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Relation between coping and posttrauma cognitions on PTSD in a combat-trauma population

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Abstract

Individual differences in cognitive processes and coping behaviors play a role in the development and maintenance of posttraumatic stress disorder (PTSD). Given the large numbers of combat-exposed service members returning from the Operation Enduring Freedom (OEF), Operation Iraqi Freedom (OIF), and Operation New Dawn (OND) conflicts, exploring individual differences in cognitive-affective processes is important for informing our understanding of PTSD etiology and early intervention in military samples. The present study examined the unique main and interactive effects of negative posttrauma cognitions (i.e., negative beliefs about self [NS], the world [NW], and self-blame [SB]) and coping strategies (i.e., positive behavioral, positive cognitive, avoidant coping, and social and emotional coping) on PTSD diagnosis within 155 ($M_{age} = 30.7$, $SD = 4.48$) OEF/OIF/OND combat trauma-exposed veterans recruited from an ongoing study examining the effects of combat trauma and stress reactivity. In the final, stepwise logistic regression analysis, avoidant coping, but no other coping strategy, was significantly positively related to PTSD diagnosis in the initial step. Higher levels of NS, but not NW, were significantly associated with having a PTSD diagnosis, while SB was associated with decreased likelihood of PTSD, above and beyond coping strategies. A significant interaction effect was found between NS and positive cognitive coping, such that greater positive cognitive coping weakened the relationship between NS and PTSD. Examining and addressing coping behaviors and negative thoughts of self jointly may benefit assessment and intervention approaches in a combat-trauma population.

Keywords

Combat trauma; PTSD; coping behaviors; maladaptive cognitions

Combat exposure is a particularly potent form of trauma, associated with elevated rates of posttraumatic stress disorder (PTSD) compared to other forms of trauma (Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995). Rates of combat trauma are high (31-86%; Hoge et al., 2004) among returning service members of Operations Enduring Freedom/ Iraqi Freedom/ New Dawn, (OEF/OIF/OND). Prevalence of PTSD has been estimated at 23% in returning service members (see meta-analysis by Fulton et al., 2015), with rates varying as a function of combat exposure. Substantial variability in response to combat trauma exists, as experience of a traumatic event alone is not sufficient for the development of PTSD. Thus, understanding vulnerability and protective factors that contribute to or buffer against the development of PTSD in this population serves to inform etiologic models. These models can in turn inform effective prevention and intervention strategies (Bowman & Yehuda, 2004; McKeever & Huff, 2003).

Individual differences in cognitive response to the experience of a traumatic event, such as the challenging of, and/or alterations in, previously established cognitive schemas, may function to increase vulnerability for PTSD symptomatology (Foa, Riggs, Dunca, Rothbaum, 1993; Janoff-Bulman, 1992). For example, the cognitive processing model postulates that an individual's appraisal of a traumatic event, and their subsequent ability to cope, determines how that individual then adapts (Ehlers & Clark, 2000). The emotional processing model (Foa & Kozak, 1986; Foa & Rothbaum, 1998), is based on the idea that emotions, particularly fear, are represented by information structures in memory and can be activated. This model proposes that the fear structure can lead to problematic representations that result in negative cognitions about the world being dangerous and about one's inability to cope with symptoms. These problematic representations can then increase vulnerability to developing PTSD. In support of these processing models, extant studies have consistently associated negative posttrauma cognitions with the development of PTSD in civilian (Dunmore, Clark, & Ehlers, 2001; Foa et al., 1999; Kolts, Robinson, & Tracy, 2004; Laposa & Alden, 2003) and veteran (Holliday, Link-Malcolm, Morris, & Surís, 2014) populations. Posttrauma cognitions may also distinguish between trauma survivors with and without PTSD (Beck et al., 2004; Foa et al., 1999) and prospectively predict greater posttraumatic stress symptoms, even after controlling for prior trauma history (Bryant & Guthrie, 2005, 2007). From an intervention perspective, changes in trauma-related cognitions during Cognitive Processing Therapy (CPT; Monson et al., 2006) for PTSD have been shown to predict PTSD symptom change during treatment (Schumm, Dickstein, Walter, Owens, & Chard, 2015) and are associated with maintenance of treatment gains (Iverson, King, Cunningham, & Resick, 2015).

