



Predictors of recovery from post-deployment posttraumatic stress disorder symptoms in war veterans: The contributions of psychological flexibility, mindfulness, and self-compassion

Eric C. Meyer^{a,b,c,*}, Yvette Z. Szabo^{a,b,c}, Sheila B. Frankfurt^{a,b,c}, Nathan A. Kimbrel^{d,e,f},
Bryann B. DeBeer^{a,b,c}, Sandra B. Morissette^g

^a Department of Veterans Affairs VISN 17 Center of Excellence for Research on Returning War Veterans, Waco, TX, USA

^b Central Texas Veterans Health Care System, Temple, TX, USA

^c Texas A&M Health Science Center, College of Medicine, College Station, TX, USA

^d Durham VA Medical Center, Durham, NC, USA

^e VA Mid-Atlantic Mental Illness Research Education and Clinical Center, Durham, NC, USA

^f Department of Psychiatry and Behavioral Sciences, Duke University Medical Center, Durham, NC, USA

^g The University of Texas at San Antonio, San Antonio, TX, USA

ARTICLE INFO

Keywords:

Posttraumatic stress disorder
Mindfulness
Self-compassion
Psychological flexibility
Recovery
Resilience

ABSTRACT

Posttraumatic stress disorder (PTSD) is a major challenge among war veterans. This study assessed the contribution of several interrelated, modifiable psychosocial factors to changes in PTSD symptom severity among combat-deployed post-9/11 Veterans. Data were drawn from a longitudinal study of predictors of mental health and functional outcomes among U.S. Iraq and Afghanistan war Veterans ($N = 117$). This study assessed the unique contribution of psychological flexibility, mindfulness, and self-compassion to PTSD recovery, after accounting for established predictors of PTSD chronicity, including combat exposure, alcohol use problems, and traumatic brain injury. PTSD symptom severity was assessed using a clinician-administered interview, and PTSD recovery was defined as the change in symptom severity from lifetime worst severity, measured at baseline, to current severity at one-year follow-up. A mindful awareness latent factor comprised of all three variables measured at baseline predicted PTSD recovery beyond the other predictors of PTSD chronicity ($f^2 = 0.30$, large effect). Each construct predicted PTSD recovery when tested individually. When tested simultaneously, self-compassion, but not mindfulness or psychological flexibility, predicted PTSD recovery. These findings suggest that mindful awareness of emotional distress predicts recovery from PTSD symptoms in war veterans, which supports the utility mindfulness-based interventions in promoting post-trauma recovery.

1. Introduction

A recent meta-analysis estimated that 23% of Iraq and Afghanistan war veterans meet criteria for posttraumatic stress disorder (PTSD; Fulton et al., 2015). PTSD is linked to a host of negative outcomes, such as functional impairment, decreased satisfaction across multiple life domains (e.g., occupational, social), and suicide risk (DeBeer, Kimbrel, Meyer, Gulliver, & Morissette, 2014; Meyer et al., 2018b; Vogt et al., 2017), underscoring the importance of identifying facilitators of PTSD recovery among post-9/11 veterans. Critically, there appears to be a natural course of recovery for many people exposed to trauma. Thus, not everyone who experiences acute distress or eventually meets

criteria for PTSD following a traumatic event will continue to meet diagnostic criteria over time. Research on trajectories of symptoms indicates that, of those who develop PTSD, many experience some level of recovery (Bonanno et al., 2012; Reijnen, Rademaker, Vermetten, & Geuze, 2015). Others experience stable or worsening symptoms that are considered chronic after three months (American Psychiatric Association [APA], 2000). Importantly, meta-analytic reviews have found that factors during or after the trauma (peri-traumatic dissociation, lack of social support) were more strongly associated with PTSD than pre-trauma factors (e.g. age, gender; Brewin, Andrews, & Valentine, 2000; Ozer, Best, Lipsey, & Weiss, 2003; Xue et al., 2015), which points to the importance of potentially malleable factors.

* Corresponding author. VA VISN 17 Center of Excellence for Research on Returning War Veterans, Central Texas Veterans Health Care System (151C), 4800 Memorial Drive, Waco, TX 76711, USA.

E-mail address: Eric.Meyer2@va.gov (E.C. Meyer).

<https://doi.org/10.1016/j.brat.2019.01.002>

Received 21 August 2018; Received in revised form 21 December 2018; Accepted 4 January 2019

Available online 07 January 2019

0005-7967/ Published by Elsevier Ltd.

However, each risk factor accounted for relatively little of the variance in PTSD symptoms, which suggests a gap in our understanding of factors that influence severity and persistence of symptoms, particularly post-trauma. Identifying modifiable factors is critical to inform optimal treatment targets for promoting recovery.

The purpose of the present study was to advance understanding of the recovery process by examining factors associated with change in symptoms over time among recently returned war veterans. This study focused on a set of conceptually-related, modifiable constructs (i.e., psychological flexibility, mindfulness, self-compassion), each of which has been linked to PTSD symptom severity. The functional-contextual model of psychopathology (Hayes, Luoma, Bond, Masuda, & Lillis, 2006; Hayes, Strosahl, & Wilson, 2012; Hayes, Wilson, Gifford, Follette, & Strosahl, 1996) conceptualizes psychological flexibility as the response to a broad range of unwanted internal experiences (i.e., negatively evaluated cognitions, emotions, and physiological sensations) including, but not limited to, those associated with trauma (e.g., emotional distress unwanted memories, physiological hyperarousal). Psychological inflexibility occurs when psychological reactions to unwanted internal experiences come to rigidly override personal values and contextual factors in guiding behavioral choices (Bond et al., 2011; Hayes et al., 2012). A key factor impeding psychological flexibility is unwillingness or perceived inability to remain in contact with these unwanted internal experiences that results in efforts to avoid or alter these experiences, even when doing so interferes with important values and goal-consistent behavior (Bond et al., 2011; Hayes et al., 1996, 2012). In two prior reports, we found that lower levels of psychological flexibility were uniquely and prospectively associated with PTSD symptom severity after accounting for established pre-trauma (i.e., personality factors, military rank), peri-trauma (i.e., amount of exposure to combat and military sexual trauma, peri-traumatic dissociation), and post-trauma risk factors (i.e., recent life stress, post-deployment social support; Meyer, Morissette, Kimbrel, Kruse, & Gulliver, 2013; Meyer et al., 2018c). Mindfulness is the ability to self-regulate one's attention to the present moment in a curious, open and accepting manner (Bishop et al., 2004). The focus of this attention could be on internal experiences (e.g., thoughts, emotions, sensations) or external stimuli (e.g., sounds, visual stimuli, or other sensory information). It is negatively associated with PTSD symptoms (Dahm et al., 2015; Wahbeh, Lu, & Oken, 2011) and broadly linked with better overall psychological health (Keng, Smoski, & Robins, 2011). Self-compassion involves a mindful response to emotional distress, in which one's distressing experiences are perceived as being part of the universal human experience and addressed with self-kindness instead of self-criticism or condemnation (Neff & Dahm, 2015). Greater self-compassion was prospectively associated with lower PTSD symptom severity in combat veterans even after accounting for level of combat exposure (Hiraoka et al., 2015), and is generally associated with fewer mental health problems (MacBeth & Gumley, 2012).

