



Associations Between Mindfulness, PTSD, and Depression in Combat Deployed Post-9/11 Military Veterans

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Abstract

Objectives Combat experiences predict PTSD and depression in U.S. military veterans. However, few studies have investigated associations between mindfulness and these constructs. We examined main, direct, and indirect effects for mindfulness and combat experiences on veterans' PTSD and depressive symptoms and investigated the explanatory value of mindfulness on outcome variance in these models.

Methods A total of 485 post-9/11 era military veterans with previous combat deployments residing in four major US cities completed online surveys asking about their combat experiences, mindfulness, and mental health. Two multivariable ordinary least squares regression models were specified to investigate main effects of mindfulness and combat experiences on veterans' PTSD and depressive symptoms. Path models examined direct and indirect effects of combat experiences and mindfulness on these outcomes.

Results There were significant associations for mindfulness ($\beta = -0.68, p < 0.001$), ($\beta = -0.67, p < 0.001$) and combat experiences ($\beta = 0.12, p < 0.001$), ($\beta = 0.09, p < 0.001$) with PTSD and depression respectively. In both models, the addition of the mindfulness parameter significantly increased model R^2 . Path analysis demonstrated significant direct effects for mindfulness and combat experiences and indirect effects for combat experiences on PTSD and depressive symptoms through the mindfulness pathway.

Conclusions The associations of mindfulness with PTSD and depressive symptoms were greater in magnitude than the associations for combat experiences, and mindfulness explained a large and significant proportion of the variance in outcomes. Additional longitudinal research investigating how mindfulness skills and strategies may buffer against risk for PTSD and depression posed by combat experience is warranted in this high risk population.

Keywords PTSD · Veterans · Mindfulness · Military · Combat

Nearly 2,000,000 veterans of the Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF) military

conflicts are eligible to receive Veterans Health Administration services (Department of Veterans' Affairs 2016). While evidence indicates that many OEF/OIF veterans cope well with their military experiences (Kang et al. 2015; Kang and Bullman 2009), they are at risk for mental health disorders including posttraumatic stress disorder (PTSD) and depression (Bruce 2010; Kang et al. 2015; Seal et al. 2009). Prevalence estimates in this cohort are 23% for PTSD and 11% to 16% for depression (Killgore et al. 2006), though some studies show depression rates as high as 21% (Vaughan et al. 2014). PTSD and depression are among the strongest predictors of poor psychosocial outcomes in veterans, including social and economic dysfunction, risky behavior, and suicide (Barr et al. 2016; Mcfall and Cook 2006; Ramchand et al. 2015). Combat experiences are particularly salient predictors of PTSD and depression in OEF/OIF

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veterans; this risk increases with the amount and intensity of combat experiences (Castro and McGurk 2007; LeardMann et al. 2013). Combat experiences like exposure to killing, wounding of service members by friendly fire, witnessing a friend being wounded or killed, exposure to dead or dying people, and being fired upon are most closely associated with PTSD (Guyker et al. 2013; Hoge et al. 2004; Killgore et al. 2008, 2006; Stretch et al. 1996). Theoretical accounts of PTSD etiology posit that following exposure to adverse events like combat experiences, disturbances in consciousness, perception, and memory, as well as efforts to avoid event-related thoughts, emotions, and memories, are instrumental in the development and maintenance of trauma symptoms (American Psychiatric Association 2013; Batten et al. 2007; Foa et al. 1989; Walser and Westrup 2007). Empirical studies support this view and demonstrate that experiential avoidance, avoidant coping, thought suppression, and dissociation are associated with increased PTSD and depressive symptoms following traumatic experiences (Briere et al. 2005; Gil 2005; McCaslin et al. 2008; Morina et al. 2008; Silver 2002; Tull et al. 2004).

As efforts to improve mental and behavioral health outcomes for military service members and veterans have continued, an emerging theoretical and empirical literature has begun to investigate mindfulness as a potential protective factor in the context of PTSD and depressive symptoms (Johnson et al. 2014; Thompson et al. 2011; Vujanovic et al. 2011). Mindfulness is conceptualized as a special way of paying attention to internal experience characterized by intentional focus on present moment mental events without judgment (Kabat-Zinn 1990; Marlatt and Kristeller 1999). Throughout this study, we use the term mindfulness to refer to the broader construct inclusive of the nonjudgment dimension and the term mindful attention to refer to intentional focus on present-moment mental events, though it follows that cultivating an attitude of nonjudgment toward mental events is contingent on the capacity to focus intentionally on those events. The theoretical literature suggests that mindful attention may protect against PTSD and depressive symptoms in several ways, including facilitating nonjudgmental acceptance of aversive mental states, which may in turn decrease guilt, shame, and avoidance associated with PTSD symptoms (Henning and Frueh 1997; Walser and Westrup 2007). In addition, mindful attention is associated with psychological flexibility, which may facilitate interruption of avoidant, ruminative, or other maladaptive cognitive patterns associated with PTSD and depressive symptoms (Jha et al. 2007). Finally, studies have shown that practicing mindful attention can produce brain changes in limbic and cortical regions associated with reduced reactivity to aversive stimuli and improved emotion regulation (Tang et al. 2015). In this way, theories of mindfulness predict that more mindful individuals may be better equipped to apply cognitive control and regulation

strategies to aversive mental states that characterize PTSD and depressive symptoms.

Theoretical accounts of the potential for mindfulness to buffer against the negative consequences of adverse experiences have received support in the empirical mindfulness literature. For example, mindfulness has been shown to be a significant predeployment predictor of postdeployment distress, anxiety, and arousal in National Guard soldiers (Call et al. 2015), and has been linked to improved resilience in firefighter and law enforcement samples (Kaplan et al. 2017). In another study conducted with Marine infantry platoons investigating the effects of mindfulness-based mind fitness training (MMFT; Stanley et al. 2011), a mindful attention training intervention designed for high-stress cohorts, results showed improved mindful attention and enhanced heart and breathing rate recovery for the intervention condition after military training exercises designed to induce stress. Further, neuroimaging showed changes in brain regions linked to information processing about the body's internal physiological state and response to stress (Johnson et al. 2014). A recent study (Jha et al. 2017) investigating the MMFT protocol with military cohorts also found that those who practiced mindful attention exercises more frequently showed significantly better attention control during their high-stress predeployment period.

While several studies investigating the effectiveness of mindfulness-based interventions have demonstrated post-treatment improvements in symptoms of PTSD and depression, the overall evidence for mindfulness-based interventions as treatments for PTSD is mixed. For example, studies have shown that mindfulness-based cognitive therapy (Segal et al. 2013) and mindfulness-based stress reduction (MBSR; Kabat-Zinn 1990) are linked to reductions in self-reported PTSD and depressive symptoms in combat-exposed veterans (Bhatnagar et al. 2013; Harding et al. 2018; Kearney et al. 2012; King et al. 2013; Polusny et al. 2015; Stephenson et al. 2017). In addition, a recent meta-analysis (Hopwood and Schutte 2017) found that mindfulness-based interventions were more effective than active and waitlist control conditions for reducing symptoms of PTSD, with Hedge's g across studies indicating a moderate effect size. But in a recent multisite randomized controlled trial (RCT) comparing MBSR and present-centered group therapy for veterans, results showed greater improvement in PTSD symptoms in the MBSR group on one measure of PTSD but not another, and differences were not maintained at 16 week follow up (Davis et al. 2018). Another recent review found that while mindfulness-based interventions were effective for improving distress in anxiety and stress-related disorders, they were not effective for treating fear symptoms (de Abreu Costa et al. 2019). Furthermore, guidelines for PTSD treatment advanced by the International Society for Traumatic Stress Studies (ISTSS 2019) concluded that there is insufficient evidence to recommend MBSR, the most

widely studied mindfulness-based intervention, for general population adults with PTSD, a conclusion shared by the Department of Veterans' Affairs (VA) management of post-traumatic stress disorder working group guidelines for PTSD treatment (2017). The VA guidelines also highlighted the dearth of rigorous RCTs investigating the effectiveness of mindfulness-based approaches other than MBSR for treating PTSD, and called for additional high-quality trials to investigate the efficacy of mindfulness-based approaches.

