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Resilience, Traumatic Brain Injury, Depression and Posttraumatic Stress among Iraq/Afghanistan War Veterans

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Abstract

Objective—We examined the prospective influence of the resilient, undercontrolled, and overcontrolled personality prototypes on depression and posttraumatic stress disorder (PTSD) symptoms among Iraq/Afghanistan war veterans. After accounting for the possible influence of combat exposure, we expected that the resilient prototype would predict lower depression and PTSD over time and would be associated with adaptive coping strategies, higher social support, lower psychological inflexibility, and higher self-reported resilience relative to the overcontrolled and undercontrolled prototypes, independent of TBI status.

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This study is one in a series conducted from a larger project investigating adjustment of veterans from Operation Enduring Freedom and Operation Iraqi Freedom. A complete list of publications from the project is available upon request from Dr. Morissette at Sandra.Morissette@va.gov.

Method—One-hundred twenty-seven veterans (107 men, 20 women; average age = 37) participated in the study. Personality was assessed at baseline, and PTSD and depression symptoms were assessed eight months later. Path analysis was used to test the direct and indirect effects of personality on distress.

Results—No direct effects were observed from personality to distress. The resilient prototype did have significant indirect effects on PTSD and depression through its beneficial effects on social support, coping and psychological inflexibility. TBI also had direct effects on PTSD.

Conclusions—A resilient personality prototype appears to influence veteran adjustment through its positive associations with greater social support and psychological flexibility, and lower use of avoidant coping. Low social support, avoidant coping and psychological inflexibility are related to overcontrolled and undercontrolled personality prototypes, and these behaviors seem to characterize veterans who experience problems with depression and PTSD over time. A positive TBI status is directly and prospectively associated with PTSD symptomology independent of personality prototype. Implications for clinical interventions and future research are discussed.

Keywords

Resilient personality; PTSD; depression; combat exposure; traumatic brain injury

Posttraumatic stress disorder (PTSD) and depression are frequently experienced by Iraq/Afghanistan war veterans. Evidence indicates that 12 to 20% of Iraq/Afghanistan war veterans have a diagnosis of PTSD and about 15% endorse symptoms of depression (Hoge et al., 2004; Seal, Bertenthal, Miner, Sen, & Marmar, 2007). Approximately 23% of Iraq/Afghanistan veterans develop clinically significant levels of posttraumatic stress disorder (PTSD) (Fulton et al., 2015). Higher rates of PTSD and other mental health problems have been observed among veterans who served in Iraq than among those serving in Afghanistan (Ramchand et al., 2010). Importantly, depression and PTSD share several overlapping symptoms and often co-occur among Iraq/Afghanistan veterans. A diagnosis of PTSD and/or depression among these war veterans is associated with functional difficulties including occupational and social impairment, physical health problems and substance use (Brenner et al., 2010; Hoge et al., 2004; Thomas et al., 2010).

These disorders are further complicated by co-occurring traumatic brain injuries (TBI) commonly incurred through blast exposures. Approximately 15 to 20% of returning service members report a probable TBI during their deployment (Belanger, Uomoto, & Vanderploeg, 2009; Hoge, McGurk, Thomas, Cox, Engel, & Castro, 2008). The Armed Forces Health Surveillance Center (2011) identified 212,742 cases of TBI in all armed forces members, classifying 76.7% as mild, 16.8% as moderate, and 1.1% as severe. Concomitants of TBI often include symptoms of depression and PTSD (Morissette et al., 2011).

The complexities and confounds of co-occurring PTSD and TBI on clinical assessment -- and the corresponding need to identify factors that complicate or enhance recovery -- are widely acknowledged (Bahraoui et al., 2014; Vasterling, Bryant, & Keane, 2012). It is preferable to study these factors within contextual models that examine optimal adjustment

among veterans despite existing indicators of risk (e.g., combat exposure; Dolan et al., 2012). Such adjustment is likely influenced by an array of psychosocial and contextual variables (Vasterling & Dikmen, 2012) and their influence may be best investigated longitudinally in studies that include a wide range of veterans known to have either PTSD or TBI, both, or neither (Bahraini, et al., 2014).

The empirical pursuit of protective factors is described as the study of resilience (Bonanno et al., 2012). The majority of returning veterans report few if any psychological problems following warzone deployment. Pre-injury self-reported resilience (McCauley et al., 2013) and protective psychological characteristics (e.g., attributions about symptoms, self-efficacy; Belanger, Barwick, Kip, Kretzmer & Vanderploeg, 2013) are associated with less distress among individuals with mild TBI (mTBI). Resilience appears to have beneficial effects on adjustment among persons with chronic conditions by facilitating the experience of positive emotions and influencing cognitive appraisals of symptoms (Ong, Zautra, & Reid, 2010). Collectively, these studies support prevailing notions of resilience including the "...ability to sustain equilibrium and adaptive functioning under stressful circumstances" (Mancini & Bonanno, 2010; p. 259) and the ability to "bounce back" or demonstrate "'better than expected' development or functioning" (Windle & Bennett, 2012, p. 219) in the wake of a negative life event.

Critical reviews of the resilience literature observe that the lack of a comprehensive, well-articulated theoretical model undermines the ability to identify the key mechanisms and characteristics of resilience under specific situations and to develop strategic interventions to promote resilience (Davydov, Stewart, & Chandieu, 2010; Fletcher & Sarkar, 2013). Of the available models, the Block and Block (1980) theory of ego control and ego resiliency -- two psychological factors related to the capacity for effective adaptation to change and conflict (Block, 1993) -- explicates specific personality prototypes that appear particularly advantageous for clinical applications. The three prototypes --- resilient, undercontrolled, and overcontrolled -- are mapped out with behavioral ratings (in studies of children; Caspi & Silva, 1995) and with self-report measures of personality traits from adolescents and adults (Chapman & Goldberg, 2011; Dennissen, Asendorpf, & van Aken, 2008; Letzring, Block, & Funder, 2005). Resilient individuals are often typified by low neuroticism (or negative affectivity) and above-average scores on other personality traits. Undercontrolled individuals are characterized by low conscientiousness and a moderate level of neuroticism. Overcontrolled individuals are characterized by high neuroticism, low extraversion, and average scores on other factors.