Coping strategies, defined as the cognitive and behavioral efforts used to manage external and internal stressors (Folkman & Moskowitz, 2004), have also been associated with PTSD as well as other psychiatric disorders (Ahern et al., 2004; Cofini, Carbonelli, Cecilia, Binkin, & Orio, 2015; Grosso et al., 2014; Gutner, Rizvi, Monson, & Resick, 2006; Ozer, Best, Lipsey, & Weiss, 2003). Extant literature suggests that certain coping strategies are associated with greater PTSD severity, such as avoidant coping (i.e., efforts to withdraw from, suppress, or deny the experience of the stressor or subsequent reactions; Clohessy & Ehlers, 1999; Hooberman, Rosenfeld, Rasmussen, & Keller, 2010). Other coping strategies, such as self-sufficient coping (i.e., problem- or emotion-focused coping strategies without

the aid of social support), are protective and associated with lower levels of PTSD (Linley & Joseph, 2004; Ozer et al., 2003).

The interplay of coping behaviors and posttrauma cognitions may be particularly useful for characterizing risk for development of PTSD (Bomyea, Risbrough, & Lang, 2012; Bryant et al., 2005). It may be that select coping strategies are particularly relevant in the context of dysfunctional cognitions. For example, active coping strategies such as cognitive reinterpretation may buffer against the impact of negative posttrauma cognitions. This aligns with existing cognitive-based treatment approaches that aim to teach individuals to reappraise thoughts about their trauma experiences (Monson et al., 2006). Conversely, avoidant coping strategies might further intensify the severity and impact of negative cognitions, a theory supported by the large body of literature examining coping motives for substance use following trauma (Bonn-Miller, Vujanovic, Boden, & Gross, 2011; Dixon et al., 2009).

Despite the fact that both posttrauma cognitions and coping behaviors are core features of the processing models of PTSD and related treatment approaches, the joint assessment and interaction of posttrauma cognitions and coping behaviors in relation to PTSD symptomatology has been limited in extant literature. Available research suggests negative cognitions of self and world are correlated with avoidant coping styles (Matthews, Harris, & Cumming, 2009) and coping self-efficacy may mediate an association between negative cognitions and PTSD (Cieslak, Benight, & Lehman, 2008). However, the joint and potential interactive effects of posttrauma cognitions and coping style on PTSD have not been evaluated. Additionally, the interplay between coping behaviors and negative cognitions aligns with existing treatment approaches that attempt to target both behavioral and cognitive processes, to decrease avoidance and modify negative cognitions through a change in interpretation of traumatic events (Schumm et al., 2015). Indeed, the two primary evidence-based treatments for combat trauma (i.e., Prolonged Exposure and CPT) attempt to modify both cognitions and avoidant coping, although with differing emphases.

The present study examined the main and interactive effects of negative posttrauma cognitions (i.e., negative thoughts of self and the world and self-blame) and coping strategies (i.e., self-sufficient, avoidant, and socially-supported) on PTSD diagnostic status. With these aims in mind, we hypothesized the following: 1) negative posttrauma cognitions (negative thoughts about self, negative thoughts about the world, and self-blame) would be positively associated with PTSD; 2) maladaptive coping behaviors (e.g., avoidant coping) would be positively associated with PTSD; 3) adaptive coping behaviors (e.g., positive behavioral coping) would be negatively associated with PTSD; 4) an interaction of posttrauma cognitions and coping behavior would be found, above and beyond main effects, such that negative posttrauma cognitions would be positively associated with PTSD among those endorsing low but not high levels of adaptive coping behaviors.

Methods

Sample

The present sample is composed of 155 OIF/OEF/OND veterans, who participated in a larger study designed to examine the role of genes in the relationship between combat trauma, stress reactivity, and alcohol use in veterans. Participants were recruited through the community, local university, and the local Veteran's Affairs Medical Center (VAMC) by advertising (e.g., flyers, internet, direct mail). All study activities were approved by the local Institutional Review Boards of the university and VAMC. Given the focus on capturing at-risk drinking and examination of biological markers, inclusion criteria for the larger study included: ability to provide informed consent; being a regular drinker (at least 4 days in the month prior to the study screener) who did not meet *DSM-IV* criteria for alcohol dependence; and age between 21-40 years. Exclusion criteria for the larger study included: current major depressive disorder and substance abuse or dependence (excluding alcohol and cannabis abuse and nicotine and caffeine abuse/dependence) as assessed by the Mini-International Neuropsychiatric Interview (MINI; Sheehan et al., 1998); women who were pregnant or nursing, or who suspected they might be pregnant; history of a moderate or severe traumatic brain injury; the presence of a blood-clotting disorder; and presence of a medical condition or use of medication affecting hypothalamic-pituitary-adrenal axis functioning (e.g., psychoactive medications such as SSRIs).

