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# **Depression Suppresses Treatment Response for Traumatic** Loss-Related Posttraumatic Stress Disorder in Active Duty Military Personnel

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There are multiple well-established evidence-based treatments for posttraumatic stress disorder (PTSD). However, recent clinical trials have shown that combat-related PTSD in military populations is less responsive to evidence-based treatments than PTSD in most civilian populations. Traumatic death of a close friend or colleague is a common deployment-related experience for active duty military personnel. When compared with research on trauma and PTSD in general, research on traumatic loss suggests that it is related to higher prevalence and severity of PTSD symptoms. Experiencing a traumatic loss is also related to the development of prolonged grief disorder, which is highly comorbid with depression. This study examined the association between having traumatic loss-related PTSD and treatment response to cognitive processing therapy in active duty military personnel. Participants included 213 active duty service members recruited across two randomized clinical trials. Results showed that service members with primary traumatic loss-related PTSD (n = 44) recovered less from depressive symptoms than those who reported different primary traumatic events (n = 169), B = -4.40. Tests of mediation found that less depression recovery suppressed recovery from PTSD symptoms in individuals with traumatic loss-related PTSD, B = 3.75. These findings suggest that evidence-based treatments for PTSD should better accommodate loss and grief in military populations.

Although there are well-established evidence-based treatments for PTSD, recent studies have found that military service members with combat-related PTSD do not respond as robustly to those treatments as their civilian counterparts. In fact, about one-half of active duty military members retain a PTSD diagnosis after completing evidence-based treatment for PTSD (Cigrang et al., 2017; Foa et al., 2018; Resick et al.,

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<sup>[</sup>Correction added on 31 August 2019 after first online publication: The statement "(MASKED FOR REVIEW)" has been removed from the Methods section]

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2015, 2017) compared with less than 20% of civilian women and men (Galovski, Blain, Mott, Elwood, & Houle, 2012; Resick, Nishith, Weaver, Astin, & Feuer, 2002; Resick, Williams, Suvak, Monson, & Gradus, 2012).

In order to improve these response rates and better serve military service members with PTSD, the factors that contribute to this discrepancy in recovery rates need to be explored. One factor that may contribute to less robust recovery in active duty and veteran populations is the uniqueness of war zone exposure among combatants and the frequency and types of traumatic events endorsed by service members. Previous research by the STRONG STAR Consortium (Litz et al., 2018) showed that reports of common deployment-related traumatic events can be grouped into at least six distinct categories, each with unique perievent and postevent response patterns: traumatic loss, life threat to self, life threat to others, moral injury by self, moral injury by others, and aftermath of battle. Experiencing the traumatic loss of a close friend or colleague is a very prevalent and distressing category of trauma that service members often encounter. For example, in a study conducted by Hoge et al. (2004), 86%-87% of active duty service members deployed to Iraq and 43% of service members deployed to Afghanistan knew someone who was killed or seriously injured during combat. Litz and colleagues (2018) found that 20% of 999 active duty military personnel assessed for participation in a PTSD clinical trial clinical endorsed a traumatic loss as the traumatic event, as defined by the Diagnostic and Statistical Manual of Mental Disorders (4th ed.; DSM-IV; American Psychiatric Association [APA], 2000), that bothered them most. This is not surprising given the high risk of danger coupled with the magnified and highly interdependent nature of military life during combat deployments. Losing a service member from one's own unit can be similar to losing a close family member. Service members are also at risk for losing unit members from suicide even after returning home (U.S. Department of Veteran Affairs, 2016).

Experiencing a traumatic loss appears to be associated with an increased risk of PTSD. Although the overall risk of developing PTSD following trauma exposure is approximately 9% (Breslau et al., 1998), research in civilian samples has found higher rates of PTSD development related to traumatic loss, ranging from 22% to 35% (Amick-McMullan, Kilpatrick, & Resnick, 1991; Boelen, Keijser, & Smid, 2015; Green et al., 2001). Additionally, Breslau and colleagues (1998) found that the event most often reported as an individual's most distressing traumatic event (in 31% of all PTSD cases) was the sudden, unexpected death of a loved one. Finally, in a large sample of bereaved civilians, individuals who experienced violent loss of loved ones had significantly higher PTSD symptom levels than those bereaved by nonviolent losses (Boelen et al., 2015).

