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RESEARCH ARTICLE

Preventative and restorative safety behaviors: Effects on exposure treatment outcomes and risk for future anxious symptoms

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Abstract

Objectives Two studies investigated the differential effect of preventative and restorative safety behaviors on the treatment and development of anxiety and depression.

Method Study 1 investigated the impact of preventative and restorative safety behaviors in prolonged exposure therapy among US veterans with PTSD ($N = 95$). Study 2 was a 3-month prospective study investigating preventative and restorative safety behaviors as risk factors for anxious and depressive symptoms in a non-clinical sample ($N = 84$).

Results The results of Study 1 showed that both preventative and restorative safety behaviors were associated with worse treatment outcomes (both PTSD symptoms and depressive symptoms). The results of Study 2 found that preventative, but not restorative, safety behaviors predicted increases in future anxious symptoms. Neither preventative nor restorative safety behaviors conferred risk for increases in future depression symptoms (anhedonia).

Conclusions Preventative and restorative safety behaviors impact PTSD treatment outcomes, while only preventative safety behaviors predict future anxiety.

KEYWORDS

anxious arousal, preventative, restorative, safety behaviors

1 | INTRODUCTION

People with anxiety often engage in "safety behaviors" to reduce anxiety or avert threat. Safety behaviors are typically defined as behaviors and cognitive processes aimed at preventing or minimizing a feared consequence (Salkovskis, 1991). Although safety behaviors are often idiosyncratic, research suggests some disorder specific commonalities and themes in the types of behaviors people use (Schmidt et al., 2012). For example, individuals with PTSD tend to engage in safety behaviors related to physical danger (e.g., checking the perimeter of one's house for intruders; Dunmore, Clark, &

Ehlers, 1999), whereas individuals with social anxiety engage in safety behaviors designed to avoid negative evaluation (e.g., being overly polite; Wells et al., 1995). People with generalized anxiety disorder use safety behaviors to elicit reassurance and minimize uncertainty (e.g., trying to do things perfectly; Beesdo-Baum et al., 2012). In contrast, people with panic disorder tend to use behaviors aimed at reducing physical symptoms (e.g., checking pulse; Kamphuis & Telch, 1998).

Over the past 25 years, a growing body of research has demonstrated that safety behaviors can influence the development, (Deacon & Maack, 2008; Dunmore et al.,1999; Goodson, Haeffel, Raush, & Hershenberg, 2016; Radomsky, Gilchrist, & Dussault, 2006), maintenance (Beesdo-Baum et al., 2012; McManus, Sacadura, & Clark, 2008; Olatunji, Etzel, Tomarken, Ciesielski, & Deacon, 2011), and treatment of anxiety (e.g., panic disorder, Helbig-Lang et al., 2014; generalized anxiety disorder, Beesdo-Baum et al., 2012; social anxiety, Wells et al., 1995; contamination fears, Rachman, Shafran, Radomsky, & Zysk, 2011; and specific phobias, Powers, Smits, & Telch, 2004). Safety behaviors have been found to increase threat expectations (Engelhard, van Uijen, van Seters, & Velu, 2015), prevent extinction (Lovibond, Mitchell, Minard, Brady, & Menzies, 2009), increase contamination concerns and estimations of threat (Deacon & Maack, 2008), maintain catastrophic beliefs about anxiety (Salkovskis, Clark, Hackmann, Wells, & Gelder, 1999), and decrease perceptions of control (Milosevic & Radomsky, 2013). In light of these findings, safety behaviors have become a target in exposure therapy treatments for anxiety disorders (Helbig-Lang & Petermann, 2010). A number of studies have found that reducing safety behaviors enhances treatment outcomes across anxiety disorders (Wells et al., 1995, Morgan & Raffle, 1999, McManus et al., 2008). For instance, in a study of generalized anxiety disorder, residual safety behavior use at posttreatment was associated with worse long-term outcomes (Beesdo-Baum et al., 2012). Further, at least two studies have found that safety behavior elimination as the primary intervention is effective in reducing anxiety in transdiagnostic samples (Riccardi, Korte, & Schmidt, 2017; Schmidt et al., 2012). Thus, safety behaviors have clear implications for anxiety treatment outcomes.

Recent theorizing and research, however, suggests the association between safety behaviors and anxiety is not as straightforward as initially thought. For example, some studies have found safety behaviors can facilitate approach toward feared stimuli (Hood, Antony, Koerner, & Monson, 2010; Milosevic & Radomsky, 2008). Other studies have shown that safety behaviors do not interfere with emotional and cognitive change during treatment (Deacon, Sy, Lickel, & Nelson, 2010; Hood et al., 2010; Sy, Dixon, Lickel, Nelson, & Deacon, 2011). Moreover, some research has shown that safety behaviors can even enhance treatment outcomes (Goetz & Lee, 2014). Highlighting these discrepant findings, in a recent review of the impact of safety behaviors on exposure therapy, Meulders and colleagues (2016) speculated that safety behaviors may be burdensome when used to avoid feared consequences, but beneficial when used to facilitate goal achievement. Taken together, these contradictory findings indicate that there is still more to understand about the role of safety behaviors in the etiology, maintenance, and treatment of anxiety.