Taken together, these findings suggest that mindfulness is associated with better physiological and psychological functioning following exposure to military-related stressors and may enhance the suite of stress-response tools available to military veterans and service members. However, mindfulness-based interventions are not recommended as first-line PTSD treatments for veterans. It is important to place these conclusions in the context of the larger veterans' PTSD treatment literature, which is characterized by a suite of intervention approaches with limited effectiveness in improving symptoms related to military trauma. A recent review of RCTs of prolonged exposure (PE) and cognitive processing therapy (CPT), the gold standard treatments for military PTSD, showed that two-thirds of military-connected patients who received CPT or PE retained their PTSD diagnoses following treatment (Steenkamp et al. 2015). A 2015 review (Haagen et al. 2015) also found that veterans with PTSD benefited less from guideline recommended psychotherapies including EMDR, exposure, CPT, and trauma-focused modalities than other populations, and that veterans with high and low PTSD symptom severity saw less improvement from these treatments than those with moderate symptoms. Thus, while exposure-based protocols and CPT are the recommended treatments for many military service members and veterans with PTSD symptoms, there is a need for additional research to support the development of novel PTSD prevention and intervention strategies for these populations.

In order to advance such research and contribute to improved understanding of associations between combat experiences, mindful attention, military-related PTSD, and depressive symptoms, we developed the following specific aims. The first aim was to examine the statistical main effects of combat experiences and mindful attention on PTSD and depressive symptoms, as well as the additive explanatory potential of mindful attention on outcome variance in main effects models. The second aim was to examine and compare direct and indirect effects among combat experiences, mindful attention, and PTSD and depressive symptoms. To address our first aim, we hypothesized that (1) combat experiences would demonstrate positive associations with the outcomes PTSD and depression, while (2) mindful attention would demonstrate negative associations with these outcomes. We also hypothesized that (3) mindful attention would significantly increase the variance explained by main effects models

examining associations between combat experiences, covariates, and PTSD and depressive symptoms. To address our second aim, we hypothesized that (4) path models would show negative direct effects between combat experiences and mindful attention and positive indirect effects between PTSD and depressive symptoms through the mindful attention pathway, while mindful attention would demonstrate a negative direct effect with PTSD and depressive symptoms. Consistent with common practice in the military behavioral health literature, the covariates age, gender, race/ethnicity, marital status, and education were included in statistical models (Dedert et al. 2009; Vasterling et al. 2010; Vujanovic et al. 2011).

Method

Participants

Study participants were recruited from a sampling frame comprising veterans who participated in the Los Angeles/Orange County, Chicago, and Bay Area Veterans' Surveys (Castro et al. 2014, 2015a; Castro and Kintzle 2017). All those who agreed to be contacted for future research were invited to take part in the study. Inclusion criteria were veteran status (not currently serving in the military) and separation from the military after September 11, 2001; respondents who did not endorse these two categories in the survey were automatically blocked from proceeding. There were no additional exclusion criteria. Upon completing the survey, participants received a \$15 Amazon gift card. After the target of 1000 completed surveys was reached, a total of 577 validated surveys were retained. Only participants who endorsed at least one combat experience (84.06%, $n = 485$) were included in the present study. A flowchart detailing sample composition is presented in Fig. 1. Sample descriptive statistics are presented in Table 1.

Procedure

The investigators built the survey instrument in Qualtrics and created a MailChimp account to distribute the survey. Twice per month, the investigators sent the survey to participants who had agreed to be contacted after first removing email addresses of those who had already completed the survey as well as those who requested to be removed from the mailing list and those who did not endorse both inclusion criteria. Following survey distribution, the investigators verified that raw surveys had been completed by valid participants by confirming that email addresses associated with completed surveys were also associated with individuals included in the initial sampling frame. Gift cards were then provided electronically to valid participants. Data collection was conducted from July, 2016 to February, 2017. All procedures were

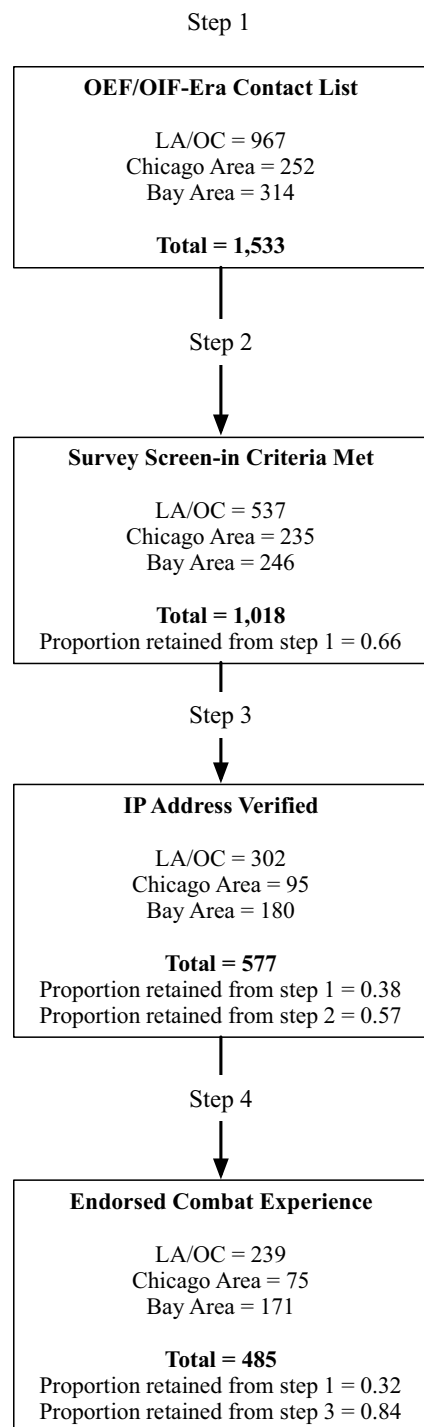


Fig. 1 Sample composition

approved by the institutional review board at the University of Southern California.

Measures

Demographic Covariates Demographic covariates included age; gender categories male, female, or transgender; race categories White, Black, Latino, or other; marital status

categories single, married or living with a partner, and divorced or separated; and level of education categories no college degree, Associate's or Bachelor's degree, or graduate degree. All demographic variables were assessed with dichotomous items (0 = "no" and 1 = "yes").