Compared with civilians (e.g., Boelen et al., 2015), less is known about the mental and behavioral health impact of traumatic loss in military samples. A recent study (Litz et al., 2018) found that treatment-seeking service members who reported traumatic loss as their index traumatic events endorsed higher levels of reexperiencing symptoms, avoidance, and guilt as compared with service members who reported life threat events. Similarly, Simon et al. (2018) examined the association between loss, complicated grief, and PTSD symptoms in service members and veterans. The authors found that losing a fellow service member, which was endorsed by 41% of the sample, was associated with a higher prevalence of complicated grief; this was then related to significantly higher levels of PTSD severity, functional impairment, trauma-related guilt, and lifetime suicide attempts. Simon and colleagues (2018) recommended additional research on the topic and proposed that clinical severity of disorders with partially overlapping symptoms, such as depression, may serve as a clinical severity marker for individuals with PTSD who have been exposed to a death. They in turn called for treatment outcome research to attend to this subpopulation of individuals with PTSD.

Depression and PTSD are highly comorbid and, as Simon and colleagues (2018) discussed, have overlapping symptoms. Epidemiological studies have shown that 48% of individuals with a lifetime diagnosis of PTSD have comorbid depression (Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995) with similar rates (44% for men and 56% for women) in veterans (Kulka et al., 1990). Although there have been no population comorbidity studies for military populations who enlisted and/or served specifically in the time after the September 11, 2001, terrorist attacks in the United States (9/11), a large (N = 309) study of U.S. veterans who had deployed to Iraq, Afghanistan, and surrounding locations found that 39% of individuals with current PTSD also had current major depression (MDD; Kimbrel, Meyer, DeBeer, Gulliver, & Morissette, 2016). It appears that comorbid depression impacts the natural recovery process following trauma exposure. One longitudinal study of civilians found that, following a traumatic event, higher reported levels of depression symptoms at each time point (measured at 1 week, 1 month, and 4 months) were related to a worsening of PTSD symptoms at the next time point (King, King, McArdle, Shalev, & Doron-LaMarca, 2009). Follow-up data from a large epidemiological study found that, among survivors of a large earthquake who had PTSD, individuals with comorbid MDD were less likely to recover from PTSD 3 years later (26.4%) recovery rate) than those without MDD (47.4% recovery rate; Tural, Onder, & Aker, 2012).

Treatment studies have shown similar findings. For example, Haagen, ter Heide, Mooren, Knipscheer, and Kleber (2017) found that the presence and severity of a comorbid depressive disorder predicted poorer PTSD treatment outcome in a sample of refugees engaged in Eye Movement Desensitization and Reprocessing (EMDR) therapy. A reduction in PTSD symptoms over the course of cognitive processing therapy (CPT) was also correlated with a reduction in symptoms of depression (Galovski et al., 2016; Liverant, Suvak, Pineles, & Resick, 2012), and sudden improvements in depression during treatment were related to better PTSD treatment response (Keller, Feeny, & Zoellner, 2014). To our knowledge, only one treatment study has examined the relation between depression and PTSD recovery in a veteran sample; the authors found that a reduction in symptoms of depression preceded a reduction in symptoms of PTSD in veterans engaged in CPT in a residential setting (Schumm, Dickstein, Walter, Owens, & Chard, 2015).

Depression and PTSD are separate constructs from the abnormal sequelae of traumatic loss, namely traumatic grief, which is interchangeably used here and in the literature with the term "prolonged grief disorder" (PGD) (Boelen, van den Bout, & de Keijser, 2003; Jordan & Litz, 2014; Prigerson et al., 1996). However, the symptoms of PGD and depression have considerable overlap and are highly comorbid. In a confirmatory factor analysis study, Boelen and van den Bout (2005) found that traumatic grief was highly correlated with symptoms of depression (r = .78) and that several core symptoms (feelings of worthlessness, self-blame, and experiencing a lack of meaning in the world) could not separate depression from traumatic grief in an initial factor analysis. In a study that examined the mediating variables in the relation between violent (vs. nonviolent) loss and PTSD, PGD, and depression (Boelen et al., 2015), the same combination of mediators was found for the association between violent loss and both PGD and depression (i.e., unrealness, negative cognitions about the self and the future, catastrophic misinterpretations, depressive avoidance). In comparison, anxious avoidance uniquely mediated the association between violent loss and PTSD. Although not everyone with a traumatic loss goes on to develop PGD, there is a higher risk of developing PGD among individuals who experience violent, sudden, or unexpected loss than among those who experience loss from foreseeable and natural causes (Boelen et al., 2015; Lobb, Kristjanson, & Aoun, 2010). Thus, if PTSD treatment outcomes are associated with outcomes on symptoms of depression (Galovski et al., 2016; Haagen et al., 2017; Keller et al., 2014; Liverant et al., 2012), and depression is highly comorbid with PGD, individuals who have experienced traumatic loss, who are at risk of experiencing symptoms of traumatic grief, and, therefore, symptoms of depression, would have a poorer prognosis for PTSD recovery following treatment than those who have experienced other types of traumatic events.

