

Combat Experiences, Pre-Deployment Training, and Outcome of Exposure Therapy for Post-Traumatic Stress Disorder in Operation Enduring Freedom/Operation Iraqi Freedom Veterans

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The association between exposure to multiple potentially traumatic events (PTEs) and subsequent increased risk of post-traumatic stress disorder (PTSD) is well established. However, less is known about the relation between exposure to numerous PTEs, as is typical with military service, and treatment outcome. Furthermore, there has been little research examining military specific protective factors, such as pre-deployment preparedness, on PTSD treatment response. The current study investigated combat exposure and potential moderators of treatment outcome for exposure therapy in Operation Enduring Freedom/Operation Iraqi Freedom (OEF/OIF) veterans with PTSD. One hundred and eleven OEF/OIF veterans diagnosed with PTSD participated in 8 weeks of exposure therapy. Results indicated that increased combat exposure was associated with a reduced rate of change in PTSD symptoms but not depression symptoms. These findings were consistent across two measures of combat exposure. There was preliminary support for the moderating effect of pre-deployment preparedness on the association between combat exposure and treatment response. Together, these findings suggest that increased combat exposure is associated with poor treatment response in veterans with PTSD; however, this can be reduced by elevated pre-deployment preparedness. Copyright © 2012 John Wiley & Sons, Ltd.

Key Practitioner Message:

- Increased combat exposure is associated with poorer treatment response.
- Pre-deployment training is associated with improved treatment response.
- PTSD interventions should account for the frequency of combat in military personnel.

Keywords: PTSD, OEF/OIF, Veterans, Exposure Therapy, Combat Exposure, Pre-Deployment Preparedness

The cumulative effects of multiple potential traumatic events (PTEs) on the symptoms of post-traumatic stress disorder (PTSD) and response to treatment is an area of great interest (Cloitre *et al.*, 2009; Follette, Polusny, Bechtel, & Naugle, 1996; Kilpatrick, Resnick, & Acierno, 2009; Suliman *et al.*, 2009). On the basis of epidemiological findings, individuals rarely experience only a single PTE (Kessler, 2000; Kilpatrick, Acierno, Resnick, Saunders, & Best, 1997). Moreover, findings suggest that the effect of exposure to multiple PTEs is cumulative in that it is associated with increased symptoms of PTSD, anxiety and depression (Follette *et al.*, 1996; Hedtke *et al.*, 2008; Suliman

et al., 2009). In addition, these findings are consistent across civilian victims of rape, domestic violence and childhood sexual abuse (e.g., Follette *et al.*, 1996) as well as combat-exposed veterans (e.g., Hiley-Young, Blake, Abueg, Rozytko, & Gusman, 1995; Koenen, Stellman, Stellman, & Sommer, 2003; Owens *et al.*, 2009; Renshaw, 2011).

One area of particular concern is the influence of increased combat exposure on the severity and treatment of PTSD in veterans. Since 2001, nearly 1.5 million US service members have been deployed in Operation Enduring Freedom/Operation Iraqi Freedom (OEF/OIF; Committee on the Initial Assessment of Readjustment Needs of Military Personnel, Veterans and their Families, 2010), with many returning home with psychiatric disorders post-deployment (Hoge *et al.*, 2004). In addition, OEF/OIF veterans report increased combat exposure when compared with veterans of past military operations

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(Renshaw, Rodrigues, & Jones, 2009). Two recent studies demonstrated that increased exposure to combat has a curvilinear relation with PTSD symptoms during deployment in active duty soldiers (Lee, Goudarzi, Baldwin, Rosenfield, & Telch, 2011) and is linearly related to more severe post-deployment PTSD symptoms in a sample of recently returning veterans (Renshaw, 2011). Taken together, these findings indicate that OEF/OIF veterans may be at greater risk for negative mental health outcomes as a result of increased PTE exposure.

Interestingly, Renshaw (2011) provided preliminary evidence for the protective effect of pre-deployment training and preparation on the association between combat exposure and PTSD symptoms. The association between combat exposure and PTSD was diminished in those that reported higher levels of pre-deployment training. This finding is consistent with theoretical models of PTSD that suggest the disorder is associated with increased beliefs of a 'dangerous world' and an 'incompetent self' (Foa & Jaycox, 1999). Veterans who perceive greater pre-deployment training may view themselves as better able to deal with combat stress, view combat as less dangerous or both. As such, pre-deployment training may be a key protective factor in the development of PTSD in veterans who were exposed to greater combat. However, additional work on pre-deployment training is needed given the preliminary nature of these findings.

Considerable research suggests that exposure-based, cognitive behavioural interventions (e.g., prolonged exposure therapy; Foa, Hembree, & Rothbaum, 2007) and cognitive behavioural therapies (CBT) with significant exposure components (e.g., cognitive processing therapy; Resick & Schnicke, 1992) are effective treatments for PTSD (e.g., Foa, Rothbaum, Riggs, & Murdock, 1991; Schnurr *et al.*, 2007).

However, the impact of exposure to multiple PTEs on treatment response is unclear. In a review of the severity and characteristics of the event (Schottenbauer, Glass, Arnkoff, Tendick, & Gray, 2008), a mixed pattern of results was found for the impact of multiple PTEs on treatment outcome of exposure-based therapies. Childhood traumatic events were unrelated to treatment response for CBT in a large sample of sexual assault victims (Resick, Nishith, & Griffin, 2003). A history of childhood trauma was shown to be unrelated to treatment response in community samples with a broader presenting trauma history (Taylor, 2003; Van Minnen, Arntz, & Keijsers, 2002). The only study to examine the impact of aspects of the presenting trauma provided contradictory findings (Hembree, Street, Riggs, & Foa, 2004). Assault victims who were physically injured as a result of their trauma and had a history of childhood trauma responded poorer to treatment than those without such characteristics.

