THE STRUCTURE OF PTSD AND DEPRESSION SYMPTOMS IN MARINES BEFORE AND AFTER DEPLOYMENT

by
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A thesis submitted to the Faculty of the University of Delaware in partial fulfillment of the requirements for the degree of Master of Arts in Psychology

Fall 2014

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ACKNOWLEDGMENTS

I would like to thank Adele Hayes, my advisor, for all of her input and guidance throughout this project, as well as Beth Ready and Carly Yasinski for their advice. I would like to thank Brett Litz and Bill Nash for allowing me to perform this investigation using their data, and Brett Litz and Alyssa Boasso for their support and guidance. Lastly, I would like to thank my wife, Jaime Barnes, for her patience, support, and love throughout this process.

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ABSTRACT

Some research has suggested that the symptoms of Posttraumatic Stress Disorder (PTSD) and Major Depressive Disorder may constitute one post-trauma reaction. The current study aimed to extend this research by investigating the extent to which symptoms of PTSD and depression [as measured by the Posttraumatic Stress Disorder Checklist (PCL) and the Beck Depression Inventory-II (BDI-II)] are hierarchical in nature, with a common general distress factor and variance specific to each measure, and whether this structure changes before and after a stressful military deployment. The same sample of 298 marines deployed to Afghanistan in 2010 was assessed 1-month before deployment, and 1- and 5-months after returning from deployment, using self-report measures of PTSD and depression, as well as measures of affectivity, lifetime trauma, current deployment trauma, and coping. At all three assessments, PTSD and depression symptoms loaded onto one higher-order factor. In addition, there was remaining variance specific to each measure at the baseline and 5-month post-return assessments. At the 1-month assessment, the PTSD-specific factor was less strong, and the depression-specific factor did not reach statistical significance. These findings suggest a robust and stable common symptom presentation that might be particularly strong in the aftermath of exposure to potentially traumatic experiences. Yet, there are also symptom patterns specific to PTSD and depression that warrant investigation.

Chapter 1

INTRODUCTION

Because Major Depressive Disorder and Posttraumatic Stress Disorder (PTSD) are among the most commonly co-occurring diagnoses (Brown, Campbell, Lehman, Grisham, & Mancill, 2001; Kessler, Chiu, Demler, & Walters, 2005; Rytwinski, Scur, Feeny, & Youngstrom, 2013), and their co-occurrence is associated with increased symptom severity and lower functioning, this symptom overlap has been of particular interest to researchers.

Factor analytic studies suggest that PTSD symptoms fit best in factors consisting of mostly mood disorders rather than anxiety disorders (Cox, Clara, & Enns, 2002; Slade & Watson, 2006). Furthermore, Watson (2005) proposed a collapsed category of emotional disorders for the updated version of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5, APA, 2013), in which PTSD was to be considered a distress disorder along with Major Depressive Disorder, Dysthymia, and Generalized Anxiety Disorder. Several theoretical reasons have been proposed to account for this overlap of mood and anxiety disorder symptoms.

1.1 The Commonality of Mood and Anxiety

In broad conceptualizations of symptom overlap in psychopathology, some researchers have proposed a higher-order "negative affect syndrome" that characterizes specific mood and anxiety disorders as surface-level variations of a shared underlying vulnerability (Andrews, 1990; Barlow, Allen, & Choate, 2004; Brown, Chorpita, & Barlow, 1998; Clark & Watson, 1991). This work is related to

Clark and Watson's (1991) tripartite model of depression and anxiety, in which they propose that shared high negative affect (also termed general distress) and low positive affect are specific to depression, and autonomic arousal is specific to anxiety. Brown and colleagues (1998) later found that the specificity of autonomic arousal may only pertain to certain anxiety disorders (e.g., panic disorder and agoraphobia) and that low positive affect may not only be associated with depression, but also with some specific anxiety disorders (e.g., Social Phobia; Kotov, Watson, Robles, & Schmidt, 2007). Nonetheless, the common negative affectivity factor has remained salient across studies (see Watson, 2005). Barlow (2000) extended this work in his triple vulnerability theory of emotional disorders that posits: 1) an underlying genetic vulnerability manifesting as temperament and related to a "negative affect syndrome," 2) a psychological vulnerability resulting from early childhood experiences such as stress and disrupted attachment, and 3) a disorder-specific psychological vulnerability related to the learned disorder-specific characteristics (Barlow, 2000; Suárez, Bennett, Goldstein, & Barlow, 2009). Across these conceptualizations of mood and anxiety symptomatology, a pattern emerges that suggests that emotional disorders share some commonality in symptoms (and perhaps underlying vulnerability), along with components that are unique to each disorder.

The general structure of the tripartite model, with shared higher-order commonality among mood and anxiety disorders and some distinct specificity, is often conceptualized statistically as a general-specific model (i.e., a bifactor model; Holzinger, & Swineford, 1937). This conceptual general-specific structure has been

consistently supported in mixed samples of mood and anxiety disorders (Gibbons, Rush, & Immekus, 2009; Norton, Cosco, Doyle, Done, & Sacker, 2012; Simms, Gros, Watson, O'Hara, 2008; Simms, Prisciandaro, Krueger, & Goldberg, 2012). Although taxometric studies suggest that PTSD and depression symptoms load onto the same higher-order factor (Cox et al., 2002; Slade & Watson, 2006), less is known about symptom presentations specific to PTSD or depression that account for variance beyond this common factor. Such clarifications can have important assessment and treatment implications, as an overemphasis on the symptom overlap can lead to neglect of disorder-specific symptoms that might have different influences on the symptom course, intervention targets, and prognosis.

