 = .13$. Follow-up t-tests indicated that SBU participants reported a significant reduction in CCQ scores from baseline ($M = 548.89$, $SD = 123.19$) to pretreatment ($M = 469.17$, $SD = 146.67$), $t(17) = 2.49$, $p = .02$, $d = .53$. In contrast, SBA participants nearly identical scores at baseline (M = 546.19, SD = 123.19) and pretreatment (M = 547.62, SD = 109.88), $t(20) = .08$, $p = .94$, $d = .01$. Thus, as hypothesized, participants who knew they would be using safety behaviors in forthcoming exposure trials experienced decreased threat estimation, whereas those who knew safety aids would be available but used only if necessary did not. Contrary to hypotheses, changes in self-efficacy did not differ between groups following treatment descriptions as the time x condition interaction for CCSES scores was not significant, $F(1, 37) = 0.81$, $p = .37$, partial $\eta^2 = .02$.

Changes during exposure trials

Hierarchical linear modeling (HLM) analyses using HLM 7.0 statistical software (SSI Inc.) were used to test changes in danger expectancies, self-efficacy, danger inferences, and hypervigilance during the 6 exposure trials, with time entered as the level 1 predictor and group entered as the level 2 predictor. The quadratic effect of time (time^2) was also included in all models as a level 1 predictor to account for any non-linear change in the variable of interest over the trials. When the quadratic effect of time was not significant, $time^2$ was removed to preserve a more parsimonious model.

Danger expectancies—The CCQ intercept (i.e., CCQ score immediately prior to trial 1) was significantly non-zero in both conditions, b = 450.42, $t(38) = 12.65$, $p < .001$ for SBA, and b = 306.61, $t(35) = 9.77$, $p < .001$ for SBU, with initial mean CCQ scores significantly lower in SBU compared to SBA, b = −143.81, $t(37) = -3.03$, $p < .01$. There was a significant quadratic effect of time in both conditions, b = 6.12, $t(190) = 2.34$, $p < .05$ in SBA, and b = 17.65, $t(190) = 8.30$, $p < .001$ in SBU, indicating significant nonlinear (quadratic) changes in CCQ scores across trials. The difference in CCQ slopes between the SBU and SBA conditions was significant, b = 11.53, $t(190) = 3.42$, $p < .001$, in the hypothesized direction. As shown in Figure 1, CCQ scores decreased more quickly in the SBU condition than the SBA condition and were substantially lower following the final exposure trial.

Self-efficacy—The CCSES intercept (i.e., CCSES score immediately prior to trial 1) was significantly non-zero in both conditions, b = 226.31, $t(37) = 14.36$, $p < .01$ in SBA and b = 269.47, $t(37) = 23.89$, $p < .001$ in SBU. Initial CCSES scores were significantly higher in SBU than SBA, b = 43.16, $t(37) = 2.23$, $p < .05$. The quadratic effect of time was significant in the SBA condition, b = −4.50, $t(38) = -3.79$, $p < .001$, and the SBU condition, b = −4.44, $t(191) = -3.89$, $p < .001$, indicating quadratic change in CCSES scores across trials in both conditions. Contrary to hypothesis, the difference in CCSES slopes between conditions was not significant, $p = .79$, indicating comparable improvement in self-efficacy across trials.

Danger inferences—Initial inferences of danger in both the SBA and SBU conditions were significantly non-zero, b = 47.48, $t(36) = 5.20$, $p < .001$ for SBA, and b = 48.62, $t(36) = 4.52$, $p < .001$ in SBU, with no significant differences between groups ($p = .94$). There was a significant quadratic effect of Time in SBU, b = 3.30, $t(186) = 4.34$, $p < .001$, but not in SBA, b = 0.79, $t(186) = 1.58$, $p = .12$. There was a significant linear effect of Time in SBA, b = −7.20, $t(188) = -4.67$, $p < .01$. Inference of danger slopes were significantly different between conditions, b = 2.50, $t(186) = 2.74$, $p < .001$, in a direction consistent with our hypothesis. As shown in Figure 2, inferences of danger declined more slowly across exposure trials in the SBA condition than the SBU condition.