Combat Experiences Combat experiences were measured using the 13-item short version of the Combat Experiences Scale (CES), available on request from the Deployment Risk and Resilience Inventory; from: http://www.ncptsd.va.gov/ncmain/assessment/assessmt_request_form.html. Scale items are dichotomous (0 = "no" and 1 = "yes") and capture common impactful deployment-related experiences. Items begin with the question stem "While deployed, did you experience any of the following events" and include experiences such as "seeing dead bodies or human remains" and "being attacked or ambushed". Chronbach's alpha for the CES in this sample was 0.83, with $M = 7.37$, $SD = 3.43$. Scores ranged from 1 to 13. Self-report of combat experiences, though dependent on personal memory, can be used to assess combat history (Adler et al. 1996; Schlenger et al. 1992).

Mindful Attention Mindful attention was measured using the Mindful Attention and Awareness Scale (MAAS; Brown and Ryan 2003), a 15-item measure on a 6-point Likert type scale. Response options range from 1 *almost always* to 6 *almost never*. Sample items include "I find it difficult to stay focused on what's happening in the present" and "I find myself doing things without paying attention". To facilitate interpretation of results, MAAS scores were recoded so that higher scores indicated more mindful attention. Chronbach's alpha for the MAAS was 0.92 in these data, with $M = 3.23$, $SD = 0.94$. MAAS mean scores ranged from 1 to 6.

Posttraumatic Stress Disorder PTSD was measured using the 20-item PTSD Checklist for DSM-5 (PCL-5; Weathers et al. 2013). Participants responded to each item on a 5-point Likert-type scale with response options ranging from 0 *Not at all* to 4 *Extremely*, with higher scores indicating more PTSD symptoms. Sample items begin with the question stem "In the past month, how much were you been bothered by" and include "repeated, disturbing, and unwanted memories of the stressful experience" and "having strong negative feelings such as fear, horror, anger, guilt, or shame". Chronbach's alpha for The PCL-5 in these data was 0.96, with $M = 40.74$, $SD = 19.19$. PCL-5 scores ranged from 0 to 80. The PCL-5 prompt did not explicitly include instructions to complete the measure in response to a combat trauma.

Depression Depression was measured using the Patient Health Questionnaire 9 (PHQ-9; Kroenke et al. 2001), a 9-item measure on a 4-point Likert type scale with response options ranging from 0 *Not at all* to 3 *Nearly every day*, with higher scores

Table 1 Descriptive statistics

	<i>N</i>	%	Mean	SD
Age				
21–29	54	11.13		
30–39	236	48.66		
40–49	138	28.46		
50–59	48	9.89		
60 +	9	2.04		
Race				
White	237	48.87		
Black	50	10.31		
Latino	130	26.80		
Other	68	14.02		
Gender				
Male	396	81.65		
Female	88	18.14		
Transgender	1	0.21		
Education				
No degree	162	33.40		
College degree	263	54.23		
Grad degree	60	12.37		
Marital status				
Single	83	17.11		
Married/cohabitating	317	65.36		
Separated	84	17.32		
Other	1	0.21		
Total combat experiences	485		7.37	3.43
PCL-5	462		40.74	19.20
PHQ-9	468		12.16	6.47
MAAS	469		3.23	0.94

The PCL-5 refers to the PTSD Checklist for DSM-5; the PHQ-9 refers to the Patient Health Questionnaire-9; the MAAS refers to the Mindful Awareness and Attention Scale

indicating more severe depressive symptoms. Items begin with the question stem “Over the last two weeks, how often have you been bothered by the following problems” and include “feeling down, depressed or hopeless” and “trouble concentrating on things, such as reading the paper or watching television.” Chronbach’s alpha for the PHQ-9 in these data was 0.89, with $M = 12.16$, $SD = 6.47$. PHQ-9 scores ranged from 0 to 27.

Data Analyses

Zero-order correlations for all study variables were computed and are presented in Table 2. Two multivariable ordinary least squares (OLS) regression models were estimated to test study hypotheses (1) and (2) by examining associations of mindful attention and combat experiences with veterans’ symptoms of

PTSD and depression. Continuous variables were examined for skewness and homoscedasticity of residuals. Regression model one examined associations for mindful attention, combat experiences, and covariates including age, race, marital status, and education with PTSD symptoms. Regression model two examined associations of these independent variables and covariates with symptoms of depression. To facilitate interpretation of results, mindful attention and deployment experience variables were centered on the mean and no linear transformations were performed. After examining results of regression analyses, two path models were specified to test hypothesis (3) by estimating direct effects of combat experiences on mindful attention, PTSD, and depression and direct effects of mindful attention on PTSD and depression, as well as indirect effects of combat experiences on PTSD and depression through the mindful attention pathway. The estimator was maximum likelihood with missing values. Hypothesis (4) was tested by examining the F statistic to determine whether adding the mindful attention variable to regression models one and two significantly increased model R^2 .

Covariates were entered into models as binary variables. Modeled race categories included Black, Latino, and a combination of all other race category with contrast category White race. Male gender was modeled with contrast category female. Marital status categories were modeled as single or divorced/separated from a partner with contrast category married or cohabitating with a partner. Education categories were modeled as no degree and advanced (Master’s or Doctoral) degree with contrast category Bachelor’s or Associate’s degree. All analyses were performed in Stata version 14.1 (StataCorp 2019).

Results

Regression diagnostics showed that mindful attention and combat experiences variables were skewed slightly to the right. To account for heteroscedasticity of residuals demonstrated by the Breusch-Pagan test (Hayes and Cai 2007) ($\chi^2(1) = 1.91$, prob. $> \chi^2 = 0.12$), all parameters were estimated using robust standard errors. Regression model one demonstrated a negative association for mindful attention ($\beta = -0.68$, $p < 0.001$) and a positive association for combat experiences ($\beta = 0.12$, $p < 0.001$) with PTSD symptoms. Comparison of standardized coefficients indicated that the magnitude of the association for mindful attention was nearly six times that for combat experiences. In addition, Latino ethnicity ($\beta = 0.08$, $p < 0.01$), age ($\beta = 0.12$, $p < 0.01$), and having no college degree ($\beta = 0.07$, $p < 0.05$) were significantly and positively associated with PTSD symptoms. Model one explained 57% of the variance in PTSD symptoms in these data. The addition of mindful attention to a model examining the association of combat experiences and covariates on

Table 2 Zero-order correlations for study variables

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) PTSD	1												
(2) Depression	0.87***	1											
(3) Combat experiences	0.33***	0.31***	1										
(4) Mindfulness	-0.73***	-0.71***	-0.29***	1									
(5) Age	0.13**	0.08	0.03	-0.03	1								
(6) Male	-0.02	0.00	0.20***	0.00	-0.08	1							
(7) Black	-0.03	-0.01	-0.12**	0.11*	0.13**	-0.05	1						
(8) Latino	0.02	-0.05	-0.06	0.06	-0.23***	0.07	-0.20***	1					
(9) Other race	-0.10*	-0.06	-0.01	0.07	-0.00	0.01	-0.14**	-0.24***	1				
(10) Single	-0.04	-0.01	-0.08	0.08	-0.21***	-0.14**	0.06	0.08	0.10*	1			
(11) Separated/divorced	0.10*	0.14**	0.09*	-0.05	0.09*	-0.02	-0.01	0.01	-0.01	-0.21***	1		
(12) No degree	0.26***	0.24***	0.16***	-0.23***	0.05	-0.07	-0.04	0.05	-0.05	-0.01	0.15**	1	
(13) Grad degree	-0.13**	-0.17***	-0.19***	0.12**	0.20***	-0.05	-0.05	-0.03	-0.01	0.01	-0.07	-0.26***	1

Mindfulness derived from the MAAS; combat experiences derived from the CES; PTSD derived from the PCL-5; depression derived from the PHQ-9

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

PTSD symptoms yielded a significant increase in the model R^2 , from 0.18 to 0.60 ($F(1, 442) = 400.75, p < .001$).