1.2 The Commonality of Depression and PTSD

One line of research offers evidence to suggest that PTSD and depression might be manifestations of a common underlying post-trauma reaction. These studies examine symptom overlap in the context of exposure to trauma. Breslau and colleagues (2000) found, both retrospectively and prospectively, that participants exposed to trauma who did not develop PTSD were not then likely to develop depression, whereas those with PTSD were significantly more likely to develop depression. These researchers hypothesized that this common symptom expression might also highlight a common vulnerability, such as the common negative affectivity described by Clark & Watson (1991) and Brown and colleagues (1998). Other studies have supported the common relationship between PTSD and depression by demonstrating that symptoms of the two disorders follow a similar trajectory (a peak

at 1-month after exposure to a trauma, with a steady decline over 7-months) and share many similar predictors of that trajectory (Norman et al., 2011). Using canonical correlations, O'Donnell, Creamer, and Pattison, (2004) found that at 3- and 12-months post-traumatic injury, depression and PTSD loaded onto a general traumatic stress factor. At the 3-month assessment, there was also a factor unique to depression, but this dissipated over time such that there was only a general factor one year after trauma exposure. These researchers concluded that most of the variance of PTSD and depression can be accounted for by the same general traumatic distress factor, with some peak in unique depression symptoms soon after the trauma. Au and colleagues (2013) used latent profile analyses in a sample of sexual assault survivors and found that symptoms of PTSD and depression cohered tightly at each of four assessments after the trauma and at all levels of severity. Most important, there were no symptom profiles that contained primarily PTSD or depression symptoms at any of the time points. These authors conclude that PTSD and depression might not be distinct disorders with unique variance, but instead might represent a common stress response in the face of trauma. Although provocative, other than O'Donnell and colleagues (2004), the methods used in these studies do not clearly parse general and specific (unique) symptom variance, and none of these studies include a pre-trauma assessment.

1.3 The Current Study

Evidence thus far suggests significant PTSD and depression symptom overlap, but it is not clear whether there are stable clusters of symptoms specific to either

disorder. In addition, little is known about what constitutes these general and possibly specific factors. The current study aims to extend and clarify previous research on the commonality of PTSD and depression symptoms following trauma by examining the structure of symptoms across three assessment points (pre-deployment, 1- and, 5-months post-return from deployment) in the same sample of Marines before and after a stressful deployment to Afghanistan in 2010. First, the factor structure of the measures will be assessed at each time point. One-factor, two-factor correlated, multiple-factor correlated, and general-specific factor models will be fitted to the data. A one-factor model would suggest that the measures constitute a single post-trauma reaction with very little remaining variance specific to the separate measures. Two-factor correlated (i.e., one depression factor and one PTSD factor) and multiple-factor correlated models (i.e., one depression factor and three PTSD factors based on the DSM-IV subclusters) would suggest that the constructs indicated by the two measures are distinct but correlated and might not be manifestations of a common vulnerability or stress response. A general-specific model would suggest a structure in which the symptoms are hierarchical with a higher-order common factor and some significant remaining variance that is specific to each measure. If a general-specific model fits the data well, these factors will be described in terms of the symptoms loading most strongly onto the factors and the factor associations with variables related to the tripartite model, trauma history, current deployment exposure, and coping factors.

Chapter 2

METHOD

2.1 Participants

The data for this study were originally collected as part of the Marine Resilience Study (MRS), a longitudinal risk and resilience investigation of active duty Marines deployed to Iraq and Afghanistan between 2008 and 2012 (Baker et al., 2012). Four separate cohorts were scheduled to complete a battery of assessments in garrison one month before a 7-month deployment and then roughly 3-, 5-, and 8-months after returning from deployment. Across all cohorts, 2600 Marines completed the pre-deployment assessment, 2317 (89.1%) completed the Time-1 assessment, 1901 (73.1%) completed the Time-2 assessment, and 1634 (62.8%) completed the Time-3 assessment. Participation at each assessment was voluntary and individual informed consent was obtained before enrollment.

Only cohort 4 was included in the current analyses for several reasons. First, PTSD symptoms were indexed to military events at baseline but to lifetime events at follow-up assessments for cohorts 1 and 2. The PTSD index event was changed to lifetime events early on in the study because many participants reported that their most impactful traumatic event occurred outside of the military. Furthermore, several studies using the MRS data have not included the first three cohorts of Marines because they were deployed at times of relatively low war-zone exposure. By contrast, Marines in cohort 4 experienced relatively greater combat exposure, as they were deployed to Helmand Province in Afghanistan at a time of heavy conflict and unrest.

Because the current study aims to investigate the impact of trauma exposure on the structure of depression and PTSD symptoms, only cohort 4 was used.

The current analyses aimed to investigate the impact of a stressful deployment on the factor structure of depression and PTSD symptoms, so it was important to include only participants with data at all time points, thereby eliminating the potential confound of fluctuations in factor structure due to having different participants in analyses at different time points. There were not a sufficient number of participants with data across all three post-return assessments, so only participants with data at pre-deployment and the first 2 post-return assessments were included in the analyses. This resulted in a final sample of 298.

In addition, variability around the planned timing of assessments was pertinent across and within cohorts. To rectify the significant variability in time since baseline assessment within cohort 4, we employed procedures outlined by King et al., (2006). For the post-return from deployment assessments, scores on all measures were assigned to two follow-up date ranges determined by the count of days since the date of return from deployment. We aimed to minimize the dispersion of days within the ranges and to maximize the number of participants. The ranges of days that best fit the data were 22 to 40 days after return for assessment 1 (M=30, SD=4) and 142 to 160 days for assessment 2 (M=153, SD=4). In other words, on average, assessments occurred 1-month pre-deployment (T0) and 1-month (T1) and 5-months after returning from deployment (T2).

To assess differences due to attrition, paring down of the sample, and adjusting somewhat the date ranges of the post-return assessments, we compared the included and excluded samples on pre-deployment variables. T-tests revealed that the final sample reported a significantly higher average of previous deployments than those excluded. Table 1 contains other demographic information for the current sample.

2.2 Measures

2.2.1 Psychological Symptoms

The Posttraumatic Stress Disorder Checklist (PCL; Weathers, Litz, Herman, Huska, & Keane, 1993) was administered at all time points. The PCL assesses the severity of all seventeen DSM-IV PTSD symptoms on a 1 to 5 scale. A sum score can be used with higher scores indicating more PTSD symptoms. At each time point, the PCL was indexed to any lifetime traumatic event endorsed as currently most distressing. The PCL has shown good psychometric properties such as high internal consistency and diagnostic validity (Weathers et al., 1993). In the current study the PCL had good internal consistency across all three time points (α = .90 to .95)

The Beck Depression Inventory-II (BDI-II; Beck, Steer, & Brown, 1996) was administered at all time points. The BDI-II is an updated version of the original BDI that was altered to correspond to the diagnostic and duration criteria of the DSM-IV. It assesses the severity of depression symptoms on a 0 to 3 scale and a sum score can be used such that higher scores indicate more depressive symptoms. The BDI-II has been shown to have strong internal consistency, test-retest reliability, and discriminant

validity (Beck et al., 1996; Beck, Steer, Ball, & Ranieri, 1996). In the current study the BDI-II showed good internal consistency across time points (α = .88 to .90).