For the present study, data was used from those participants who had a history of a Criterion A combat trauma event during OIF/OEF/OND deployment, assessed as part of the clinical interview with the Life Events Checklist (LEC; Gray, Litz, Hsu, & Lombardo, 2004) and who met certain criteria (described in the Measures section) as part of the Clinician Administered PTSD Scale (CAPS) DSM-IV version (Blake et al., 1995). To date, published work from this study has examined the relationship between PTSD and disturbed sleep (Lind et al., 2017), and additional work under review has examined anxiety sensitivity and distress tolerance. Thus, the current work is the first from this study to examine negative cognitions and their interplay with coping behaviors on PTSD.

Measures

Demographic variables—Demographic variables, including gender, race, ethnicity, age, marital status, education, income, and employment status, were asked of all participants via questionnaire at the initial visit. Veteran-specific items, including military branch, rank, and number of deployments were also assessed.

Combat experiences—The Combat Experiences Scale from the Deployment Risk and Resilience Inventory (DRRI; King, King, Vogt, Knight, & Samper, 2006) includes 15 yes/no questions about combat experiences that occurred during deployment. Responses were summed to create a total score, where higher scores indicate more experiences endorsed ($\alpha = .88$ in present sample).

Posttraumatic stress disorder—The Clinician Administered PTSD Scale (CAPS) DSM-IV version (Blake et al., 1995) is a diagnostic interview for current and lifetime PTSD

that assesses the frequency and severity of PTSD symptoms and results in both a diagnosis using *DSM-IV* criteria and a symptom severity score. The CAPS demonstrates high inter-rater and test-retest reliability (i.e., ranging from .90 to .98) and internal consistency across items of .94 (Blake et al., 1995). Structured clinical interviews were conducted by post-doctoral fellows, master's level social workers, and doctoral psychology students; interviews were audio-recorded and inter-rater reliability, among 128 randomly selected cases from the overarching study, was high ($k = .92$). In the present study, classification in the PTSD group was based on meeting diagnostic criteria for PTSD and having a severity score of 40 or higher (Weathers, Keane, & Davidson, 2001). Controls, all trauma-exposed, must not have met criteria for lifetime or current PTSD, with a severity score of no greater than 25.

Negative cognitions—The Posttraumatic Cognitions Inventory (PTCI; Foa et al., 1999) is a PTSD-related questionnaire that assesses the types of thoughts individuals have following a traumatic experience. Individuals rate how much they agree or disagree with each item on a Likert scale from 1 (*totally disagree*) to 7 (*totally agree*). The 33 items of the PTCI fall into three subscales, representing negative cognitions about the self, negative cognitions about the world, and self-blame. In line with existing literature (Beck et al., 2004) we examined the three subscales separately within our dataset and found high inter-item reliability (α 's of .94 for negative thoughts of self, .87 for negative thoughts of the world, and .80 for self-blame). We refer to these subscales as NS, NW, and SB (negative thoughts of self, negative thoughts of the world, and self-blame, respectively).

Coping—The COPE Inventory (COPE; Carver, Scheier, & Weintraub, 1989) is a 60-item self-report measure of an individual's coping behavior across 15 different dimensions (e.g., venting emotions ["I let my feelings out"], positive reinterpretation ["I learn something from the experience"]), with four items per dimension. The measure possesses adequate internal consistency and reliability (Carver et al., 1989) including moderate to high inter-item reliability in the present study for all scales (α 's = 0.69 – 0.96) except for denial ($\alpha = 0.31$). Inspection of the distribution of denial in the present study indicated substantial deviations from normality, which may influence inter-item reliability. For this reason, denial was removed from subsequent analyses.