Parameter estimates for regression model two showed a significant negative association for mindful attention ($\beta = -0.67, p < 0.001$) and a positive association for combat experiences ($\beta = 0.09, p < 0.001$) with symptoms of depression. As with PTSD symptoms, mindful attention demonstrated the strongest association with depressive symptoms, with higher mindful attention scores linked to lower PHQ-9 scores. Among model two covariates, being single ($\beta = 0.07, p < 0.05$) and divorce/separation from a cohabitating partner ($\beta = 0.10, p < 0.01$) were significantly associated with depressive symptoms. Model two explained 54% of the variance in depressive symptoms in these data. As in model one, adding mindful attention to a model examining statistical effects of combat experiences and covariates on depressive symptoms yielded a significant increase in the model R^2 , from 0.16 to 0.54 ($F(1, 446) = 461.42, p < .001$). All standardized and unstandardized regression coefficients, standard errors, and 95% confidence intervals for parameter estimates are presented in Table 3.

In path model one, results demonstrated a direct effect between mindful attention and PTSD symptoms ($\beta = -0.69, p < 0.001$). In addition, results showed direct effects between combat experiences and mindful attention ($\beta = -0.30, p < 0.001$) and combat experiences and PTSD symptoms ($\beta = 0.12, p < 0.001$) as well as an indirect effect between combat experiences and PTSD symptoms through the mindful attention pathway ($\beta = 0.21, p < 0.001$). This is interpreted to mean that for a unit increase in combat experiences, there is an expected 20% standard deviation increase in PTSD symptoms via lower mindful attention. The total effect between combat experiences and PTSD symptoms was ($\beta = 0.33, p < 0.001$). Path model one with standardized parameter estimates is shown in Fig. 2. In path model two, results demonstrated a direct effect between mindful attention and depressive symptoms ($\beta = -0.68, p < 0.001$). In addition, results showed significant direct effects between combat experiences and mindful attention ($\beta = -0.30, p < 0.001$) and combat experiences and depressive symptoms ($\beta = 0.10, p < 0.01$), as well as an indirect effect between combat experiences and depressive symptoms through the mindful attention pathway ($\beta = 0.20, p < 0.001$). As with path model one, this can be interpreted to mean that for a unit increase in combat experiences, there is an expected 20% standard deviation increase in depressive symptoms via lower mindful attention. The total effect for combat experiences on depression was ($\beta = 0.31, p < 0.001$). Path model two with standardized parameter estimates is shown in Fig. 3.

Discussion

This study compared main, direct, and indirect statistical effects of combat experiences and mindful attention on symptoms of PTSD and depression, the two most common mental health disorders associated with OEF/OIF military service. While high rates of deployment, combat experiences, and PTSD and depressive symptoms in the current sample may limit this study's generalizability to the larger veteran population, study results contribute to improved understanding of the subset of combat-deployed veterans who suffer from PTSD and depressive symptoms. Study hypothesis (1) was supported. Consistent with previous research, combat experiences demonstrated positive associations with both PTSD and depression. While military personnel undergo substantial training to prepare for combat experiences which may include killing and witnessing the death of comrades, enemy combatants, and civilians, the research literature nevertheless shows that these experiences have a linear and cumulative effect on PTSD and depressive symptoms such that more combat experiences, both in terms of frequency and intensity, predict more symptoms (Guyker et al. 2013; Hoge et al. 2004). Hypothesis (2) was also supported. Mindful attention demonstrated negative associations with both PTSD and depressive symptoms several times greater in magnitude than the associations for combat experiences. This difference in magnitude is noteworthy because combat experiences show robust associations with PTSD and depressive symptoms in the veteran mental health literature, and researchers have called for additional investigation to explore modifiable protective factors, like mindfulness, with comparable effect sizes (Vogt et al. 2005; Xue et al. 2015). Regression results also supported hypothesis (3). Accounting for the additive effect of mindful attention in OLS models resulted in an increase of over 30% in the variance explained by each model. This indicates that difficulties with attention control and awareness may represent important dimensions of combat-related PTSD and depression and suggests that modifying attentional processes might impact risk for these disorders.

One interpretation for this constellation of findings is that individuals with greater capacity for mindful attention may be more resilient to psychological stresses associated with combat exposure. This interpretation is consistent with the previous research showing that mindfulness-based interventions can improve neurological, psychological, and physiological mechanisms of stress recovery (Johnson et al. 2014). However, study results can also be interpreted to suggest that exposure to combat experiences, as well as PTSD and depressive symptoms, may degrade mindful attention. It may be that pathways of influence among mindful attention, PTSD symptoms, and depression are multidirectional; higher levels of mindful attention may support resilience to combat stresses, but may also be degraded when coping thresholds are

exceeded in the context of combat experiences and persistent PTSD and depressive symptoms. Longitudinal studies are required in order to develop nuanced models of causal effects among these constructs in veterans and to understand how they interact over time.

Results of path analysis supported hypothesis (4) and provided additional insight into the pattern of associations among combat experiences, mindful attention, and PTSD and depressive symptoms. Significant direct effects were observed for combat experiences and mindful attention on symptoms of both PTSD and depression, and combat experiences demonstrated a positive indirect effect on both outcomes through the mindful attention pathway. For both PTSD and depressive symptoms, the indirect effects for combat experiences were larger than the direct effects. That is, the largest proportion of the total effect for combat experiences on PTSD and depressive symptoms in these data resulted from the product of the negative direct effect of combat experiences on mindful attention and the negative direct effect of mindful attention on PTSD and depressive symptoms. Combat experiences thus demonstrated the strongest association with PTSD and depressive symptoms by reducing the magnitude of the effect between mindful attention and these outcomes. This pattern of associations supports the view that mindful attention may help to improve understanding of the pathway linking combat experiences with PTSD and depression and provides insight into how that pathway may be disrupted. While additional research is required in order to clarify causal linkages among these constructs, both logical analysis and the empirical literature provides support for the view that combat experiences influence mindful attention, PTSD, and depressive symptoms rather than the reverse. The relation between mindful attention and PTSD and depressive symptoms, however, may be more nuanced. The strong negative association of mindful attention with symptoms of PTSD and depression in both OLS regression and path models, in conjunction with previous literature showing that improving mindfulness can enhance attention control, cognitive flexibility, and emotion regulation, suggests that these mechanisms may in turn protect against the development and maintenance of PTSD and depressive symptoms in military populations (Johnson et al. 2014; Tang et al. 2015). At the same time, it may be that PTSD and depressive symptoms inhibit mindful attention. Particularly if mindfulness skills are not well developed, emotional and cognitive dysregulation associated with PTSD and depressive symptoms may disrupt present-centered, nonjudgmental attention and awareness of thoughts, feelings and urges.