2.2.2 Tripartite Model Variables

The Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegan, 1988) was assessed at each time point. The PANAS is a 20-item measure consisting of both positive and negative emotion words. The participants were asked to indicate the extent to which they have felt each emotion over the past week on a 1 to 5 scale. Good psychometric properties have been reported for the PANAS such as internal consistency (Watson et al., 1988). Items within each affect pole were added to create sum scores. For the current study, internal consistency across time points was good for positive (α = .89 to .91) and negative affect (α = .86 to .90). PANAS negative emotions will indicate negative affectivity that has been shown to relate generally to psychopathology, and PANAS positive affectivity has been shown to relate more specifically to depression and certain anxiety disorders (Clark & Watson, 1991; Kotov et al., 2007).

The Panic and Agoraphobia module of *The Miniature International Diagnostic Interview Schedule for Psychiatric Illness* (MINI; Sheehan et al. 1998) was assessed at pre-deployment and the second post-return time point. The investigators did not include the measure in the immediate post-return assessment to avoid overwhelming service members so soon after return from a stressful deployment. The MINI is used to asses diagnoses based on DSM-IV criteria and has been demonstrated to have good reliability and validity (Sheehan et al. 1998). In the current study, the “yes/no”

symptom responses were combined to provide a sum score with higher scores indicating more panic symptoms. These symptoms represent increased autonomic arousal that has been shown to be more specific to anxiety in the tripartite model (Clark & Watson, 1991). Internal consistency was moderate across assessments in the current study (α = .67 to .77).

2.2.3 Trauma History

The Childhood Trauma Questionnaire (CTQ; Bernstein & Fink, 1998) was measured at the pre-deployment time point. The CTQ is a 28-item measure that assesses the frequency of child abuse and neglect experiences on a 1 to 5 scale. A 25-item summary score is created by excluding the three items of the Minimization/Denial Scale for detecting false-negative trauma reports and summing across the five 5-item subscales of emotional abuse, physical abuse, sexual abuse, emotional neglect, and physical neglect. The CTQ has shown good psychometric properties such as test-retest reliability and convergent validity (Bernstein & Fink, 1998; Scher, Stein, Asmundson, McCreary, & Forde, 2001). The MRS employed a modified 22-item version of the CTQ, with 1 item missing from the emotional abuse, physical abuse and physical neglect subscales. To match the original summary score, incomplete subscales were weighted to reflect 5 rather than 4 items, and then all subscales were summed to create a composite total score. Internal consistency for the current study was good (α = .87).

The Life Events Checklist (LEC; Gray, Litz, Hsu, & Lombardo, 2004) was also measured at pre-deployment. The LEC assesses lifetime exposure to 16 potentially

traumatic events with five response items: happened to me, witnessed it, learned about it, not sure, and doesn't apply. A prior lifetime trauma composite was created by first assigning a 1 to each item endorsed as happened to me or witnessed it and a 0 to all other responses, and then by summing across the 16 events. The LEC has demonstrated good psychometric properties such as temporal stability and convergent validity (Gray et al., 2004). Internal consistency is not reported as the items are indicators of discrete events.

2.2.4 Deployment Exposure

The Combat Experiences Subscale (CES) of *The Deployment Risk and Resilience Inventory* (DRRI; King, King, Vogt, Knight, & Samper, 2006) was administered at the first post-deployment time point to assess experiences during the current deployment. The DRRI is a battery of questionnaires that assesses exposure to various military-related events. The Combat Experiences Subscale is a 16-item "yes/no" scale that assesses individual- or unit-level exposure to war-zone-related stressors such as "I fired my weapon at the enemy." The MRS used a revised version, where response options represent frequency of exposure, ranging from 0 to 4 (see Vasterling et al., 2006), and items that pertain only to personal experiences. The full measure has shown good psychometric properties such as reliability, internal consistency, and convergent and discriminant validity (King et al., 2006; Vasterling et al., 2008). A Combat Experiences sum score was used for the current study. The CES evidenced good internal consistency ($\alpha = .90$).

The Moral Injury Events Scale (MIES; Nash et al., 2013) was administered at the first post-deployment assessment to indicate events during deployment that may contradict soldiers deeply held moral values without necessarily producing life threat. Participants are asked how much they agree or disagree with eleven statements relating to morally-related experiences (e.g., "I violated my own morals by failing to do something that I felt I should have done") on a 1 to 6 scale. A sum score was created across all eleven items with higher scores indicating more moral injury. The measure has shown good psychometric properties such as internal validity and temporal stability after dropping two items due to low item-total correlations (Nash et al., 2013). In the current study the MIES evidenced good internal consistency (α = .87).

2.2.5 Coping Variables

The Interpersonal Support Evaluation List (ISEL; Cohen, & Hoberman, 1983) was assessed at each time point. The original ISEL is a 40-item measure of the perceived availability of 4 different types of social support; tangible (i.e., material support), appraisal (i.e., the availability of having someone to talk to), self-esteem (i.e., seeing oneself positively in comparison to others), and belonging (i.e., the availability of having others to spend time with). The MRS study used a modified version of the ISEL that omitted the items of the self-esteem subscale. These 30-items were endorsed on a 1 to 4 scale, and although the ISEL is a multidimensional measure, a total ISEL score can be computed with higher scores indicating more social support. The ISEL has demonstrated good psychometric properties such as test-retest reliability

and construct validity (Brookings, & Bolton, 1988; Cohen, Mermelstein, Kamarck, & Hoberman, 1985). In the current sample, the items of the ISEL evidenced good internal consistency (α = .93 to .95).