To our knowledge, no studies have examined whether the presence of Criterion A traumatic events that entail traumatic loss are associated with worse outcomes from evidence-based treatments among service members with PTSD nor whether symptoms of depression affect the association between traumatic loss and PTSD symptom improvement with treatment. The current study examined the relation between reporting a traumatic loss as an index traumatic event (i.e., the event reported as currently most distressing) and treatment response to CPT in an active duty military sample. Additionally, this study examined whether symptoms of depression would mediate that association. Given the literature suggesting that military service members with traumatic loss experience more severe baseline PTSD symptoms than those who report life threat index traumas (Litz et al., 2018) and that loss of a fellow service member is related to higher levels of psychopathology than other types of loss (Simon et al., 2018), we hypothesized that participants who reported a traumatic loss as their index trauma would experience less robust recovery from PTSD compared to participants with other types of index traumas. Given the research suggesting the negative effects of depression on PTSD recovery overall, we further hypothesized that the association between traumatic loss and PTSD recovery would be mediated in the traumatic loss group by smaller changes in symptoms of depression from baseline to posttreatment.

#### Method

#### **Participants and Procedure**

Data for this study were taken from two large randomized clinical trials (Resick et al., 2015, 2017), which were approved by all appropriate institutional review boards. Participants were 213 active duty U.S. military personnel who had experienced at least one deployment, met diagnostic criteria for PTSD according to the *DSM-IV-TR* (APA, 2000) during the initial assessment, and who completed either individual (n = 83) or group (n = 130) CPT (Resick, Monson, & Chard, 2016) as part of two large randomized clinical trials. See Resick et al. (2015, 2017) for a full description of these studies. Table 1 lists the demographic and descriptive statistics on the main study variables for the overall sample and for the groups as derived from the mutually exclusive categories described later.

The majority of participants were male (91.5%), had been deployed multiple times (76.1% reported at least two deployments), were married (74.2%), and reported at least some higher education (74.2% endorsed having attended at least some college). This sample was somewhat diverse in ethnicity (51.6% White, 26.3% African American, 18.8% Hispanic) and military occupation specialty (34.7% combat arms, 22.1% combat support, 43.2% combat services support). On average, participants were 34 years old and were midlevel enlisted soldiers (79.3% E-4–E-6) with approximately 11 years of service. Participants were assessed on the main study variables prior to receiving treatment and 2 weeks after completion of treatment. All participants included in the current study provided complete data.

Participants' index traumatic events were identified using a combination of self-report event checklists and a structured clinical interview. After participants completed the Life Events Checklist (LEC) and the Deployment Risk and Resilience Inventory–2 (DRRI-2) Combat Experiences and Aftermath of Battle subscales, masters- or doctoral-level clinical interviewers used this information and a structured clinical interview to guide participants to identify the traumatic experience that has bothered them the most within the past month. Event descriptions were written, verbatim, by the trained interviewers. The written interview answers were used to categorize all index events. Thus, although participants often endorsed multiple traumatic experiences that were both military- and non-military-related, only index events were coded and analyzed for the current study.