Longitudinal studies suggest that psychological flexibility, mindfulness, and self-compassion each could be related to PTSD symptoms over time (Bryan, Ray-Sannerud, & Heron, 2015; Call, Pitcock, & Pyne, 2015; Hiraoka et al., 2015; Meyer et al., 2018c; Zeller, Yuval, Nitzan-Assayag, & Bernstein, 2015). We posit that these mindful awareness variables influence how Veterans respond to trauma-related reminders and cues. These interrelated factors reflect a common core of open and non-judgmental (i.e., mindful) awareness in relation to emotional distress (Birnie, Speca, & Carlson, 2010; Meyer et al., 2018a; Neff & Dahm, 2015; Yadavaia, Hayes, & Vilardaga, 2014). Having an open, non-judgmental stance in relation to internal distress may reduce the overt and covert avoidance that is thought to be central to the etiology and maintenance of PTSD. As such, these factors would impact both resilience and recovery in relation to PTSD.

Recent findings from our group indicate that psychological flexibility, mindfulness, and self-compassion load onto a higher order factor that prospectively predicted lower disability and greater quality of life

after accounting for PTSD symptoms (Meyer et al., 2018a). A range of interventions seek to bolster these facets of mindful awareness to counteract avoidant and self-critical responses to emotional distress including Acceptance and Commitment Therapy (ACT; Hayes et al., 2012), several compassion-focused interventions (Kirby, 2017), Mindfulness-Based Stress Reduction (Kabat-Zinn, 1982), Dialectical Behavior Therapy (Linehan, 1993), and Mindfulness-Based Cognitive Therapy (King et al., 2013). Of note, mindfulness-based interventions have been effective in both trauma-exposed civilians (Kelly & Garland, 2016; Neff & Germer, 2013) and veterans (King et al., 2013; Polusny et al., 2015; Meyer et al., 2018d). Moreover, improvements in mindfulness skills were negatively associated with PTSD and depression symptoms among veterans attending a residential PTSD program that involved a combination of cognitive-behavioral and mindfulness-based treatment (Owens, Walter, Chard, & Davis, 2012). Thus, studying the influence of these factors, both individually and in combination, on changes in PTSD symptoms is relevant for understanding treatment mechanisms in a number of widely used PTSD treatments. Many of these interventions typically target each of the mindful awareness variables in tandem, scaffolding the development of them off one another.

In order to rigorously assess the relative contribution of mindful awareness factors (i.e., psychological flexibility, mindfulness, self-compassion) to changes in PTSD symptoms over time, we accounted for a number of established predictors of PTSD chronicity. Higher initial symptom severity (Galatzer-Levy et al., 2013), longer time since trauma (Schell, Marshall & Jaycox, 2004), and fewer years of education (Xue et al., 2015) are all associated with PTSD chronicity. We also examined gender, as female gender has been linked with symptom chronicity in civilians (Zlotnick et al., 1999) although the evidence regarding gender differences in PTSD symptoms in veterans is mixed (Crum-Cianflone & Jacobson, 2014; Fulton et al., 2015). We accounted for deployment-related exposure variables likely to influence long-term recovery: traumatic brain injury (TBI; Hoge et al., 2008) and amount of combat exposure (Xue et al., 2015). We included problems related to alcohol use because longitudinal evidence suggests history of alcohol abuse is a risk factor for chronic PTSD symptoms (Zlotnick et al., 1999). With the exception of alcohol use, these known predictors of chronicity are static and unmalleable, which underscores the need to identify modifiable targets for intervention. Importantly, the constructs that characterize a mindful attitude in the presence of emotional distress are mutable and can be learned or bolstered in psychological interventions and through self-guided practice.

The present study examined the contributions of mindful awareness variables (i.e., psychological flexibility, mindfulness, and self-compassion) to recovery from PTSD symptoms. Our goal was to provide an empirical analysis of potential intervention targets for promoting PTSD recovery. We utilized an observational longitudinal study that would allow us to examine a range of PTSD symptoms (i.e., both syndromal and subsyndromal) given prior findings demonstrating that subsyndromal PTSD is frequently associated with impaired psychosocial functioning (Marshall et al., 2001). Recovery was operationalized as change in PTSD symptom severity from the worst PTSD symptom severity experienced at any time in their lifetime (assessed retrospectively at baseline) to current PTSD symptom severity at one-year follow-up in a longitudinal observational study. This study extends the prior research on the relationships between psychological flexibility, self-compassion, and mindfulness and PTSD symptom severity to examine the relationship between these constructs and change in PTSD symptoms. Further, this study considers their contribution above and beyond other factors known to be associated with PTSD chronicity in war veterans. We tested two models: In the primary model, we extended our prior findings (Meyer et al., 2018a) by examining whether a mindful awareness latent factor (comprised of psychological flexibility, mindfulness, and self-compassion) predicted PTSD symptom recovery after accounting for known predictors of PTSD chronicity. Our first hypothesis was that the mindful awareness factor would account for unique

variance in PTSD recovery. We considered this latent factor to be a useful analogue for aforementioned interventions in which these factors are often targeted in combination (e.g., Meyer et al., 2018c; Neff & Germer, 2013; Yadavaia, Hayes, & Vilardga, 2014). In a secondary model, we examined psychological flexibility, mindfulness, and self-compassion as concurrent predictors to examine their covariation and relative unique contribution to PTSD recovery. Our second hypothesis was that each variable that comprises the mindful awareness factor would separately and uniquely predict PTSD recovery over and above known predictors of PTSD chronicity.