The Connor-Davidson Resilience Scale (CD-RISC; Connor & Davidson, 2003) is a measure of a person's ability to thrive despite adversity and was assessed at each time point. The CD-RISC consists of 25 items on a 0 to 4 scale indicating participant's resilience over the month prior to the assessment. A total score of all 25 items can be used such that higher scores indicate more resilience. The CD-RISC has shown good psychometric properties such as test-retest reliability and internal consistency in clinical and non-clinical populations (Connor & Davidson, 2003). In the current study, the CD-RISC showed good internal consistency (α = .95 to .96).

The Brief Cope (Carver, 1997) was used to assess coping strategies at each time point. The Brief Cope is a 28-item questionnaire that assesses 14 different coping styles on a 4-point scale (Carver, 1997). The Brief Cope has demonstrated good psychometric properties such as internal reliability (Carver, 1997). To create an index of avoidant coping in the current study, scores on the five following 2-item subscales were combined: self-distraction, denial, behavioral disengagement, self-blame, and substance use (Schnider, Elhai, & Gray, 2007). We created sum scores at each time point with higher scores indicating more avoidant coping. The items evidenced acceptable internal consistency across time points (α = .70 to .73).

2.3 Data Analysis

The primary analyses for the current study involved a series of cross-sectional Confirmatory Factor Analyses (CFA), using the items of the PCL and BDI-II as indicators at pre-deployment (T0), 1-month post-return (T1), and 5-months post-return (T2). First, a one-factor model was fit to the data. Here, all items of both measures were allowed to load onto one latent variable. This model assumes that all of the items of both measures constitute one construct, with minimal remaining variance. Next, in a two-factor correlated model, the items of each measure were allowed to load onto respective latent variables, which were allowed to correlate. As PTSD is a multifaceted construct, a multiple-factor correlated model was also run in which the items of the BDI-II and the items of each of the three DSM-IV PTSD symptom clusters (Re-experiencing, Avoidance, and Hyperarousal) were allowed to load onto respective latent variables, and the four resulting latent variables were allowed to correlate. Both the two-factor correlated and the multiple-factor correlated models assume that the constructs (and for the multiple-factors correlated models, the PTSD subclusters) are distinct but associated phenomena. Finally, a general-specific model (i.e., bifactor; Holzinger, & Swineford, 1937) was fit to the data. Here, the items of the BDI-II and PCL were allowed to load onto one general factor representing the commonality among the items of both measures. Items within each measure were also allowed to load onto factors specific to each measure, representing their unique variance over and above the general factor. These models assume a hierarchical structure similar to the more commonly used second-order models; however, the

general-specific model offers some advantages. In second-order models, the specific factors are represented as error variances of the first-order latent variables and require complex models when assessing relationships with external variables. General-specific models allow researchers to more easily evaluate the significance of specific factor variances and their associations with criterion variables.

When general-specific models provided optimal fit, item factor loadings and associations with external variables were examined to describe the items that contribute to the factors and nomological networks related to the factors. For instance, in a general-specific model, it is useful to know which items on the PCL and BDI-II load onto the general factor and which contribute to the remaining variance in the specific symptom factors. For associations with external criterion variables, significance levels or directionality of associations could vary between the general and specific factors, which could shed some light on what these constructs are and offer some indication of their predictive validity.

Inspection of the data revealed a pattern of responses with a positive skew, as would be expected with a sample of psychopathological symptoms in a general, rather than clinical, population. There are several possible strategies for accounting for skewed distributions such as poisson, negative binomial, or zero-inflated poisson or negative binomial models that treat the variables as count data (e.g., numbers of cigarettes smoked). As the current data involve likert-scale response options with no more than five possible values, we instead chose to treat the items as ordered categorical or ordinal (i.e., discrete ordered categories) rather than as continuous

variables. This strategy not only avoids violating the assumption of normality of error distributions, but it is generally recommended when analyzing ordinal data, such as those found in psychometric surveys with fewer than five response options (Flora & Curran, 2004; Wirth, & Edwards, 2007). Furthermore, this approach has been used in other research with similar trauma-exposed populations and analyses (Meis, Erbes, Kaler, Arbisi, & Polusny, 2011).

Factor analyses were conducted with MPlus version 7 (Muthén & Muthén, 2008-2011) with a robust weighted least squares estimator (i.e., WLSMV) and polychoric correlations. The following fit indices and cutoff values were used to evaluate model fit: (a) Root Mean Square Error of Approximation (RMSEA) close to .06 or below, (b) Comparative Fit Index (CFI) and (c) Tucker-Lewis Index (TLI) values approaching .95 or greater (Hu & Bentler, 1999), and (d) Weighted Root Means Square Residual (WRMR) close to 1.0 or below. Chi-square difference tests were also employed when fit indices were similar between models. Because the models were run using the WLSMV estimator, difference testing was performed using the DIFFTEST option in MPlus, which utilizes a correction factor.

Chapter 3

RESULTS

Table 2 lists information about the sum scores for each measure at each time point. Percentages of participants above the clinical cut scores of 16 for the BDI-II (Sprinkle et al., 2008) and 39 for the PCL (Dickstein et al., under review) are presented, along with comorbidity (i.e., participants above the clinical cut scores on both measures) and the correlations between the PCL and BDI-II at each time point.

3.1 Factor Analysis

For the factor analyses at T0, the general-specific model fit the data best (RMSEA = .03; CFI = .97; TLI = .96; WRMR = .85). The multiple-factor correlated model, in which the PCL items were divided into DSM-IV symptom clusters, showed the next best model fit (RMSEA = .03; CFI = .96; TLI = .96; WRMR = .99). A chi-square difference test revealed that the general-specific model provided a significantly better fit to the data (X^2 (32, N=298) = 75.03, p = .000). At T1, item 9 of the BDI-II (suicidal ideation) was not endorsed by any of the participants and so was removed from analyses. Here, the general-specific model again fit the data best (RMSEA = .06; CFI = .96; TLI = .95; WRMR = 1.14), with the multiple-factor correlated model (with the BDI-II and three PCL factors) providing the next best fit (RMSEA = .06; CFI = .95; TLI = .95; WRMR = 1.36). Again, however, the general-specific model provided a significantly better fit to the data (X^2 (31, N=298) = 134.40, p = .000). At T2, the general-specific model showed optimal model fit (RMSEA = .05; CFI = .95; TLI = .95; WRMR = 1.11), with the multiple-factor correlated model as the closest, but

poorer fitting, model (RMSEA = .06; CFI = .94; TLI = .94; WRMR = 1.36). There was again a significant difference between the models (X^2 (32, N=298) = 186.28, p = .000). The results of the factor analyses suggest that the general-specific model provides the best fit to the data across all three time points.