The findings of these studies suggest that historical PTEs such as childhood experiences may be unrelated to treatment response for a recent trauma. In contrast,

findings from the only study to examine specific sequelae of the presenting traumatic event, injury, demonstrated that increased PTEs were associated with decreased treatment response. Given the mixed state of these findings and the consistent use of civilian samples, it is unclear how these results generalize to combat veterans. All of these studies classified multiple PTEs as events from childhood as opposed to the multiple exposures to a recent trauma. The PTEs that are experienced by combat veterans occur within the relatively brief period of a deployment.

Furthermore, none of the prior studies assessed the impact that frequency of PTEs had on treatment response. Prior work demonstrates that an increased number of PTEs is associated with more severe initial PTSD symptoms (Filipas & Ullman, 2006; Lauterbach & Vrana, 2001; Schumm, Briggs-Phillips, & Hobfoll, 2006). Combat involves exposure to numerous PTEs in a brief period. Furthermore, the increased frequency of PTEs is associated with an increased likelihood of exposure to negative consequences (e.g., seeing dead bodies, being injured, seeing a fellow soldier harmed or killed). Frequent exposure to more severe trauma is hypothesized to be associated with poorer treatment response in this population. However, such conclusions cannot be drawn due to the lack of research on combat exposure's role in treatment response. All of the reviewed studies were completed with civilian victims of repeated sexual abuse/assault. Furthermore, no studies have examined the combined effect of exposure to multiple PTEs and the protective factor of perceived pre-deployment training on treatment response.

Thus, the present study investigated the influence of combat and perceived pre-deployment training on treatment response for exposure therapy in OEF/OIF veterans. Such work is consistent with recommendations to identify individual level variables that are indicative of treatment response (Krause, 2011; Thompson-Brenner, 2011). Identification of such variables allows researchers and clinicians to better tailor interventions to meet the needs of specific subgroups. For the current study, levels of combat exposure and perceived pre-deployment preparedness were identified as such variables. Participants for the current study were part of a larger randomized controlled trial comparing exposure therapy for PTSD delivered either via telehealth technologies or a traditional in-person settings (for an overview of the methods, refer to Gros *et al.*, 2011). The goal of the overall project is to provide support for telehealth treatments as a cost-effective, preferred and equally efficacious treatment for PTSD and related symptoms. For the purposes of the present study on combat exposure and treatment outcome, patients in both treatments conditions were considered in analyses and treatment modality was investigated as a potential moderator. We hypothesized that consistent with previous literature, increased combat exposure would be related to reduced treatment response in

OEF/OIF veterans and that pre-deployment preparedness would moderate this relation such that increased perceived pre-deployment training would attenuate the association between combat exposure and treatment response.

METHOD

Participants

Participants were 111 OEF/OIF veterans diagnosed with PTSD ($n = 72$) or subthreshold PTSD ($n = 39$) according to the Clinician-Administered PTSD Scale (CAPS; Blake *et al.*, 1995) and recruited through referrals at a large Southeastern VA Medical Center. Diagnoses were made by trained research staff supervised by a licensed clinical psychologist. Subthreshold PTSD was defined as endorsement of Criterion A (history of PTE) and B (re-experiencing symptoms of the trauma) for PTSD and either the Criterion C (avoidance symptoms) or D symptom cluster (arousal symptoms) as defined by the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) (Blanchard, Hickling, Taylor, Loos, & Gerardi, 1994; Grubaugh *et al.*, 2005). Persons who are actively psychotic or demented, individuals with both suicidal ideation and clear intent, or persons with substance dependence were excluded. Participants on active medications were required to maintain medications at current dosages for the duration of treatment.

The sample was primarily male ($n = 101$; 91%), employed ($n = 67$; 60%), and married ($n = 57$; 52%). The mean age was 31.66 years (standard deviation = 8.37 years). The sample was representative of the surrounding area with most participants self-identifying as Caucasian ($n = 56$; 51%) or African American ($n = 49$; 44%).

Intervention and Assessment Procedures

A full description of the larger study methodology involving a complete list of assessment measures, treatment protocols and the randomization process can be found in Gros *et al.*, (2011). An abbreviated presentation of the methodology that is most pertinent to the current study is presented below.

The treatment involved eight weekly 1.5-hour individual sessions of exposure therapy. Assessments were completed at 1-week pre-treatment, sessions 2, 4, 6, and immediately post-treatment (session 8). The pre-treatment and post-treatment assessments involved a series of clinician-rated and self-reported measures. Self-reported measures of PTSD and depression were administered at sessions 2, 4 and 6 in addition to the pre-treatment and post-treatment (session 8) assessments.

Telecommunications Technology

Treatment sessions for the telehealth patients were conducted using in-home videoconferencing technology as part of a larger study. Either an Internet-based instant video service (e.g., 'Skype') or an analogue videophone (Viterion 500 [Viterion Telehealth Care, Tarrytown, NY]) was used at the participant's discretion. Research has demonstrated that exposure therapy can be delivered effectively to individuals with PTSD via telehealth technologies (Germain, Marchand, Bouchard, Drouin, & Guay, 2009; Gros, Yoder, Tuerk, Lozano, & Acierno, 2011; Tuerk, Yoder, Ruggiero, Gros, & Acierno, 2010). After completing an initial assessment, participants were randomized to either receive treatment in-person ($n = 54$) or via telehealth ($n = 57$) as part of a larger study.

Exposure Therapy

The treatment was largely consistent with the treatment model described by Foa and colleagues (2007; Riggs, Cahill, & Foa, 2006) in which the primary components were *in vivo* and imaginal exposure trials. Exposure trials were completed in-session as well as scheduled for between session periods. A daily planner was used in order to maximize treatment participation and homework completion. As a secondary component, patients also were asked to schedule and track the completion of personally meaningful activities in their daily planner, consistent with the overarching guidelines of behavioural activation (Lejuez, Hopko, LePage, Hopko, & McNeil, 2001).