One gap in the literature on safety behaviors is with regard to their possible heterogeneity. To date, the majority of studies on safety behaviors have focused on interpersonal behaviors in the context of social anxiety, and they have been treated as a singular construct (Goodson et al., 2016). However, recent research suggests that different types of safety behaviors might have differential effects on anxiety outcomes (Piccarillo, Dryman, & Heimberg, 2015). Helbig-Lang and Petermann (2010) proposed that safety behaviors should be classified as either restorative or preventative (see also Rachman & Hodgson, 1980). The primary distinction between these subtypes is the timing and motivation for their use (i.e., to mitigate anxiety once it begins or to prevent the onset of anxiety). Restorative safety behaviors are performed in response to an increase in anxiety and serve to dampen the anxiety and restore a sense of safety (e.g., using hand sanitizer after touching a contaminant or locking windows after hearing a noise outside). Restorative safety behaviors can take the form of compulsive actions (e.g., excessive hand washing in response to contamination), escape behaviors (e.g., taking medication at the first onset of anxious symptoms), neutralizing behaviors (e.g., counting), and reassurance seeking (e.g., going to the hospital; see Table 1, p. 220 in Helbig-Lang & Petermann, 2010).

In contrast, preventative safety behaviors are performed to prevent the onset of anxiety (using a towel to touch a doorknob) and have been described to function as emotional avoidance or situational avoidance (Helbig-Lang & Petermann, 2010). They are performed in anticipation of encountering a feared stimulus (to avoid contact and aversive

feelings). Preventative safety behaviors often take the form of situational avoidance (e.g., avoiding physical exertion), compulsive behaviors (checking behaviors in preparation of leaving home), cognitive strategies (e.g., excessive preparation), and social avoidance (e.g., avoiding eye contact; Helbig-Lang & Petermann, 2010).

Based on work by Helbig-Lang and Petermann (2010) and others, we hypothesized that preventative, but not restorative safety behaviors would negatively impact treatment outcomes as well as lead to increases in anxiety. This is because preventative safety behaviors function similar to traditional avoidance strategies, which are well-established risk factors for anxiety development and maintenance. Restorative safety behaviors, on the other hand, are performed to calm oneself in response to anxiety/threat and therefore allow for some confrontation with feared stimuli. At least one study supports this hypothesis. Goetz and Lee (2014) found that restorative safety behaviors enhanced the effect of a single session of exposure therapy while preventative safety behaviors were detrimental. The researchers speculated that preventative safety behaviors instill a more restrictive context and thereby interfere with generalization of safety signals during the exposure therapy. As such, it could be that preventative safety behaviors engender more behavioral restriction as situations are avoided, which in turn leads to more anxiety. It could also be that some restorative safety behaviors in some contexts may actually increase self-efficacy (Rachman et al., 1986) because individuals feel they can tolerate a given situation with the safety behavior. Along these lines, Goetz and colleagues (2016) concluded that preventative safety behaviors hinder engagement with a stimulus, while restorative safety behaviors still allow for threat confrontation.

Study 1 will examine the effect of safety behaviors (both restorative and preventative) on PTSD treatment outcomes (Helbig-Lang & Petermann, 2010). The effect of safety behaviors in PTSD treatment outcome studies has yet to be studied. This is somewhat surprising given that early conceptual models highlight the role of safety behaviors in PTSD onset and maintenance (Dunmore et. al., 1999). This may be particularly relevant to PTSD among military veterans given that training in situational awareness and vigilance is an important aspect in military and combat readiness training. Engagement in combat further entrenches threat-vigilance, as protective behaviors are powerfully reinforced through a sundry of traumatic events that often occur intermittently.

A second gap in the literature is with regard to the role of safety behaviors in the etiology of anxiety disorders. It is unknown if the safety behaviors that lead to negative outcomes in the treatment of anxiety disorders are also involved in the etiology of anxiety disorders. Indeed, risk factors do not always align with treatment factors. Thus, Study 2 was designed to examine whether restorative and preventative safety behaviors could predict the development of anxious and depressive symptoms in a nonclinical sample of adults using a naturalistic design. At least one study (Goodson et al., 2016) has shown that safety behaviors precede and predict increases in anxious symptoms in healthy adults. However, it remains unclear if particular classes of safety behaviors confer more or less risk than other classes of safety behaviors. This study provides additional data regarding whether or not safety behaviors should be considered risk factors for anxiety or only factors that affect its maintenance and remission.

Finally, in both studies, we examined the specificity of the effect of safety behaviors on anxiety. Prior research suggests that safety behaviors may cut across current diagnostic categories. We examined discriminant validity by testing if safety behavior also conferred risk for depressive symptoms, which are often comorbid with anxiety. The relatively few studies examining the association between safety behaviors and depressive symptoms have generally supported their co-occurrence. A cross-sectional study of eating disordered patients found greater safety behavior usage was associated with higher self-reported symptoms of depression (Waller & Marcoulides, 2013). Similarly, in individuals with social anxiety, safety behaviors were found to correlate with depressive symptoms concurrently (Kocovski et al., 2016). In addition, avoidance-related safety behaviors have been found to be associated with elevated levels of depression in a large analogue sample (Placencia, Alden, & Taylor, 2011). However, longitudinal designs have not consistently supported the association between safety behaviors and depressive symptoms. Schmidt and colleagues (2012) found the elimination of safety behaviors in treatment resulted in decreases in depressive symptoms; however, Goodson and colleagues (2016) found no association between safety behaviors and depressive symptoms in a sample of Veterans seeking outpatient treatment. The current research will provide two additional tests examining the effect of safety behaviors on depressive symptoms.

2 | STUDY 1

2.1 | Method

2.1.1 | Overview

We used a treatment effectiveness design to test the differential impact of preventative and restorative safety behaviors on treatment outcomes for Veterans with military-related PTSD. We hypothesized that preventative, but not restorative, safety behaviors would decrease treatment effectiveness. We also hypothesized the detrimental effect of preventative safety behaviors on future anxiety would be specific to PTSD, but not depressive, symptoms. The project was determined by the Corporal Michael J Crescenz (Philadelphia) Veteran's Affairs Medical Center Internal Review Board to meet criteria for quality management and was approved as such.