Analytic Plan

Prior to conducting primary analyses, all data was inspected for normality and outliers and adjusted accordingly. Analyses were conducted using R (version 3.30) and SPSS (version 22). As the COPE includes a large number of scales, prior research has tended to either use select scales or to factor analyze the 15 dimensions, resulting in a variety of factor solutions ranging from 2 to 5 factors (Litman, 2006). In line with this extant literature, and for purposes of data reduction, exploratory factor analysis (EFA) was conducted on the subscales of the COPE to inform upon the combination of scales prior to the primary study analyses. The denial subscale of the COPE was removed due to low endorsement of items, lack of normality, and low inter-item reliability, as described above. All factor analyses were conducted in R using the psych package (version 1.6.9; Revelle, 2016). Although inspection of a Scree plot supported a 4-factor solution, EFA models for 3, 4, and 5 factors were run using varimax rotation to evaluate potential alternative factor analytic solutions, such as

those suggested in prior research (e.g., Boden, Bonn-Miller, Vujanovic, Drescher, 2012; Weinberg, Gil, Gilbar, 2014). Varimax rotation was used in line with prior literature (e.g., Weinberg et al., 2014) and evidence of small correlations among the subscales. The 4-factor model was the most parsimonious (see Supplemental Table 1 for factor loadings from the 3-, 4- and 5-factor solutions). Although prior research has supported a variety of factor solutions of the COPE, variations are dependent on the behavioral dimensions included in the model, and there has been consistent support for a largely similar 4-factor model (see Litman, 2006). It should also be noted that in our sample, the 3- and 5-factor solutions provided similar results, particularly for subscales making up the avoidant coping factor.

The 4-factor solution for the COPE, used for primary analyses, was as follows: 1) Avoidant Coping (consisting of mental disengagement, behavioral disengagement, substance use); 2) Social and Emotional Coping (consisting of emotional support, instrumental support, focus on and venting of emotions, religion); 3) Positive Behavioral Coping (consisting of planning, active coping, suppression of competing activities, restraint); and 4) Positive Cognitive Coping (consisting of positive reinterpretation and growth, humor, acceptance). Items that composed each factor were averaged for subsequent analyses.

The primary analysis examining associations with PTSD status consisted of a series of stepwise logistic regressions with coping behaviors, post-trauma cognitions, and their interaction. Variables were grand-mean centered. In a series of eight individual regression models, the four factors of the COPE were entered in step one, the three subscales of the PTCI (NS, NW, SB) were entered in step two, and interaction terms were entered individually in step three for NS and SB with the COPE factors (e.g., SB x Positive Cognitive Coping only). A final regression model was conducted with only the significant interaction entered in the final step. Estimates of significant effects were determined based on odds ratios (ORs) and confidence intervals (CIs) wherein a CI that does not include one indicates significance and the OR indicates increased (greater than one) or decreased (less than one) probability of a PTSD diagnosis. Given the variability in the literature, and suggestions by Carver et al. (1989) that the COPE subscales may not necessarily best combine into broader categories, we conducted follow-up analyses to examine the individual COPE subscales from factors with significant main and interaction effects on PTSD using the same stepwise strategy as above (i.e., COPE subscale entered in step 1; PTCI subscales entered in step 2; relevant interactions entered in step 3) in separate, logistic regressions.

Results

Descriptives

Approximately 36% ($n = 55$) of the sample met criteria for current combat-related PTSD per the CAPS. Participants were predominantly male (87.7%), Caucasian (68.8%), with a mean age of 30.7 ($SD = 4.48$). The majority of participants served in the Army (56.5%) and were enlisted (88.3%, vs. officer status). The number of deployments participants experienced varied (range 1-8) around an average of 1.96 ($SD=1.30$) and the average score on the Combat Experiences Scale was 6.79 ($SD=4.23$).

The demographic variables considered as covariates included age, gender, and race. None of these variables were significantly correlated with PTSD status (all $ps > .05$) and were therefore not included in the regression models. Means and correlations for study variables are presented in Table 1. Patterns were broadly as expected, such that negative cognitions were moderately to strongly correlated with PTSD, with the exception of SB, and to each other. Coping factors were associated in the expected directions, and positive and emotional coping factors were correlated with one another. However, the avoidant coping factor was not correlated with any other coping factors and was the only factor associated with negative cognitions and PTSD status.