The predictive utility of these personality prototypes is supported by prospective studies of behavioral ratings of children in which the prototypes predicted emotional, behavioral, and health outcomes in adulthood (Caspi & Silva, 1995; Chapman & Goldberg, 2011; Dennissen et al., 2008). Resilient individuals reported less distress and aggression than those classified as either undercontrolled or overcontrolled. Resilient individuals further assume some normative adult social roles earlier (Dennissen et al., 2008) and have a lower cardiovascular disease risk in middle age (Chapman & Goldberg, 2011). Cross-sectional studies with adults reveal that resilient individuals report more adaptive, proactive problem-solving styles following the onset of a traumatic disability, as well as a greater sense of acceptance at

medical discharge than overcontrolled individuals (Berry, Elliott, & Rivera, 2007). In contrast, compared to resilient individuals, overcontrolled individuals report higher depression following disability onset (Berry et al., 2007) and are more socially isolated and engage in fewer recreational pursuits in older age (Stecca, Alessandri, & Caprara, 2010). Undercontrolled adults report more mistrust of others, including family members, than resilient adults (Stecca, et al., 2010). In summary, both theory and prior research assert that a resilient personality prototype may be viewed as a “protective trait” that can “...account for stress resistance or the maintenance of positive outcomes in the face of challenge” (Ong, Bergeman, & Boker, 2009, p. 1784).

In the present study, we used a prospective design and a contextual model to examine how resilient, undercontrolled and overcontrolled prototypes predict distress over time among Iraq/Afghanistan war veterans. We expected the resilient prototype to be associated with less distress over time, whereas we expected the overcontrolled prototype to be associated with greater distress. The model was construed to examine several mechanisms that may elucidate the ways in which a resilient prototype may facilitate adjustment over time. Based on our understanding of the characteristics that typify resilience, we hypothesized that a resilient prototype would be associated with greater perceived social support, greater sense of personal resilience, greater psychological flexibility (and less experiential avoidance), and more effective coping behaviors compared with the overcontrolled and undercontrolled prototypes. We further hypothesized that these mediating variables would, in turn, be associated with lower depression and PTSD symptoms. In contrast, we expected that veterans characterized as undercontrolled and overcontrolled would experience difficulty marshalling and utilizing social support, and would report fewer psychological resources, and rely on ineffectual coping strategies.

In our contextual model we also examined whether a positive history of TBI at baseline would have a direct and deleterious relationship with depression and PTSD over time, as well as indirect effects through a negative association with psychological resources such as social support, self-reported resilience, coping, and psychological flexibility. Thus, our *a priori* model was designed to detect any potential effects of personality factors independent of TBI status on the mediating and outcome variables. Finally, we expected that the degree of combat exposure participants reported at baseline would influence the primary outcome variables of PTSD and depression at the eight month follow-up. Therefore, combat exposure was included as a covariate to account for any variance in the self-report measures attributable to this factor.

Method

Participants and Procedure

The present study is a secondary analysis of an initial sample of 145 Iraq/Afghanistan war veterans enrolled in a larger project examining war zone experiences and post-deployment adjustment (entitled Project SERVE). Several studies have been conducted from the project and a complete list is available upon request from the last author. The current study is the first from the project to examine the association of personality prototypes to subsequent adjustment.

Participants were recruited through randomly selected mailings to veterans enrolled in the Central Texas Veterans Health Care System (CTVHCS) system, with advertisements at recruitment sites and veterans' service organizations, and during in-service presentations to VA staff. Eligible participants were required to be enrolled in the CTVHCS; however, there was no requirement that the veteran be receiving treatment. Prospective participants were eligible if they were: (a) an Iraq/Afghanistan war veteran, (b) able to provide informed consent, and (c) able to complete measures in the baseline assessment. Exclusion criteria included (a) a diagnosis of bipolar or psychotic disorder, (b) recently initiated psychiatric medications or psychotherapy, or (c) suicidality or homicidality warranting crisis intervention. Initial eligibility was determined in a phone interview and later confirmed during an in-person interview.

Participants who responded to study recruitment strategies were screened by telephone using a scripted interview that inquired about inclusion/exclusion criteria. Participants who were deemed initially eligible from the screen were scheduled for an in-person assessment at the beginning of which informed written consent procedures were completed. Inclusion/exclusion criteria were confirmed during the baseline interview (e.g., diagnostic assessment of exclusionary diagnoses). Diagnostic interviews were completed by trained master's level assessors. Diagnostic consensus was reached on all interviews under the supervision of a licensed clinical psychologist.

Of the 145 who enrolled in the study, 8 were excluded for a diagnosis of schizophrenia or bipolar disorder and 9 were excluded due to missing all the items in the Multidimensional Personality Questionnaire (MPQ). For the remaining 128 participants, we further used the criteria proposed by Patrick, Curtin, and Tellegen (2002) to identify any invalid responses with two validation scales: the Variable Response Inconsistency (VRIN) and the True Response Inconsistency (TRIN) scales. One participant who did not meet the valid case criteria was excluded. The final number of participants for subsequent analyses is 127. The average age of this sample was 37.64 ($SD = 10.54$) years old and the average years of education was 14.17 ($SD = 2.542$) years. The majority were male ($n = 107$). The distribution of the participants in terms of race was as follows: White/Caucasian ($n = 80$), African American ($n = 23$), and Other ($n = 24$). With respect to ethnicity, 33 participants identified as Hispanic. Almost two-thirds of the final sample ($n = 82$; 64%) had service-connected pensions for a disability.