3.2 Item Loadings

Evaluating the factor loadings helps to describe which PCL and BDI-II items (symptoms) constitute the general and specific factors. Table 3 lists factor loadings for the general-specific models at each time point. Loadings that are significant and have values above .30 are presented in bold font. At T0, BDI-II item 5 (guilt) showed a low loading on the depression specific factor, and PCL items 8 (trouble remembering parts of the trauma), 9 (anhedonia), and 12 (foreshortened future) showed low loadings on the PTSD specific factor. At T1, BDI-II items 1 (sadness), 10 (crying), 16 (sleep), and 17 (irritability) showed low loadings on the specific depression factor, and PCL items 8 (trouble remembering parts of the trauma), 9 (anhedonia), 10 (distance from others), 11 (emotional numbness), 12 (foreshortened future), and 15 (concentration problems) showed low loadings on the specific PTSD factor. At T2, BDI-II items 11 (agitation), and 16 through 19 (sleep; irritability; appetite; concentration problems) showed low loadings on the depression specific factor, and PCL items 8 through 13 (trouble remembering parts of trauma; anhedonia; distance from others; emotional numbness; foreshortened future; sleep), and 15 (concentration problems) showed low loadings on the PTSD specific factor. Also in Table 3, variance components for each factor are listed. General and specific PTSD and depression factors showed significant variance

at all time points, except for the depression specific factor at T1, which suggests that although trending ($p = .09$) the variance of the depression items are mostly accounted for by the general factor.

3.3 External Variable Associations

Next, the significant general and specific factors were correlated with variables that are theoretically predicted to be associated with PTSD and depression symptoms. The pattern of associations can further aid in describing the characteristics of each factor. These results are presented in Table 4. At T0, positive affectivity, number of previous deployments, social support, and resilience were significantly negatively associated with the general factor. Negative affectivity, panic symptoms, childhood trauma, life events, and avoidant coping were significantly positively associated with the general factor. For the specific depression factor at T0, positive affectivity, social support, and resilience showed significant negative associations, whereas negative affectivity, childhood trauma, and avoidant coping showed significant positive associations. At T0 the specific PTSD factor showed a significant negative association with social support, and significant positive associations with panic symptoms, number of deployments, and life events.

At T1, the general factor showed significant negative associations with positive affectivity, social support, and resilience, and significant positive associations with negative affectivity, childhood trauma, life events, trauma exposure and moral injury during the current deployment, and avoidant coping. The PTSD specific factor at T1 showed significant negative associations with life events, and moral injury, and

significant positive associations with positive affectivity, deployment trauma exposure, social support and resilience.

At T2, the general factor evidenced significant negative associations with positive affectivity, social support, and resilience, and significant positive associations with negative affectivity, panic symptoms, childhood trauma and life events, trauma exposure and moral injury during the current deployment, and avoidant coping. The depression specific factor showed significant negative associations with positive affectivity, social support and resilience, and significant positive associations with negative affectivity, moral injury, and avoidant coping. The PTSD specific factor showed significant positive associations with negative and positive affectivity, panic symptoms, deployment trauma exposure, and avoidant coping.

Table 1

Pre-Deployment Socio-demographic and Military Characteristics

Characteristic	*n*	%	*M*	*SD*
Age			22.8	3.61
Male	298	100.0		
Education				
Some high school	7	2.3		
HS diploma/GED	206	69.1		
Some college	77	25.9		
Bachelor's degree	8	2.7		
Advanced degree	0	0.0		
Ethnicity				
Not Hispanic/Latina/o	223	74.8		
Hispanic/Latina/o	75	25.1		
Race[a]				
Black/African American	12	4.0		
American Indian/Alaskan Native	2	0.7		
Asian	11	3.7		
Native Hawaiian/Pacific Islander	6	2.0		
White	253	84.9		
Multiracial	13	4.3		
Marital status[b]				
Never married	176	59.1		
Married	113	37.9		
Separated/divorced	8	2.7		
Rank				
Junior enlisted serviceman (E1-E3)	192	64.4		
Non-commissioned officer (E4-E5)	84	28.2		
Staff non-commissioned officer (E6-E9)	16	5.3		
Officer (O1-O3 / CWO2)	6	2.0		
Service length (months)			4.71	3.33
Previously deployed	116	38.9		
Number of previous deployments			2.31	1.24

Note. N = 298. Demographics were assessed at baseline (1 month prior to deployment). GED = General Educational Development Test. [a]Data missing for 1 participant. [b]Data missing for 1 participant.

Table 2

Descriptive Statistics for the BDI-II and PCL Sum Scores

	T0 *n*=298		T1 *n*=298		T2 *n*=298	
	BDI	PCL	BDI	PCL	BDI	PCL
M(*SD*)	5.14(6.54)	22.01(7.81)	5.79(6.49)	29.56(13.28)	6.07(6.77)	27.69(11.33)
Range	0 to 45	17 to 74	0 to 46	17 to 77	0 to 40	17 to 73
Clinical cut score *n*(%)	19(6.4%)	13(4.4%)	17(5.7%)	63(21.1%)	24(8.1%)	45(15.1%)
Clinical cut comorbidity	4(1.3%)		12(4.0%)		16(5.4%)	
BDI – PCL correlations	.51***		.61***		.68***	

Note. T0 = pre-deployment; T1 = 1-month post-return; T2 = 5-months post-return. BDI = The Beck Depression Inventory-II; PCL=The Posttraumatic Stress Disorder Checklist. The clinical cut score is 39 for the PCL and 16 for the BDI-II (Dickstein et al., under review; Sprinkle et al., 2008).