2. Method

2.1. Participants

One hundred and seventeen U.S. military veterans, who served in support of the post-9/11 conflicts in Iraq and Afghanistan and were registered for healthcare at a Veterans Affairs (VA) Healthcare System in the Southwestern United States, were recruited to participate in a parent longitudinal study of factors impacting psychosocial readjustment following warzone service. Exclusion criteria included the presence of a current or lifetime psychotic disorder, bipolar disorder, recent change in treatment status (i.e., recently starting or stopping psychiatric medication or psychotherapy – veterans could enroll in the study once they met treatment stabilization criteria), or plans to relocate out of the area within four months of the baseline assessment. Participants were recruited through advertising at enrollment sites, presentations to clinical staff, and direct mailings. We over-sampled for veterans with PTSD and other non-excluded mental health diagnoses. Participants who met the additional eligibility criterion of exposure to one or more potentially traumatic events that met *Diagnostic and Statistical Manual of Mental Disorder* (4th ed., text rev.; DSM-IV-TR) Criterion A for PTSD (APA, 2000) during their military service were invited to participate in another study during which additional self-report measures were collected.

Sample demographics and clinical characteristics are presented in Table 1. Nearly two-thirds of participants (64.1%) met criteria for PTSD at some point in their lifetime. At baseline, 41.0% met criteria for current (i.e., during the last 30 days) PTSD. At one-year follow-up, 40.2% met criteria for current PTSD.

Table 1
Demographics and military history characteristics.

Characteristic	M(SD)	% (n)
Gender		83.8% male (n = 98)
Age	37.33 (10.15)	
Race/Ethnicity		
White		59.1% (n = 68)
Black/African American		25.2% (n = 29)
Alaskan Native		4.3% (n = 5)
Asian/Asian American		2.6% (n = 3)
Pacific Islander		1.7% (n = 2)
Other		4.3% (n = 5)
Hispanic/Latino		31.3% yes (n = 36)
Branch of Service		
Army		86.2% (n = 100)
Marine Corps		9.5% (n = 11)
Navy		5.2% (n = 6)
Air Force		2.6% (n = 3)
Military Service		
Active Duty		95.7% (n = 111)
Reserves		36.2% (n = 42)
National Guard		13.8% (n = 16)
Number of deployments	2.11 (1.31)	
Time since deployment (months)	45.22 (24.37)	

Note. N = 107 to 117 due to missing data. Totals may be more than 100% due to non-mutually exclusive categories.

2.2. Procedure

This study was approved by the local Institutional Review Board and written informed consent was obtained at the outset. Clinical interviews and self-report questionnaires were completed in private offices at the medical center. Master's level technicians as well as licensed or license-eligible psychologists who completed an extensive training and certification process conducted all interviews. Diagnostic consensus was reached in each case during weekly diagnostic review groups led by the first author and senior author who have extensive PTSD assessment experience. In addition, consensus was reached at the symptom level in cases in which questions arose regarding diagnostic status. For this study, lifetime worst PTSD symptom severity, deployment history (time of last deployment, combat exposure, TBI history), alcohol misuse and the mindful awareness variables (psychological flexibility, self-compassion and mindfulness) were measured at baseline. Current PTSD symptom severity was assessed at one-year follow-up.

2.3. Measures

2.3.1. Demographic information

Participants reported their date of birth, gender, age, and years of education. Participants also reported their military history, including number of deployments, time of most recent deployment and branch of service.

2.3.2. Clinician administered PTSD scale

The Clinician-Administered PTSD Scale for DSM-IV (CAPS-IV; Blake et al., 1995) is a structured clinical interview that assesses full PTSD diagnostic criteria. Interviews were based on the Criterion A event identified by each participant as the worst that occurred during their military service, which nearly all participants identified as having occurred during their service in Iraq or Afghanistan. Symptoms must have been rated a frequency of at least 1 on a scale of 0 (*None of the time*) to 4 (*Most or all of the time*) and an intensity of at least 2 on a scale of 0 (*None*) to 4 (*Extreme*) to meet symptom criterion (Blake et al., 1995). At baseline, a continuous measure of symptom severity was assessed for the month that participants identified as being the worst during their lifetime in terms of PTSD symptom severity and associated functional impairment and current (past 30 days) symptom severity. Participants could identify the month preceding the baseline assessment as their lifetime worst month. Current symptom severity was assessed at one-year follow-up. The CAPS demonstrated excellent internal consistency in the current sample for lifetime worst (Cronbach's $\alpha = 0.92$) and current symptoms measured at baseline (Cronbach's $\alpha = 0.92$), as well as current symptoms measured at one-year follow-up (Cronbach's $\alpha = 0.93$).

2.3.3. Time since deployment

Veterans reported the date and location of all deployments in support of the post-9/11 wars. Time since deployment was calculated as time in months from most recent return from deployment to the date of baseline assessment.

2.3.4. Combat exposure

The 7-item Critical Warzone Experiences scale (CWE; Kimbrel et al., 2014) was used to assess combat exposure. Each item assesses frequency of exposure (e.g. being wounded/injured, being directly responsible for the death of an enemy combatant) and is rated on a scale of 1 = *never* to 4 = *10 + times*. The CWE demonstrated adequate internal consistency in the present study (Cronbach's $\alpha = 0.79$).

2.3.5. Traumatic brain injury

History of TBI was assessed using the Brief Traumatic Brain Injury Screen, a three-item clinician administered measure that was developed specifically for troops returning from deployments in Afghanistan and

Iraq (Schwab et al., 2006). Veterans screened positive for TBI based on endorsement of a head injury during deployment (e.g., from a blast, vehicular accident, fall, bullet, fragment) that led to an alteration of consciousness loss of consciousness, or post-traumatic amnesia.