Participants were assessed at three separate time points: a baseline interview and two follow-up mailing assessments four and eight months later, as described in detail below and depicted in Figure 2.

Measures of Primary Predictor Variables

Personality Prototypes—The Multidimensional Personality Questionnaire Brief Form (MPQ; Patrick et al., 2002) was administered at baseline. The MPQ contains 155 items (with a true/false response format) and is composed of 11 primary trait scales: Wellbeing, Social Potency, Achievement, Social Closeness, Stress Reaction, Aggression, Alienation, Control, Harm Avoidance, Traditionalism, and Absorption. The 11 trait scales feature three higher order dimensions that correspond to constructs of emotion and temperament: Positive

Emotionality (PEM), Negative Emotionality (NEM), and Constraint (CON). These three dimensions assess the defining characteristics of the resilient prototype. Higher PEM scores reflect a positive and active engagement with the environment and a capacity to experience positive emotions (e.g., enthusiasm, zest). Higher scores on NEM reflect a predisposition for anger, resentment, anxiety and negatively-valenced emotional relationships. Higher CON scores reflect a penchant for caution, harm-avoidance, and convention; lower scores suggest impulsivity and sensation-seeking tendencies. In terms of the Big Five personality traits, the NEM scale may be construed as a combination of the Neuroticism factor and low Agreeableness, PEM may be considered a combination of Extraversion and Achievement Motivation from the Conscientiousness factor, and CON reflects Conscientiousness and aspects of Openness to Experience (Tellegen & Waller, 2008).

The MPQ Brief Form has been used in prior studies of resiliency in adult development (Shiner, Masten, & Roberts, 2003) and traumatic stress (Miller & Harrington, 2011). For this study the Cronbach's alpha coefficient for the MPQ was .76. Alpha coefficients for the 11 primary trait scales in the present study ranged from .64 (Traditionalism) and .69 (Absorption) to .88 (Wellbeing) and .89 (Closeness).

Assessment of traumatic brain injury—Veterans were screened at baseline for possible deployment-related TBI with the Brief Traumatic Brain Injury Screen (BTBIS; Schwab et al., 2007). The screening interviews were conducted by trained masters or doctoral-level clinical interviewers. Veterans screened positive for TBI based on endorsement of a head injury during deployment (e.g., from a blast, vehicular accident, fall, bullet, fragment) that led to an alteration of consciousness (e.g., being disoriented, “dazed,” or confused, seeing “stars”), loss of consciousness, or posttraumatic amnesia. Fifty-seven veterans (44.8% of the sample) screened positive for TBI.

Combat Exposure—The 18-item Full Combat Exposure Scale (FCES; Hoge et al., 2004) assesses combat experiences during warzone deployment (e.g., being attacked or ambushed, handling human remains, incoming mortars). Among Iraq/Afghanistan veterans, scores on the FCES are strongly associated with PTSD symptoms (Hoge, et al. 2004). Participants completed the FCES during the baseline assessment. Internal consistency was .92 in the current study.

Measures of Psychological Resources and Mediating Variables

Self-reported resilience—Veterans completed the Connor-Davidson Resilience Scale (CDRISC; Connor & Davidson, 2003) at baseline. This measure contains 25 items rated on a 5-point Likert-type scale ranging from 0 (not true at all) to 4 (true nearly all of the time). Higher total scores reflect greater resilience. The psychometric properties of the CDRISC are among the best in comparisons with other available resilience measures (Windle, Bennett, & Noyes, 2011). Internal consistency was .96. Sample items include “I am able to adapt when change occurs,” “I can deal with whatever comes my way,” “I like challenges,” and “I tend to bounce back after illness, injury or other hardships.”

Psychological Inflexibility—The Acceptance and Action Questionnaire - II (AAQ-II; Bond et al., 2011) assessed baseline levels of psychological inflexibility and experiential avoidance, which refers to being unwilling or unable to remain in contact with unwanted private experiences (e.g., cognitions, emotions, physiological sensations) and taking steps to avoid the experience (Hayes et al., 2004). The AAQ-II is a seven-item self-report measure that uses a 7-point Likert-type scale (1 = *never true*, 7 = *always true*). Sample items include “I am afraid of my feelings” and “Emotions cause problems in my life.” Higher total scores indicate greater psychological inflexibility.

The AAQ-II exhibits a single-factor structure, good internal consistency, good test–retest reliability, and good convergent associations with the original AAQ (Bond et al., 2011). AAQ-II scores have been uniquely predictive of PTSD severity in cross-sectional research with a subset of the current sample (Meyer, Morissette, Kimbrel, Kruse, & Gulliver, 2013) and in prospective research with college students exposed to a campus shooting (Kumpula, Orcutt, Bardeen, & Varkovitzky, 2011). Internal consistency was .94 in the current study.

Social support—The DRRI-Postdeployment Social Support scale (PDSS) from the Deployment Risk and Resilience Inventory (King, King, Vogt, Knight, & Samper 2006) was used to assess perceived availability of social support. The PDSS was administered four months after the initial assessment. This 15-item self-report scale uses a 5-point Likert-type scale from “1” (strongly disagree) to “5” (strongly agree). The scale was validated for use with Iraq/Afghanistan veterans (Vogt, Proctor, King, King, & Vasterling, 2008). The PDSS assesses perceived emotional and instrumental forms of social support from family, friends, employers and the community following deployment. The scale has demonstrated good internal consistency (.87) in prior research with veterans (Vogt et al., 2008). Internal consistency was .90 in the present study.