Effects of Coping and Posttrauma Cognitions on PTSD Diagnosis

The primary hierarchical logistic regression analysis is presented in Table 2. In the first step, which included the four COPE factors, only Avoidant Coping was significantly associated with an increased risk for PTSD ($OR = 1.59$, 95% CI = 1.26-2.00, $p < .001$). However, when NS, NW, and SB were added in step 2, the effect of Avoidant Coping was not robust to adjustment for PTCI scales. In this step, NS, but not NW, was significantly associated with increased risk for PTSD status ($OR = 4.45$, 95% CI = 3.31-16.75, $p < .001$) and SB was associated with a decreased likelihood of PTSD ($OR = .40$, 95% CI = .22-.72, $p = .002$). In order to examine potential moderation, interaction terms for NS and SB with each COPE factor were first added independently into the model in step 3 in separate analyses. Results were as follows for the interactions with NS and the COPE factors: Positive Behavioral Coping ($OR = 1.02$, 95% CI = .74-1.41, $p = .89$); Social/Emotional Coping ($OR = 1.07$, 95% CI = .84-1.38, $p = .58$); Avoidance Coping ($OR = 1.00$, 95% CI = .86-1.48, $p = .98$); Positive Cognitive Coping ($OR = .64$, 95% CI = .43-.94, $p = .02$). Results were as follows for the separate interactions with SB and the COPE factors: Positive Behavioral Coping ($OR = 1.16$, 95% CI = .83-1.62, $p = .38$); Social/Emotional Coping ($OR = 1.03$, 95% CI = .84-1.25, $p = .80$); Avoidance Coping ($OR = 1.01$, 95% CI = .73-1.38, $p = .97$); Positive Cognitive Coping ($OR = .96$, 95% CI = .75-1.24, $p = .78$). The only significant interaction, NS and Positive Cognitive Coping, is presented in Table 2 as the final model. This interaction effect suggests that Positive Cognitive Coping may attenuate the association of NS with PTSD; specifically, with endorsement of higher levels of Positive Cognitive Coping, the association between NS and PTSD status was weakened, as compared to lower endorsement.

Follow-up Analyses with Select Coping Subscales

Follow-up analyses further examined the two coping factors indicated by initial analyses, Avoidant Coping and Positive Cognitive Coping. A stepwise regression approach, similar to the primary model, was used to examine the effect, on PTSD, of each coping subscale (e.g., substance use) within a larger factor (e.g., avoidant coping), post-trauma cognitions, and potential interactions. Each subscale was examined in a separate model given the potential multicollinearity indicated by high loadings onto a common factor, and each interaction was examined independently, in line with the primary analyses above. As with the primary analyses, the same pattern appeared for the three regressions using facets of the Avoidant Coping factor; substance use, mental disengagement, and behavioral disengagement were significantly associated with PTSD status in the initial step ($ORs = 1.29, 1.18, 1.28$, respectively, all $ps < .02$), but were no longer significant in step 2 (all $ps > .33$), which

included NS, NW, and SB. PTCI subscales exhibited the same pattern as in the main analyses in step 2, with NS positively associated and SB negatively associated with PTSD status in all three regressions ($p < .01$). None of the interactions between NS and Avoidant Coping behaviors or SB and Avoidant Coping behaviors were significant (all $p > .66$). For subscales of the Positive Cognitive Coping factor, in the first step of the models, positive reinterpretation and growth was significantly associated with PTSD status ($OR = 0.85$, 95% $CI = 0.73-0.97$, $p = .02$), but not humor ($p = .75$) or acceptance ($p = .37$). As with the primary analyses, positive reinterpretation and growth did not retain significance when NS, NW, and SB were added into the models. In separate analyses, a significant interaction was found for positive reinterpretation and growth with NS ($OR = .76$, $p = .05$), with no other significant interaction effects. Although findings suggest that the earlier interaction of the Positive Cognitive Coping factor and NS may be driven by the positive reinterpretation and growth subscale, results should be interpreted cautiously in the absence of multiple testing corrections and power limitations.