Identifying modifiable protective factors, like mindfulness, that may buffer against the development of PTSD and depressive symptoms in combat-exposed veterans is important for a several reasons. Both PTSD and depression are socially and economically costly disorders, but much of the previous veteran mental health research literature has often focused on risk

Table 3 Unstandardized parameter estimates, standard errors, and standardized parameter estimates for regression models

	PTSD			Depression		
	B (SE)	95%CI	β	B (SE)	95%CI	β
Mindfulness	− 13.78 (0.69) ***	− 15.14, − 12.43	− 0.68	− 4.65 (0.22) ***	− 5.07, − 4.22	− 0.67
Combat experiences	0.70 (0.23) ***	0.26, 1.14	0.12	0.17 (0.07)*	0.03, 0.31	0.09
Age	0.26 (0.08) **	0.10, 0.43	0.12	0.04 (0.03)	− 0.01, 0.09	0.05
Male (ref female)	− 2.14 (1.60)	− 5.25, 0.96	− 0.04	− 0.26 (0.53)	− 1.30, 0.78	− 0.02
Race (ref White)						
Black	3.05 (2.26)	− 1.39, 7.49	0.05	1.11 (0.74)	− 0.34, 2.55	0.05
Latino	3.66 (1.48) **	0.74, 6.57	0.08	0.19 (0.54)	− 0.89, 1.26	0.01
Other race	− 1.02 (2.04)	− 5.03, 2.99	− 0.02	0.10 (0.62)	− 1.12, 1.31	0.01
Marital status (ref married/partner)						
Single	1.95 (1.95)	− 1.89, 5.78	0.04	1.23 (0.58)*	0.09, 2.37	0.07
Divorced/separated	2.16 (1.53)	− 0.84, 5.15	0.04	1.63 (0.54) **	0.59, 2.72	0.10
Education (ref college degree)						
No college degree	2.72* (1.39)	0.00, 5.44	0.07	0.55 (0.46)	− 0.36, 1.46	0.04
Grad degree	− 1.17 (2.10)	− 5.29, 2.95	− 0.02	− 1.17 (0.78)	− 2.71, 0.37	− 0.06
R^2	0.57			0.54		

Mindfulness derived from the MAAS; combat experiences derived from the CES; PTSD derived from the PCL-5; depression derived from the PHQ-9

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

factors, like combat, that are inseparable from the military's core mission, and hypothesized protective factors, like grit, for which efficacious interventions have not been developed (Credé et al. 2017; Ramchand et al. 2015; Schultz et al. 2014). Many previously examined risk factors, like combat experiences, pre-existing mental health conditions, or adverse experiences prior to military service, are difficult to modify. It is unlikely that service members deployed to combat zones or unpredictable operating theaters will be able to effectively limit their exposure to adverse experiences directly related to their military role, or that screening measures will be able to capture all those who may have elevated risk for developing mental health disorders prior to experiencing military-related stressors. Mindfulness, however, is a highly modifiable characteristic (Chiesa et al. 2011) targeted by existing evidence-based interventions with robust empirical support (Hopwood and Schutte 2017; Linehan 2018; Segal et al. 2013). Current

study findings add to this body of research and support the view that interventions targeting mindfulness skills in the context of military stressors may have some utility in preventing the development of PTSD and depressive symptoms.

Other significant contributors to PTSD and depressive symptoms in these data included age, Latino ethnicity, divorce/separation, and not having a college degree. These associations are consistent with past research (Hoge et al. 2004; Killgore et al. 2006; Seal et al. 2009). As has been previously observed, Latino respondents in the current sample tended to be younger, which may account for a portion of their increased risk (Dohrenwend et al. 2008). Some of these characteristics or their underlying mechanisms of influence on mental health symptoms may be addressed through intervention, but others, like divorce, will for a variety of reasons likely prove difficult to address at scale. However, study results show that the magnitude of associations for demographic covariates is

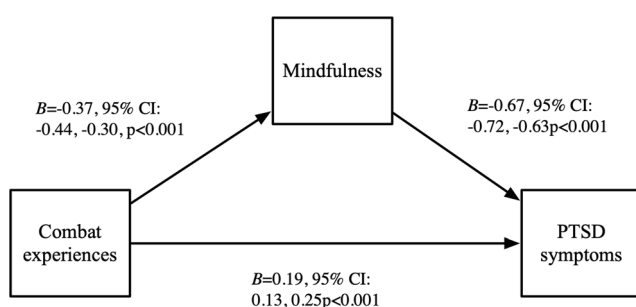


Fig. 2 Path model one with standardized parameter estimates and 95% confidence intervals for outcome PTSD

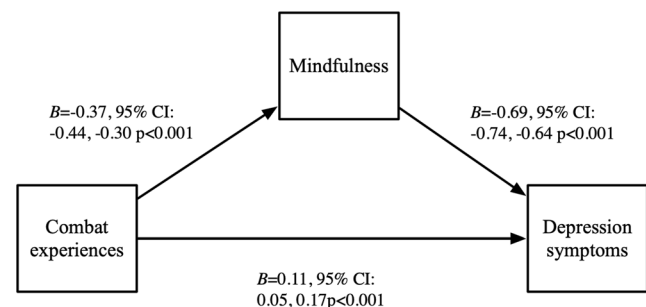


Fig. 3 Path model two with standardized parameter estimates 95% confidence intervals for outcome depression

substantially lower than the magnitude of associations for mindful attention and combat experiences.

Consistent with previous theoretical accounts of the role of mindfulness in the treatment of mental health symptoms, we suggest that the ability to apply mindful attention to internal states is a necessary component of self-regulation and healthy functioning following exposure to adverse experiences, particularly, as is the case for symptoms of PTSD and depression, when they are intensely unpleasant. Conversely, deficits in mindfulness are associated with maladaptive approaches to coping with distress, like avoidance and suppression, which are linked to more severe symptoms (Gil 2005; Morina et al. 2008; Silver 2002; Tull et al. 2004). The large and significant proportion of variance in symptoms of PTSD and depression explained by mindful attention in this study supports the emerging view that mindfulness skills may help to facilitate adaptive coping among military service members and veterans in the context of adverse experiences. It is also important to note that some researchers and clinicians have argued that a mindful style of engagement diverges conceptually and practically from culturally congruent approaches to managing distressing emotions that characterize military coping styles, particularly among the combat arms specialties most likely to be exposed regularly to fighting (Castro et al. 2015b). Consistent with previous approaches taken (e.g., Jha et al. 2017; Stanley et al. 2011), we suggest that mindfulness-based approaches to prevention and intervention in the military context must be framed as practical behavioral tools for facilitating attention control and adaptive management of thoughts and emotions associated with adverse experiences.

Limitations and Future Research

Analyses were performed on cross-sectional data, and causal relations between variables cannot be assumed. In addition, due to the cross-sectional design of this study, we were not able to examine the role of mindfulness in the longitudinal development or maintenance of PTSD or depression. The study was also reliant on self-report measures, including the CES scale, which is limited by recall of combat experiences that in some cases may have occurred up to 15 years ago. The MAAS, while a well-validated and frequently used measure of mindfulness, does not capture the nonjudgment dimension of mindfulness. Rather, the MAAS captures attention control and awareness, which are prerequisites for those dimensions. In addition, while the PCL-5 prompt did not explicitly include instructions to complete the measure in response to a combat trauma, the PCL-5 was included directly after the CES in the survey instrument, and participants who did not endorse combat experience were not included in analyses. Finally, this sample was predominantly white and male. More longitudinal research that addresses these

limitations and investigates pathways of influence that characterize relations among combat experiences, mindfulness, and PTSD and depressive symptoms in veterans appears warranted in order to enhance resilience among members of this population.