Hypervigilance—The quadratic time term was not statistically significant for either SBA or SBU (*ps* > .18); consequently, the model was re-run excluding the $time^2$ predictor to preserve model parsimony. In this model, initial hypervigilance ratings in both conditions were significantly non-zero, b = 114.44, $t(37) = 12.37$, $p < .001$ in SBA and b = 89.33, $t(37) = 7.54$, $p < .001$ in SBU, with no significant differences between groups ($p = .10$). Hypervigilance significantly declined in SBA, b = −11.38, $t(37) = -3.68$, $p < .001$, and in SBU, b = −15.41, $t(370) = -5.09$, $p < .001$, with no significant group differences in the magnitude of hypervigilance slopes ($p = .35$). Thus, the hypothesis that the SBA condition would demonstrate slower reductions in hypervigilance than those in the SBU condition was not supported.

Discussion

Findings are mixed regarding the clinical utility of including or excluding safety behaviors during exposure therapy, and the topic remains an ongoing source of debate (e.g., Helbig-Lang & Petermann, 2010; Meulders et al., 2016). Accumulating evidence suggests the *manner* in which safety behaviors are incorporated into exposure therapy (e.g., used versus simply made available) affects important aspects of the treatment process and outcome (e.g., Blakey & Deacon, 2015; Powers et al., 2004; Sy et al., 2011). The present study reported a secondary analysis of Sy and colleagues' (2011) data aimed at testing the relative effects of safety behavior availability and utilization on indicators of inhibitory learning and key cognitive process variables over the course of repeated exposure trials for claustrophobic concerns.

Proponents of the judicious use of safety behaviors argue that this approach may help facilitate early engagement in exposure, presumably by reducing individuals' perceptions of dangerousness and intolerability (Rachman et al., 2008). However, it is unclear whether the manner in which safety is presented prior to exposure may differentially affect such perceptions. In the present study, ratings of danger expectancy and self-efficacy were assessed following the safety manipulation – prior to beginning exposure trials. In line with hypotheses, participants in the SBA condition exhibited no benefit from receiving the safety manipulation while those in the SBU condition demonstrated significant positive changes in both danger expectancy and self-efficacy. It appears the knowledge that safety behaviors will be used during a forthcoming exposure task is reassuring, whereas the knowledge that coping aids are available to be used "just in case" is not. It is perhaps not surprising that fearful individuals would view an exposure task as more safe and tolerable when they know they will be using safety behaviors to manage threat and anxiety during the task. Whether providing such a reassuring rationale is beneficial is debatable; from an inhibitory learning perspective, expectancy violation is maximized when exposure tasks are expected to be more dangerous and intolerable, not less so (Craske et al., 2014). Aside from the clinical implications of these findings, researchers should consider the possibility that pre-treatment perceptions and expectancies are affected by information about the availability and utilization of safety behaviors during exposure.

Those who oppose the use of safety behaviors during exposure caution that these behaviors may interfere with learning during exposure (e.g., Craske et al., 2014; Salkovskis, 1991; Salkovskis et al., 1999). The degree to which SBA versus SBU interferes with learning was assessed by measuring changes in key inhibitory learning variables (i.e., danger expectancy and perceived self-efficacy) across exposure trials. As hypothesized, those in the SBA condition exhibited significantly less change in danger expectancy across trials, and the rate at which this learning occurred was slower relative to those in the SBU condition. Ratings of danger expectancy in the SBU group nearly reached zero by the fourth trial and remained low through the sixth trial while ratings in the SBA group continued to lag behind SBU ratings at the end of the treatment session. The SBA condition also demonstrated less improvement in self-efficacy across trials, but the rate at which learning occurred across trials was similar in both groups.