Demographic Characteristi	cs and De	scriptive	Statistic	s for Main	ı Study Va	ariables							
		Total S: (N = 2)	ample 213)			Traumati $n = (n = 1)$	ic Loss 44)			Other I $(n = 1)$	Event (69)		
Characteristic	W	SD	и	%	М	SD	u	%	Μ	SD	u	%	Statistical Test
Age (years)	33.9	7.2			32.8	7.0			33.5	6.7			t(211) = 0.46
Male			195	91.5			44	100.0			151	89.3	$\chi^2(1, N = 213) = 5.12^*$
Married/cohabitating			158	74.2			32	72.7			126	74.6	$\chi^2(1, N = 213) = 0.06$
Race/ethnicity													$\chi^2(3, N = 213) = 0.64$
Black			54	25.3			12	27.3			42	24.9	
Hispanic			41	19.2			Г	15.9			34	20.1	
White			98	46.0			20	45.5			78	46.2	
Other			20	9.4			S	11.4			15	8.9	
Education													$\chi^2(2, N = 213) = 1.05$
High school or less			55	25.8			14	31.8			41	24.3	
Some college/													
associate's degree			143	67.1			27	61.4			116	68.6	
College/graduate			15	7.0			б	6.8			12	7.1	
degree													
Months in service	135.6	75.6			133.8	76.0			142.7	74.7			t(211) = 0.68
Enlisted rank			206	96.7			42	95.5			164	97.0	$\chi^2(1, N = 213) = 0.28$
Typical duty													$\chi^2(2, N = 213) = 0.62$
Combat arms			74	34.7			17	38.6			57	33.7	
Combat support			47	22.1			8	18.2			39	23.1	
Combat service			92	43.2			19	43.2			73	43.2	
support													•
Number of deployments													$\chi^2(3, N = 213) = 10.76^{**}$
1			51	23.9			S	11.4			46	27.7	
2			LL	36.2			24	54.5			53	31.4	
3			52	24.4			٢	15.9			45	26.6	
≥ 4			33	15.5			8	18.2			25	14.8	
Main study measures													
PCL-S (baseline)	55.2	10.4			55.6	12.2			55.1	9.6			t(211) = 0.30
PCL-S (follow-up)	45.3	15.4			44.9	15.6			45.4	14.4			t(211) = 0.16
BDI-II (baseline)	28.9	11.1			27.6	11.5			29.3	11.0			t(211) = 0.90
BDI-II (follow-up)	21.5	14.1			23.7	15.5			20.9	13.3			t(211) = 1.20
Note. PCL-S = PTSD Checklist-S * $p < .05$ . ** $p < .01$ .	tressor-Spec	ific Version	i; BDI-II =	= Beck Depr	ession Inver	ntory–II.							

Table 1

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Index events were categorized in two ways, using the typology established by Stein et al. (2012). First, they were categorized nonexclusively, meaning they could be assigned up to three categories if the selected index event included multiple types of traumatic experiences. For example, if a service members described his or her index event during the structured interview by reporting that he or she was injured by an improvised explosive device (IED) while riding in a vehicle on a convoy and a friend was killed in that same IED explosion, the event would be coded as follows: life threat to self + traumatic loss. With this coding structure, approximately half of the index events (46.2%) were assigned multiple codes. Next, index events were coded again, this time using mutually exclusive categories. Index events were only given one category, which was determined by the coder to be the most salient part of the experience, following the coding rules created by Stein et al. (2012).

For both exclusive and nonexclusive coding, two independent raters, blind to the hypotheses of the study, coded the index events. One rater coded all of the events, and the second coded a random 20% of the events. High interrater reliability was established between the coders for both the exclusive ratings, Cohen's  $\kappa = 0.80$ , and the nonexclusive ratings, Cohen's  $\kappa s = 0.77 - 0.86$ , indicating that coders not only agreed on which categories were present but also agreed on which category was primary when participants provided complex and multidimensional index events. A final meeting was called to settle any disagreements, and the results of this final meeting provided the data used in the analyses reported hereafter. Also, an independent auditor who was not a part of the original coding team, but is an author on this paper, verified that the coders' ratings were consistent with the coding scheme. The auditor reviewed the ratings for all 213 participants and made no changes to the final ratings provided by the coding team.

When index events were categorized using mutually exclusive coding, the distribution of index events was as follows: life threat to self (n = 46, 21.6%), traumatic loss (n = 44, 20.7%), aftermath of violence (n = 38, 17.8%), moral injury by other (n = 36, 16.9%), life threat to others (n = 35, 16.4%), and moral injury by self (n = 14, 6.6%). Participants were then separated into two groups (traumatic loss vs. other events), first using exclusive categories (n = 44 for traumatic loss, n = 169 other) and then using nonexclusive categories (n = 55 traumatic loss, n = 158 other). For the nonexclusive categorizations, 7 of the 11 participants with secondary traumatic loss were categorized as having experienced aftermath of violence as their primary index event, whereas the remaining 4 were categorized as primarily having experienced moral injury by others.