2.3.6. Alcohol-related problems

The 23-item The Rutgers Alcohol Problem Index (RAPI; White & Labouvie, 1989) assessed problems related to drinking (e.g., relatives avoided you, neglected responsibilities). Each item is rated from 1 = *never* to 5 = *always or almost always/more than 10 times* and is rated according to how many times the item happened when drinking or because of alcohol use. The RAPI demonstrated excellent internal consistency in the current sample (Cronbach's $\alpha = 0.95$). The RAPI was significantly positively skewed and log-transformed for analysis.

2.3.7. Psychological flexibility

The Acceptance and Action Questionnaire-II (AAQ-II; Bond et al., 2011) is a seven-item self-report measure used to assess psychological inflexibility. Items are rated on a Likert scale from 1 (*Never true*) to 7 (*Always true*). Sample items include, "I am afraid of my feelings" and "Emotions cause problems in my life." Items were scored so that higher scores indicated greater psychological flexibility. The AAQ-II demonstrated excellent internal consistency in the current sample (Cronbach's $\alpha = 0.95$).

2.3.8. Trait mindfulness

The Mindfulness Attention Awareness Scale (MAAS; Brown & Ryan, 2003) is a 15-item self-report scale that assesses trait mindfulness, emphasizing enhanced awareness of and attention to current experience. Items are rated using a scale from 1 (*Almost always*) to 6 (*Almost never*). Higher scores indicate greater mindfulness. The MAAS demonstrated excellent internal consistency in the current sample (Cronbach's $\alpha = 0.94$).

2.3.9. Self-compassion

The 26-item Self-Compassion Scale (SCS; Neff, 2003) was used to assess self-compassion. Items are rated on a scale from 1 (*Almost never*) to 5 (*Almost always*). Higher scores indicate greater self-compassion. The SCS demonstrated excellent internal consistency in the current sample (Cronbach's $\alpha = 0.95$).

2.4. Data analytic plan

Missing data was relatively low in the dataset (baseline CAPS 0%, lifetime worst CAPS 0%; gender 0%, TBI = 1.0%; years of education 1%; psychological flexibility 1.7%; self-compassion 1.7%; Combat Exposure 6.8%; Months since deployment 8.5%; follow-up PTSD 12.0%; mindfulness 14.5%) and determined to be missing at random, therefore Markov Chain Monte Carlo multiple imputation with 5 imputed datasets was used to retain all participants. SPSS does not pool R^2 and F tests for imputed datasets, so these parameters are from a dataset selected at random (dataset 2) from a total of 5 imputed datasets.

Our primary outcome was change in PTSD symptoms, which was calculated as the difference between lifetime worst symptom severity assessed at baseline and current symptom severity at one-year follow-up. We examined the proportion of participants who reported clinically significant change in PTSD symptoms in either direction, as indicated by a change of 15 points or more on the CAPS-IV (Weathers, Keane, & Davidson, 2001). Next, correlations between study variables were examined (see Table 2). Then, two hierarchical linear regression models were conducted to assess the contribution of psychological flexibility, mindfulness, and self-compassion to PTSD change scores. The first model tested the "mindful awareness" latent factor composed of these three variables. The mindful awareness factor was created using a principle axis factor analysis that extracted a single factor that explained 75.5% of the variance in scores the three variables (see Meyer

et al., 2018a, for additional details regarding construction of this factor). The second model tested self-compassion, mindfulness, and psychological flexibility separately but within the same model. In both models, the first step included lifetime worst PTSD symptom severity. The second step included time since deployment, gender, and years of education. The third step included deployment-related exposures (TBI exposure, combat exposure) and alcohol use related problems. The fourth step tested our key predictors of interest: the mindful awareness factor in model 1 and psychological flexibility, mindfulness, and self-compassion in model 2. Effect sizes are estimated using f^2 and conventional benchmarks of 0.02 (small), 0.15 (medium) and 0.35 (large). All analyses were conducted in SPSS, v. 22 (IBM Corp., Armonk, NY).

3. Results

3.1. PTSD recovery

On average, Veterans reported a clinically significant 29-point decline in PTSD symptoms on the CAPS-IV ($M = 29.30$, $SD = 28.26$) between their lifetime worst (highest) level of symptoms and their current (past month) symptom level. Over two-thirds (67.5%) reported clinically significant improvement, 5.1% reported clinically significant decline, and 27.4% did not report any significant change. PTSD scores changed over time as follows: from lifetime worst ($M = 67.50$, $SD = 33.10$), to baseline (baseline; $M = 42.21$, $SD = 29.12$), to annual-follow-up ($M = 38.20$, $SD = 30.35$). For 19 participants (16.2%), the current symptom severity was also the lifetime worst month. CAPS scores did not significantly change between baseline and annual follow-up, $t(116) = 1.89$, $p = .06$.

3.2. Predictors of PTSD recovery

Two hierarchical linear regression models were conducted to examine predictors of PTSD symptom change. As expected, in step 1, lifetime worst PTSD symptom severity predicted PTSD recovery ($r_p = .51$, $p < .001$), such that greater initial symptoms were associated with greater recovery, and predicted 27.0% of the variance in PTSD recovery ($F(1, 115) = 42.57$, $p < .001$, $f^2 = 0.37$, large effect). In step 2, the addition of time since deployment, gender, and education, did not predict additional unique variance in PTSD recovery (3.9%; $F_{\text{change}}(3, 112) = 2.08$, $p = .11$, $f^2 = 0.06$, small effect) although two variables (lifetime worst PTSD symptoms ($r_p = .53$, $p < .001$) and years of education ($r_p = .23$, $p = .02$) were significant individual predictors of recovery. In step 3, the addition of combat exposure, TBI, and alcohol-related problems predicted an additional 11.8% of the variance in PTSD recovery ($F_{\text{change}}(3, 109) = 7.48$, $p < .001$, $f^2 = 0.21$, medium effect). Four individual variables were significant predictors in step 3: lifetime worst PTSD symptoms ($r_p = .62$, $p < .001$), years of education ($r_p = .25$, $p = .01$), combat exposure ($r_p = -0.32$, $p < .01$), and gender ($r_p = .30$, $p < .01$).