2.1.2 | Participants

Participants were 95 veterans who received prolonged exposure therapy (PE) at an urban Veteran's Affairs medical center and its surrounding community-based outpatient clinics including general mental health clinic (44%), a PTSD clinical team (27%), community-based outpatient clinics (27%), and an Addictions Recovery Unit (1%). The mean age of the participants was 52.02 (*SD* = 14.42), and the majority were male (78%). With respect to ethnicity, 53% were Caucasian, 42% were African-American, and 4% were Hispanic. All participants carried a diagnosis of PTSD and the majority had combat-related index traumas (65%). Approximately half of participants (55%) carried a comorbid diagnosis of unipolar depression, 21% had at least one comorbid anxiety disorder, and 16% carried mood disorder or alcohol/substance use disorder in remission diagnoses. The majority of participants were prescribed psychiatric medications (*n* = 73; 77%); 10 participants (11%) were prescribed benzodiazepines.

2.2 | Measures

2.2.1 | PTSD symptoms

The PTSD Checklist (PCL-5) is a 20-item, self-report measure that assesses the severity of PTSD symptoms (Weathers et al., 2013). The PCL-5 is frequently used in VA settings and has good psychometric properties (Wortman et al., 2016). Respondents rated the severity of each item on a 5-point scale (0 = *not at all*; 4 = *extremely*). Individual items were summed to provide a total score (0–80) with higher scores associated with a greater severity of PTSD symptoms. Among combat veterans, a score of 33 and above is used as the cut-off for clinical significance (Bovin et al., 2015; Weathers et al., 2013). Internal consistency estimates were not available in the current study because the community therapists were not required to enter item-by-item data for the symptom measures (in order to reduce their burden). The PCL-5 has demonstrated strong levels of internal consistency in prior research. Cronbach's alpha is typically in the range of .91–.95 in treatment seeking military service members (Wortmann et al., 2016).

2.2.2 | Depressive symptoms

The Patient Health Questionnaire–9 (PHQ-9; Kroenke, Spitzer, & Williams, 2001) is a 9-item self-report measure designed to assess symptoms of depression. The diagnostic validity and high levels of sensitivity and specificity for major depression have been demonstrated for the PHQ-9 in several studies (Kroenke et al., 2001). Each item on this measure corresponds to a DSM-IV diagnostic criterion for a major depressive episode. Respondents rated the frequency with which they experience each of the symptoms of depression on a 4-point scale (0 = *not at all*; 3 = *nearly every day*). Individual items were summed to provide a total score, with higher scores indicative of greater depression severity (*moderate*; 15–19 = *moderately severe*; 20–27 = *severe*). Internal consistency estimates were not available in the current study because the community therapists were not required to enter item-by-item data for the symptom measures (in order to reduce their burden). The PHQ-9 has demonstrated strong levels of internal consistency in prior

research. Cronbach's alpha is typically greater than .85 in treatment seeking veteran samples (e.g., Hershenberg, Smith, Goodson, & Thase, 2018).

2.2.3 | Safety behaviors

Safety behaviors were measured by the Safety Behavior Assessment Form-41 (SBAF; Goodson et al., 2016). The SBAF is a 41-item measure of safety behaviors designed to measure the frequency of safety behavior usage across a wide range of trauma- and anxiety-related conditions. The SBAF asks respondents to rate the frequency with which they engage in various safety behaviors on a 4-point scale (0 = never; 3 = always). The SBAF has demonstrated excellent internal consistency (Cronbach's alpha = .94) and test-retest reliability ($r = .76$). It is also able to discriminate between clinical and nonclinical populations (Goodson et al., 2016).

For the purposes of this study, SBAF items were classified as either preventative or restorative. The definitions and examples provided by Helbig-Lang and Petermann (2010; examples in Table 1, p. 220) guided the creation of the two subscales. The categorization process was as follows: first, the two authors independently classified the items into preventative and restorative categories. The two classifications were compared and any differences were reconciled after a discussion (the authors initially disagreed on six items). To confirm the subscale structure, the full list of SBAF items was rated by five undergraduate research assistants. The research assistants were provided the definition and behavioral examples from Helbig-Lang and Petermann (2010). The research assistants rated the items as either restorative (0) or preventative (1). An average score was then created from the five ratings for each item. Items with an average greater than .5 were categorized as restorative and those less than .5 as preventative. The subscales created by the average scores were then compared to those created by the authors. Any discrepancies between the subscales were again discussed and reconciled by the authors (there was disagreement for five items). This process led to a final preventative scale comprised of 23 items and a final restorative scale comprised of 18 items (see Appendix for specific items). Internal consistency ratings for both scales were high with Cronbach's alphas of .82 for the preventative scale and .80 for the restorative scale.

2.2.4 | Procedure

Veteran participants in PE were administered measures of safety behaviors (SBAF), PTSD symptoms (PCL-5), and depressive symptoms (PHQ-9) pre- and posttreatment. The participants were part of a larger project investigating prolonged exposure treatment effectiveness and treatment predictors in veterans with PTSD (Goodson, Helstrom, Moreno, & Smith, 2017; Goodson, Lefkowitz, Helstrom, & Gawrysiak, 2013). Prolonged exposure was carried out in a mental health outpatient clinic at a large, urban medical center and surrounding community-based outpatient clinics (CBOCS). Veterans were deemed to be appropriate for PE by their treating clinicians (i.e., no immediate threat of harm to self or others, no non-PTSD related psychosis or uncontrolled bipolar disorders, no active alcohol or substance dependence, and no severe traumatic brain injury).

There were a total of 17 therapists, including 12 licensed clinicians and 5 therapists-in-training. The breakdown of licensed providers by discipline was as follows: psychology (eight), social work (two), and nursing (two). All therapists-in-training were psychology interns supervised by VA-certified PE providers. Of the 12 licensed providers, eight were official VA certified PE providers while four had undergone PE training and were in the process of obtaining certification with at least two cases being completed under supervision of official PE consultants. The average number of cases completed by a provider was two with a range of 1–9. Twenty-nine percent of the cases were completed by therapists-in-training who were psychology pre-doctoral interns completing an evidence-based treatment.