## Measures

**PTSD symptoms.** The PTSD Checklist–Stressor-Specific Version (PCL-S; Weathers, Litz, Herman, Huska, & Keane, 1993) is a 17-item, self-report scale that measures how much an individual is bothered by reexperiencing, avoidance, and

arousal symptoms on a scale from 1 (*not at all*) to 5 (*extremely*). Higher scores reflect a higher level of PTSD symptom severity. A review of the psychometric properties of the PCL-S reported acceptable test–retest reliability, internal consistency, convergent validity, and sensitivity to change (Wilkins, Lang, & Norman, 2011). In the current sample, coefficient alpha for PCL-S total scores was excellent at both baseline, Cronbach's  $\alpha = .84$ , and follow-up assessments, Cronbach's  $\alpha = .94$ .

**Depression.** The Beck Depression Inventory-II (BDI-II; Beck, Steer, & Brown, 1996) is a 21-item, self-report measure of the severity of depressive symptoms. Each item represents a unique affective or somatic symptom related to depression and is composed of four statements that reflect symptom severity. The statements are scaled from 0 (*no disturbance*) to 3 (*maximal disturbance*). Scores on all items are summed to obtain a total severity score. The BDI-II has demonstrated excellent test–retest reliability, concurrent validity, and criterion-based validity in a variety of samples (e.g., Beck, Steer, Ball, & Ranieri, 1996; Wang & Gorenstein, 2013). In the current sample, the coefficient alpha for BDI-II total scores was excellent at both baseline, Cronbach's  $\alpha = .90$ , and follow-up assessments, Cronbach's  $\alpha = .92$ .

**Lifetime trauma exposure.** The LEC for *DSM-5* (LEC-5; Weathers et al., 2013) includes a list of 16 potentially traumatic life events that are commonly associated with PTSD symptoms and is designed to facilitate PTSD diagnosis. For each potentially traumatic life event, respondents rate their experience of that event on a nominal scale with response options including 1 = happened to me, 2 = witnessed it, 3 = learned about it, 4 = part of my job, 5 = not sure, and 6 = doesn't apply. The LEC-5 was used in the current study to assist in the identification of the participant's index traumatic event.

**Deployment-related factors.** The DRRI-2 (King, King, Vogt, Knight, & Samper, 2006) is a comprehensive assessment tool consisting of 17 separate scales that are designed to identify key deployment-related risk factors in service members and veterans. In the current study, two of the DRRI-2 subscales, Combat Experiences and Aftermath of Battle, were used to assist in the identification of the participant's index event. Items for these scales are rated on a 6-point Likert scale ranging from 1 (*almost none of the time*) to 6 (*daily or almost daily*), with higher scores indicating more exposure to military-related traumatic events during deployment.

## **Data Analysis**

We began by examining the degree to which participants in the primary traumatic loss group (using mutually exclusive codes) differed from those with other primary index events on key demographic variables. We also examined whether the other index events differed in terms of changes in depression and changes in PTSD severity in order to justify combining those groups in our later analyses. Then, to address our first prediction, that traumatic loss would be associated with less recovery over the course of CPT treatment, we computed difference scores (baseline – follow-up) for the PCL-S between the two assessment time points and tested whether the traumatic loss and other primary index events groups differed in changes in PTSD severity using a between groups *t* test. The resulting test term is analytically equivalent to the Group  $\times$  Time interaction term from a repeated measures ANOVA when using complete data, and it had the added benefit of allowing us to use a single variable in the subsequent mediation analysis.

To address our second prediction, that changes in PCL-S scores would be mediated by changes in depression, we similarly computed difference scores for the BDI-II. We then used these difference scores as a mediator of the association between traumatic loss and PTSD using the PROCESS macro (Hayes, 2017) in SPSS, using bias-corrected bootstrapping to provide the strongest possible confidence interval for the examined indirect effect (Preacher & Hayes, 2008). The test for mediation via changes in BDI-II scores controlled for treatment type (i.e., individual vs. group) given previously reported differences between the two treatment formats (Resick et al., 2017), gender, and number of previous deployments. Though our primary aim was to determine whether primary index traumatic loss (n =44) was implicated in these relations, we conducted an identical second set of analyses using the nonexclusive codes (n = 55traumatic loss, n = 158 other) to determine the degree to which having traumatic loss as the most salient (as determined by coders) component of one's experience was important. Finally, we followed up the mediation results by examining differences between the groups' changes in depression.