Measures

Beck Depression Inventory—2nd Edition (Beck, Steer, & Brown, 1996)

The Beck Depression Inventory—2nd Edition (BDI-II) is a 21-item measure designed to assess the cognitive, affective, behavioral, motivational and somatic symptoms of depression in adults and adolescents (Beck, Steer, & Brown, 1996). Each item is rated on a 0–3 scale with different responses based on the targeted symptom content. The BDI-II has demonstrated excellent test–retest reliability over a 1-week interval ($r = 0.93$), excellent internal consistency ($\alpha < 0.92$) and convergent and discriminant validity in multiple samples (Beck *et al.*, 1996; Steer & Clark, 1997).

Clinician-Administered PTSD Scale (Blake *et al.*, 1995)

The Clinician-Administered PTSD Scale (CAPS) is a clinician-rated scale designed to diagnose current and lifetime PTSD (Blake *et al.*, 1995). The CAPS targets the 17 specific PTSD symptoms from the DSM-IV (APA, 2000) to assess the intensity and frequency of each symptom

on a five-point Likert scale. The CAPS has been shown to have adequate internal consistency (α s ranged from 0.73 to 0.95), inter-rater reliability on the same interview (r s ranged from 0.92 to 0.99) and test-retest reliability over a 2-day to 3-day period across different interviewers (r s ranged from 0.77 to 0.98; for review, see Orsillo, 2002).

PTSD Checklist—Military (Weathers, Litz, Herman, Huska, & Keane, 1993)

The PTSD Checklist—Military (PCL-M) is a 17-item measure designed to assess PTSD symptom severity. Respondents are presented with 17 specific symptoms of PTSD and asked to rate 'how much you have been bothered by that problem in the last month' on a five-point Likert scale, ranging from 1 (not at all) to 5 (extremely). The PCL has been shown to have excellent internal consistency in veterans, victims of motor vehicle accidents and sexual assault survivors (α s > 0.94) and excellent test-retest reliability in veterans ($r = 0.96$). In addition, the PCL has demonstrated excellent convergent validity with alternative measures of PTSD (r s range from 0.77 to 0.93; Orsillo, 2002).

Combat Experiences Scale (Keane, Fairbank, Caddell, & Zimering, 1989)

The Combat Experiences Scale (CES) is a seven-item scale designed to assess the frequency of combat exposure on a five-point Likert scale (Keane *et al.*, 1989). Sample items include 'Were you ever under enemy fire?' and 'What percentage of soldiers in your unit were killed (KIA), wounded, or missing action (MIA)?' The CES has demonstrated high internal consistency ($\alpha = 0.85$) and test-retest reliability ($r = 0.97$) and is a consistent predictor of PTSD symptomatology in veterans (Keane *et al.*, 1989).

Deployment Risk and Resiliency Inventory (L. A. King, King, Vogt, Knight, & Samper, 2006)

The Deployment Risk and Resiliency Inventory (DRRI) consists of 13 subscales to assess pre-deployment, active duty and post-deployment factors in recently returning combat veterans (L. A. King *et al.*, 2006). For the current study, two subscales were of interest—the DRRI-C (Training and Deployment Preparation; items include 'I was accurately informed about what to expect from the enemy.') and the DRRI-I (Combat Experiences; items include 'I personally witnessed someone from my unit or an ally unit being seriously wounded or killed.'). Work with OEF/OIF veterans has shown the DRRI to demonstrate acceptable internal consistency for the subscales (α s > 0.81) and convergent and discriminative validity (Vogt, Proctor, King, King, & Vasterling, 2008).

Data Analysis

The current hypotheses were assessed with multilevel modelling (MLM). MLM is considered a superior method for analyzing longitudinal data as opposed to ordinary least square regression approaches for several reasons including its improved mechanism for handling missing data and its ability to handle repeated measures (Singer & Willett, 2003). MLM divides variance across two levels. Level 1 contains variance attributed to intra-individual changes (i.e., change associated with treatment) and level 2 contains variation attributed to inter-individual differences (i.e., differences in combat exposure). Linear change models were fitted to the data that included a level 1 fixed effect for intercept (β_{00}), representing pre-treatment severity, and slope (β_{10}), representing the rate of change during treatment, and a random effect to capture residual variation. A level 2 model was fitted to the data that included measures of combat severity, pre-deployment preparedness, an interaction between these effects as predictors of intercept (β_{01}) and slope (β_{11}) and corresponding random effects to capture individual level residual variation. Data analyses were performed with SPSS 19 (SPSS Inc., Chicago, IL) and HLM 6.08 (Lincolnwood, IL).

RESULTS

Descriptive statistics are reported in Table 1. Bivariate relations amongst PCL-M, BDI-II, DRRI-I, CES and DRRI-C were conducted to assess for multicollinearity. CES and DRRI-I scores were positively related ($r = 0.67$, $p < 0.01$), and BDI-II and PCL-M scores were positively related ($r = 0.83$, $p < 0.01$). As such, these variables were included in separate analyses. MLM was used to assess the rate of change in PCL-M and BDI-II scores during the course of treatment. An unconditional change model that included subthreshold PTSD as a fixed effect for intercept and slope suggested that PCL-M scores ($\beta_{10} = -1.75$, $p < 0.01$) and BDI-II scores ($\beta_{10} = -0.91$, $p < 0.01$) declined during the course of treatment. The fixed effect for subthreshold PTSD for the intercept was significant for the PCL-M ($\beta_{01} = -14.37$, $p < 0.01$) and BDI-II ($\beta_{01} = -10.83$, $p < 0.01$), but it was not significant for slope (PCL-M: $\beta_{11} < 0.01$, $p = 0.99$; BDI: $\beta_{11} = 0.17$, $p = 0.71$). As such, subthreshold PTSD diagnosis was retained as a fixed effect for the intercept but was removed as a fixed effect for slope. Prior to conducting the primary outcome analyses, potential covariates were examined including treatment type (in person or telehealth), age, self-reported ethnicity, sex and marital status. None of these variables were significantly associated with intercept or slope and were not included in the tested models.