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Author Contributions NB designed and executed the study, conducted data analysis, and wrote the manuscript. MK collaborated on the study design and writing of the study. CAC collaborated in study conceptualization, writing, and editing of the final manuscript. All authors approved the final version of the manuscript for submission.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Ethical Approval All procedures involving human participants were in accordance with the ethical standards of the University of Southern California Institutional Review Board and with the 1964 Helsinki declaration and its later amendments.

Informed Consent Informed consent was obtained from all study participants.

References

- Adler, A. B., Vaitkus, M. A., & Martin, J. A. (1996). Combat exposure and posttraumatic stress symptomatology among U. S. Soldiers Deployed to the Gulf War. *Military Psychology*, 8(1), 1–14. https://doi.org/10.1207/s15327876mp0801_1.
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC: Author.
- Barr, N. U., Sullivan, K., Kintzle, S., & Castro, C. A. (2016). PTSD symptoms, suicidality and non-suicidal risk to life behavior in a mixed sample of pre- and post-9/11 veterans. *Social Work in Mental Health*, 14(5), 465–473. <https://doi.org/10.1080/15332985.2015.1081666>.
- Batten, S. V., Orsillo, S. M., & Walser, R. D. (2007). Acceptance and mindfulness-based approaches to the treatment of posttraumatic stress disorder. In S. M. Orsillo & L. Roemer (Eds.), *Acceptance and mindfulness-based approaches to anxiety* (pp. 241–269). Boston, MA: Springer US. https://doi.org/10.1007/0-387-25989-9_10.
- Bhatnagar, R., Phelps, L., Rietz, K., Juergens, T., Russell, D., Miller, N., & Ahearn, E. (2013). The effects of mindfulness training on post-traumatic stress disorder symptoms and heart rate variability in combat veterans. *The Journal of Alternative and Complementary Medicine*, 19(11), 860–861. <https://doi.org/10.1089/acm.2012.0602>.
- Briere, J., Scott, C., & Weathers, F. (2005). Peritraumatic and persistent dissociation in the presumed etiology of PTSD. *American Journal of Psychiatry*, 162(12), 2295–2301. <https://doi.org/10.1176/appi.ajp.162.12.2295>.
- Brown, K. W. & Ryan, R. M. (2003). The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology*, 84(4), 822–848.

- Bruce, M. L. (2010). Suicide risk and prevention in veteran populations. *Annals of the New York Academy of Sciences*, 1208(1), 98–103. <https://doi.org/10.1111/j.1749-6632.2010.05697.x>.
- Call, D., Pitcock, J., & Pyne, J. (2015). Longitudinal evaluation of the relationship between mindfulness, general distress, anxiety, and PTSD in a recently deployed National Guard sample. *Mindfulness*, 6(6), 1303–1312. <https://doi.org/10.1007/s12671-015-0400-0>.
- Castro, C. A., & Kintzle, S. (2017). *The state of the American veteran: the San Francisco veterans' study*. Los Angeles: University of Southern California, Center for Innovation and Research on Veterans & Military Families.
- Castro, C. A., & McGurk, D. (2007). The intensity of combat and behavioral health status. *Traumatology*, 13(4), 6–23. <https://doi.org/10.1177/1534765607309950>.
- Castro, C. A., Kintzle, S., & Hassan, A. (2014). *The state of the American veteran: The Los Angeles County veterans' study*. Los Angeles: University of Southern California, Center for Innovation and Research on Veterans & Military Families.
- Castro, C. A., Kintzle, S., & Hassan, A. (2015a). *The state of the American veteran: the Orange County veterans' study*. Los Angeles: University of Southern California, Center for Innovation and Research on Veterans & Military Families.
- Castro, C. A., Kintzle, S., & Hassan, A. M. (2015b). The combat veteran paradox: paradoxes and dilemmas encountered with reintegrating combat veterans and the agencies that support them. *Traumatology*, 21(4), 299–310. <https://doi.org/10.1037/trm0000049>.
- Chiesa, A., Calati, R., & Serretti, A. (2011). Does mindfulness training improve cognitive abilities? A systematic review of neuropsychological findings. *Clinical Psychology Review*, 31(3), 449–464. <https://doi.org/10.1016/j.cpr.2010.11.003>.
- Credé, M., Tynan, M. C., & Harms, P. D. (2017). Much ado about grit: a meta-analytic synthesis of the grit literature. *Journal of Personality and Social Psychology*. <https://doi.org/10.1037/pspp0000102>.
- Davis, L. L., Whetsell, C., Hamner, M. B., Carmody, J., Rothbaum, B. O., Allen, R. S., ... Bremner, J. D. (2018). A multisite randomized controlled trial of mindfulness-based stress reduction in the treatment of posttraumatic stress disorder. *Psychiatric Research and Clinical Practice*, appi.Prp.20180. <https://doi.org/10.1176/appi.prp.20180002>.
- de Abreu Costa, M., D'Alô de Oliveira, G. S., Tatton-Ramos, T., Manfro, G. G., & Salum, G. A. (2019). Anxiety and stress-related disorders and mindfulness-based interventions: a systematic review and multilevel meta-analysis and meta-regression of multiple outcomes. *Mindfulness*, 10(6), 996–1005. <https://doi.org/10.1007/s12671-018-1058-1>.