#### **Results**

#### **Preliminary Analyses**

As can be seen in Table 1, the group of individuals who endorsed traumatic loss as the primary component of their index event differed significantly only in terms of gender and number of prior deployments. With respect to gender, fewer females (n = 0) than expected experienced primary traumatic loss, standardized residual = -1.98, which is consistent with higher overall rates of male participants and gender-specific limitations in combat-oriented roles that may limit the occasions to experience such losses. Although no women experienced a traumatic loss as their primary index event, two women had traumatic loss index events when using the collapsed primary and secondary categorization. This quasicomplete separation of gender within our primary traumatic loss variable made it difficult to completely control for the effect of gender in the model. A separate set of analyses was conducted for male participants only, and the same pattern of results reported hereafter were found. Female service members were included in this and subsequent analyses because we felt it was important to note their lack of experiencing traumatic loss



*Figure 1.* Mediation models for (A) individuals with primary traumatic loss (n = 44) and (B) individuals with either primary or secondary traumatic loss (n = 55). Change scores were calculated as pretreatment minus posttreatment. Covariates were included in models of both the mediator and the outcome variables but have been omitted for clarity. PTSD = posttraumatic stress disorder.

as their primary index event. With respect to number of prior deployments, only one category had more or fewer participants than expected by chance: Significantly more participants than expected by chance who endorsed traumatic loss as the primary component of their index traumatic event reported having two prior deployments (n = 24, standardized residual = 2.00). Additionally, there were no differences in changes in depression,  $F(4, 164) = 2.20, p = .072, \eta^2 = .05$ ; or changes in PTSD severity,  $F(4, 164) = 0.76, p = .071, \eta^2 = .01$ , among the other index event groups, indicating that it was appropriate to pool them together as a single group for subsequent analyses.

#### **Main Analyses**

Participants' PCL-S scores improved overall (*M* score change = 9.92, SD = 13.87) and in both the primary traumatic loss group (*M* score change = 10.69, SD = 11.82) and other primary index event group (*M* score change = , SD = 14.38). The difference in change between groups was not significant, *t*(211) = 0.41, *p* = .691, *d* = 0.07. Similar results were found when these analyses were rerun using nonexclusive categories, *t*(211) = 0.22, *p* = .829, *d* = 0.03. Thus, our first hypothesis—that having a traumatic loss would be associated with less improvement from baseline to posttreatment PCL-S scores—was not supported.

The failure to find a direct association between traumatic loss and improvement in PCL-S scores does not preclude an indirect effect of a third variable. When the indirect and direct effects have opposite signs, they can in essence cancel each other out in a phenomenon known as "inconsistent mediation" (Hayes, 2017; MacKinnon, Fairchild, & Fritz, 2007). As illustrated in Figure 1, Model A, the mediation analysis revealed that the indirect effect was significant, B = -3.00, SE = 1.44, 95% CI [5.92, -0.23], within the overall model of changes in PCL-S scores, F(7, 204) = 28.24, p < .001. Reporting a traumatic loss as the primary component of one's index event predicted smaller improvements in depression, B = -4.40, t(206) = -1.98, p = .038; and less improvement in depression predicted smaller improvements in PCL-S scores, B = 0.68, t(205) = 12.45, p < .001.

Results of the mediation analysis coupled with the lack of apparent association between traumatic loss and PCL-S change suggest this is an example of inconsistent mediation. In fact, the mediation model estimates the direct effect as being significant and in the opposite direction of the indirect effect, B = 3.75, t(205) = 2.14, p = .033, indicating that when changes in depression symptoms are not accounted for, experiencing a traumatic loss is associated with more recovery from PTSD following treatment rather than less. Thus, for individuals with traumatic loss index events, a lack of change in symptoms of depression suppresses recovery from PTSD. However, these effects were present only for individuals who experienced traumatic loss as the primary component of their index event. This model predicted 15% of the variance in changes in depression and 50% of the variance in changes in PTSD scores. An identical second set of analyses was conducted using the nonexclusive codes (n = 55 traumatic loss, n = 158 other). As seen in the Figure 1, Model B, the total effect, B = 0.89, t(205) = 0.42, p = .667; direct effect, B = 2.92, t(205) = 1.80, p = .072; and indirect effect, B = -2.02, SE = 1.28, 95% CI [-4.57, 0.48], were nonsignificant in the overall model of changes in PCL-S scores, F(7, 204) = 28.60, p < .001.