Table 1. Descriptive statistics for outcome and moderators of treatment response

| | Pre-treatment | Session 2 | Session 4 | Session 6 | Post-treatment (session8) |
|-------------------|---------------|---------------|---------------|---------------|---------------------------|
| Symptom variables | | | | | |
| PCL | 56.70 (15.21) | 55.21 (14.88) | 49.54 (16.53) | 45.47 (17.17) | 44.64 (17.55) |
| BDI | 23.64 (11.39) | 21.62 (10.73) | 18.13 (10.06) | 17.00 (11.02) | 17.09 (12.44) |
| CAPS | 60.72 (18.50) | – | – | – | 47.87 (25.02) |
| Combat exposure | | | | | |
| CES | 20.45 (5.86) | – | – | – | – |
| DRRI-I | 20.93 (4.05) | – | – | – | – |
| Moderators | | | | | |
| DRRI-C | 51.32 (9.38) | – | – | – | – |

PCL-M = PTSD Check List—Military Version. BDI-II = Beck Depression Inventory. CAPS = Clinician-Administered PTSD Scale. CES = Combat Exposure Scale. DRRI-I = Deployment Risk and Resilience Inventory, I (combat exposure) subscale. DRRI-C = Deployment Risk and Resilience Inventory, C (Pre-deployment training).

Combat Exposure as Predictor of Treatment Response

Separate models were used for the CES and DRRI-I subscales to address potential multicollinearity issues due to a moderate correlation between the measures ($r=0.67$, $p<0.01$). The CES and DRRI-I were entered as level 2 fixed effects for intercept and slope for the PCL-M and BDI-II. For the PCL-M, CES scores were not significantly associated with intercept ($\beta_{01}=0.35$, $p=0.25$) but were positively associated with slope ($\beta_{11}=0.08$, $p<0.05$). Similar findings were obtained for the DRRI-I in that it was not significantly related to intercept ($\beta_{01}=0.19$, $p=0.67$) but was positively related to slope ($\beta_{11}=0.18$, $p<0.05$). CES and DRRI-I scores accounted for 11% and 12%, respectively, of the variance in slope for the PCL-M. These findings suggest that increased CES and DRRI-I scores, indicative of increased combat exposure, were associated with a lower rate of change in PCL-M scores, suggesting slower treatment response.

For the BDI-II, CES scores were not significantly associated with intercept ($\beta_{01}=0.15$, $p=0.46$) and slope ($\beta_{11}=0.02$, $p=0.34$). Similar findings were obtained for the DRRI-I in that it was not significantly related to intercept ($\beta_{01}=0.19$, $p=0.67$) and slope ($\beta_{11}=0.07$, $p=0.41$). Furthermore, the effect sizes were small with the CES and DRRI-I accounting for 4% and 2% respectively, of the variance in slope for the BDI-II. This suggests that combat exposure was unrelated to the rate of change in BDI-II scores.

Moderating Effect of Pre-Deployment Training on the Relation Between Combat Exposure and Treatment Response

The DRRI-C (Training and Deployment Preparation) and a DRRI-C \times combat exposure (CES/DRRI-I) interaction were included as fixed effects for the slope of the PCL-M and BDI-II (Table 2). For the PCL-M, the DRRI-C had a significant fixed effect ($\beta_{12}=-0.05$, $p<0.05$) and a

significant interaction with the CES ($\beta_{13}=0.01$, $p<0.01$). Similar findings were obtained for the DRRI-I subscale such that the interaction term approached significance ($\beta_{13}=0.01$, $p=0.06$). The interaction term with the CES accounted for 13% of the variance in slope for the PCL-M. The interaction term for the DRRI-I accounted for 6% of the variance in slope for the PCL-M. Interaction effects typically have small effect sizes (Aiken & West, 1991) that can make them difficult to detect in smaller samples (Heo & Leon, 2010). Given that effects were found across two measures of combat exposure, prior research has supported an interaction between combat exposure and pre-deployment training in a combat-exposed sample (Renshaw, 2011), and the limitations of the 0.05 criteria (Cohen, 1994; Nickerson, 2000; Van De Schoot, Hoijtink, & Romeijn, 2011), the interaction between the DRRI-C and the DRRI-I, was considered valid and was interpreted.

The interaction was probed at $+/-1$ standard deviation of the combat exposure measures (CES, DRRI-I) and the DRRI-C. The findings suggested that the relation between combat exposure (CES, DRRI-I) and treatment response for PTSD was attenuated by elevated pre-deployment training (DRRI-C) (Figure 1).

For the BDI-II, the DRRI-C was unrelated to treatment response ($\beta_{12}=-0.03$, $p=0.54$). Furthermore, the interactions between the DRRI-C and CES ($\beta_{13}=0.01$, $p=0.87$) and DRRI-C and DRRI-I ($\beta_{13}=0.01$, $p=0.57$) were not significant (Table 2).

DISCUSSION

The present study investigated the relation between combat exposure and treatment response in OEF/OIF veterans with PTSD. Findings suggested that increased combat exposure was associated with a lower rate of change in PTSD symptoms but not depressive symptoms. Additionally, the findings provided partial support for pre-deployment preparedness as moderator of this

Table 2. Multilevel model examining combat exposure and pre-deployment training as moderators of treatment response for PTSD and depression symptoms

| Combat exposure measure | | PCL-M | |
|---------------------------------|--------------|-----------------|---------------------------|
| | | CES | DRRI-I |
| Intercept | β_{00} | 62.93** (2.11) | 62.75** (2.20) |
| Subthreshold PTSD | β_{02} | -14.48** (3.31) | -14.10** (3.38) |
| Slope | β_{10} | -1.70** (0.33) | -1.62** (2.60) |
| Combat exposure | β_{11} | 0.09** (0.02) | 0.11* (0.05) |
| Pre-deployment training | β_{12} | -0.05** (0.02) | -0.07* (0.03) |
| Combat exposure \times DRRI-C | β_{13} | 0.01** (0.002) | 0.01 ⁺ (0.004) |
| | | BDI-II | |
| | | CES | DRRI-I |
| Intercept | β_{00} | 27.96** (1.60) | 27.85** (1.61) |
| Subthreshold PTSD | β_{01} | -10.64** (2.10) | -10.40** (2.10) |
| Slope | β_{10} | -0.90** (0.20) | -0.88** (0.20) |
| Combat exposure | β_{11} | 0.03 (0.03) | 0.04 (0.04) |
| Pre-deployment training | β_{12} | -0.03 (0.02) | -0.03 (0.02) |
| Combat exposure \times DRRI-C | β_{13} | 0.01 (0.01) | 0.01 (0.003) |

* $p < 0.05$.** $p < 0.01$. ⁺ $p = 0.06$.