PE is a behaviorally based treatment designed to address trauma-related symptoms and distress. The core interventions of PE include psychoeducation, breathing retraining, in vivo exposure, and imaginal exposure. PE is typically delivered in 9–12 weekly or twice-weekly, 90-minute sessions. Psychoeducation and breathing retraining are offered in the first two sessions. The remainder of sessions focuses largely on in vivo and imaginal exposure. In vivo exposure is focused on real-life situations that are avoided or difficult to tolerate by the patient. Construction

of an in vivo exposure hierarchy guides the patient through structured exposure to progressively more anxiety-provoking situations. Imaginal exposure involves the revisiting of the index trauma memory in a safe environment and the processing of negative affect associated with the memory. Over the course of treatment, clients begin to differentiate between safe and unsafe settings and habituate to anxiety elicited both by their memories and real-life situations.

2.3 | Results

Means, standard deviations, and intercorrelations of study measures are summarized in Table 1. Sixty-three of 95 veterans that initiated prolonged exposure completed treatment. The average number of sessions for completers was 10 (standard deviation [*SD*] = 2.3). Treatment completers and non-completers did not differ on any of the demographic (age, gender, ethnicity, or type of index trauma) or baseline measures (PCL-5, PHQ-9, or SBAF scores). Bayesian multiple imputation with 5 imputations was used to resolve missing data (Schafer & Graham, 2002).

Prior research suggests that medication use, specifically benzodiazepine use, can reduce the efficacy of exposure therapy for patients with PTSD (Rothbaum et al., 2014; see Goodson et al., 2017 for exception). Thus, we examined the association between medication use on the study variables. Medication status (any medication versus no medication) was not significantly associated with pretreatment or posttreatment levels of PTSD symptoms (pretreatment $r = .17$; posttreatment $r = .14$), safety behaviors (pretreatment $r = .04$; posttreatment r = .14), or depressive symptoms (pretreatment $r = .16$; posttreatment $r = .17$). Medication status also did not predict pre- to post-intervention changes in PTSD symptoms ($b = 1.00$, $t = .21$, $p = .84$), safety behaviors ($b = 4.72$, $t = .74$, $p = .74$), or depressive symptoms ($b = 1.02$, $t = .60$, $p = .55$). Similarly, benzodiazepine use specifically was not associated with pretreatment or posttreatment levels of PTSD symptoms (pretreatment $r = –.04$; posttreatment $r = –.11$), safety behaviors (pretreatment $r = –.13$; posttreatment $r = –.13$), or depressive symptoms (pretreatment $r = .09$; posttreatment $r = –.06$). They also did not predict pre- to post-intervention changes in PTSD symptoms ($b = –5.14$, $t = –.76$, $p = .45$), safety behaviors ($b = –10.88$, $t = –98$, $p = .33$), or depressive symptoms ($b = –2.66$, $t = –1.03$, $p = .31$).

2.3.1 | Power analysis

Based on prior research, we expected a medium effect size for effect of safety behaviors on therapy outcomes. The sample size of 95 was used for the statistical power analyses. The recommended effect sizes used for this assessment of multiple regression were as follows: small ($R^2 = .05$), medium ($R^2 = .15$), and large ($R^2 = .35$). The alpha level used for this analysis was $p < .05$. The analysis revealed the statistical power for detecting a small effect was .65 whereas the power was .95 for detecting a medium effect. Thus, there was adequate power (i.e., power > .80) for the expected medium effect size level, but less than adequate for a small effect size.

2.3.2 | Changes in safety behaviors pre- to posttreatment

Dependent samples *t*-tests were used to analyze changes in safety behaviors across treatment. Results showed significant reductions in both preventative ($t = 6.27$, $df = 117$, $p < .001$) and restorative safety behaviors (t = 3.44, $df = 117$, $p = .004$) over the course of treatment. The mean preventative safety behavior score at baseline was 43.99 ($SD = 9.87$) and the post-therapy score was 35.58 ($SD = 11.55$; Cohen's *d* effect size = .78, which is a large effect). The mean restorative safety behavior score at baseline was 24.22 ($SD = 7.99$) and post-therapy score was 19.50 ($SD = 8.98$; Cohen's *d* effect size = .56, which is a medium effect). Note that the significant results remain the same if SBAF total score is used rather than subscale scores, ($t = 5.19$, $df = 517$, $p < .001$).

2.3.3 | Changes in safety behaviors predicting treatment response

To test this hypothesis, we used two hierarchical multiple regression analyses. In both analyses, the Time 1 outcome measure (T1 PCL-5) was entered in the regression equation to create a residual change score for the same Time 2

TABLE 1 Study 1: means, standard deviations, and correlations (prior to multiple imputation)

	1	2	3	4	5	6	7	8	9
1 PCL-5	(57.83, 11.94)								
2 PHQ	**.65** (16.82, 5.16)								
3 SBAF	**.39**	**.42** (67.46, 16.71)							
4 SBAF-Prevent	**.36**	.26	**.92** (44.23, 8.50)						
5 SBAF-Restore	.25	.19	**.81**	**.71** (23.58, 6.88)					
6 PCL-5-Post	**.52**	**.31**	**.26**	.18	.12 (44.00, 17.86)				
7 PHQ-Post	**.41**	**.47**	**.33**	.15	.20	**.77** (12.11, 6.12)			
8 SBAF-Post	**.27**	.26	**.35**	.24	.28	**.76**	**.69** (53.96, 17.97)		
9 SBAF-Prevent-Post	.22	.13	.24	**.28**	.19	**.74**	**.63**	**.96**(34.58, 10.58)	
10 SBAF-Restore-Post	.18	.11	.19	.17	**.35**	**.69**	**.66**	**.94**	**.80** (18.07, 8.08)