Step 4 was significant in both Model 1 and Model 2 (see Table 3). In Model 1, the mindful awareness factor accounted for an additional 13.3% of the variance in PTSD recovery ($F_{\text{change}}(1, 108) = 32.60$, $p < .001$, $f^2 = 0.30$, large effect). The mindful awareness factor ($r_p = .48$, $p < .001$) was a significant individual predictor of PTSD recovery. In Model 2, the addition of psychological flexibility, mindfulness, and self-compassion in the final step explained an additional 14.4% of the variance in recovery from PTSD symptoms ($F_{\text{change}}(3, 106) = 11.83$, $p < .001$, $f^2 = 0.34$, large effect). Self-compassion ($r_p = .23$, $p = .03$), but not psychological flexibility ($r_p = .14$, $p = .16$) or mindfulness ($r_p = .08$, $p = .45$), emerged as a significant individual predictor. In both models, five other variables were significant individual predictors: lifetime worst PTSD symptoms, years of education, gender, combat exposure, and alcohol use.

Table 2
Study variable descriptive statistics and correlations.

	Means (SD) or % sample	2	3	4	5	6	7	8	9	10	11	12	13	14
1. PTSD recovery	29.30 (28.26)	.51**	.15	-.36**	-.07	.11	.13	< .01	.04	.11	.11	.09	.14	.13
2. Lifetime worst PTSD symptoms	67.50 (33.09)	–	.78**	.62**	.05	-.17	.13	.44**	.42**	.23*	-.46**	-.41**	-.41**	.49**
3. Baseline PTSD symptoms	42.21 (29.12)	–	–	.70**	.07	-.25**	.10	.45**	.38**	.26**	-.71**	-.54**	-.63**	-.73**
4. Annual follow-up PTSD symptoms	38.20 (30.35)	–	–	–	.05	-.25**	.01	.49**	.46**	.20*	-.60**	-.52**	-.58**	-.65**
5. Time since deployment	44.57 (23.88)	–	–	–	–	.06	< .01	< .01	-.04	-.02	-.06	-.06	-.04	-.05
6. Years of Education	13.80 (2.04)	–	–	–	–	–	-.37**	-.12	-.23*	-.18*	.07	.22*	.09	.15
7. Gender	83.8% male	–	–	–	–	–	–	.37**	.34**	.10	.03	-.05	.06	.02
8. Combat exposure	6.98 (5.76)	–	–	–	–	–	–	–	.49**	.20*	-.42**	-.28*	-.24*	-.36**
9. TBI	49.6% yes	–	–	–	–	–	–	–	–	.14	-.28*	-.36**	-.18	-.31**
10. Alcohol related problems	5.25 (10.83)+	–	–	–	–	–	–	–	–	–	-.20*	-.31**	-.18	-.27**
11. Psychological Flexibility	32.05 (11.73)	–	–	–	–	–	–	–	–	–	–	.61**	.74**	.90**
12. Mindfulness	53.57 (17.00)	–	–	–	–	–	–	–	–	–	–	–	.60**	.82**
13. Self-compassion	77.19 (21.08)	–	–	–	–	–	–	–	–	–	–	–	–	.89**
14. Mindfulness awareness factor	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Note. N = 117 * $p < .05$, ** $p < .01$; PTSD = posttraumatic stress disorder, TBI = traumatic brain injury. Mindful awareness = factor comprised of psychological flexibility, mindfulness and self-compassion. +Variable was transformed for analysis. Untransformed values are reported on here. Pearson correlations used for all normally distributed, continuous variables. Spearman correlations were used for gender, alcohol use and TBI.

3.3. Sensitivity analyses

We ran sensitivity analyses to test whether shared variance among the mindful awareness variables precluded our ability to detect unique relationships between psychological flexibility, mindfulness, and PTSD recovery in Model 2. Sensitivity analyses modeled Steps 1–3 as described above; Step 4 was the addition of each individual predictor. As expected, when examined individually, psychological flexibility contributed an additional 10.1% of the variance in PTSD recovery ($r_p = .42$, $p < .001$; $f^2 = 0.21$, medium effect). Mindfulness alone contributed an additional 5.7% of the variance in PTSD recovery ($r_p = .33$, $p = .001$; $f^2 = 0.16$, medium effect). Self-compassion alone contributed an additional 13.5% of the variance in PTSD recovery ($r_p = .46$, $p < .001$; $f^2 = 0.31$, medium effect). We also ran sensitivity analyses with combinations of two predictors tested simultaneously. The combination of psychological flexibility and mindfulness accounted for an additional 10.8% of the variance in PTSD recovery ($f^2 = 0.23$, medium effect); psychological flexibility ($r_p = .31$, $p < .01$), but not mindfulness ($r_p = .15$, $p = .16$), was a significant predictor. The combination of mindfulness and self-compassion contributed an additional 13.7% of the variance in PTSD recovery ($f^2 = 0.31$, medium effect); self-compassion ($r_p = .35$, $p = .001$), but not mindfulness ($r_p = .12$, $p = .28$), was a significant predictor. The combination of psychological flexibility and self-compassion contributed an additional 14.3% of the variance in PTSD recovery ($f^2 = 0.33$, large effect); self-compassion ($r_p = .26$, $p = .01$), but not psychological flexibility ($r_p = .11$, $p = .10$),

was a significant predictor.

4. Discussion

Despite the availability of several evidence-based treatments for PTSD, there have been several calls for additional perspectives regarding treatment-related factors that may facilitate recovery (Gutner, Galovski, Bovin, & Schnurr, 2016; Hoge & Chard, 2018; Litz, 2017; Steenkamp, Litz, Hoge, & Marmar, 2015). The current study indicates that a set of conceptually related, modifiable psychosocial mindful awareness factors – psychological flexibility, mindfulness, and self-compassion – predicted recovery from PTSD symptoms among war veterans after accounting for the contributions of participants' highest level of lifetime PTSD symptom severity and several other factors linked to PTSD chronicity. The current findings expanded on prior findings in which we found that the mindful awareness factor predicted lower disability and greater quality of life in war veterans one year later even after accounting for the large relationship between PTSD symptom severity and these recovery-related outcomes (Meyer et al., 2018a). Taken together, these findings indicate that a behavioral and attitudinal stance characterized by mindful awareness in relation to emotional distress facilitates healthy adaptation among trauma-exposed war veterans. Moreover, these findings suggest that increased focus on promoting these qualities in psychosocial interventions will likely be beneficial among veterans with PTSD.