PCL-M = PTSD Check List—Military Version. CES = Combat Exposure Scale. DRRI-I = Deployment Risk and Resilience Inventory, I (combat exposure) subscale. DRRI-C = Deployment Risk and Resilience Inventory, C (Pre-deployment training). BDI-II = Beck Depression Inventory.

relation such that increased pre-deployment preparedness reduced the strength of the association between combat exposure and treatment response for PTSD symptoms. Taken together, these findings suggest that although combat exposure is associated with poorer PTSD treatment response, this effect may be attenuated by increased pre-deployment preparedness.

The findings from the existing literature on the frequency of PTEs and treatment outcome are mixed and

focused primarily on civilian samples with sexual abuse and assault histories (Schottenbauer *et al.*, 2008). In contrast to previous findings, the present study demonstrated a consistent negative influence of repeated PTEs (i.e., combat exposure) on treatment outcome across two measures. There are several possible explanations for this difference. First, the sample used in the current study, combat veterans, differed from those used in previous research (Hembree *et al.*, 2004; Resick *et al.*, 2003). The

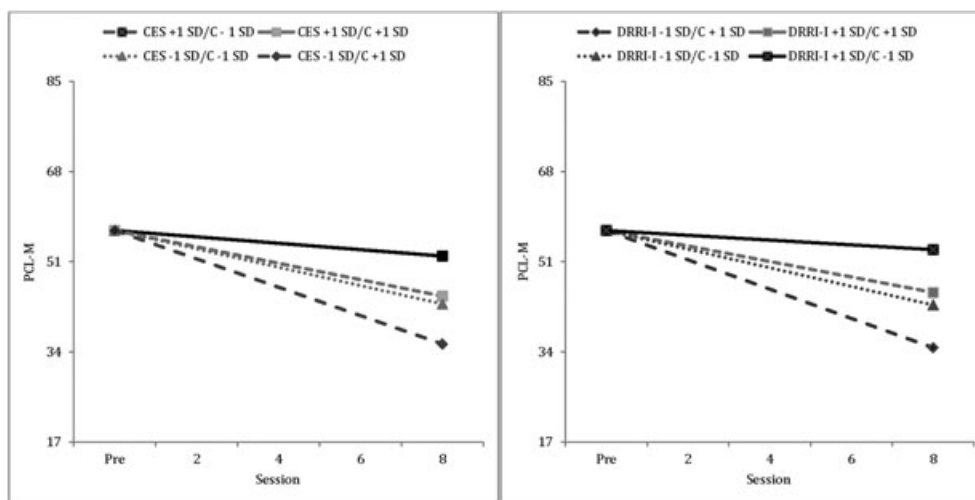


Figure 1. Outcome trajectories for PCL-M at ± 1 standard deviation (SD) of the CES and ± 1 SD of the pre-deployment training subscale. CES = Combat Exposure Scale. DRRI-I = Deployment Risk and Resilience Inventory, I (Combat Exposure) subscale. PCL-M = PTSD Check List—Military Version. C = DRRI-C = pre-deployment training subscale

differences in qualitative (e.g., combat in a foreign country as opposed to assault in one's home) or quantitative (e.g., consistent exposure to ongoing combat as opposed to distinct periods of assault) aspects of the trauma could have impacted treatment response. Additional cross-trauma comparative research is needed to better understand the differences across populations of trauma-exposed individuals. Second, in contrast to previous research that used correlational and regression analyses, the present study utilized MLM, which may have been more sensitive in detecting differences. MLM provides estimates of rates of change as opposed to overall pre-treatment to post-treatment symptom changes (Singer & Willett, 2003). Additional research on veterans and other populations using MLM would be useful in providing additional support for the influence of multiple traumas on treatment outcome.

Another implication of the findings relates to the moderating effect of pre-deployment preparedness (i.e., perceived readiness for combat or resilience training) and preparation on the relation between combat exposure and treatment outcome. Pre-deployment training and combat readiness programs have gained in popularity in the US military (e.g., 'Battlemind training') (Castro & Hoge, 2005; Hall, Cipriano, & Bicknell, 1997; Sharpley, Fear, Greenberg, Jones, & Wessely, 2008). However, evidence regarding the impact that these programs have on those that go on to develop PTSD and subsequently enter treatment have yet to be reported. The present findings are the first to suggest that pre-deployment preparedness may serve to reduce the negative impact of increased combat exposure on treatment response for PTSD.

The present findings also identified a different pattern of results for the symptoms of PTSD and depression. Specifically, combat exposure was not statistically related to treatment response for symptoms of depression, and the effect sizes were also substantially smaller than those for the symptoms of PTSD. This finding was surprising given the highly overlapping nature of the symptoms of depression and PTSD (Gros, Simms, & Acierno, 2010; Kessler, Sonnega, Bromet, & Hughes, 1995; Perkonig, Kessler, Storz, & Wittchen, 2000). More specifically, recent research has demonstrated that specific symptoms of PTSD—referred to as symptoms of dysphoria (Simms, Watson, & Doebbell, 2002) or numbing (D. W. King, Leskin, King, & Weathers, 1998)—are more associated with depression than PTSD itself (Gros *et al.*, 2010). Given these findings, the present study may suggest that the influence of combat exposure is most strongly related to the PTSD-specific symptoms, namely re-experiencing, avoidance, and hyperarousal. Interestingly, these symptoms (re-experiencing, avoidance, and hyperarousal) are most commonly targeted using exposure therapy, potentially explaining the identified changes in treatment outcome

in the present study. However, note that recent empirical research has suggested that the symptom overlap between depression and PTSD does not fully account for this comorbidity (van Emmerik & Kamphuis, 2011). Future work is needed to identify factors that are associated with the treatment of co-occurring depression in PTSD patients.