# **Alternative Explanatory Model**

The hypothesized mediation model necessarily leads to inconsistent mediation, but there is an alternative plausible model. The alternative model is that changes in PTSD predict changes in depression rather than vice versa and that changes in PTSD and exposure to a traumatic loss are uncorrelated predictors. We examined this model and found that both traumatic loss, B =-5.19, t(206) = -3.10, p = .002,  $\beta = -.16$ ; and changes in PTSD, B = 0.64, t(206) = 12.50, p < .001,  $\beta = .68$ , predicted changes in depression, accounting for 46% of the variance. This model is more parsimonious, as it requires estimating one fewer path and it does not require positing a hidden, positive association between traumatic loss and improvement in PTSD. Choosing between them is a matter of theory rather than statistics.

## **Exploratory Analyses**

The *a* path in the top model in Figure 1 indicates that when mutually exclusive codes were used, the traumatic loss group had a decrease in BDI-II scores that was 4.40 points smaller than the other index event group, but that path does not indicate whether either, neither, or both groups actually exhibited a significant decrease in depression from baseline to posttreatment. To better understand the observed suppression effect, we

conducted exploratory repeated measures t tests on the BDI-II pre- and posttreatment scores separately for both the primary traumatic loss group and the other index event group. The results showed that the traumatic loss group exhibited a nonsignificant decrease in depression symptoms throughout treatment (*M* score change = 3.84), t(43) = 2.02, p = .053, d = 0.30. In contrast, participants with other index events experienced a significant decrease in depressive symptoms over the course of treatment (M score change = 8.40), t(168)= 8.43, p < .001, d = 0.64. A t test examining the depression difference scores showed that the difference in changes in depression was significant, t(211) = 2.09, p = .038, d =0.35. Given this result, the suppression effect appears to be driven by the fact that individuals with traumatic loss as the primary component of their index event showed less global improvement in depression over the course of treatment. We conducted supplemental item-level analyses to determine whether any particular depressive symptoms were responsible for the differences between groups. None of the individual symptoms changed differently over time between the groups, suggesting that observed differences in changes in depression were due to global improvement in depression as opposed to improvement of any particular symptoms.

#### Discussion

In the current study, we examined the association between traumatic loss and treatment response among active duty military personnel who received CPT. We hypothesized that traumatic loss would be associated with less robust recovery from PTSD and that less change in depression would mediate the relation between traumatic loss and PTSD recovery. Our hypotheses were partially supported. Contrary to our first hypothesis, when we did not account for the effects of depression, it appeared that there were no differences in PTSD recovery between participants who experienced primary traumatic loss as their index event and the comparison group. However, consistent with our second hypothesis, participants who experienced primary traumatic loss index events experienced less reduction in their symptoms of depression than those with other primary index events, and reductions in symptoms of depression were associated with reductions in PTSD symptoms from baseline to posttreatment. In other words, individuals who recovered less from depression recovered less from PTSD, similar to what has been reported in previous treatment studies (Galovski et al., 2016; Liverant et al., 2012). Specifically, depression symptoms appear to be suppressing recovery of PTSD for individuals who endorse primary traumatic loss index events, significantly more so than for those with other types of index events. Importantly, this was only true for participants who experienced a traumatic loss that was determined to be the primary (i.e., most salient) part of their index event.

These findings are consistent with cognitive behavioral theory. Core symptoms of depression include loss of interest and engagement in activities (i.e., depressive avoidance) and chronic fatigue as well as feelings of worthlessness and excessive generalized guilt. All of these symptoms are represented on the BDI-II and represent malleable risk factors for intervention. Depressive avoidance and lack of engagement in activities tend to be broad in scope but would likely include avoidance of trauma reminders. In turn, this would impede progress in PTSD treatments because successful treatment relies on approaching rather than avoiding situations, memories, and emotions. Additionally, when individuals experience a general sense of guilt or worthlessness, they may believe that they do not deserve to experience joy or to recover from PTSD. Furthermore, they may believe that recovering from PTSD will mean that they have forgotten or disrespected their lost loved one. In this way, excessive guilt, feelings of worthlessness, or lack of joy can serve to reinforce avoidance of accepting the reality that their loved one is "really gone."