Discussion

This study fills a gap in the literature by examining the joint impact of coping behaviors and posttrauma cognitions on PTSD diagnosis, exploring their independent effects as well as their interplay in a sample of combat-exposed OEF/OIF/OND veterans. The main finding of the present study suggests that when considered simultaneously, posttrauma cognitions, particularly NS, have a stronger association with PTSD than coping behaviors. Additionally, findings also suggest that Positive Cognitive Coping may moderate the association of NS on PTSD in this sample, although findings are in need of further replication. As such, these novel results illustrate the importance of examining these factors in combination in order to better elucidate their interplay and subsequent impact on PTSD outcomes.

Of the four identified factors from the EFA model of the COPE Inventory (i.e., Positive Behavioral, Positive Cognitive, Social and Emotional, and Avoidant Coping), only the Avoidant Coping factor demonstrated a significant association with PTSD diagnosis, consistent with the pattern of correlations amongst the variables. However, when the NS, NW, and SB subscales from the PTCI were entered in the model, Avoidant Coping was no longer significantly associated with PTSD. Notably, although NW showed moderate correlations with PTSD diagnosis, only NS and SB were significantly associated with PTSD diagnosis in the regression analyses. The pattern of findings was consistent in the follow-up analyses across the Avoidant Coping subscales.

The findings regarding the NS subscale in the multivariate regression and the strong, positive correlation with PTSD diagnosis supported our hypothesis and were consistent with the literature (e.g., Holliday et al., 2014). The lack of significant findings regarding main effects and limited correlations of most of the coping behaviors, alone and upon inclusion of posttrauma cognitions, was unexpected. Although small correlations are consistent with some existing literature (Boyras, Waits, Felix, & Wynes, 2016), a larger body of literature has suggested the relevance of coping strategies with regard to PTSD (e.g., Cofini et al., 2015), both as risk (e.g., Hooberman et al., 2010) and protective (e.g., Ozer et al., 2003) factors and in association with negative cognitions (e.g., Matthews et al., 2009). One

potential explanation of this unexpected finding may be that extant literature documenting associations with these coping behaviors has primarily been conducted in civilian samples. It may be that in the context of unique aspects of military culture, certain types of strategies are more encouraged or more commonly used than others, individual's reporting of behavior does not map on to actual behaviors, or the associations may differ for other unknown reasons unique to the trauma type or context. Additionally, it is possible that coping strategies are restricted while individuals are chronically exposed to life-threatening events, such as those experienced on military deployment, versus acute events. Alternatively, other measures of coping might be more relevant for this population, such as perceived coping self-efficacy (e.g., Cieslak et al., 2008).

Although the findings regarding the association of the SB subscale with a decreased likelihood of PTSD initially appear unexpected, this subscale has often not shown an association with PTSD in extant literature examining samples of firefighters (Bryant & Guthrie, 2007) and motor-vehicle accident victims (Beck et al., 2004), with suggestions that it may be more specific for risk for PTSD among sexual-assault trauma survivors (Koss, Figueredo, & Prince, 2002). Moreover, other research has also found that higher scores on SB have been associated with less risk of PTSD, perhaps due to a suppressor effect such as ambiguity in items that cover characterological and behavioral self-blame (Startup, Makgekgenene, & Webster, 2007). Alternatively, findings may also be viewed in light of a developing literature on moral injury. Moral injury stemming from certain military experiences that are incongruent with one's beliefs of what is right and wrong (Frankfurt & Frazier, 2016) is characterized by guilt and shame (Bryan, Bryan, Roberge, Leifker, & Rozek, 2017) and as such, may be associated with self-blame. Moral injury has been posited to differ from PTSD in symptom profile (Buechner & Jinkerson, 2016), perhaps explaining the lack of association with PTSD status. Thus, further examination of different facets of self-blame and their potential association with moral injury may be particularly useful in future studies.

The interaction with NS and the Positive Cognitive Coping factor (consisting of positive reinterpretation and growth, humor, and acceptance subscales) suggests that the association between NS and PTSD status was weaker for those who endorsed high levels of Positive Cognitive Coping as compared to low and moderate levels. Follow-up analyses suggested this effect may have been driven by the positive reinterpretation and growth subscale. Findings should be interpreted with caution given that only one interaction out of many was significant, results were not subjected to correction for multiple testing, and power was potentially limited. However, speculatively, our data suggest that Positive Cognitive Coping may have acted as a buffer for PTSD and that the ability to reappraise one's trauma experiences or reactions to trauma experiences may act as a protective mechanism, a goal of many existing cognitive-based treatment strategies (e.g., determining whether problematic thoughts or interpretations are realistic, inaccurate, or overgeneralized; Monson et al., 2006). Although the cross-sectional nature of the study limits conclusions that can be drawn, based on the main effects of NS, it can be hypothesized that these negative cognitions are indeed still occurring but that the negative impact of those cognitions is limited in individuals who engage in positive cognitive coping strategies. Evidence that teaching restructuring and acceptance strategies has been effective at reducing PTSD symptoms (Iverson et al., 2015)