Note. PCL-5 = PTSD Checklist-5; PHQ = Patient Health Questionnaire; SBAF = Safety Behavior Assessment Form total score; SBAF-Prevent = Safety Behavior Assessment Form Preventative Subscale; SBAF-Restore = Safety Behavior Assessment Form- Restorative Subscale; PCL-5-Post = PTSD Checklist-5- Post-score; PHQ-Post – Patient Health Questionnaire- Post-score; SBAF-Post = Safety Behavior Assessment Form Post Score; SBAF-Prevent-Post = Safety Behavior Assessment Form- Preventative Subscale – Post-Score; SBAF-Restore-Post = Safety Behavior Assessment Form- Restorative Subscale- Post-score.

Higher scores on all measure indicate greater levels of the construct being measured.

Correlations in bold are significant at the .05 level. Parentheses contain mean and standard deviation for the variable.

measure (T2 PCL-5; dependent variable). Baseline level of safety behaviors (T1 SBAF subscale) was also entered in the first step to control for individual differences in baseline levels of safety behavior subtype. In the second step, the respective difference score (T1 SBAF subscale–T2 SBAF subscale) was used. As predicted, changes in SBAF preventative subscale score were correlated with posttreatment PTSD symptoms ($b = -1.16$, $t = -6.29$, $p < .001$, partial correlation = –.75, Cohens' $f = .89$) when controlling for baseline PTSD symptoms. Individuals whose SBAF preventative subscale scores showed little or no reduction from pre- to post treatment reported greater levels of PTSD symptoms than those whose SBAF preventative subscale scores showed greater reduction from pre- to posttreatment. The effect size was in the large range. Contrary to hypotheses, changes in the SBAF restorative subscale score also predicted posttreatment PTSD symptoms ($b = -1.53$, $t = -8.14$, $p < .001$, partial correlation = –.77, Cohen's $f = .92$) when controlling for baseline PTSD scores. Individuals whose SBAF restorative subscale scores showed little or no reduction from pre- to posttreatment reported greater levels of PTSD symptoms than those whose SBAF restorative subscale scores showed greater reduction from pre- to posttreatment. The effect size was in the large range. Note that the significant results remain the same if SBAF total score is used rather than subscale scores ($b = -.72$, $t = -8.73$, $p < .001$, partial correlation = –.80, Cohen's $f = .98$). The significant results were robust to data analytic approach and additional control variables. All significant results remained significant, and large effect sizes remained large if: a) change in safety behaviors from pre-to-post was operationalized as a saved standardized residual (from regressing post SBAF subscale score onto pre SBAF subscale score); b) a difference score was used for the outcome variable (T1 PCL-5–T2 PCL-5); c) medication or benzodiazepine use was added as a covariate; d) baseline subscale score was removed as a covariate; and e) change in depressive symptoms was added as a covariate.

2.3.4 | Specificity hypothesis

We tested the predictive power of restorative and preventative safety behaviors to predict depressive symptoms. We did not expect either type of safety behavior to predict changes in depressive symptoms. To test our hypotheses, we used two hierarchical multiple regression equations. In each equation, the Time 1 outcome measure (T1 PHQ-9) was entered in the regression equation to create a residual change score for the same Time 2 measure (T2 PHQ-9; dependent variable). Baseline level of safety behaviors (T1 SBAF subscale) was also entered in the first step to control for individual differences in baseline levels of safety behavior subtype. In the second step, the respective difference score of T1 SBAF subscale–T2 SBAF subscale was used. Contrary to predictions, both SBAF preventative and restorative subscale scores predicted post-treatment depressive symptoms ($b = -.33$, $t = -3.85$, $p = .005$, partial correlation = –.59, Cohen's $f = .64$; and $b = -.46$, $t = -5.51$, $p < .001$, partial correlation = –.66, Cohen's $f = .71$, respectively) when controlling for baseline depressive symptoms. Individuals whose SBAF subscale scores showed little or no reduction from pre- to posttreatment reported greater levels of depressive symptoms than those whose SBAF subscales scores showed greater reduction from pre- to posttreatment. The effect size was in the large range. Note that the significant results remain the same if SBAF total score is used rather than subscale scores ($b = -.21$, $t = -5.09$, $p < .001$, partial correlation = –.65, Cohen's $f = .73$). The significant results were largely robust to data analytic approach and additional control variables. All significant results remained significant, and large effect sizes remained large if: a) change in safety behaviors from pre-to-post was operationalized as a standardized residual (from regressing post SBAF subscale score onto pre SBAF subscale score); b) a difference score was used for the outcome variable; c) medication or benzodiazepine use was added as a covariate; and d) baseline subscale score was removed as a covariate.

It is important to note that significant results for predicting depressive symptoms did not hold if change in PTSD symptoms (PCL-5) was added as a covariate. When controlling for change in PCL-5 scores, both SBAF subscales were no longer significant predictors of changes in depressive symptoms (preventative: $b = -.09$, $t = -.89$, $p = .39$; restorative: $b = -.17$, $t = -1.64$, $p = .12$). This result suggests that the effect of SBAF subscales on depressive symptoms is the indirect result of its effect on PTSD symptoms. In other words, declines in individuals' PTSD symptoms leads to a subsequent decline in their depressive symptoms.

3 | STUDY 2

3.1 | Method

3.1.1 | Overview

We tested the predictive power of restorative and preventative safety behaviors to predict changes in anxious symptoms in a sample of undergraduates. We hypothesized that preventative, but not restorative, safety behaviors would lead to an increase in anxiety over time. We also hypothesized the detrimental effect of preventative safety behaviors on future anxiety would be specific to anxious, but not depressive, symptoms. Thus, we also examined the predictive power of restorative and preventative safety behaviors to predict anxious arousal (anxiety specific) and anhedonia (depression specific), respectively.