These findings have important implications for improving trauma-focused therapy for individuals who experience primary traumatic loss. For these individuals, it may be important to focus on symptoms of depression, particularly those symptoms that contribute to avoidance and depressive cognitions. Potential areas to target include reducing depressive avoidance and increasing motivation by facilitation of interest in activities through values-based behavioral activation, decreasing fatigue and improving sleep quality through cognitive behavioral therapy for insomnia, and reducing isolation by building skills in seeking social support. Additionally, if maladaptive cognitions that are specifically related to depressive avoidance are present (e.g., "If I experience joy, it means I don't miss my friend," "I should not do things I enjoy because my friend is unable to do so," "If I recover from PTSD, it means my friend is really gone"), the clinician should emphasize the facilitation of processing natural sadness and grief and support the patient in moving toward positive and meaningful activities that function to "honor" or "remember" their loved ones.

Given the finding of inconsistent mediation, the alternative model, in which a traumatic loss-related index event and changes in PTSD symptoms are uncorrelated predictors of changes in depression over the course of CPT treatment, is also plausible. Although it has been shown that having experienced traumatic loss is associated with an increased risk of developing PTSD (Amick-McMullan et al., 1991; Boelen et al., 2015; Green et al., 2001) and higher levels of PTSD severity compared with having experienced life threat events (Litz et al., 2018), there are no known previous studies examining the relation between traumatic loss and PTSD treatment response compared with other types of trauma. However, this alternative model is generally inconsistent with the larger literature on the association between depression and PTSD recovery, which suggests that symptoms and diagnosis of depression predict less natural (King et al, 2009; Tural, Önder, & Aker, 2012) and treatment-led PTSD recovery (Haagen et al., 2017) and that improvements in depression predict reduction in PTSD symptoms throughout PTSD treatment (Keller et al., 2014; Schumm et al., 2015).

This alternative model would imply that lack of recovery from depression is predicted by lack of recovery from PTSD, but it does not provide any explanation for the higher rates of PTSD nonrecovery in military populations. Thus, it would be impossible to speculate on potentially effective adjustments to evidence-based PTSD treatments to improve outcomes for service members and veterans. Time-lagged research is needed on the associations among traumatic loss, depression, and PTSD recovery in order to empirically parse apart these two models.

To our knowledge, the current study was the first to identify a suppression effect of depression on the recovery of PTSD in individuals with traumatic loss. The importance of these findings is elevated when considering the frequency of traumatic loss in the military coupled with recent data showing that military service members do not respond as well to first line PTSD treatments as do their civilian counterparts (Steenkamp, Litz, Hoge, & Marmar, 2015). The primary limitation to this study was the lack of assessment of traumatic grief, as our current findings did not allow us to tease apart the overlap of depression and traumatic grief as a suppressing mechanism. Future research should focus on separating the role of traumatic grief from depression in this model. The second limitation to this study was that symptoms of depression and PTSD were measured simultaneously; thus, it was not possible to determine the exact trajectory of change of depression and PTSD from pre- to posttreatment, and alternative explanatory models are also plausible. Session-by-session assessment of symptoms is needed to determine the points during treatment at which individuals who experienced traumatic loss index events differ from those who experienced other primary traumatic experiences. This would enable us to understand the specific components of treatment that should be tailored for a traumatic loss population. Additionally, in light of the fact that studies with women show more gains from evidence-based treatments for PTSD as compared to studies with mostly men (e.g. Galovski, Blain, Chappuis, & Fletcher, 2013; Sripada et al, 2017), the lack of women who experienced traumatic loss as their primary index event might have influenced our results. However, we think it is noteworthy in itself that none of the female service members reported this as their primary index event and would encourage future investigators to examine if this is the case in a broader sample of female service members as women take on combat roles in larger numbers. Finally, this study used indirect categorization of index events by trained coders rather than by the participant. Replication of this study using categories created by participant rating may yield different results. However, the high degree of interrater reliability between coders implies clear and meaningful categories were able to be derived using the current methodology.

In conclusion, it is of utmost importance to provide our military service members and veterans with gold standard, evidence-based mental health care for PTSD. Traumatic loss is a significant risk for our military personnel and veterans, and the presence of traumatic loss may inhibit recovery from PTSD. The current study provides preliminary data to assist providers and clinical researchers in understanding the potential role of traumatic loss and depression in PTSD recovery and continuing to make trauma-related treatment more effective for this population. As future research provides a better understanding of the unique challenges facing this group, we must continue to test and adapt treatment to best meet the needs of our military service members.

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