Coping—The Brief COPE (B-COPE, Carver, 1997) assessed coping styles at the 4-month assessment. The Brief COPE is a shortened version of the Full COPE (Carver, Scheirer, & Weintraub, 1989). The Brief COPE consists of 28 items (two items each in fourteen subscales). Responses on the Brief COPE are rated on a four-point Likert-type scale that ranges from 0 (“I haven’t been doing this at all”) to 3 (“I’ve been doing this a lot”). Following a previous factor analysis of the B-COPE (Grosso et al., in press), two factors were created by summing the subscales of the B-COPE: action-oriented and avoidant coping. Higher scores on both scales reflect a greater proclivity for that coping style. Internal coefficients were .83 and .73 for the action-oriented coping and the avoidant coping factors, respectively.

Mental Health Symptoms

Depression—The Beck Depression Inventory–II (BDI–II; Beck, Steer, & Brown, 1996) was administered eight months after the initial assessment. The BDI-II is a widely used self-report measure that contains 21 items rated on a 4-point Likert-type scale. Higher scores indicate greater severity of depressive symptoms. The BDI-II has demonstrated excellent psychometric properties in prior research (Beck, Steer, Ball, & Ranieri, 1996; Beck et al., 1996). Internal consistency was .96 in the current study.

PTSD symptoms—The PTSD Checklist–Military Version (PCL–M; Weathers, Litz, Herman, Huska, & Keane, 1993) was administered eight months after the initial assessment. The 17-item PCL-M is a common self-report measure of military-related PTSD symptoms experienced during the past month. The PCL-M has excellent internal consistency and validity (Blanchard, Jones-Alexander, Buckley, & Forneris, 1996). Across studies of veterans, PCL-M cutoff scores to screen for PTSD range from 28 to 60 (Keen, Kutter, Niles, & Krinsley, 2008). Generally, a cutoff score of 50 is used among studies of male Vietnam veterans (Forbes, Creamer, & Biddle, 2001; Weathers et al., 1993). Internal consistency was .97.

Results

Cluster Analysis

Cluster analysis was conducted with SPSS 22.0 to identify the three personality prototypes. In doing hierarchical clustering, each participant was at first treated as one independent cluster and combined in pairs in a series of steps. Ward's method along with squared Euclidean distance measures were used to minimize the total within-cluster sums of squares for each step (Sharma, 1996). By observing the largest shift in the total within-cluster sums of squares between steps, the number of clusters can be determined (Aldenderfer & Blashfield, 1984). After defining the number of clusters, the initial cluster centers from Ward's method were used in the follow-up non-hierarchical K-means analysis to optimize the cluster classification. Additionally, the level of agreement between the preliminary Ward's method and the K-mean classification results were estimated by Cohen's Kappa. We adopt the guideline proposed by Landis and Koch (1977) in which Kappa values between .41 to .60 as moderate, .61 to .80 as substantial, and $>.81$ as almost perfect agreement. Finally, we labelled the clusters by inspecting the PEM, NEM, CON average scores for each cluster.

The agglomeration schedule shows that the largest change in within-cluster sum of squares existed between the 124th step and the 125th step. Therefore, the optimal cluster solution exists when the participants combined till the 127th step, indicating that the suggested number of clusters is $127 - 124 = 3$. We further applied the three-cluster solutions from the Ward method to the K-means clustering analysis to assign each participant into one of the three clusters. Figure 1 presents the personality prototypes (using z scores for ease of interpretation) of the three clusters obtained from K-means cluster results. The Overcontrolled group ($n = 27$) was identified by its high level of NEM and low level of PEM. The Resilient group ($n = 51$) was identified as the group with the highest PEM and the lowest NEM. Finally, the Undercontrolled group ($n = 49$) was characterized by the lowest level of Constraint. The Cohen's Kappa coefficient for the agreement between the Ward and k-means classifications was .67, which is regarded as substantial agreement (Landis & Koch, 1977).

The pattern to the prototypes depicted in Figure 1 differs slightly from a previous cluster analysis (Miller, Grief, & Smith, 2003) and a latent profile analysis (Wolf, Miller, Harrington, & Reardon, 2012) of MPQ data obtained from veterans meeting screening criteria for PTSD. In these studies, a “low psychopathology” prototype had relatively

average PEM, CON and NEM scores (unlike the pronounced elevation on PEM and lower NEM that characterize the Resilient prototype in Figure 1). Perhaps differences in inclusion and exclusion criteria account for some of these variations: Participants in the Miller et al. (2003) and the Wolf et al. (2012) studies met screening criteria for PTSD and veterans with psychotic or bipolar disorders, psychological crises, and recently initiated therapy or medication were excluded from the present study.

Associations among the Variables

The simple associations between personality type and the three types of manifest variables (i.e., the potential mediators, distress outcomes, and covariates) are listed in Table 1. PEM and NEM were significantly and inversely correlated, $-.39$ ($p < .001$). Similarly, NEM and CON were significantly correlated, $-.18$ ($p < .05$). The correlation between PEM and CON (.13) was not significant. The MPQ Unlikely Virtues scale (designed to detect “faking good”) was not significantly correlated with any of the other self-report variables (all r 's ranged from $-.16$ to $.14$).

Results from one-way ANOVAs indicated significant associations between personality prototype and all the manifest variables (all p 's $< .05$). Follow-up post-hoc comparisons provided evidence of the mean score differences between any two of the personality subgroups. Both the Overcontrolled and Undercontrolled groups had higher psychological inflexibility and lower self-reported resilience at baseline, lower social support at four months, and more PTSD symptoms at eight months compared to the Resilient group. The Overcontrolled group had the highest depression scores at the eighth month, followed by the Undercontrolled and the Resilient group. The Overcontrolled group had higher combat exposure scores than the Resilient group, but these two groups were not significantly different from the Undercontrolled group. The Resilient group applied more action-oriented and less avoidant coping strategies at four months than the Undercontrolled group. The Overcontrolled group had higher combat exposure scores than the Resilient group, but the Resilient and Undercontrolled groups did not differ.