3.1.2 | Participants

Participants were 84 unselected undergraduates (mean age = 19.11; 68 women, 16 men) from the volunteer participant pool at the University of Notre Dame. The self-reported ethnicity of the sample was 75% Caucasian, 15% Asian, 7% Hispanic/Latino, and 3% African-American.

3.2 | Measures

3.2.1 | Anxious symptoms

The Beck Anxiety Inventory (BAI; Beck & Steer, 1993) was used to measure anxious symptoms. The BAI is a 21-item measure of anxiety that assesses the emotional, cognitive, and physiological symptoms of anxiety. The BAI has strong psychometric properties (Beck, Epstein, Brown, & Steer, 1988). Internal consistency for the BAI in the current sample was good with alpha = .89 at baseline and alpha = .88 at Time 2.

3.2.2 | Depressive symptoms

The Mood and Anxiety Symptom Questionnaire (MASQ; Watson et al., 1995) was used to assess depressive and anxious symptoms, respectively. The MASQ is a 90-item self-report questionnaire that assesses anxious arousal (anxiety specific) and anhedonic symptoms (depression specific) based on the tripartite theory of anxiety and depression (Clark & Watson, 1991). The Anxious Arousal subscale has 17 items that assess symptoms hypothesized to be relatively specific to anxiety (e.g., somatic tension and hyperarousal). The anhedonia subscale has 22 items that assess symptoms hypothesized to be specific to depression (e.g., low positive affect, loss of pleasure in daily activities). The anhedonic and anxious arousal subscales were used as measures of depressive and anxious symptoms, respectively. The MASQ has demonstrated good reliability and validity in past research (e.g., Watson et al., 1995). Internal consistency for the two subscales in the current sample was good with alpha = .80 (T1) and .83 (T2) for the anxious arousal subscale and alpha = .88 (T1) and .86 (T2) for the anhedonic subscale.

3.2.3 | Safety behaviors

The SBAF was used to assess safety behaviors (see Study 1 for description). Internal consistency for the two subscales in the current sample was good with alpha = .83 for the preventative scale (23 items) and alpha = .86 for the restorative subscale (18 items).

3.2.4 | Procedure

The study used a 3-month prospective longitudinal design. At time 1, participants were administered an informed consent form, a brief demographics questionnaire, a measure of anxious symptoms (BAI), a measure of anxiety specific and depressive specific symptoms (MASQ), and a measure of preventative and restorative safety behaviors (the SBAF). Participants completed the same mood measures three months later.

TABLE 2 Study 2: means, standard deviations, and correlations (prior to multiple imputation)

	1	2	3	4	5	6	7	8
1 BAI	–							
2 Arousal_MASQ	**.63**	–						
3 Anhedonia_MASQ	**.40**	**.29**	–					
4 Prevent_SBAF	**.43**	**.43**	**.31**	–				
5 Restore_SBAF	**.57**	**.52**	**.29**	**.72**	–			
6 BAI T2	**.62**	**.45**	**.48**	**.46**	**.47**	–		
7 Arousal_MASQ T2	**.35**	**.51**	**.35**	**.45**	**.41**	**.46**	–	
8 Anhedonia_MASQ T2	**.24**	**.28**	**.72**	**.37**	.20	**.43**	**.34**	–
Mean	8.72	21.81	53.67	48.45	33.70	8.53	21.83	53.46
SD	7.77	5.20	13.01	7.75	6.83	7.69	6.50	13.83

Note. $N = 84$. BAI = Beck Anxiety Inventory; Arousal_MASQ = Arousal subscale of the Mood and Anxiety Symptom Questionnaire at baseline; Anhedonia_MASQ = Anhedonia subscale of the Mood and Anxiety Symptom Questionnaire at baseline; Prevent_SBAF = Preventative behaviors subscale of the Safety Behavior Assessment Form; Restore_SBAF = Restorative behaviors subscale of the Safety Behavior Assessment Form; BAI T2 = Beck Anxiety Inventory at time 2; Arousal_MASQ T2 = Arousal subscale of the Mood and Anxiety Symptom Questionnaire at time 2; Anhedonia_MASQ T2 = Anhedonia subscale of the Mood and Anxiety Symptom Questionnaire at time 2/.
Higher scores on all measure indicate greater levels of the construct being measured. Correlations in bold are significant at the .05 level.

3.3 | Results

Means, standard deviations, and inter-correlations of study measures are summarized in Table 2. Seventy-eight of 84 participants completed all measures at both time points. Completers and non-completers did not differ on any of the baseline measures. Bayesian multiple imputation with five imputations was used to resolve missing data (Schafer & Graham, 2002).

3.3.1 | Power analysis

Based on prior research (Goodson et al., 2016), we expected a medium effect size for effect of safety behaviors on therapy outcomes. The recommended effect sizes used for this assessment of multiple regression were as follows: small ($R^2 = .02$), medium ($R^2 = .13$), and large ($R^2 = .26$). The alpha level used for this analysis was $p < .05$. The analysis revealed the statistical power for detecting a small effect was .44 whereas the power was .84 for detecting a medium effect. Thus, there was more than adequate power (i.e., power * .80) for the expected medium effect size level, but less than adequate for a small effect size.