Given that there is interest in the unique contributions of each

Table 3
Final step of hierarchical linear regression models predicting recovery from PTSD symptoms.

	Model 1				r_p	Model 2				r_p
	B	SE	LL	UL		B	SE	LL	UL	
Lifetime worst PTSD	.74***	.07	.60	.87	.72	.74***	.07	.59	.87	.72
Time since deployment	-.02	.08	-.17	.13	-.02	-.02	.08	-.18	.13	-.02
Gender	13.00*	5.78	1.60	24.21	.21	13.52*	5.79	2.08	24.75	.22
Education	2.21*	1.04	.18	4.29	.22	2.35*	1.06	.30	4.44	.23
Combat exposure	-1.15**	.40	-1.92	-.36	-.27	-1.16**	.41	-1.95	-.33	-.27
TBI (yes/no)	-7.665	4.68	-16.48	1.57	-.16	-8.90	4.78	-18.26	.96	-.18
Alcohol related problems	36.20*	16.58	3.59	69.11	.23	34.27*	16.72	1.33	68.29	.22
Psychological flexibility						.38	.27	-.15	.91	.14
Mindfulness						.12	.17	-.21	.47	.08
Self-compassion						.33*	.15	.04	.62	.23
Mindful Awareness	12.29***	2.30	7.82	16.84	.48					

Note. N = 117 * $p < .05$, ** $p < .01$, *** $p < .001$. Statistics reported are pooled statistics, with the exception of model parameters (below), which are from Imputation set 2 of 5. LL = lower limit of 95% confidence interval of B, UL = upper limit of 95% confidence interval of B. Model 1: $R^2 = 0.59$, $F(8, 108) = 17.16$, $p < .001$. Model 2: $R^2 = 0.57$, $F(10, 106) = 14.09$, $p < .001$.

individual modifiable factor as well as prior evidence indicating that they form a higher-order latent factor, these factors were tested as a higher-order factor in the primary model and as individual predictors in the secondary model. In the primary model, as hypothesized, the mindful awareness latent factor predicted unique variance in PTSD recovery, with a large effect. The current findings bolster prior theoretical and empirical conceptualization of mindful awareness as a collective factor (Meyer et al., 2018a) that can be targeted via a range of interventions (Arch et al., 2012; Birnie et al., 2010; Meyer et al., 2018d; Neff & Germer, 2013; Yadavaia et al., 2014).

In the secondary model, self-compassion was a unique predictor but, contrary to our hypotheses, psychological flexibility and mindfulness were not unique predictors of PTSD recovery in the multivariate model when all factors were examined concurrently. Self-compassion may be particularly beneficial due to its components of self-kindness and a sense of common humanity (Neff & Dahm, 2015), which could reduce social isolation and emotional experiences such as guilt, shame and other emotions that tend to impede the PTSD recovery process. It may also be that the self-compassion measure explicitly assesses the mindful awareness construct in relation to emotional pain or distress, making it conceptually closer to PTSD symptoms than the trait measure of mindfulness.

Because the individual mindful awareness variables are conceptually interrelated and statistically correlated, we speculated that shared variance may have accounted for the non-significance of the mindfulness and psychological flexibility variables in Model 2. Indeed, in our sensitivity analyses, each construct predicted unique variance in PTSD recovery. Mindfulness accounted for about half as much unique variance (small effect) compared to both self-compassion and psychological flexibility when they were tested individually (medium effects). When the different pairs of predictors were tested, self-compassion was a significant predictor in each test, whereas mindfulness was not. Psychological flexibility remained a unique predictor when it was paired with mindfulness but not when included with self-compassion. Both psychological flexibility and self-compassion include a common core of mindful awareness in relation to emotional distress as well as additional elements facilitative of post-trauma recovery. Thus, it is perhaps not surprising that these constructs emerged as stronger unique predictors of recovery compared to mindfulness alone. Thus, it may be that our sample size precluded us from observing statistically significant associations with mindfulness and psychological flexibility when all three were considered together. Although self-compassion did emerge as a unique predictor of recovery, it is important to note that each modifiable factor contributes unique elements to this latent factor of mindful awareness. The mindful awareness predictor was a stronger predictor of any individual variable, evidenced by partial correlations, which may suggest that Model 1 may be the most parsimonious and clinically relevant representation of these constructs. While each of these constructs has been associated with PTSD symptoms, the present study extends these findings to include recovery from PTSD symptoms.

Five known predictors of PTSD recovery remained significant along with the mindful awareness variables. Lifetime worst PTSD symptom severity was the strongest predictor of PTSD change scores such that higher worst PTSD symptom severity was associated with greater declines, or recovery from symptoms. Given that more severe PTSD has been associated with greater PTSD chronicity (Simon, 1999), we consider that this may reflect regression to the mean. Years of education remained a significant predictor in the final step of the model such that more years of education was associated with greater recovery. This is consistent with prior findings indicating that lower education is linked with greater PTSD risk (Xue et al., 2015). Greater education may be linked to greater access to resources and community or social networks, as well as greater intelligence and potentially to exposure to psychological constructs such as mindfulness. Further, the present study replicates prior research that suggests alcohol use (Zlotnick et al., 1999) and combat exposure (Xue et al., 2015) are both related to PTSD

chronicity or symptom severity. In the present study, men experienced greater recovery, which adds to prior literature examining sex that found male Veterans have a greater prevalence of PTSD than female veterans (Fulton et al., 2015). Presence or severity of PTSD may be different from recovery from it, so it may be that women veterans experience a more chronic course of PTSD. Of note, some variables that did not achieve statistical significance had comparable partial correlation coefficients (i.e., similar effect sizes). Specifically, presence of a TBI and, to a lesser extent, psychological flexibility display partial correlation coefficients with PTSD recovery that are comparable to other statistically significant predictors (e.g., gender). This may suggest that TBI and psychological flexibility are important for recovery but their contribution is less apparent in models that include all of the predictors.