Our findings are consistent with previous research highlighting the importance of studying the nuanced effects of safety behavior utilization during exposure (e.g., Goetz, Davine, Siwiec, & Lee, 2015). The present study improves upon existing work by exploring cognitive process variables thought to affect the quality of inhibitory learning (Blakey & Abramowitz, 2016); namely, inferences of danger and hypervigilance toward threat. Both of these cognitive process variables were assessed after each exposure trial. Analyses provided mixed support for the hypothesis that these cognitive process variables would improve more quickly in the SBU versus SBA condition. As hypothesized, inferences of danger declined significantly more quickly in the SBU group, but both conditions ultimately demonstrated similar pre-to-post change by the end of the treatment session. The hypothesis that hypervigilance would also reduce more quickly in the SBU group was not supported as hypervigilance reduced at a similar rate in both conditions. It is possible that the frequency of hypervigilance was similar across conditions for different reasons. Specifically, hypervigilance in the SBA condition may have been influenced by the need to know whether it was necessary to use a coping aid, whereas hypervigilance in the SBU condition may have been focused on participants' actual use of safety behaviors. The hypervigilance scale called for individuals to rate the percentage of time spent thinking about actions they could take to prevent feared outcomes or reduce their anxiety. Individuals in the SBU condition may have interpreted these items as referring to time spent thinking about the safety behavior as it was utilized, rather than engaged in an anxious, ruminative process of planning for threat as was the intent for the hypervigilance measure.

There are limitations of the current study that deserve note. First, the study sample consisted of non-treatment-seeking undergraduates. Despite the sample being markedly symptomatic (approximately half met full DSM-IV criteria for claustrophobia and two-thirds met all DSM-IV criteria except for functional impairment/marked distress), generalization of findings to clinical, treatment-seeking individuals may be limited. Additionally, treatment consisted of a single exposure session. Although previous research has demonstrated that single-session treatments are highly efficacious for individuals with claustrophobic concerns (e.g., Öst, Alm, Brandberg, & Breitholtz, 2001), a single-session design precludes making conclusions regarding the effect of SBA and SBU on long-term (i.e., between-session) inhibitory learning. For example, SBU may lead to greater decreases in threat expectancy during exposure compared to SBA, but it remains to be seen whether that differential response would be maintained at a follow-up session, particularly if the safety aides are no longer present. Future research should replicate the present findings utilizing a multi-session treatment or follow-up design. Another potential limitation is the use of the CCSES as an indicator of self-efficacy. This is a measure of *coping* self-efficacy, which may not be the same as the conceptualization of self-efficacy as relating to distress tolerance in inhibitory learning theory. For instance, self-efficacy related to distress tolerance may place less emphasis on perceptions of one's ability to "control" or "manage" their anxiety during exposure. Finally, due to the experimental nature of this study safety behaviors were incorporated into exposure in a controlled manner (SBA *or* SBU), which may not reflect the idiosyncratic fluctuations in their use (i.e., SBA *and* SBU) by anxious individuals under typical treatment conditions. Further, the degree to which individuals believed each of the safety behaviors offered in the study were capable of mitigating their feared outcomes (i.e., perceived relevance of each safety behavior option) was not assessed.

The principal contribution of the present study is the finding that making coping aids available for use if needed during exposure, as opposed to mandating their use, leads to slower improvement in some indices of inhibitory learning. The present study thus suggests SBU is generally superior to SBA as a strategy for the judicious use of safety behaviors. However, the present findings do not speak to whether or not safety behaviors should be used during exposure. A large body of research, as well as theoretical considerations, suggests inhibitory learning may be maximized by discouraging rather than encouraging the use of safety behaviors during exposure (Blakey & Abramowitz, 2016). Additional research is necessary to examine the relative efficacy of exposure with and without the judicious use of safety behaviors, as well as the contextual factors (both internal and external) that affect treatment outcomes in these approaches.

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References

Abramowitz JS, Deacon BJ, & Whiteside SP (2011). Exposure therapy for anxiety: Principles and practice. Guilford Press.