3.3.2 | Predicting anxious symptoms

We hypothesized that undergraduates exhibiting high levels of preventative, but not restorative, safety behaviors at baseline would exhibit the greatest levels of anxious symptoms 3 months later compared to those with low levels of preventative and restorative safety behaviors. To test this hypothesis, we used two hierarchical multiple regression equations. In each equation, the Time 1 outcome measure (BAI at T1) was entered in the regression equation to create a residual change score for the same Time 2 measure (BAI at T2; dependent variable). Next, the main effect of safety behavior subtype (SBAF preventative and restorative, respectively) was entered. As predicted, SBAF preventative subscale scores predicted future anxious symptoms ($b = .22$, $t = 2.33$, $p = .02$, partial correlation = .26, Cohen's $f = .13$) when controlling for baseline anxiety. Individuals with higher SBAF preventative subscale scores reported higher levels of anxious symptoms in the future than those with lower SBAF preventative subscale scores. The effect size was in the small range after controlling for baseline anxiety. Consistent with hypotheses, SBAF restorative subscale scores

did not predict future anxious symptoms ($b = .14$, $t = 1.12$, $p = .26$, partial correlation = .13, Cohen's $f = .11$) when controlling for baseline anxious symptoms.

3.3.3 | Specificity hypothesis

We also examined the specificity of preventative and restorative safety behaviors as risk factors for anxious symptoms. Specifically, we tested the predictive power of restorative and preventative safety behaviors to predict anxious arousal (anxiety specific) and anhedonia (depression specific), respectively. We hypothesized that undergraduates exhibiting high levels of preventative, but not restorative, safety behaviors at baseline would exhibit the greatest levels of anxious arousal symptoms three months later compared to those with low levels of preventative and restorative safety behaviors. We did not expect either type of safety behavior to predict changes in depressive symptoms. To test our hypotheses, we used two sets of hierarchical multiple regression equations. In each equation, the dependent variables were anxious specific symptoms at time 2 (MASQ anxious arousal at T2) and depression specific symptoms at time 2 (MASQ anhedonia at T2), respectively. Baseline levels of depression specific symptoms (MASQ anhedonia at baseline) and anxious specific symptoms (MASQ anxious arousal) were entered as covariates to control for initial symptom levels and to create a residual change score for the same T2 outcome variable. Next, the main effect of safety behavior subtype (SBAF preventative and restorative, respectively) was entered. As predicted, SBAF preventative subscale score predicted future anxious arousal ($b = .21$, $t = 2.36$, $p = .02$, partial correlation = .28, Cohen's $f = .20$) when controlling for baseline arousal and baseline depressive symptoms. Individuals with higher SBAF preventative subscale scores reported higher levels of anxious arousal symptoms in the future than those with lower SBAF preventative subscale scores. The effect size was in the small to medium range after controlling for baseline anxiety and anhedonia. As predicted, SBAF restorative subscale did not predict future anxious arousal symptoms ($b = .15$, $t = 1.36$, $p = .18$, partial correlation = .16, Cohen's $f = .14$) when controlling for baseline arousal and anhedonia.

Next, we examined the effect of preventative and restorative safety behaviors on depression specific symptoms (anhedonia). Neither SBAF preventative subscale ($b = .19$, $t = 1.23$, $p = .22$, partial correlation = .14, Cohen's $f = .12$) nor restorative subscale ($b = -.08$, $t = -.41$, $p = .68$, partial correlation = −.05) predicted future anhedonia when controlling for baseline anhedonia and arousal symptoms.

4 | DISCUSSION

The current set of studies was designed to investigate the differential effect of preventative and restorative safety behaviors on the treatment and development of anxiety and depression. We hypothesized that preventative, but not restorative, safety behaviors would lead to increases in anxiety overtime and negatively impact treatment outcomes. We further hypothesized that the effects of safety behaviors would be specific to anxiety, but not depressive outcomes. To test our hypothesis, we conducted two studies that examined the possible differentiating effects of restorative and preventative safety behaviors on the treatment and development of anxiety.

Study one investigated the role of safety behaviors in prolonged exposure therapy outcomes in veterans with PTSD. Results showed that both preventative and restorative safety behaviors were associated with worse treatment outcomes. This result was contrary to hypotheses and is inconsistent with some studies that have found restorative safety behaviors are not associated with outcomes in exposure therapy (Goetz, Davine, Siwiec, & Lee, 2016). One possible explanation for our findings is related to the treatment used in our study. Past studies have typically used brief exposure sessions (e.g., single session) or treatment analogues whereas our study was a complete trial of the full prolonged exposure protocol which had patients address many different types of safety behaviors across multiple contexts. A second explanation is that both preventative and restorative safety behaviors are specifically important in the treatment of PTSD related symptoms. A competing theory of restorative behaviors (e.g., Craske et al., 2008) is that they can still be detrimental because the continued diminishing of anxiety may lead to lower fear tolerance, which is associated with reduced fear extinction.

To our knowledge, study one was the first study to formally investigate safety behaviors in PTSD treatment. The results are consistent with treatment outcome studies for other anxiety disorders (Beesdo-Baum et al., 2012; Cuming et al., 2009; Helbig-Lang et al., 2014). Thus, our findings show that prior results generalize to PTSD, and add to the growing body of evidence that safety behaviors are important to address in treatment settings (Helbig-Lang & Petterman, 2010). The findings also indicate that both preventative and restorative safety behaviors should be assessed and eliminated prior to initiating (and throughout) PTSD treatment. Given the sizable percentage of individuals who do not respond or show only minimal improvement in PTSD treatment, identifying variables (e.g., preventative and restorative safety behaviors) that impact treatment outcome has significant importance (Goodson et al., 2017).

The results from study one also showed that safety behaviors have the potential to influence depressive symptoms outcomes in therapy. This finding extends existing cross-sectional research showing a positive correlation between certain safety behaviors and depressive risk factors such as excessive reassurance seeking (Joiner, Metalsky, Katz, & Beach, 1999). However, the effect of safety behaviors on depressive outcomes did not hold when controlling for changes in PTSD symptoms. This suggests that engaging in safety behaviors during exposure influences depression indirectly through maintenance of PTSD symptomology. That is, safety behaviors maintain PTSD symptoms, which in turn maintains depression.