Several limitations of the present study require consideration. First, the present study relied on retrospective, self-reported measures of combat exposure and pre-deployment training and support. More formal documentation of the extent and content of pre-deployment training should follow in future studies, though accessing this information is somewhat difficult. Moreover, despite similar findings having been obtained for pretreatment levels of PTSD (Renshaw, 2011), implications of the findings of the current study should be interpreted with caution given the limitations of the methodology. Recently, Lee and colleagues (2011) developed the Combat Experience Log (CEL), a system by which combat experiences are reported by active duty service members while they are in theater. The CEL provides a method to assess exposure to PTEs that is less vulnerable to retrospective bias and could be used in prospective studies of PTSD development and treatment response. Furthermore, the CEL will be able to capture more relevant aspects of combat experience that may be associated with resilience and outcomes such as perceived threat during a combat experience. Second, although all patients endorsed significant Criteria A PTEs on the CAPS, the combat exposure questionnaires assessed the amount of combat exposure, rather than PTEs, limiting conclusions regarding multiple traumatic exposures. Third, the study involved single measures of self-reported PTSD and depression as the outcomes. Future studies should incorporate more thorough assessment procedures of these constructs to replicate and expand the findings of the present study. Finally, an extensive trauma history for each patient was not available and so the current study was unable to control for the effects of past traumas, including that of childhood traumatic events.

In conclusion, the present study is among the first to demonstrate a negative relation between increased combat exposure and treatment response for PTSD symptoms in OEF/OIF veterans. However, perceived pre-deployment training moderated this relation such that increased perceptions of pre-deployment training reduced the impact of combat exposure on treatment response. These findings highlight the important role of increased combat exposure in the treatment of PTSD symptoms and provide preliminary evidence as to the additive benefits of combat training on treatment response. Researchers are encouraged to replicate these findings in order to provide more substantial evidence as to the role of these variables with the goal of enhancing the treatment process.