American Psychiatric Association. (1994). Diagnostic and statistical manual of mental disorders - Fourth edition (DSM-IV) . Washington, DC: American Psychiatric Association.

Blakey SM & Abramowitz JS (2016). The effects of safety behaviors during exposure therapy for anxiety: Critical analysis from an inhibitory learning perspective. Clinical Psychology Review, 49, 1–15. doi:10.1016/j.cpr.2016.07.002 [PubMed: 27475477]

Blakey SM, & Deacon BJ (2015). “If a safety aid is present, there must be danger”: The paradoxical effects of hand sanitizer during a contamination exposure task. Journal of Experimental Psychopathology, 6, 264–277.

Craske MG, Kircanski K, Zelikowsky M, Mystkowski J, Chowdhury N, & Baker A (2008). Optimizing inhibitory learning during exposure therapy. Behaviour Research and Therapy, 46, 5–27. [PubMed: 18005936]

Craske MG, Treanor M, Conway CC, Zbozinek T, & Vervliet B (2014). Maximizing exposure therapy: An inhibitory learning approach. Behaviour Research and Therapy, 58, 10–23. [PubMed: 24864005]

Goetz AR, Davine TP, Siwiec SG, & Lee HJ (2015). The functional value of preventive and restorative safety behaviors: A systematic review of the literature. Clinical Psychology Review, 44, 112–124. [PubMed: 26776082]

Helbig-Lang S, & Petermann F (2010). Tolerate or eliminate? A systematic review on the effects of safety behavior across anxiety disorders. Clinical Psychology: Science and Practice, 17, 218–233.

Levy HC, & Radomsky AS (2016a). Are all safety behaviours created equal? A comparison of novel and routinely used safety behaviours in obsessive-compulsive disorder. Cognitive Behaviour Therapy, 45, 367–379. [PubMed: 27243978]

Levy HC, & Radomsky AS (2016b). It’s the who not the when: An investigation of safety behavior fading in exposure to contamination. Journal of Anxiety Disorders, 39, 21–29. [PubMed: 26938430]

Meulders A, Van Daele T, Volders S, & Vlaeyen JW (2016). The use of safety-seeking behavior in exposure-based treatments for fear and anxiety: Benefit or burden? A meta-analytic review. Clinical Psychology Review, 45, 144–156. [PubMed: 26905473]

Olatunji BO, Cisler JM, & Deacon BJ (2010). Efficacy of cognitive behavioral therapy for anxiety disorders: A review of meta-analytic findings. The Psychiatry Clinics of North America, 33, 557–577. doi:10.1016/j.psc.2010.04.002

Öst LG, Alm T, Brandberg M, & Breitholtz E (2001). One vs. five sessions of exposure and five sessions of cognitive therapy in the treatment of claustrophobia. Behaviour Research and Therapy, 39, 167–183. [PubMed: 11153971]

Powers MB, Smits JA, & Telch MJ (2004). Disentangling the effects of safety-behavior utilization and safety-behavior availability during exposure-based treatment: A placebo-controlled trial. Journal of Consulting and Clinical Psychology, 72, 448. [PubMed: 15279528]

Rachman S, Radomsky AS, & Shafran R (2008). Safety behaviour: A reconsideration. Behaviour Research and Therapy, 46, 163–173. [PubMed: 18199423]

Rachman S, Shafran R, Radomsky AS, & Zysk E (2011). Reducing contamination by exposure plus safety behaviour. Journal of Behavior Therapy and Experimental Psychiatry, 42, 397–404. [PubMed: 21458404]

Salkovskis PM (1991). The importance of behaviour in the maintenance of anxiety and panic: A cognitive account. Behavioural Psychotherapy, 19, 6–19.