TBI diagnosis was significantly associated with personality prototype ($p < .01$). A majority of individuals in the Overcontrolled group screened positive for TBI ($n = 17$, 63%). In contrast, a majority of individuals in the Resilient group screened negative for TBI ($n = 37$; 71%). A higher proportion of men screened positive for TBI than women. No associations were found between gender and personality prototype. There was no significant association between personality prototypes and the distribution of service-connected pensions. TBI was not associated with race or ethnicity.

Independent sample t -tests revealed several significant differences between those with a positive and negative TBI history. Individuals with TBI had higher psychological inflexibility and combat exposure at baseline, lower social support at the fourth month, and more PTSD and depression symptoms at the eighth month than those without TBI (all p 's $< .01$). TBI history was not significantly related to self-reported resilience at baseline or to the coping strategy variables (i.e., active and avoidant) at the fourth month.

Correlations among all the mediators, mental health symptom outcomes, and the covariate variables are provided in Table 2. All of the mediating variables were associated with PTSD and depression ($p < .05$), except for action-oriented coping. Lower self-reported resilience and higher psychological inflexibility at baseline and lower social support at the fourth month were significantly associated with higher PTSD and depression at the eighth month. Higher avoidant coping at the fourth month was also significantly positively associated with PTSD and depression. Combat exposure was significantly associated with the mediating variables (except action-oriented coping) and with PTSD and depression.

Path Analysis

Path analysis was used to test the proposed contextual model (Figure 2), in which psychological inflexibility and self-reported resilience at baseline and social support, action-oriented and avoidant coping at the fourth month were positioned as potential mediators of the relationships between personality prototypes and TBI diagnosis at baseline to PTSD and depression eight months later. Combat exposure was included as a covariate in the model. Direct and indirect effects were examined in the model with Mplus 7.1 (Muthén & Muthén, 1998-2012). Missing data were handled by conducting the full information maximum likelihood (FIML) methods to incorporate information from incomplete responses and retain available information from all 127 participants in the analyses. Additionally, 1000 bootstrapping samples were produced to estimate the 95% confidence interval (CI) for all the path coefficients. Bootstrapping technique was applied to compensate the significant test results based on small sample (i.e., 127 in the present study), especially in testing indirect effect (Preacher & Hayes, 2008).

To achieve an ideal model to interpret the data, we began with a saturated model in which all possible correlations between variables were specified in the model depicted in Figure 2. Then we excluded three non-significant paths based on the previous univariate association results. The three paths deleted in the corrected model (Figure 3) were the paths from TBI to self-reported resilience (the CDRISC) at baseline and to active and avoidant coping at the fourth month.

Fit indices were examined to assess model fit. A chi-square significance test with a p value greater than .05 indicates adequate model fit. Two incremental fit indices, the comparative fit index (CFI) and Tucker-Lewis Index (TLI) were chosen; a value of CFI and TLI exceeding .95 indicates a good fit (Hu & Bentler, 1999; Yu, 2002). Furthermore, two absolute fit indices, the root mean squared error of approximation (RMSEA) and the standardized root mean squared residual (SRMR) were used for model evaluation. A model with a RMSEA value below .05 indicates good fit, whereas RMSEA values between .05 and .08 suggest acceptable fit (Browne & Cudeck, 1992). A cutoff value of .09 for SRMR also suggests good model fit (Hu & Bentler, 1999). The test of the corrected model provided excellent fit indices: $\chi^2(3) = 1.453$, $p = 0.693$; CFI = 1.00; TLI = 1.00; RMSEA = 0.000; SRMR = 0.011. Thus, the path coefficients yielded from the corrected model were interpretable.

Direct effects—Both the standardized and unstandardized path coefficients for the corrected model are displayed in Table 3. Personality prototype was significantly associated

with most of the mediators at baseline and at the fourth month. Compared with the Resilient group, the Overcontrolled prototype was significantly associated with more psychological inflexibility and lower self-reported resilience at baseline, and with less social support and greater avoidant coping at the fourth month (all p 's < .01). Similarly, the Undercontrolled prototype was significantly associated with greater psychological inflexibility and lower self-reported resilience at baseline, and with lower social support, less action-oriented coping and more avoidant coping at the fourth month than the Resilient group (all p 's < .01). TBI was not associated with any mediator at baseline or at the fourth month.

Most of the mediators were associated with the mental health outcomes. Greater psychological inflexibility at baseline and lower social support and more avoidant coping at the fourth month significantly predicted higher PTSD and depression at the eighth month (all p 's < .001). However, self-reported resilience (as assessed by the CDRISC) at baseline and action-oriented coping at the fourth month was not significantly predictive of either PTSD or depression. A positive TBI diagnosis significantly predicted PTSD symptoms at the eighth month assessment. Personality prototype was not directly predictive of either PTSD or depression. The final model accounted for about 75% of the variance in PTSD ($R^2 = 0.75$) and 73% of the variance in depression.

Indirect effects—All possible indirect effects of personality type and TBI diagnosis on distress outcomes at the eighth month are shown in Table 4. Personality prototype had indirect effects through psychological inflexibility at baseline ($p < .01$) and through social support ($p < .01$) and avoidant coping at the fourth month ($p < .05$) to PTSD. Similarly, the indirect effect from personality prototype to depression at 8 months was significant via psychological inflexibility at baseline ($p < .05$), social support ($p < .05$) and avoidant coping at the fourth month ($p < .05$). Consequently, the prospective relationship of the Overcontrolled and Undercontrolled personality prototypes to depression and PTSD are best understood in their effects on psychological inflexibility, social support and avoidant coping. No significant indirect effect was observed for TBI diagnosis on PTSD or depression in the final model.