*** $p \leq .001$

Table 3

Factor Loadings of the General-Specific Model of the BDI-II and PCL

	T0			T1			T2		
Item	General	BDI	PCL	General	BDI	PCL	General	BDI	PCL
BDI 1	**.50*****	**.47*****		**.69*****	.24***		**.68*****	**.42*****	
BDI 2	**.55*****	**.60*****		**.48*****	**.61*****		**.49*****	**.51*****	
BDI 3	**.50*****	**.50*****		**.46*****	**.66*****		**.45*****	**.63*****	
BDI 4	**.68*****	**.36*****		**.52*****	**.65*****		**.75*****	**.44*****	
BDI 5	**.66*****	.23**		**.61*****	**.32*****		**.62*****	**.40*****	
BDI 6	**.60*****	**.56*****		**.38*****	**.35*****		**.30*****	**.48*****	
BDI 7	**.44*****	**.76*****		**.47*****	**.66*****		**.51*****	**.64*****	
BDI 8	**.50*****	**.54*****		**.61*****	**.54*****		**.59*****	**.63*****	
BDI 9	**.65*****	**.37*****					**.33****	**.64*****	
BDI 10	**.60*****	**.35***		**.47*****	.29***		**.48*****	**.35*****	
BDI 11	**.64*****	**.37*****		**.60*****	**.34*****		**.78*****	.11	
BDI 12	**.62*****	**.53*****		**.53*****	**.69*****		**.79*****	**.41*****	
BDI 13	**.69*****	**.37*****		**.52*****	**.48*****		**.63*****	**.44*****	
BDI 14	**.61*****	**.57*****		**.50*****	**.76*****		**.37*****	**.76*****	
BDI 15	**.47*****	**.64*****		**.43*****	**.57*****		**.66*****	**.41*****	
BDI 16	**.50*****	**.40*****		**.65*****	.18*		**.75*****	-.06	
BDI 17	**.60*****	**.45*****		**.71*****	.29***		**.77*****	.07	
BDI 18	**.41*****	**.54*****		**.46*****	**.42*****		**.54*****	.26**	
BDI 19	**.65*****	**.43*****		**.60*****	**.41*****		**.79*****	.18**	
BDI 20	**.48*****	**.61*****		**.42*****	**.59*****		**.70*****	**.45*****	
BDI 21	**.48*****	**.32****		**.48*****	**.37*****		**.52*****	**.38*****	
PCL 1	**.67*****		**.55*****	**.76*****		**.48*****	**.66*****		**.55*****

PCL 2	**.55*****		**.54*****	**.70*****		**.53*****	**.52*****		**.43*****
PCL 3	**.69*****		**.32*****	**.68*****		**.47*****	**.60*****		**.51*****
PCL 4	**.64*****		**.58*****	**.74*****		**.39*****	**.70*****		**.54*****
PCL 5	**.48*****		**.71*****	**.77*****		**.40*****	**.67*****		**.54*****
PCL 6	**.67*****		**.38*****	**.74*****		**.30*****	**.59*****		**.53*****
PCL 7	**.64*****		**.43*****	**.73*****		**.36*****	**.67*****		**.50*****
PCL 8	**.32****		.23*	**.70*****		.09	**.44*****		.26**
PCL 9	**.79*****		.27**	**.83*****		-.08	**.88*****		.02
PCL 10	**.69*****		**.43*****	**.90*****		-.01	**.87*****		.04
PCL 11	**.65*****		**.33*****	**.85*****		.03	**.85*****		-.06
PCL 12	**.60*****		.26**	**.66*****		.23**	**.61*****		-.04
PCL 13	**.65*****		**.43*****	**.75*****		**.31*****	**.66*****		.26***
PCL 14	**.73*****		**.41*****	**.82*****		**.31*****	**.77*****		**.32*****
PCL 15	**.71*****		**.40*****	**.84*****		.23***	**.76*****		.21***
PCL 16	**.36*****		**.67*****	**.55*****		**.66*****	**.59*****		**.53*****
PCL 17	**.36*****		**.71*****	**.58*****		**.73*****	**.64*****		**.52*****
Variance	**.25****	**.22****	**.31*****	**.48*****	.06	**.23*****	**.46*****	**.18*****	**.30*****

Note. T0 = pre-deployment; T1 = 1-month post-return; T2 = 5-months post-return. General = the general factor; BDI = the depression specific factor; PCL=the PTSD specific factor. BDI 1 – BDI 21 = items of the Beck Depression Inventory-II; PCL 1 – PCL 17 = items of the Posttraumatic Stress Disorder Checklist. Significant loadings above .30 are bolded, and significant variance components are also bolded.

Table 4

Associations Among General and Specific Factors and External Variables

	T0			T1			T2		
	General	BDI	PCL	General	BDI	PCL	General	BDI	PCL
The Tripartite Model Variables									
Negative Emotion	**.50*** **	**.20*** **	.03	**.70*** **		.08	**.61*** **	**.14***	**.24*** **
Positive Emotion	**-.18***	**-.35*** **	.13	**-.37*** **		**.48*** **	**-.25*** **	**-.27*** **	**.14***
PANIC Symptoms	**.24*** **	-.02	**.24*** **				**.42*** **	-.04	**.31*** **
Trauma History									
Deployments	**-.34****	.12	**.40*** **	.06		.06	-.16	.21	.05
Childhood Trauma	**.26*** **	**.17***	.10	**.25*** **		-.09	**.20*** **	-.02	.06
Lifetime Trauma	**.23*** **	-.03	**.38*** **	**.33*** **		**-.13***	**.26*** **	-.11	.01
Deployment Exposure									
Combat Exposure				**.28*** **		**.49*** **	**.32*** **	-.08	**.23*** **
Moral Injury				**.49*** **		**-.23*** **	**.28*** **	**.19****	.04
Coping Factors									

Social Support	**-.35****	**-.34*****	**-.13***	**-.49*****	**.34*****	**-.30*****	**-.28*****	.01
Resilience	**-.29*****	**-.42*****	.04	**-.38*****	**.37*****	**-.17*****	**-.30*****	-.05
Avoidant Coping	**.45*****	**.25*****	-.03	**.68*****	-.00	**.45*****	**.25*****	**.24*****

Note. T0 = pre-deployment; T1 = 1-month post-return; T2 = 5-months post-return. General = the general factor; BDI = the depression specific factor; PCL = the PTSD specific factor. Negative Emotion and Positive Emotion were measured by the *Positive and Negative Affect Schedule*; Panic Symptoms were measured by *The Miniature International Diagnostic Interview Schedule for Psychiatric Illness*; Deployments were the number of reported previous deployments; Childhood Trauma was measured by the *Childhood Trauma Questionnaire*; Lifetime Trauma was measures by the *Life Events Checklist*; Combat Exposure was measured by the *Combat Experiences Scale* of the *Deployment Risk and Resilience Inventory*; Moral injury was measured by the *Moral Injury Events Scale*; Social Support was measured by *The Interpersonal Support Evaluation List*; Resilience was measured by *The Connor-Davidson Resilience Scale*; Avoidant Coping was measured by *The Brief Cope*. Significant correlations are bolded.