Salkovskis PM, Clark DM, Hackmann A, Wells A, & Gelder MG (1999). An experimental investigation of the role of safety-seeking behaviours in the maintenance of panic disorder with agoraphobia. Behaviour Research and Therapy, 37, 559–574. [PubMed: 10372469]

Sloan T, & Telch MJ (2002). The effects of safety-seeking behavior and guided threat reappraisal on fear reduction during exposure: An experimental investigation. Behaviour Research and Therapy, 40, 235–251. [PubMed: 11863235]

Sy JT, Dixon LJ, Lickel JJ, Nelson EA, & Deacon BJ (2011). Failure to replicate the deleterious effects of safety behaviors in exposure therapy. Behaviour Research and Therapy, 49, 305–314. [PubMed: 21397895]

Telch MJ, & Lancaster CL (2012). Is there room for safety behaviors in exposure therapy for anxiety disorders? In Neudeck P & Wittchen HU (Eds.), Exposure therapy: Rethinking the model: Refining the method. New York, NY: Springer.

Telch MJ, Smits JA, Brown M, Dement M, Powers MB, Lee H, & Pai A (2010). Effects of threat context and cardiac sensitivity on fear responding to a 35% CO2 challenge: A test of the context-sensitivity panic vulnerability model. Journal of Behavior Therapy and Experimental Psychiatry, 41, 365–372. [PubMed: 20430368]

Valentiner DP, Telch MJ, Petruzzi DC, & Bolte MC (1996). Cognitive mechanisms in claustrophobia: An examination of Reiss and McNally's expectancy model and Bandura's self-efficacy theory. Cognitive Therapy and Research, 20, 593–612.

Westra HA, & Stewart SH (1998). Cognitive behavioural therapy and pharmacotherapy: complementary or contradictory approaches to the treatment of anxiety?. Clinical Psychology Review, 18, 307–340. [PubMed: 9564583]