Discussion

Consistent with our initial hypotheses, veterans characterized as Resilient at the baseline assessment had greater perceived social support, less avoidant coping, and less psychological inflexibility than veterans classified as Overcontrolled or Undercontrolled. They also reported the lowest levels of PTSD and depression. Taking into account the variance attributable to combat experience and TBI, a resilient personality prototype was not directly predictive of distress assessed eight months later. Rather, a resilient personality was prospectively predictive of lower PTSD and depression symptoms over time through its beneficial influence on several adaptive characteristics, including greater social support and lower avoidant coping and psychological inflexibility. Thus, the protective and adaptive qualities of a resilient personality maintained a positive influence over time despite prior combat exposure and the common occurrence of a head injury. In contrast, facets of an Undercontrolled and Overcontrolled personality appear to complicate adjustment in addition to the deleterious effects that may be associated with increased combat exposure. The

indirect effects of personality on adjustment over time were independent of the significant association of TBI status with PTSD.

The resilient group was characterized by low levels of negative emotionality and high levels of positive emotionality on the MPQ. Positive emotions may facilitate adjustment in times of stress as they promote flexibility and an ability to attend to and integrate new information (Cohn, Fredrickson, Brown, Mikels, & Conway, 2009; Fredrickson, 2013). Experiencing positive emotions can help people feel closer and more connected with others (Kok et al., 2013) and increased contact and support from important individuals is often a characteristic of resilience (Bonanno, 2005). Positive emotions appear to serve as a buffer against depression in times of stress (Fredrickson, Tugade, Waugh, & Larkin, 2003) and evidence suggests that they promote physical health (Fredrickson, Cohn, Coffey, Pek & Finkel, 2008; Kok & Fredrickson, 2010). There is also prospective evidence that positive emotions may be elements of resilience that promote adaptive cognitive appraisals of symptoms experienced by persons with chronic health conditions (Ong et al., 2010). From the perspective of Fredrickson's (2013) broaden-and-build model positive emotion may be the defining feature of trait resilience as it promotes flexibility in thinking and appraisals of stress, facilitates flexible coping and problem solving, enhances social relationships and circumvents lingering effects of stress and negative emotions (Ong et al., 2009). Future research should attend to the potentially unique benefits of positive emotionality in resilient personality prototypes to further our understanding of the interplay between positive affect, psychological flexibility, coping and supportive relationships. The results of the present study indicate that screening with personality instruments (such as the MPQ) to determine resilient, undercontrolled and overcontrolled traits may be used to assess therapeutic prognosis and to potentially allocate treatment resources to veterans who may be particularly at risk for chronic, unremitting problems over time.

The mediating effect of avoidant coping, social support and psychological inflexibility provides some "...explanation for the mechanism that drives the relationship" (Hoyt, Imel & Chan, 2008, p. 323) of the personality prototypes with depression and PTSD over time. The use of avoiding coping behaviors, a lack of flexibility and a problematic social support systems appear to characterize individuals who have overcontrolled and undercontrolled personality prototypes that, in turn, reinforce and perpetuate symptoms associated with depression and PTSD. This pattern is consistent with the broader literature regarding the relations between PTSD, depression symptoms, coping (e.g., Holahan, Moos, Holahan, Brennan, & Schutte, 2005) and psychological inflexibility (Kumpula et al., 2011; Marx & Sloan, 2005; Meyer et al., 2013). Importantly, these are issues that can be addressed in strategic interventions.

Avoidant coping strategies can be modified through evidence-based treatments such as prolonged exposure and cognitive processing therapy (Liverant, Suvak, Pineles & Resick, 2012; Rauch et al., 2009). Similarly, prior research indicates that psychosocial treatment targeting psychological inflexibility is effective in treating depression in veterans (Walser et al., 2013) and that increases in psychological flexibility mediate response to treatment for anxiety and depression (Berking, Neacsiu, Comtois & Linehan, 2009; Hayes, Orsillo, & Roemer, 2010). Future research is needed to address whether personality prototypes

influence the effectiveness of these treatments in reducing symptoms of PTSD and depression.

Social support is another modifiable mediator between personality subtypes and mental health symptoms. Within the veteran mental health literature, low social support is a consistent predictor of greater symptoms, suicidal ideation, and poor functional outcomes (DeBeer, Kimbrel, Meyer, Gulliver & Morissette, 2014; Pietrzak, Russo, Ling & Southwick, 2011; Tsai, Harpaz-Rotem, Pietrzak, & Southwick, 2012). While social support is modifiable, there are few interventions for veterans that directly address improving social support within the larger context of treatments aimed to reduce mental health symptoms. As part of a recovery-based approach, over the past several years the Veterans Health Administration (VHA) has provided nationwide access to integrated peer support programs within mental health services for veterans with severe mental illness. Within civilian populations, peer support programs have demonstrated benefits such as greater treatment engagement, better quality of life, increased social functioning, greater life satisfaction, fewer inpatient visits, and greater community engagement (Clarke et al., 2000; Craig, Dougherty, Jamieson-Craig, Boocock, & Attafua, 2004; Min, Whitecraft, Rothbard, & Salzer, 2007).

Interestingly, despite the direct association of TBI to PTSD, TBI status had a limited influence on all other self-report variables in the contextual model. The study did not assess repeated concussions (that often occur with multiple exposures to blasts during deployment) and we did not account for pre- or post-deployment TBI. It is possible that individuals who experienced several TBIs might display more distress (and fewer psychological resources) than those with a single episode. Reliance on the self-reported incidence of TBI is another limitation of the study. Similarly, the lack of predictive effects for self-reported resilience raises questions about the prospective value of the Connor-Davidson instrument. Although higher scores on the CDRISC were associated with other self-report measures in a manner consistent with clinical and theoretical expectations, the measure did not predict later adjustment after controlling for other predictors. Apparently the CDRISC shares considerable overlap with other adaptive psychological characteristics assessed in the current study. The Resilient personality prototype was indirectly obtained from the MPQ. It is possible that the fairly transparent, “face valid” nature of the CDRISC may limit its utility as measure of personal resilience, particularly in prospective designs.