- Dedert, E. A., Green, K. T., Calhoun, P. S., Yoash-Gantz, R., Taber, K. H., Mumford, M. M., ... Beckham, J. C. (2009). Association of trauma exposure with psychiatric morbidity in military veterans who have served since September 11, 2001. *Journal of Psychiatric Research*, 43(9), 830–836. <https://doi.org/10.1016/j.jpsychires.2009.01.004>.
- Department of Veterans' Affairs, Veterans Health Administration, Office of Mental Health and Suicide Prevention. (2016). Veteran Suicide Data Report, 2005–2016. Retrieved from: https://www.mentalhealth.va.gov/docs/data-sheets/OMHSP_National_Suicide_Data_Report_2005-2016_508-compliant.pdf.
- Dohrenwend, B. P., Turner, J. B., Turse, N. A., Lewis-Fernandez, R., & Yager, T. J. (2008). War-related posttraumatic stress disorder in Black, Hispanic, and majority White Vietnam veterans: the roles of exposure and vulnerability. *Journal of Traumatic Stress*, 21(2), 133–141. <https://doi.org/10.1002/jts.20327>.
- Foa, E. B., Steketee, G., & Rothbaum, B. O. (1989). Behavioral/cognitive conceptualizations of post-traumatic stress disorder. *Behavior Therapy*, 20(2), 155–176. [https://doi.org/10.1016/S0005-7894\(89\)80067-X](https://doi.org/10.1016/S0005-7894(89)80067-X).
- Gil, S. (2005). Coping style in predicting posttraumatic stress disorder among Israeli students. *Anxiety, Stress, and Coping*, 18(4), 351–359. <https://doi.org/10.1080/10615800500392732>.
- Guyker, W. M., Donnelly, K., Donnelly, J. P., Dunnam, M., Warner, G. C., Kittleson, J., ... Meier, S. T. (2013). Dimensionality, reliability, and validity of the combat experiences scale. *Military Medicine*, 178(4), 377–384. <https://doi.org/10.7205/MILMED-D-12-00223>.
- Haagen, J. F. G., Smid, G. E., Knipscheer, J. W., & Kleber, R. J. (2015). The efficacy of recommended treatments for veterans with PTSD: A metaregression analysis. *Clinical Psychology Review*, 40, 184–194. <https://doi.org/10.1016/j.cpr.2015.06.008>.
- Harding, K., Simpson, T., & Kearney, D. J. (2018). Reduced symptoms of post-traumatic stress disorder and irritable bowel syndrome following mindfulness-based stress reduction among veterans. *The Journal of Alternative and Complementary Medicine*, 24(12), 1159–1165. <https://doi.org/10.1089/acm.2018.0135>.
- Hayes, A. F., & Cai, L. (2007). Using heteroskedasticity-consistent standard error estimators in OLS regression: An introduction and software implementation. *Behavior research methods*, 39(4), 709–722.
- Henning, K. R., & Frueh, B. C. (1997). Combat guilt and its relationship to PTSD symptoms. *Journal of Clinical Psychology*, 53(8), 801–808. [https://doi.org/10.1002/\(SICI\)1097-4679\(199712\)53:8<801::AID-JCLP3>3.0.CO;2-I](https://doi.org/10.1002/(SICI)1097-4679(199712)53:8<801::AID-JCLP3>3.0.CO;2-I).
- Hoge, C. W., Castro, C. A., Messer, S. C., McGurk, D., Cotting, D. I., & Koffman, R. L. (2004). Combat duty in Iraq and Afghanistan, mental health problems, and barriers to care. *New England Journal of Medicine*, 351(1), 13–22. <https://doi.org/10.1056/NEJMoa040603>.
- Hopwood, T. L., & Schutte, N. S. (2017). A meta-analytic investigation of the impact of mindfulness-based interventions on post traumatic stress. *Clinical Psychology Review*, 57, 12–20. <https://doi.org/10.1016/j.cpr.2017.08.002>.
- International Society for Traumatic Stress Studies. (2019). *Posttraumatic stress disorder prevention and treatment guidelines: methodology and recommendations*. Oakbrook Terrace: ISTSS Retrieved from: http://www.istss.org/getattachment/Treating-Trauma/New-ISTSS-Prevention-and-Treatment-Guidelines/ISTSS_PreventionTreatmentGuidelines_FNL-March-19-2019.pdf.aspx.
- Jha, A. P., Krompinger, J., & Baime, M. J. (2007). Mindfulness training modifies subsystems of attention. *Cognitive, Affective, & Behavioral Neuroscience*, 7(2), 109–119. <https://doi.org/10.3758/CABN.7.2.109>.
- Jha, A. P., Morrison, A. B., Parker, S. C., & Stanley, E. A. (2017). Practice is protective: mindfulness training promotes cognitive resilience in high-stress cohorts. *Mindfulness*, 8(1), 46–58. <https://doi.org/10.1007/s12671-015-0465-9>.
- Johnson, D. C., Thom, N. J., Stanley, E. A., Haase, L., Simmons, A. N., Shih, P. B., ... Paulus, M. P. (2014). Modifying resilience mechanisms in at-risk individuals: a controlled study of mindfulness training in marines preparing for deployment. *American Journal of Psychiatry*, 171(8), 844–853. <https://doi.org/10.1176/appi.ajp.2014.13040502>.
- Kabat-Zinn, J. (1990). *Full catastrophe living: using the wisdom of your mind and body to face stress, pain, and illness*. New York: Delacorte.
- Kang, H. K., & Bullman, T. A. (2009). Is there an epidemic of suicides among current and former U.S. Military Personnel? *Annals of Epidemiology*, 19(10), 757–760. <https://doi.org/10.1016/j.annepidem.2009.05.004>.
- Kang, H. K., Bullman, T. A., Smolenski, D. J., Skopp, N. A., Gahm, G. A., & Reger, M. A. (2015). Suicide risk among 1.3 million veterans who were on active duty during the Iraq and Afghanistan wars. *Annals of Epidemiology*. <https://doi.org/10.1016/j.annepidem.2014.11.020>.
- Kaplan, J. B., Bergman, A. L., Christopher, M., Bowen, S., & Hunsinger, M. (2017). Role of resilience in mindfulness training for first