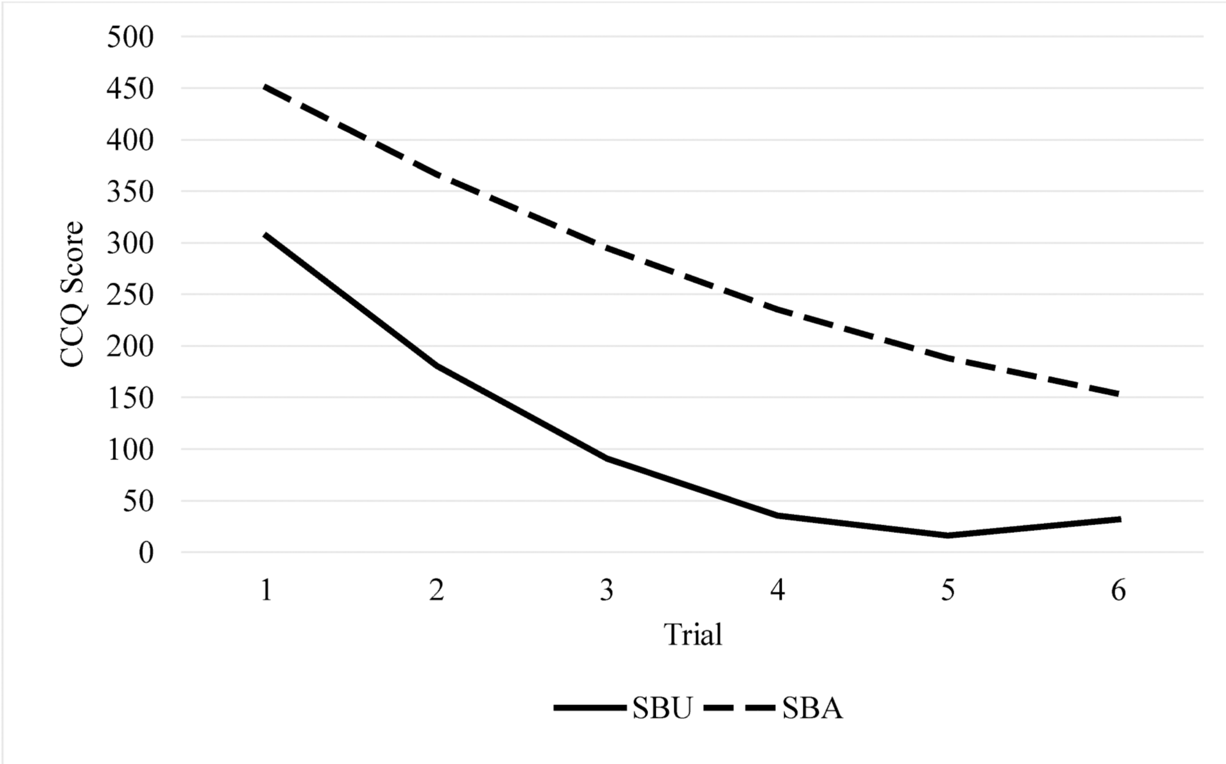

Figure 1.
Change in Danger Expectancies across Exposure Trials

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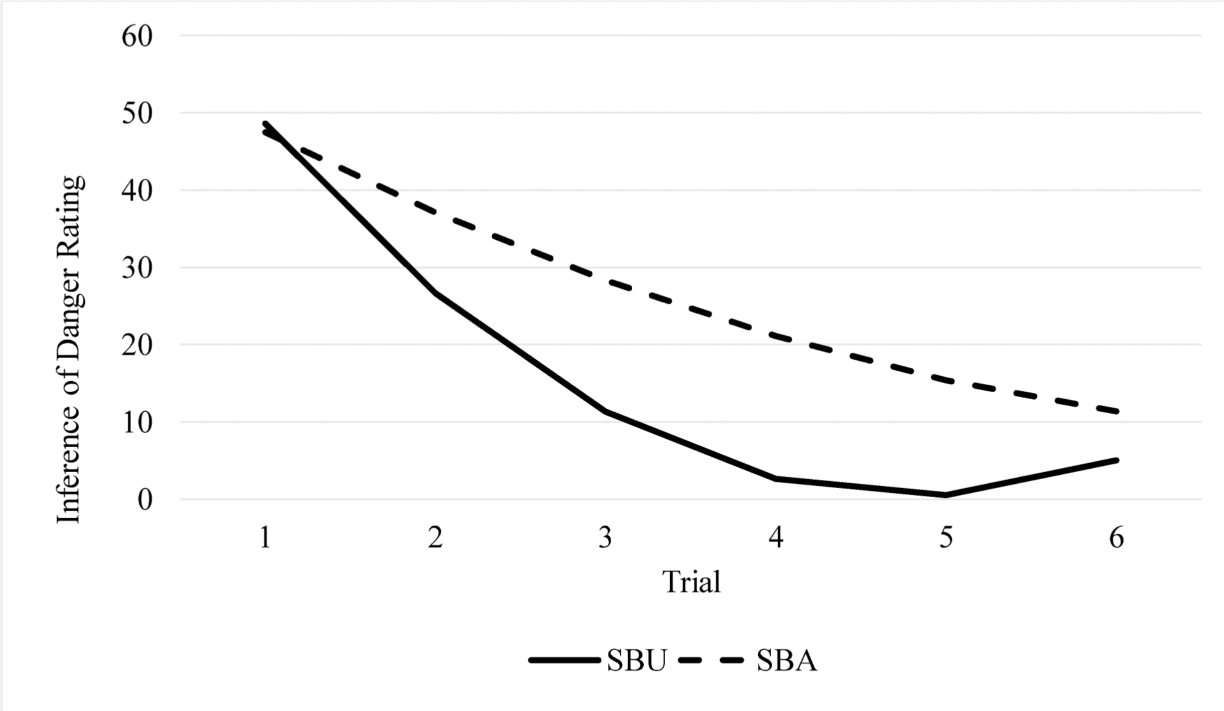

Figure 2.
Change in Inferences of Danger from Safety Aids across Exposure Trials