Findings should be interpreted within the context of limiting factors. First, the sample included veterans who were primarily Caucasian, male, and enrolled in the Central Texas VA Healthcare System; thus, the degree to which these findings generalize to other veterans is unclear. Second, the sample size was relatively small, although retention rates were very high across time (over 90% across 8 months), especially for a primarily mental health sample. These limitations are further offset by the use of a prospective design and widely-used, validated self-report measures.

The present study included no pre-deployment personality data. No measure of symptom exaggeration was used in this study; therefore, we do not know the degree to which our results may have been affected by an “overreporting” of symptoms. The differences in

combat exposure between two of the personality prototypes raises some concern about the possible effect of combat exposure on responses to the MPQ. Although the possible “contaminating” effects of combat exposure on the MPQ cannot be dismissed, we can assume these effects would be systematic, affecting responses to all of the self-report measures in the study. In addition, including combat exposure as a covariate in the model served to partial out the variance directly attributable to combat exposure in the mediator and outcome variables. In this context, then, our results reflect theoretically and clinically compelling findings. Finally, we restricted our interest in combat exposure to the total score from the Full Combat Exposure Scale and in the process, we did not isolate specific aspects of combat exposure such as the number of times in combat for study, nor did we have information about the length or duration of deployment. The degree to which these specific factors may have affected the results is unknown.

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Impact and Implications

- Although resilience is often discussed as a beneficial factor in the PTSD and TBI literature, the present study is the first to examine a resilient personality prototype and its association with adjustment over time among veterans with these conditions.
- The results of the present study indicate that screening with personality instruments to determine resilient, undercontrolled and overcontrolled traits may be used to assess therapeutic prognosis and to potentially allocate treatment resources to veterans who may be particularly at risk for chronic, unremitting problems over time.
- For veterans with Overcontrolled and Undercontrolled personality profiles, social support, avoidant coping and psychological inflexibility are modifiable factors that can be addressed in treatment to reduce symptoms of distress associated with PTSD and depression.

Note: PEM = Positive Emotionality, NEM = Negative Emotionality, CON = Constraint. Resilient prototype = 40.1% (n = 51) of the sample, Undercontrolled = 38.6% (n = 49); Overcontrolled = 21.3% (n = 27).

Figure 1.

Three Personality Prototypes based on the MPQ in the sample of 127 Veterans.

Figure 2.
Saturated A Priori Model of Personality Prototypes, TBI and Mediating Characteristics
Predicting PTSD and Depression Eight Months Following Baseline

Note. All path coefficients are shown in standardized form. * $p < .05$, ** $p < .01$, *** $p < .001$

Figure 3.
Final Model Depicting Significant Paths to PTSD and Depression Symptoms

Table 1

Mean score differences among mediators, distress outcomes, and the covariate by personality prototypes

Measure	Personality Prototype						Post-hoc test
	Overcontrolled (Cluster 1)		Undercontrolled (Cluster 2)		Resilient (Cluster 3)		
	M	SD	M	SD	M	SD	
Mediators (4 th month)							
Social Support	47.10	9.78	47.63	8.56	57.06	8.38	<.001 1 & 2 < 3
B-COPE_Action	10.08	3.92	7.91	3.42	10.20	3.97	.010 3 > 2
B-COPE_Avoidant	3.52	2.07	3.51	2.31	2.26	2.25	.020 2 > 3
AAQ-II	30.26	11.74	27.17	9.92	15.71	7.84	<.001 1 & 2 > 3
CDRISC	61.78	21.48	61.87	18.64	80.96	14.03	<.001 1 & 2 < 3
Distress outcomes (8 th month)							
PCL-M	60.24	15.13	51.50	17.76	33.98	16.57	<.001 1 & 2 > 3
BDI	32.13	12.66	24.20	12.99	11.08	9.84	<.001 1 > 2 > 3
Covariate (Baseline)							
Combat exposure	31.08	16.48	23.26	14.98	18.34	11.56	.001 1 > 3

Note: B-COPE_Action = Action coping score; B-COPE_Avoidant = Avoidant coping score AAQ-II = Acceptance and Action questionnaire; CDRISC = Connor-Davidson Resilience Scale; PCL-M = PTSD Checklist-Military; BDI = Beck Depression Inventory-II.

Table 2

Correlations among mediators, distress outcomes, and combat exposure

	1	2	3	4	5	6	7
Mediators (4 th month)							
1. Social Support							
2. B-COPE_Action	.263						
3. B-COPE_Avoidant	-.499	.120					
4. AAQ-II	-.548	-.094	.598				
5. CDRISC	.559	.406	-.369	-.611			
Distress outcomes (8 th month)							
6. PCL-M	-.676	.088	.681	.704	-.412		
7. BDI	-.689	.019	.646	.731	-.530	.861	
Covariate (Baseline)							
8. Combat exposure	-.294	.029	.152	.431	-.198	.473	.468

Note. Correlations greater than |.15| are significant at $p < .05$. B-COPE_Action = Action coping score; B-COPE_Avoidant = Avoidant coping score; AAQ-II = Acceptance and Action questionnaire; CDRISC = Connor-Davidson Resilience Scale; PCL-M = PTSD Checklist-Military; BDI = Beck Depression Inventory-II.