and alcohol dependence in a comorbid sample (Stappenbeck et al., 2015) suggests that even if it is not necessarily a deliberate strategy, it is one that can be taught and brought under one's control. The findings of this study suggest that negative beliefs about self are more strongly associated with PTSD diagnosis than any coping strategies measured, and that the association of coping behaviors and PTSD diagnosis may be best understood in the context of posttrauma negative beliefs about self.

Results highlight the important association between negative beliefs about self and PTSD diagnosis and suggest that high avoidant coping, whether examined as a broad construct or more specifically focusing on types of avoidant coping (e.g., substance use, mental and behavioral disengagement), may be the most problematic pattern of coping inherent in veterans with a PTSD diagnosis. In addition, the relevance of avoidant coping may be more associated with maladaptive thinking as opposed to directly associated with PTSD. Longitudinal studies (e.g., Kumpula et al., 2017; McLean, Yeh, Rosenfield, & Foa, 2015) could help further explore these relationships and determine timing and direction of effects, such as whether coping strategies and negative self-beliefs are established pre-trauma and/or occur posttrauma or whether negative self-beliefs impact coping style (or, if coping style and attempts at coping instead impact negative self-beliefs). Existing studies have shown that greater negative posttrauma outcomes have been attributed to dysfunctional trauma cognitions, which were in turn associated with the use of more cognitive-behavioral avoidance (i.e., maladaptive coping; Tsai, Harpaz-Rotem, Pietrzak, & Southwick, 2012). As such, future mediational studies may help identify whether the relationship between Avoidant and Positive Cognitive Coping and PTSD diagnosis is impacted by an indirect effect through maladaptive self-related cognitions. Although the cross-sectional design precludes the ability to draw causal conclusions, the results raise questions regarding the mechanisms of action in coping behaviors and their relationship with PTSD diagnosis.

Nonetheless, results from the present study may have implications on treatment strategies, as both coping strategies and maladaptive cognitions are indeed malleable (e.g., Boden et al., 2012; Gutner et al., 2006). For example, in a sample of treatment-seeking veterans, increases in active coping and decreases in avoidant coping were shown to predict lower PTSD symptom severity (Boden et al., 2012). The finding that negative thoughts of self, but not negative thoughts of the world, were strongly associated with PTSD status when examined jointly suggests that self-focused cognitions may be more treatment-relevant.

Limitations

Several limitations inherent in the current study deserve mention. First, this study was cross-sectional, therefore causation cannot be assumed, and limited conclusions can be drawn regarding order and timing of variables. Although it may appear intuitive that negative cognitions about the self and avoidant coping lead to and maintain PTSD diagnosis, directional relationships may be reversed (e.g., combat veterans with a PTSD diagnosis are more likely to develop negative beliefs about themselves and to using avoidant coping strategies). Similarly, results cannot inform whether negative cognitions about self precede, follow, or co-occur with coping behaviors and even trauma exposure itself. Therefore, future studies with a longitudinal design would be helpful to parse out these relationships. An

additional limitation in the present study is the use of the COPE Inventory due to common limitations of its factor structure. The present study used a four-factor model based on EFA, while other studies have found three-factor models to be a better fit to their data (Litman, 2006). Replication studies would be useful in order to determine whether the factor structure found with the current study and sample hold true with other veteran samples. It is also noted that in this sample, there was almost no endorsement of items composing the denial scale of the COPE, and therefore it was not included in analyses. Given the relevance of maladaptive coping overall, and the potential that the lack of endorsement may be another example of a population-specific nuance, this specific coping approach warrants further investigation, particularly in veteran or military samples. Lastly, the present study's sample was drawn from an OEF/OIF/OND combat veteran population between the ages of 21 and 40 years, with multiple exclusion criteria (e.g., current MDD, moderate/severe TBI, alcohol dependence) and the requirement of alcohol consumption due to the nature of the larger study protocol. These exclusion criteria limits generalizability of the results to all combat veterans, especially considering high comorbidity of PTSD diagnosis and these other conditions within this population. Moreover, gender was not associated with PTSD status in the present study. While this is in contrast to the civilian literature, this is in line with extant literature in military populations (e.g., Street, Vogt, & Dutra, 2009; Tolin & Foa, 2006). The lack of gender significance may also be due to the small number of females in the study (12%, n = 19).