Chapter 4

DISCUSSION

The current study aimed to clarify and extend research suggesting that symptoms of PTSD and depression may constitute one underlying post-trauma reaction (Au et al., 2013; Breslau et al., 2000; Norman et al., 2011; O'Donnell et al., 2004) by examining the hierarchical nature of these symptoms across time with an intersecting stressful experience. In a sample of Marines deployed to Afghanistan, a general-specific factor structure fit the data best at pre-deployment and at 1- and 5-months post-return from deployment. That is, symptoms of PTSD and depression (as measured with the PCL and BDI-II, respectively) loaded onto a common factor. However, there was also significant remaining variance that was specific to each measure, consistent with the tripartite model of depression and anxiety (Brown et al., 1998; Clark & Watson, 1991). Specifically, there was a specific PTSD factor that was associated with anxious arousal and fear-based traumatic experiences and that included fewer symptoms of dysphoria. In addition, there was a specific depression factor associated with more morally injurious traumatic experiences and that included fewer somatic items. The general factor (representing the commonality of the two measures) may be somewhat stronger in the immediate aftermath of deployment, as the specific depression factor was no longer significant, and most of the PCL items loaded more strongly onto the general factor. Furthermore, the general factor showed consistent significant associations with criterion variables in the expected directions

and with measures of lifetime trauma, perhaps consistent with the proposal that a common vulnerability might underlie the symptom overlap (Au et al., 2013; Breslau et al., 2000; Norman et al., 2011; O'Donnell et al., 2004). This pattern of findings also suggests that timing matters. Depression and PTSD symptoms may follow a relatively stable pattern, resembling the tripartite model (Clark & Watson, 1991), before and several months after a stressful experience. However, in the month immediately following the stressor, the convergence of the measures increases, and they seem to behave as a common stress response with some specific PTSD symptoms.

4.1 The General Factor

The first step in the current investigation involved fitting various factor models to the symptoms of the PCL and BDI-II to determine the extent to which the measures fit a general-specific structure. The results suggest that at each time point, the symptoms did fit this structure and that the general factor was remarkably stable, even in the aftermath of combat-related stress. The stability of the common factor is consistent with some of Au and colleagues (2013) findings, using latent profile analysis with the PCL and the Depression Anxiety Stress Scale-Depression (DASS-Depression scale) in female sexual assault survivors. These researchers found that no profile consisted primarily of symptoms of only one disorder, leading them to conclude that the two disorders appear to constitute one post-trauma reaction. Using a statistical approach (bifactor modeling) that can better parse general and specific factors, the current study adds to this work by identifying an underlying commonality among symptoms before and after stress exposure, as well as some unique responding

specific to each disorder, as predicted by the tripartite model (Brown et al., 1998; Clark & Watson, 1991). The finding that depression items were mostly accounted for by the general factor one month after return from deployment and that PCL items loaded more strongly onto the general factor suggests that there may be an increase in the relatively stable commonality among the measures immediately following a stressful experience.

When examining associations with criterion variables in the current study, the general factor showed more consistent relationships in the expected directions than did the specific factors, illustrating the predictive validity of the general factor relative to the specific factors. The general factor may be a more robust marker of psychopathological distress than the unique aspects of either disorder alone. For instance, the general factor was more strongly associated with the negative affectivity variable of the tripartite model than were the specific factors, as predicted by the tripartite model (Clark & Watson, 1991) and its later extensions (Brown et al., 1998; Kotov et al., 2007; Watson, 2005).

History of early adversity and lifetime traumatic experiences are important factors to investigate when considering symptoms of depression and PTSD, as they are risk factors for both disorders alone and their co-occurrence (Kessler et al., 2010; Kilpatrick et al., 2003; Perkonigg, Kessler, Storz, & Wittchen, 2001), and they figure prominently in Barlow's (2000) triple vulnerability theory. An interesting pattern emerged after deployment such that over time, the general factor was uniquely related to childhood trauma and lifetime traumatic events, whereas the specific factors were

not. This suggests that perhaps lifetime trauma is a common vulnerability underlying PTSD and depression symptoms that is also related to common symptom expression of this vulnerability (Barlow, 2000; O'Donnell et al., 2004). In other words, when people are faced with stress, the diathesis for experiencing PTSD or depression symptoms may be more similar than not (Au et al., 2013). However, consistent with other general-specific models of psychopathology (Clark & Watson, 1991; Simms et al., 2008), there are also specific factors that account for variance, beyond that accounted for by the commonality between measures.

4.2 The PTSD-Specific Factor

First, when examining the specific factors in the current study, it is important to consider factor loadings. Before deployment, several PTSD dysphoria items showed low loadings on the specific PTSD factor, and this pattern was stronger at the two post-return assessments. This suggests that the PTSD-specific factor might represent unique responding to PCL items related mostly to re-experiencing, avoidance, and hyperarousal. Some studies have suggested that the dysphoria symptoms of PTSD constitute a non-specific general distress factor that may be solely responsible for the association between PTSD and Depression (Gros, Simms, & Acierno, 2010; Simms, Watson, & Doebbelling, 2002). If this research were applicable to the current study, we would expect to see some lower loadings of non-dysphoria PCL items onto the general factor. However, the current results were quite similar to Marshall et al., (2010) who found that all seventeen PCL items were strongly related to general distress (as measured with the Patient Health Questionnaire) in survivors of

community violence and wildfire evacuees. In addition, researchers have reported that other PTSD-related symptoms (e.g., intrusive thoughts) are related to general distress (Simms et al., 2008). Similar to Forbes and colleagues (2010) findings and consistent with the tripartite model (Clark & Watson, 1991), the specific PTSD factor (without dysphoria items) in the current study was associated with panic symptoms that indicate more anxious arousal, whereas the specific depression factor was not.