- responders. *Mindfulness*, 8(5), 1373–1380. <https://doi.org/10.1007/s12671-017-0713-2>.
- Kearney, D. J., McDermott, K., Malte, C., Martinez, M., & Simpson, T. L. (2012). Association of participation in a mindfulness program with measures of PTSD, depression and quality of life in a veteran sample. *Journal of Clinical Psychology*, 68(1), 101–116. <https://doi.org/10.1002/jclp.20853>.
- Killgore, W. D. S., Stetz, M. C., Castro, C. A., & Hoge, C. W. (2006). The effects of prior combat experience on the expression of somatic and affective symptoms in deploying soldiers. *Journal of Psychosomatic Research*, 60(4), 379–385. <https://doi.org/10.1016/j.jpsychores.2006.02.012>.
- Killgore, W. D. S., Cotting, D. I., Thomas, J. L., Cox, A. L., McGurk, D., Vo, A. H., ... Hoge, C. W. (2008). Post-combat invincibility: violent combat experiences are associated with increased risk-taking propensity following deployment. *Journal of Psychiatric Research*, 42(13), 1112–1121. <https://doi.org/10.1016/j.jpsychires.2008.01.001>.
- King, A. P., Erickson, T. M., Giardino, N. D., Favorite, T., Rauch, S. A. M., Robinson, E., ... Liberzon, I. (2013). A pilot study of group mindfulness-based cognitive therapy (MBCT) for combat veterans with posttraumatic stress disorder (PTSD). *Depression and Anxiety*, 30(7), 638–645. <https://doi.org/10.1002/da.22104>.
- Kroenke, K., Spitzer, R. L., & Williams, J. B. (2001). *The PHQ-9. Journal of General Internal Medicine*, 16 (9), 606–613.
- LeardMann, C. A., Powell, T. M., Smith, T. C., Bell, M. R., Smith, B., Boyko, E. J., ... Hoge, C. W. (2013). Risk factors associated with suicide in current and former US military personnel. *JAMA*, 310(5), 496. <https://doi.org/10.1001/jama.2013.65164>.
- Linehan, M. M. (2018). *Cognitive-behavioral treatment of borderline personality disorder*. New York: Guilford.
- Management of Posttraumatic Stress Working Group (2017). VA/DoD clinical practice guideline for the management of posttraumatic stress Retrieved from: <https://www.healthquality.va.gov/guidelines/MH/ptsd/VADoDPTSDCPGFinal012418.pdf>.
- Marlatt, G. A., & Kristeller, J. L. (1999). Mindfulness and meditation. In W. R. Miller (Ed.), *Integrating spirituality into treatment: Resources for practitioners* (pp. 67–84). Washington, DC: American Psychological Association. <https://doi.org/10.1037/10327-004>.
- McCaslin, S. E., Inslicht, S. S., Metzler, T. J., Henn-Haase, C., Maguen, S., Neylan, T. C., ... Marmar, C. R. (2008). Trait dissociation predicts posttraumatic stress disorder symptoms in a prospective study of urban police officers. *The Journal of Nervous and Mental Disease*, 196(12), 912–918. <https://doi.org/10.1097/NMD.0b013e31818ec95d>.
- McFall, M. E., & Cook, J. W. (2006). PTSD and health risk behavior. *PTSD Research Quarterly*, 17(4), 1–7 Retrieved from: <https://search.proquest.com/docview/42459314?accountid=28179>.
- Morina, N., Stangier, U., & Risch, A. K. (2008). Experiential avoidance in civilian war survivors with current versus recovered posttraumatic stress disorder: a pilot study. *Behaviour Change*, 25(1), 15–22. <https://doi.org/10.1375/bech.25.1.15>.
- Polusny, M. A., Erbes, C. R., Thuras, P., Moran, A., Lambert, G. J., Collins, R. C., ... Lim, K. O. (2015). Mindfulness-based stress reduction for posttraumatic stress disorder among veterans. *JAMA*, 314(5), 456. <https://doi.org/10.1001/jama.2015.8361>.
- Ramchand, R., Rudavsky, R., Grant, S., Tanielian, T., & Jaycox, L. (2015). Prevalence of, risk factors for, and consequences of post-traumatic stress disorder and other mental health problems in military populations deployed to Iraq and Afghanistan. *Current Psychiatry Reports*, 17(5), 37. <https://doi.org/10.1007/s11920-015-0575-z>.
- Schlinger, W. E., Kulka, R. A., Fairbank, J. A., Hough, R. L., Jordan, B. K., Marmar, C. R., & Weiss, D. S. (1992). The prevalence of post-traumatic stress disorder in the Vietnam generation: a multimethod, multisource assessment of psychiatric disorder. *Journal of Traumatic Stress*, 5(3), 333–363. <https://doi.org/10.1007/BF00977233>.
- Schultz, M., Glickman, M. E., & Eisen, S. V. (2014). Predictors of decline in overall mental health, PTSD and alcohol use in OEF/OIF veterans. *Comprehensive Psychiatry*, 55(7), 1654–1664. <https://doi.org/10.1016/j.comppsy.2014.06.003>.
- Seal, K. H., Metzler, T. J., Gima, K. S., Bertenthal, D., Maguen, S., & Marmar, C. R. (2009). Trends and risk factors for mental health diagnoses among Iraq and Afghanistan veterans using Department of Veterans Affairs Health Care, 2002–2008. *American Journal of Public Health*, 99(9), 1651–1658. <https://doi.org/10.2105/AJPH.2008.150284>.
- Segal, Z. V., Williams, J. M. G., & Teasdale, J. D. (2013). *Mindfulness-based cognitive therapy for depression*. New York: Guilford Press.
- Silver, R. C. (2002). Nationwide longitudinal study of psychological responses to September 11. *JAMA*, 288(10), 1235. <https://doi.org/10.1001/jama.288.10.1235>.
- Stanley, E. A., Schaldach, J. M., Kiyonaga, A., & Jha, A. P. (2011). Mindfulness-based mind fitness training: a case study of a high-stress predeployment military cohort. *Cognitive and Behavioral Practice*, 18(4), 566–576. <https://doi.org/10.1016/j.cbpra.2010.08.002>.
- StataCorp. (2019). *Stata statistical software: release 16*. College Station: StataCorp LLC.
- Steenkamp, M. M., Litz, B. T., Hoge, C. W., & Marmar, C. R. (2015). Psychotherapy for Military-Related PTSD. *JAMA*, 314(5), 489. <https://doi.org/10.1001/jama.2015.8370>.
- Stephenson, K. R., Simpson, T. L., Martinez, M. E., & Kearney, D. J. (2017). Changes in mindfulness and posttraumatic stress disorder symptoms among veterans enrolled in mindfulness-based stress reduction. *Journal of Clinical Psychology*, 73(3), 201–217. <https://doi.org/10.1002/jclp.22323>.
- Stretch, R. H., Marlowe, D. H., Wright, K. M., Bliese, P. D., Knudson, K. H., & Hoover, C. H. (1996). Post-traumatic stress disorder symptoms among gulf war veterans. *Military Medicine*, 161(7), 407–410. <https://doi.org/10.1093/milmed/161.7.407>.
- Tang, Y.-Y., Hölzel, B. K., & Posner, M. I. (2015). The neuroscience of mindfulness meditation. *Nature Reviews Neuroscience*, 16(4), 213–225. <https://doi.org/10.1038/nrn3916>.
- Thompson, R. W., Arnkoff, D. B., & Glass, C. R. (2011). Conceptualizing mindfulness and acceptance as components of psychological resilience to trauma. *Trauma, Violence & Abuse*, 12(4), 220–235. <https://doi.org/10.1177/1524838011416375>.
- Tull, M. T., Gratz, K. L., Salters, K., & Roemer, L. (2004). The role of experiential avoidance in posttraumatic stress symptoms and symptoms of depression, anxiety, and somatization. *The Journal of Nervous and Mental Disease*, 192(11), 754–761. <https://doi.org/10.1097/01.nmd.0000144694.30121.89>.
- Vasterling, J. J., Proctor, S. P., Friedman, M. J., Hoge, C. W., Heeren, T., King, L. A., & King, D. W. (2010). PTSD symptom increases in Iraq-deployed soldiers: comparison with nondeployed soldiers and associations with baseline symptoms, deployment experiences, and postdeployment stress. *Journal of Traumatic Stress*, 23(1), 41–51. <https://doi.org/10.1002/jts.20487>.
- Vaughan, C. A., Schell, T. L., Tanielian, T., Jaycox, L. H., & Marshall, G. N. (2014). Prevalence of mental health problems among Iraq and Afghanistan veterans who have and have not received VA services. *Psychiatric Services*, 65(6), 833–835.
- Vogt, D. S., Pless, A. P., King, L. A., & King, D. W. (2005). Deployment stressors, gender, and mental health outcomes among Gulf War I veterans. *Journal of Traumatic Stress*, 18(2), 115–127. <https://doi.org/10.1002/jts.20018>.
- Vujanovic, A. A., Niles, B., Pietrefesa, A., Schmertz, S. K., & Potter, C. M. (2011). Mindfulness in the treatment of posttraumatic stress disorder among military veterans. *Professional Psychology: Research and Practice*, 42(1), 24–31. <https://doi.org/10.1037/a0022272>.

- Walser, R. D., & Westrup, D. (2007). *Acceptance & commitment therapy for the treatment of post-traumatic stress disorder & trauma-related problems: a practitioner's guide to using mindfulness & acceptance strategies*. Oakland: New Harbinger.
- Weathers, F.W., Litz, B.T., Keane, T.M., Palmieri, P.A., Marx, B.P., & Schnurr, P.P. (2013). The PTSD Checklist for DSM-5 (PCL-5). Scale available from the National Center for PTSD at <https://www.ptsd.va.gov>.
- Xue, C., Ge, Y., Tang, B., Liu, Y., Kang, P., Wang, M., & Zhang, L. (2015). A meta-analysis of risk factors for combat-related PTSD among military personnel and veterans. *PLoS One*, 10(3), e0120270. <https://doi.org/10.1371/journal.pone.0120270>.

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