Strengths of the current study included the use of a clinical diagnostic interview to assess PTSD symptom severity across time, as well as use of other psychometrically sound measures. Nonetheless, findings must be interpreted in light of several limitations. First, we recruited participants who were exposed to trauma but who did and did not meet full diagnostic criteria for PTSD to represent a range of PTSD symptoms and recovery levels. Thus, the findings of this study should be noted as examining natural courses of recovery, rather than treatment effectiveness or predictors of treatment response. Lifetime worst PTSD symptom severity was assessed retrospectively; however current PTSD symptom severity was measured at one-year follow-up, thus diminishing the effect of ambient shared measurement variance on PTSD symptom severity change scores. This study did not assess treatment involvement between the time of trauma exposure and the baseline assessment. It is possible that treatment received may have facilitated development of the mindful awareness variables; however, despite the increasing popularity of interventions that target these factors, it would have been relatively uncommon for participants to receive a treatment that explicitly addressed these factors. We did not observe significant change in PTSD symptoms from baseline to one year follow-up even though all participants were enrolled for VA care. Thus, it is unlikely that treatment received could have accounted for the relationship between the mindful awareness variables and change in PTSD symptoms. Our sample was comprised of primarily male war veterans enrolled in a VA healthcare system; thus, it is unknown to what extent the findings of this study may generalize to other populations. Finally, the construct of psychological flexibility and particularly the AAQ-II have been critiqued for perhaps being more strongly related to measures of distress than to components of the definition of flexibility (Wolgast, 2014). While the current study is not able to address these critiques directly, we observed moderate correlations between AAQ-II scores and lifetime worst PTSD symptom severity that were not higher than those for mindfulness and self-compassion.

In terms of directions for future research, in addition to PTSD, warzone service is associated with elevated risk for a broad range of mental health symptoms (Kimbrel et al., 2015). Several prior studies have shown that these mindful awareness variables are associated with a broad range of mental health symptoms (Bond et al., 2011; Kashdan & Rottenberg, 2010; Keng et al., 2011; MacBeth & Gumley, 2012). Thus, future research would benefit from examining whether these variables predict recovery in relation to additional forms of mental health symptoms. Further, whether these findings are driven by relationships between our predictors and specific constellations of PTSD symptoms (i.e., changes in avoidance symptoms vs. reexperiencing symptoms) could be addressed. To our knowledge, only one study has prospectively (i.e., from pretrauma to posttrauma) measured a mindful awareness variable (Orcutt, Bonanno, Hannan, & Miron, 2014); lower psychological flexibility assessed prior to a campus shooting predicted chronic course of PTSD symptoms. A second study measured self-compassion measured after exposure to a forest fire but before the one-month duration of symptoms required for a PTSD diagnosis; here, greater self-compassion was associated with fewer PTSD symptoms among adolescents (Zeller et al., 2015). Future research that includes

both pretrauma as well as posttrauma assessments are needed to robustly examine predictors of changes in PTSD symptoms over time. Relatedly, it would be interesting to examine the natural course of these mindful awareness variables over time among trauma-exposed populations in the absence of treatment and whether any changes in these variables are linked with changes in PTSD symptoms. Greater understanding of these relationships is particularly important as mindfulness-focused interventions and mindfulness-focused activities outside the clinic become increasingly popular.

5. Conclusions

Our findings highlighted the role that mindful awareness-related psychological processes play in the process of recovery from PTSD symptoms in war veterans above and beyond several established predictors of chronicity and severity. A latent factor comprised of these constructs predicted a large proportion of unique variance in PTSD recovery in a rigorous test accounting for lifetime PTSD severity and established predictors of PTSD chronicity. Self-compassion emerged as a unique individual predictor of PTSD recovery, whereas the contribution of psychological flexibility and trait mindfulness could only be detected when tested in sensitivity analyses, perhaps due to shared variance among these inter-related constructs. Enhanced understanding of factors that facilitate recovery from PTSD or, conversely, that contribute to getting stuck in the recovery process following trauma exposure, particularly factors that may be readily targeted using a range of existing interventions, may be harnessed to reduce the long-term impact of trauma.

Funding source

This work was supported by a VISN 17 New Investigator Award to Dr. Meyer, and VA Merit Awards to Dr. Morissette (#I01RX000304-01A1) and Drs. Morissette and Meyer (#I01RX000304-01A4) from the Rehabilitation Research and Development (RRD) Service of the VA Office of Research and Development (ORD), USA. Dr. Szabo's work on this study is supported by the VA Advanced Fellowship in Mental Illness Research and Treatment. Dr. Frankfurt's work on this study was supported by VA Career Development Award-1 #11K1RX002427-01A2 from the RR&D Service of ORD. The views expressed in this article are those of the authors and do not necessarily reflect the position or policy of the Department of Veterans Affairs or the United States government.

Acknowledgements

We thank Suzy Bird Gulliver, Ph.D., for contributing to conceptualization of the parent study.

References

- American Psychiatric Association (2000). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: Author text rev.
- Arch, J. J., Eifert, G. H., Davies, C., Vilardaga, J. C. P., Rose, R. D., & Craske, M. G. (2012). Randomized clinical trial of cognitive behavioral therapy (CBT) versus acceptance and commitment therapy (ACT) for mixed anxiety disorders. *Journal of Consulting and Clinical Psychology, 80*(5), 750–765. <https://doi.org/10.1037/a0028310>.
- Birnie, K., Speca, M., & Carlson, L. E. (2010). Exploring self-compassion and empathy in the context of mindfulness-based stress reduction (MBSR). *Stress and Health, 26*(5), 359–371. <https://doi.org/10.1002/smi.1305>.
- Bishop, S. R., Lau, M., Shapiro, S., Carlson, L., Anderson, N. D., Carmody, J., et al. (2004). Mindfulness: A proposed operational definition. *Clinical Psychology: Science and Practice, 11*(3), 230–241. <https://doi.org/10.1093/clipsy.bph077>.
- Blake, D. D., Weathers, F. W., Nagy, L. M., Kaloupek, D. G., Gusman, F. D., Charney, D. S., et al. (1995). The development of a clinician-administered PTSD scale. *Journal of Traumatic Stress, 8*(1), 75–90. <https://doi.org/10.1002/jts.2490080106>.
- Bonanno, G. A., Mancini, A. D., Horton, J. L., Powell, T. M., LeardMann, C. A., Boyko, E. J., et al. (2012). Trajectories of trauma symptoms and resilience in deployed US military service members: Prospective cohort study. *The British Journal of Psychiatry, 200*(4), 317–323. <https://doi.org/10.1192/bjp.bp.111.096552>.
- Bond, F. W., Hayes, S. C., Baer, R. A., Carpenter, K. M., Guenole, N., Orcutt, H. K., et al.