Although less consistent than the general factor, the specific PTSD factor showed associations in expected directions with the criterion variables, with the exception of the 1-month post-return assessment. Here, the specific PTSD factor was associated with fewer lifetime traumatic events and more positive emotions, social support, and resilience. This may indicate that the specific PTSD factor immediately following trauma captures symptoms of increased arousal after a stressful deployment, without depressive features. This factor may represent more resilience and less association with an underlying vulnerability to psychopathology. Related to this, in a study of natural recovery from trauma, Gilboa-Schechman & Foa (2001) found that more affective arousal and disturbance soon after exposure to a trauma predicted better recovery than less arousal. It may be that participants responding with this pattern are experiencing affective responses that are part of the natural processing of stressful life events and are predictive of recovery. This pattern also could be related to the differences in associations with positive emotion among the factors. Specific PTSD responding without several dysphoria (i.e., numbing) items was associated with more positive emotions, which have been implicated in a broadening of adaptive

coping that can result in upward spirals toward health (Fredrickson, & Joiner, 2002; Garland et al., 2010).

Immediately following deployment, the specific PTSD factor was associated with combat trauma exposure but less moral injury, further suggesting that this factor may capture service members who are experiencing stress symptoms as a result of deployment, but not the dysphoric symptoms that may result from morally injurious events. It makes sense that the PCL symptoms related to more anxious arousal (i.e., consisting mostly of re-experiencing, avoidance and hyperarousal) without dysphoria would be associated with more life threat experiences. In short, the specific PTSD factor may represent a response to trauma that could be more resilient and less related to underlying common vulnerabilities.

4.3 The Depression-Specific Factor

When examining the factor loadings of BDI-II items onto the specific depression factor, it is apparent that several depression items considered to capture somatic symptoms were entirely accounted for by the general factor. Previous research has suggested that the PTSD dysphoria symptoms relate specifically to the somatic symptoms of depression and may drive the relationship between the disorders (Biehn et al., 2013). With all items of the BDI-II loading onto the general factor in the current study, there is evidence to suggest that the relationship between the two disorders (as measured with the PCL and BDI-II) may not be strictly limited to particular symptom clusters. However, it is clear that what remains after accounting for the commonality between the measures is a specific depression factor that consists of mostly cognitive

and affective symptoms and that this pattern increases over time. As with the other factors in the general-specific models, associations with criterion variables help to describe the specific depression factor.

As the tripartite model (Clark & Watson, 1991) predicts, the specific depression factor is associated with low positive affectivity. As many of the somatic symptoms were entirely accounted for by the general factor, what remains are depressive symptoms that relate to negative thoughts and a salient absence of positive emotion. Just as we speculated that an increase in positive emotion might be associated with better coping in the specific PTSD factor after deployment, a lack of positive emotion may play a role in the poor coping resources seen in the specific depression factor at 5-months post-return from deployment.

When examining traumatic exposure during the current deployment, which includes both potential life threat (i.e., events typically described as DSM PTSD criterion A) and violations of deeply held moral beliefs, the specific depression factor was significantly correlated with moral injury and not with more typically assessed combat trauma. Here, negative thoughts about the self, others, and the world coupled with the absence of positive emotions might be associated with trauma that has less to do with life-threat and arousal and more to do with cognitive schemas (i.e., violations of deeply-held assumptions). Those experiencing the strictly anxious symptoms of the PCL may have encountered fear-based experiences, whereas those endorsing depressive symptoms (without somatic symptoms) may be more likely to have encountered violations of previously held moral beliefs. These are speculations that

might have interesting implications for the interaction between type of trauma and symptom presentation.

4.4 Clinical Implications

The current findings, if replicated, might suggest some clinical implications, particularly for populations in the immediate aftermath of stressful experiences. The results suggest that there may be a common underlying vulnerability to experiencing symptoms of both depression and PTSD. This may indicate the need for transdiagnostic treatment approaches, particularly in the acute phase following a stressful or traumatic event. Barlow and colleagues' (2004) Unified Protocol is a treatment based on previous work that suggests there are more commonalities among emotional disorders (mood and anxiety) than differences, and that these commonalities highlight important points of intervention that can be targeted by more parsimonious interventions. It may benefit clinicians to use such treatment approaches to target key common mechanisms, such as negative affectivity, early adversity, and previous trauma exposure. Furthermore, the current study findings suggest that there may be subsets of people exposed to particular types of trauma who might require different treatment resources and foci. For instance, people with symptoms of PTSD without dysphoria, who also report more positive affectivity, resilience, and social support, might need fewer therapeutic resources.

4.5 Limitations

A number of limitations and caveats should be considered when interpreting the data. Several factors limit the generalizability of the findings. The sample was

homogeneous in that it was composed entirely of male Marines and combat-related trauma, but this sample also provides an important extension of previous work by Au et al. (2013) on a sample of women who experienced sexual assault. These differences in sampling may also account for some differences in results; however, it is important to test the structure of depression and PTSD symptoms across various samples and traumatic experiences to uncover consistent patterns. Another important limitation was the use of self-report measures. This could have lead to underreporting in participants who are not psychologically-minded or familiar with the target constructs. In addition, there may be overlapping items in the measures of PTSD and depression, although previous studies found high rates of co-occurring PTSD and depression, even after accounting for the overlapping items (Taft, Resick, Watkins, & Panuzio, 2009).

4.6 Summary

The current study supports the theory that PTSD and depression may constitute one underlying post-trauma reaction, especially in the immediate aftermath of potentially traumatic experiences, with some remaining and important influence unique to each disorder. The commonality among these disorders may indicate a shared underlying vulnerability, which has been suggested elsewhere as being related to genetic, temperament, and learned psychological factors (Barlow 2000; Brown et al., 1998; Sartor et al., 2012; Tackett et al., 2013). Before, and over time after a stressful deployment, the symptoms of depression and PTSD follow a tripartite structure in which they constitute a higher-order common construct, together with

respective factors specific to each disorder that are differentially associated with positive emotion, anxious arousal, coping, and current deployment trauma.

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