Study 2 was a 3-month naturalistic prospective study investigating the role of safety behaviors as risk factors for future anxious symptoms in a nonclinical population. Consistent with hypotheses, we found that preventative, but not restorative, safety behaviors predicted an increase in both general (BAI) and specific anxious symptoms (anxious arousal) over time. These findings lend support to the etiological role of safety behaviors in the development of anxiety and are consistent with past studies that have found safety behaviors to increase anxiety (Deacon & Maack, 2008; Fawzy, 2015; Goodson et al., 2016; Olatunji, Etzel, Tomarken, Ciesielski, & Deacon, 2011). The results also support the possible differentiating role of safety behavior type for conferring risk for future depressive symptoms in nonclinical populations. Specifically, preventative safety predicted general anxiety (BAI) and specific anxiety (anxious arousal as measured by the MASQ) whereas restorative safety behaviors did not.

It is necessary to note the strong baseline correlations found between preventative and restorative behaviors in the two studies (.71 in Study 1 and .72 in Study 2). The two subscales clearly overlap, but there remain reasons to view them as distinct constructs. For example, it is important to consider that the high correlations mean that the two subscales share 49% common variance. Thus, they overlap, but are still distinguishable. Second, the two subscales are theorized as conceptually distinct factors (Helbig-Lang & Petermann, 2010). Even if both subscales fall into a single-factor structure of the SBAF, this would not decrease the importance of measuring both components. It is important to measure both components in order to maintain the construct validity of the scale (Clark & Watson, 1995). Finally, our Study 2, along with at least one other empirical study (e.g., Goetz & Lee, 2014) supports the distinction between restorative and preventative safety behaviors because they exhibited different predictive validities for anxious symptoms. That said, more work is needed to fully delineate the differences and similarities between these constructs.

The current set of studies had a number of strengths. A significant strength is the use of two independent studies. This allowed use to examine the role of safety behaviors in both treatment and etiology as well as in both a clinical and nonclinical population. A strength of Study 1was a high level of external validity. Real world therapists rather than researchers administered the treatments. It is necessary to understand how interventions work when not used under ideal conditions, as this is how therapists in real-world settings will ultimately use them. Using real staff increased the external validity of the study, and filled the critical need for effectiveness data on how best to treat mental illness in those with PTSD.

The study also had weaknesses. Although effectiveness studies are necessary for determining whether interventions work in the real world, they also have inherent weaknesses. The internal validity of effectiveness studies is not as strong as in efficacy studies in which all study elements are tightly controlled by the research team. Another limitation is that the predictor and outcome variables in Study 1 were measured concurrently. This means we cannot make definitive statements about whether or not change in safety behaviors proceeded changes in symptoms because the symptom changes overlapped temporally with the SBAF changes. Another limitation is that Study 2 examined anxious

and depressive symptoms in a relatively healthy undergraduate sample. Thus, we cannot make conclusions about clinically significant forms of anxiety and depression.

In conclusion, we tested whether type of safety behavior predicted PTSD treatment outcomes and risk for future anxiety symptoms. Both preventative and restorative safety behaviors predicted PTSD treatment outcomes. This suggests that both types of safety behaviors are important treatment targets in prolonged exposure therapy and both preventative and restorative behaviors should be systematically assessed and addressed throughout treatment to maximize symptom improvement. Similarly, in nonclinical settings and/or early in the anxiety cycle, preventative safety behaviors may be harbingers of future psychopathology as they lead to increases in future anxious symptoms. However, only preventative safety behaviors appear to confer risk for future anxious symptoms, which suggests that the distinction between the two types of safety behaviors may be particularly valuable in nonclinical populations.

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Appendix

Preventative Subscale Items

1) Scope places out before entering
2) Over-plan for everyday events
3) Sit with back to wall
4) Stay within a certain distance from home (or other safe places)
5) Prepare things to say while others are talking
6) Rush through stores or go directly to desired items and leave as quickly as possible
7) Check yard or the area around your home ("perimeter checks")

8) Check locks on doors or windows
9) Make up contingency plans in case someone is physically aggressive or there is some kind of emergency
10) Take it easy when I exercise (or do other activities that require physical exertion) so my heart rate does not get too high)
11) Stay on the outside of crowds and/or monitor for exits or escape routes
12) Be overly polite or agreeable
13) Carry a medication in case I need it
14) Make little eye contact
15) Respond to calls with text messages
16) Research things before I start or before making a decision
17) Monitor the clock
18) Try to do things perfectly
19) Plan and/or rehearse what I am going to say ahead of time
20) Make myself look busy while at work or when out in public so that others don not talk to me
21) Watch others for signs of danger
22) Pay attention to physical symptoms or sensations
23) Pretend I do not see or recognize someone so that I do n not have to speak with them

Restorative Subscale Items

1) Contact loved ones to make sure they are okay
2) Call doctors' offices (or health lines) frequently
3) Talk through silences or talk so that silences do not occur
4) Procrastinate before I start something or make a decision
5) Monitor others' reactions to things I say
6) Attempt to hide anxiety (e.g., put hands in pocket because they are shaking)
7) Check my body from problems (pain, discomfort, symmetry, discoloration, new growth, etc.)
8) Research medical symptoms of the internet
9) Check my body temperature
10) Leave events or activities early
11) Walk slowly to let someone pass who is close behind
12) Cut conversations short
13) Monitor what I say in conversations
14) Ask others for reassurance (e.g., about a decision or worry)
15) Check my pulse or heart rate
16) Talk to others about my health or health-related activities
17) Check that I can swallow without choking
18) Request specialized medical exams from providers