Table 3

Direct Effects of Corrected Path Model

Effect	Unst.	St.	Unst. 95% C.I. (Bootstrap)
Personality subtype (<i>ref</i> : Resilient) → Mediators			
OVER → Social Support **	-8.23	-0.34	(-13.60, -2.86)
UNDER → Social Support ***	-8.01	-0.40	(-12.03, -4.00)
OVER → B-COPE_Action	-0.52	-0.06	(-2.66, 1.62)
UNDER → B-COPE_Action **	-2.43	-0.31	(-3.89, -0.97)
OVER → B-COPE_Avoidant ***	2.48	0.44	(1.00, 3.96)
UNDER → B-COPE_Avoidant **	1.37	0.29	(0.54, 2.11)
OVER → AAQ-II ***	11.28	0.41	(5.78, 16.77)
UNDER → AAQ-II ***	10.14	0.43	(0.54, 2.21)
OVER → CDRISC ***	-17.92	-0.37	(-27.41, -8.44)
UNDER → CDRISC ***	-18.92	-0.46	(-25.78, -12.05)
TBI diagnosis (<i>ref</i> : TBI negative) → Mediators			
TBI positive → Social Support	-1.63	-0.08	(-5.52, 2.25)
TBI positive → AAQ-II	1.25	0.06	(-1.81, 4.32)
Mediators → Distress outcomes			
Social Support → PCL-M ***	-0.68	-0.35	(-1.02, -0.34)
COPE_Action → PCL-M	0.30	0.06	(-0.29, 0.89)
COPE_Avoidant → PCL-M ***	2.77	0.33	(1.42, 4.12)
AAQ-II → PCL-M **	0.43	0.26	(0.14, 0.73)
CDRISC → PCL-M	0.09	0.09	(-0.05, 0.23)
Social Support → BDI ***	-0.42	-0.29	(-0.68, -0.16)
COPE_Action → BDI	-0.11	-0.03	(-0.59, 0.37)
COPE_Avoidant → BDI ***	1.70	0.28	(0.72, 2.68)
AAQ-II → BDI **	0.32	0.25	(0.09, 0.55)
CDRISC → BDI	-0.02	-0.03	(-0.14, 0.10)
Personality subtype (<i>ref</i> : Resilient) → Mental health symptoms			
OVER → PCL-M	0.07	0.00	(-9.48, 9.61)
UNDER → PCL-M	1.30	0.03	(-5.00, 7.60)
OVER → BDI	2.57	0.07	(-3.88, 9.02)
UNDER → BDI	1.43	0.050	(-2.91, 5.77)
TBI diagnosis (<i>ref</i> : TBI negative) → Mental health symptoms			
TBI positive → PCL-M *	5.77	0.15	(0.77, 10.77)
TBI positive → BDI	2.31	0.081	(-1.60, 6.22)

Note. *ref* = reference group. OVER = overcontrolled; UNDER = undercontrolled; B-COPE = Brief COPE scale; AAQ-II = Acceptance and Action questionnaire; CDRISC = Connor-Davidson Resilience Scale; PCL-M = PTSD Checklist-Military; BDI = Beck Depression Inventory-II.

Personality subtype, TBI, AAQ, and CDRISC were measured at baseline. Social Support, B-COPE Action, and B-COPE Avoid were measured at 4th month. PCLM and BDI were measured at 8th month. Unst. = unstandardized; St. = standardized.

*
 $p < .05$

**
 $p < .01$

 $p < .001$

Table 4

Indirect Effects of Personality Subtypes on Distress Outcomes in Corrected Path Model

Effect	Unst.	St.	Unst. 95% C.I. (Bootstrap)
OVER → Social Support → PCL-M ^{**}	5.59	0.12	(0.45, 10.74)
OVER → B-COPE_Action → PCL-M	-0.15	-0.00	(-1.12, 0.81)
OVER → B-COPE_Avoidant → PCL-M ^{**}	6.86	0.15	(1.65, 12.07)
OVER → AAQ-II → PCL-M ^{**}	4.88	0.10	(0.95, 8.81)
OVER → CDRISC → PCL-M	-1.56	-0.03	(-4.30, 1.17)
UNDER → Social Support → PCL-M ^{**}	5.45	0.14	(1.01, 9.89)
UNDER → B-COPE_Action → PCL-M	-0.72	-0.02	(-2.33, 0.89)
UNDER → B-COPE_Avoidant → PCL-M [*]	3.80	0.10	(0.89, 6.70)
UNDER → AAQ-II → PCL-M ^{**}	4.39	0.11	(0.94, 7.84)
UNDER → CDRISC → PCL-M	-1.65	-0.04	(-4.43, 1.13)
OVER → Social Support → BDI [*]	3.44	0.10	(0.55, 6.88)
OVER → B-COPE_Action → BDI	0.06	0.00	(-0.56, 0.68)
OVER → B-COPE_Avoidant → BDI ^{**}	4.21	0.12	(1.05, 7.37)
OVER → AAQ-II → BDI [*]	3.57	0.10	(0.73, 6.41)
OVER → CDRISC → BDI	0.40	0.01	(-1.96, 2.76)
UNDER → Social Support → BDI ^{**}	3.35	0.11	(0.43, 6.27)
UNDER → B-COPE_Action → BDI	0.27	0.01	(-0.95, 1.49)
UNDER → B-COPE_Avoidant → BDI [*]	2.33	0.08	(0.44, 4.22)
UNDER → AAQ-II → BDI ^{**}	3.21	0.11	(0.62, 5.80)
UNDER → CDRISC → BDI	0.43	0.02	(-1.92, 2.77)
TBI positive → Social Support → PCL-M	1.11	0.03	(-1.57, 3.79)
TBI positive → AAQ-II → PCL-M	0.54	0.01	(-0.94, 2.03)
TBI positive → Social Support → BDI	0.68	0.02	(-1.07, 2.44)
TBI positive → AAQ-II → BDI	0.40	0.01	(-0.75, 1.54)

Note. The reference group for the personality subtypes was the resilience group. OVER = overcontrolled; UNDER = undercontrolled; B-COPE = Brief COPE scale; AAQ-II = Acceptance and Action questionnaire; CDRISC = Connor-Davidson Resilience Scale; PCL-M = PTSD Checklist-Military; BDI = Beck Depression Inventory-II. Personality subtype, AAQ-II, and CDRISC were measured at baseline. Social Support, B-COPE Action, and B-COPE Avoid were measured at 4th month. PCLM and BDI were measured at 8th month. Unst. = unstandardized; St. = standardized.

*** $p < .001$

* $p < .05$

** $p < .01$