REFERENCES

- Aiken, L.S., & West, S.G. (1991). *Multiple regression: Testing and interpreting interactions*. Newbury Park, CA: Sage.
- American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders*. (4th ed., text rev.). Washington, DC: Author.
- Beck, A.T., Steer, R.A., & Brown, G.K. (1996). *Beck depression inventory-II (BDI-II)*. San Antonio, TX: Psychological Corporation.
- Blake, D.D., Weathers, F.W., Nagy, L.M., Kaloupek, D.G., Gusman, F.D., Charney, D.S., & Keane, T.M. (1995). The development of a clinician-administered PTSD scale. *Journal of Traumatic Stress*, 8(1), 75–90.
- Blanchard, E.B., Hickling, E.J., Taylor, A.E., Loos, W.R., & Gerardi, R.J. (1994). Psychological morbidity associated with motor vehicle accidents. *Behaviour Research and Therapy*, 32(3), 283–290.
- Castro, C.A., & Hoge, C.W. (2005). Building psychological resilience and mitigating the risks of combat and deployment stressors faced by soldiers. In *Strategies to maintain combat readiness during extended deployments—A human systems approach* (pp. 13–11).
- Cloitre, M., Stolbach, B.C., Herman, J.L., Kolk, B., Pynoos, R., Wang, J., & Petkova, E. (2009). A developmental approach to complex PTSD: Childhood and adult cumulative trauma as predictors of symptom complexity. *Journal of Traumatic Stress*, 22(5), 399–408.
- Cohen, J. (1994). The earth is round ($p < 0.05$). *American Psychologist*, 49(12), 997–1003.
- van Emmerik, A.A.P., & Kamphuis, J.H. (2011). Testing a DSM-5 reformulation of posttraumatic stress disorder: Impact on prevalence and comorbidity among treatment-seeking civilian trauma survivors. *Journal of Traumatic Stress*, 24(2), 213–217. DOI: 10.1002/jts.20630
- Filipas, H.H., & Ullman, S.E. (2006). Child sexual abuse, coping responses, self-blame, posttraumatic stress disorder, and adult sexual revictimization. *Journal of Interpersonal Violence*, 21(5), 652.
- Foa, E.B., & Jaycox, L.H. (1999). Cognitive-behavioral theory and treatment of posttraumatic stress disorder. In D. Spiegel (Ed.), *Efficacy and cost-effectiveness of psychotherapy* (pp. 23–61). Washington, DC: American Psychiatric Press.
- Foa, E.B., Hembree, E.A., & Rothbaum, B.O. (2007). *Prolonged exposure therapy for PTSD: Emotional processing of traumatic experiences: Therapist guide*. New York, NY: Oxford University Press.
- Foa, E.B., Rothbaum, B.O., Riggs, D.S., & Murdock, T.B. (1991). Treatment of posttraumatic stress disorder in rape victims: A comparison between cognitive-behavioral procedures and counseling. *Journal of Consulting and Clinical Psychology*, 59(5), 715–723.
- Follette, V.M., Polusny, M.A., Bechtle, A.E., & Naugle, A.E. (1996). Cumulative trauma: the impact of child sexual abuse, adult sexual assault, and spouse abuse. *Journal of Traumatic Stress*, 9(1), 25–35.
- Germain, V., Marchand, A., Bouchard, S., Drouin, M.S., & Guay, S. (2009). Effectiveness of cognitive behavioural therapy administered by videoconference for posttraumatic stress disorder. *Cognitive Behaviour Therapy*, 38(1), 42–53.
- Gros, D.F., Strachan, M., Ruggiero, K.J., Knapp, R.G., Frueh, B.C., Egged, L.E., Lejuez, C.W., Tuerk, P.W., Acierno, R. (2011). Innovative service delivery for secondary prevention of PTSD in at-risk OIF-OEF service men and women. *Contemporary Clinical Trials*, 32(1), 122–128. DOI: 10.1016/j.cct.2010.10.003
- Gros, D.F., Yoder, M., Tuerk, P.W., Lozano, B.E., & Acierno, R. (2011). Exposure therapy for PTSD delivered to veterans via telehealth: Predictors of treatment completion and outcome and comparison to treatment delivered in person. *Behavior Therapy*, 42(2), 276–283. DOI: 10.1016/j.beth.2010.07.005
- Gros, D.F., Simms, L.J., & Acierno, R. (2010). Specificity of post-traumatic stress disorder symptoms: An investigation of comorbidity between posttraumatic stress disorder symptoms and depression in treatment-seeking veterans. *The Journal of Nervous and Mental Disease*, 198(12), 885–890. 810.1097/NMD.1090b1013e3181fe7410.
- Grubaugh, A.L., Magruder, K.M., Waldrop, A.E., Elhai, J.D., Knapp, R.G., & Frueh, B.C. (2005). Subthreshold PTSD in primary care: Prevalence, psychiatric disorders, healthcare use, and functional status. *The Journal of Nervous and Mental Disease*, 193(10), 658–664.
- Hall, D.P., Cipriano, E.D., & Bicknell, G. (1997). Preventive mental health interventions in peacekeeping missions to Somalia and Haiti. *Military Medicine*, 162(1), 41–43.
- Hedtke, K.A., Ruggiero, K.J., Fitzgerald, M.M., Zinzow, H.M., Saunders, B.E., Resnick, H.S., & Kilpatrick, D.G. (2008). A longitudinal investigation of interpersonal violence in relation to mental health and substance use. *Journal of Consulting and Clinical Psychology*, 76(4), 633–647.
- Hembree, E.A., Street, G.P., Riggs, D.S., & Foa, E.B. (2004). Do assault-related variables predict response to cognitive behavioral treatment for PTSD? *Journal of Consulting and Clinical Psychology*, 72(3), 531–534.
- Heo, M., & Leon, A.C. (2010). Sample sizes required to detect two-way and three-way interactions involving slope differences in mixed-effects linear models. *Journal of Biopharmaceutical Statistics*, 20(4), 787–802.
- Hiley-Young, B., Blake, D.D., Abueg, F.R., Rozyrko, V., & Gusman, F.D. (1995). Warzone violence in Vietnam: An examination of premilitary, military, and postmilitary factors in PTSD in-patients. *Journal of Traumatic Stress*, 8(1), 125–141.
- Hoge, C.W., Castro, C.A., Messer, S.C., McGurk, D., Cotting, D.I., & Koffman, R.L. (2004). Combat duty in Iraq and Afghanistan, mental health problems, and barriers to care. *The New England Journal of Medicine*, 351(1), 13–22.
- Keane, T.M., Fairbank, J.A., Caddell, J.M., & Zimering, R.T. (1989). Implosive (flooding) therapy reduces symptoms of PTSD in Vietnam combat veterans*. *Behavior Therapy*, 20(2), 245–260.
- Kessler, R.C. (2000). Posttraumatic stress disorder: The burden to the individual and to society. *The Journal of Clinical Psychiatry*, 61, 4–14.
- Kessler, R.C., Sonnega, A., Bromet, E., & Hughes, M. (1995). Post-traumatic stress disorder in the National Comorbidity Survey. *Archives of General Psychiatry*, 52(12), 1048–1060.
- Kilpatrick, D.G., Acierno, R., Resnick, H.S., Saunders, B.E., & Best, C.L. (1997). A 2-year longitudinal analysis of the relationships between violent assault and substance use in women. *Journal of Consulting and Clinical Psychology*, 65(5), 834–847.
- Kilpatrick, D.G., Resnick, H.S., & Acierno, R. (2009). Should PTSD criterion A be retained? *Journal of Traumatic Stress*, 22(5), 374–383.
- King, L.A., King, D.W., Vogt, D.S., Knight, J., & Samper, R.E. (2006). Deployment risk and resilience inventory: A collection of measures for studying deployment-related experiences