Conclusion

Overall, this study represents a novel examination of both negative cognitions and coping behaviors jointly with regard to PTSD risk in a combat veteran population. Results highlight the importance of examining coping behaviors and negative cognitions together, as examining coping behaviors in isolation may not provide an accurate picture of their impact on PTSD diagnosis and may neglect the covariance accounted for by negative cognitions about self and therefore overestimate the relationship. This overestimation may have implications on selecting appropriate treatment and/or prevention strategies. As a result, future studies exploring these variables using a longitudinal design and exploring potential mediation among avoidant coping, negative beliefs about self, and PTSD diagnosis may be useful to inform assessment and intervention approaches within the OEF/OIF/OND combat veteran population.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Public Significance Statement

This study suggests that in veterans exposed to combat trauma, avoidant coping was associated with an increased risk of posttraumatic stress disorder (PTSD) but not when examined in combination with negative cognitions, particularly negative thoughts of self. An interaction effect showed that engaging in positive cognitive coping weakened the relationship between negative thoughts of self and PTSD, suggesting this strategy may buffer against negative cognitions. Examining and addressing coping behaviors and negative thoughts of self jointly may benefit intervention approaches in a combat-trauma population.

Table 1
Correlations among COPE factors, PTCI subscales, and PTSD Status

Variable	Mean	N	SD	%	1	2	3	4	5	6	7	8
1. PTSD diagnostic Status	55		.36		--							
2. Negative Cognitions of Self	2.04		0.94		.60**	--						
3. Negative Cognitions of World	4.19		1.31		.43**	.61**	--					
4. Self Blame	1.88		1.00		.12	.53**	.38**	--				
5. Positive Behavioral Coping	6.86		1.89		-.06	-.10	.09	-.08	--			
6. Social/Emotional Coping	4.80		2.35		-.02	-.06	-.02	-.001	.33**	--		
7. Avoidant Coping	2.45		1.47		.34**	.46**	.40**	.22**	-.05	.06	--	
8. Positive Cognitive Coping	7.57		2.09		-.05	-.12	.08	-.16*	.44**	.20**	.13	--

** $p < .01$

Table 2
Hierarchical Regression results examining the association of COPE factors and PTCI subscales with PTSD status

Predictors	PTSD Diagnostic Status	
	OR	95% CI
Step 1		
COPE Factors		
Positive Behavioral Coping	1.02	0.82, 1.27
Social/Emotional Coping	0.99	0.84, 1.16
Avoidant Coping	1.59***	1.26, 2.00
Positive Cognitive Coping	0.89	0.73, 1.08
Step 2		
COPE Factors		
Positive Behavioral Coping	0.99	0.74, 1.35
Social/Emotional Coping	1.05	0.86, 1.28
Avoidant Coping	1.16	0.86, 1.56
Positive Cognitive Coping	0.92	0.70, 1.20
Cognitions		
Negative Cognitions about Self	4.45***	3.31, 16.75
Negative Cognitions about World	1.22	0.89, 2.34
Self Blame	0.40**	0.22, 0.72
Step 3		
COPE Factors		
Positive Behavioral Coping	1.01	0.80, 1.62
Social/Emotional Coping	1.04	0.85, 1.39
Avoidant Coping	1.16	0.88, 1.72
Positive Cognitive Coping	0.88	0.56, 1.12
Cognitions		
Negative Cognitions about Self	9.62***	4.82, 60.51
Negative Cognitions about World	1.33	.83, 2.31
Self Blame	0.35**	0.09, 0.53
Interactions (final model only)		
Negative Cognitions about Self * Positive Cognitive Coping	0.64*	0.43, 0.94

* $p < .05$;

** $p < .01$;

*** $p < .001$

Note: Only interactions found to be significant in separate, independent analyses were include in Step 3 of the final model