- of military personnel and veterans. *Military Psychology*, 18(2), 89–120.
- King, D.W., Leskin, G.A., King, L.A., & Weathers, F.W. (1998). Confirmatory factor analysis of the clinician-administered PTSD scale: Evidence for the dimensionality of posttraumatic stress disorder. *Psychological Assessment*, 10(2), 90–96.
- Koenen, K.C., Stellman, J.M., Stellman, S.D., & Sommer Jr, J.F. (2003). Risk factors for course of posttraumatic stress disorder among Vietnam veterans: A 14-year follow-up of American legionnaires. *Journal of Consulting and Clinical Psychology*, 71(6), 980–986.
- Krause, M.S. (2011). Statistical significance testing and clinical trials. *Psychotherapy*, 48(3), 217–222.
- Lauterbach, D., & Vrana, S. (2001). The relationship among personality variables, exposure to traumatic events, and severity of posttraumatic stress symptoms. *Journal of Traumatic Stress*, 14(1), 29–45.
- Lee, H.-J., Goudarzi, K., Baldwin, B., Rosenfield, D., & Telch, M.J. (2011). The combat experience log: A web-based system for the in theater assessment of war zone stress. *Journal of Anxiety Disorders*, 25(6), 794–800. DOI: 10.1016/j.janxdis.2011.03.018
- Lejuez, C.W., Hopko, D.R., LePage, J.P., Hopko, S.D., & McNeil, D.W. (2001). A brief behavioral activation treatment for depression. *Cognitive and Behavioral Practice*, 8(2), 164–175. DOI: 10.1016/s1077-7229(01)80022-5
- Nickerson, R.S. (2000). Null hypothesis significance testing: A review of an old and continuing controversy. *Psychological Methods*, 5(2), 241.
- Orsillo, S. (2002). Measures for acute stress disorder and posttraumatic stress disorder. In M.M. Antony, S. Orsillo, & L. Roemer (Eds.), *Practitioner's guide to empirically based measures of anxiety* (pp. 255–307).
- Owens, G.P., Dashevsky, B., Chard, K.M., Mohamed, S., Haji, U., Heppner, P.S., & Baker, D.G. (2009). The relationship between childhood trauma, combat exposure, and posttraumatic stress disorder in male veterans. *Military Psychology*, 21(1), 114–125.
- Perkonig, A., Kessler, R.C., Storz, S., & Wittchen, H. (2000). Traumatic events and post traumatic stress disorder in the community: Prevalence, risk factors and comorbidity. *Acta Psychiatrica Scandinavica*, 101(1), 46–59.
- Renshaw, K.D. (2011). An integrated model of risk and protective factors for post-deployment PTSD symptoms in OEF/OIF era combat veterans. *Journal of Affective Disorders*, 128(3), 321–326. DOI: 10.1016/j.jad.2010.07.022
- Renshaw, K.D., Rodrigues, C.S., & Jones, D.H. (2009). Combat exposure, psychological symptoms, and marital satisfaction in national guard soldiers who served in operation Iraqi freedom from 2005 to 2006. *Anxiety, Stress and Coping*, 22(1), 101–115.
- Resick, P.A., Nishith, P., & Griffin, M.G. (2003). How well does cognitive-behavioral therapy treat symptoms of complex PTSD? An examination of child sexual abuse survivors within a clinical trial. *CNS Spectrums*, 8(5), 340.
- Resick, P.A., & Schnicke, M.K. (1992). Cognitive processing therapy for sexual assault victims. *Journal of Consulting and Clinical Psychology*, 60(5), 748.
- Riggs, D.S., Cahill, S.P., & Foa, E.B. (2006). Prolonged exposure treatment of posttraumatic stress disorder. In V.M. Follette & J.I. Ruzek (Eds.), *Cognitive-behavioral therapies for trauma* (2nd ed., pp. 65–95). New York: Guilford.
- Schnurr, P.P., Friedman, M.J., Engel, C.C., Foa, E.B., Shea, M.T., Chow, B.K., Resick, P.A., Thurston, V., Orsillo, S.M., Haug, R., Turner, C., Bernardy, N. (2007). Cognitive behavioral therapy for posttraumatic stress disorder in women. *JAMA: The Journal of the American Medical Association*, 297(8), 820–830.
- Schottenbauer, M.A., Glass, C.R., Arnkoff, D.B., Tendick, V., & Gray, S.H. (2008). Nonresponse and dropout rates in outcome studies on PTSD: Review and methodological considerations. *Psychiatry: Interpersonal and Biological Processes*, 71(2), 134–168.
- Schumm, J.A., Briggs-Phillips, M., & Hobfoll, S.E. (2006). Cumulative interpersonal traumas and social support as risk and resiliency factors in predicting PTSD and depression among inner city women. *Journal of Traumatic Stress*, 19(6), 825–836.
- Sharpely, J., Fear, N., Greenberg, N., Jones, M., & Wessely, S. (2008). Pre-deployment stress briefing: Does it have an effect? *Occupational Medicine*, 58(1), 30–34.
- Simms, L.J., Watson, D., & Doebbell, B.N. (2002). Confirmatory factor analyses of posttraumatic stress symptoms in deployed and nondeployed veterans of the Gulf War. *Journal of Abnormal Psychology*, 111(4), 637–647.
- Singer, J.D., & Willett, J.B. (2003). *Applied longitudinal data analysis: Modeling change and event occurrence*. New York, NY: Oxford University Press.
- Steer, R.A., & Clark, D.A. (1997). *Psychometric characteristics of the beck depression inventory-II with college students*. *Measurement and Evaluation in Counseling and Development*, 30(3), 128–136.
- Suliman, S., Mkabile, S.G., Fincham, D.S., Ahmed, R., Stein, D.J., & Seedat, S. (2009). Cumulative effect of multiple trauma on symptoms of posttraumatic stress disorder, anxiety, and depression in adolescents. *Comprehensive Psychiatry*, 50(2), 121–127.
- Taylor, S. (2003). Outcome predictors for three PTSD treatments: exposure therapy, EMDR, and relaxation training. *Journal of Cognitive Psychotherapy*, 17(2), 149–162.
- Thompson-Brenner, H. (2011). Introduction to the special section: Contextualizing significance testing in clinical trials. *Psychotherapy*, 48(3), 215.
- Tuerk, P.W., Yoder, M., Ruggiero, K.J., Gros, D.F., & Acierno, R. (2010). A pilot study of prolonged exposure therapy for post-traumatic stress disorder delivered via telehealth technology. *Journal of Traumatic Stress*, 23(1), 116–123.
- Van De Schoot, R., Hoijtink, H., & Romeijn, J.W. (2011). Frontiers: Moving beyond traditional null hypothesis testing: Evaluating expectations directly. *Frontiers in Quantitative Psychology And Measurement*, 2.
- Van Minnen, A., Arntz, A., & Keijsers, G. (2002). Prolonged exposure in patients with chronic PTSD: predictors of treatment outcome and dropout. *Behaviour Research and Therapy*, 40(4), 439–457.
- Vogt, D.S., Proctor, S.P., King, D.W., King, L.A., & Vasterling, J.J. (2008). Validation of scales from the deployment risk and resilience inventory in a sample of operation Iraqi freedom veterans. *Assessment*, 15(4), 391.
- Weathers, F.W., Litz, B.T., Herman, D.S., Huska, J.A., & Keane, T.M. (1993). The PTSD checklist (PCL): Reliability, validity, and diagnostic utility. Paper presented at the ISTSS, San Antonio, TX.

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