- (2011). Preliminary psychometric properties of the acceptance and action questionnaire-II: A revised measure of psychological inflexibility and experiential avoidance. *Behavior Therapy, 42*(4), 676–688. <https://doi.org/10.1016/j.beth.2011.03.007>.
- Brewin, C. R., Andrews, B., & Valentine, J. D. (2000). Meta-analysis of risk factors for posttraumatic stress disorder in trauma-exposed adults. *Journal of Consulting and Clinical Psychology, 68*(5), 748–766. <https://doi.org/10.1037/0022-006X.68.5.748>.
- Brown, K., & 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. <https://doi.org/10.1037/0022-3514.84.4.822>.
- Bryan, C. J., Ray-Sannerud, B., & Heron, E. A. (2015). Psychological flexibility as a dimension of resilience for posttraumatic stress, depression, and risk for suicidal ideation among Air Force personnel. *Journal of Contextual Behavioral Science, 4*(4), 263–268.
- 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.
- Crum-Cianflone, N. F., & Jacobson, I. (2014). Gender differences of postdeployment post-traumatic stress disorder among service members and veterans of the Iraq and Afghanistan conflicts. *Epidemiologic Reviews, 36*(1), 5–18. <https://doi.org/10.1093/epirev/mxt005>.
- Dahm, K. A., Meyer, E. C., Neff, K. D., Kimbrel, N. A., Gulliver, S. B., & Morissette, S. B. (2015). Mindfulness, self-compassion, posttraumatic stress disorder symptoms, and functional disability in U.S. Iraq and Afghanistan war veterans. *Journal of Traumatic Stress, 28*(5), 460–464. <https://doi.org/10.1002/jts.22045>.
- DeBeer, B. B., Kimbrel, N. A., Meyer, E. C., Gulliver, S. B., & Morissette, S. B. (2014). Combined PTSD and depressive symptoms interact with post-deployment social support to predict suicidal ideation in Operation Enduring Freedom and Operation Iraqi Freedom veterans. *Psychiatry Research, 216*(3), 357–362. <https://doi.org/10.1016/j.psychres.2014.02.010>.
- Fulton, J. J., Calhoun, P. S., Wagner, H. R., Schry, A. R., Hair, L. P., Feeling, N., et al. (2015). The prevalence of posttraumatic stress disorder in operation enduring freedom/operation Iraqi freedom (OEF/OIF) veterans: A meta-analysis. *Journal of Anxiety Disorders, 31*, 98–107. <https://doi.org/10.1016/j.janxdis.2015.02.003>.
- Galatzer-Levy, I. R., Anki, Y., Freedman, S., Israeli-Shalev, Y., Roitman, P., Gilad, M., et al. (2013). Early PTSD symptom trajectories: Persistence, recovery, and response to treatment: Results from the Jerusalem trauma outreach and prevention study (J-TOPS). *PLoS One, 8*(8), e70084. <https://doi.org/10.1371/annotation/0af0b6c6-ac23-4fe9-a692-f5c30a3a30b3>.
- Gutner, C. A., Galovski, T., Bovin, M. J., & Schnurr, P. P. (2016). Emergence of trans-diagnostic treatments for PTSD and posttraumatic distress. *Current Psychiatry Reports, 18*(10), 95. <https://doi.org/10.1007/s11920-016-0734-x>.
- Hayes, S. C., Luoma, J. B., Bond, F. W., Masuda, A., & Lillis, J. (2006). Acceptance and commitment therapy: Model, processes, and outcomes. *Behavior and Research Therapy, 44*(1), 1–25. <https://doi.org/10.1016/j.brat.2005.06.006>.
- Hayes, S. C., Strosahl, K. D., & Wilson, K. D. (2012). *Acceptance and commitment therapy: The process and practice of mindful change* (2nd ed.). New York: Guilford.
- Hayes, S. C., Wilson, K. G., Gifford, E. V., Follette, V. M., & Strosahl, K. (1996). Experiential avoidance and behavioral disorders: A functional dimensional approach to diagnosis and treatment. *Journal of Consulting and Clinical Psychology, 64*(6), 1152–1168.
- Hiraoka, R., Meyer, E. C., Kimbrel, N. A., DeBeer, B. B., Gulliver, S. B., & Morissette, S. B. (2015). Self-compassion as a prospective predictor of PTSD symptom severity among trauma-exposed US Iraq and Afghanistan war veterans. *Journal of Traumatic Stress, 28*(2), 127–133. <https://doi.org/10.1002/jts.21995>.
- Hoge, C. W., & Chard, K. M. (2018). A window into the evolution of trauma-focused psychotherapies for posttraumatic stress disorder. *Journal of the American Medical Association, 319*(4), 343–345. <https://doi.org/10.1001/jama.2017.21880>.
- Hoge, C. W., McGurk, D., Thomas, J. L., Cox, A. L., Engel, C. C., & Castro, C. A. (2008). Mild traumatic brain injury in US soldiers returning from Iraq. *New England Journal of Medicine, 358*(5), 453–463. <https://doi.org/10.1056/NEJMoa072972>.
- Kabat-Zinn, J. (1982). An outpatient program in behavioral medicine for chronic pain patients based on the practice of mindfulness meditation: Theoretical considerations and preliminary results. *General Hospital Psychiatry, 4*(1), 33–47. [https://doi.org/10.1016/0163-8343\(82\)90026-3](https://doi.org/10.1016/0163-8343(82)90026-3).
- Kashdan, T. B., & Rottenberg, J. (2010). Psychological flexibility as a fundamental aspect of health. *Clinical Psychology Reviews, 30*(7), 865–878. <https://doi.org/10.1016/j.cpr.2010.03.001>.
- Kelly, A., & Garland, E. L. (2016). Trauma-informed mindfulness-based stress reduction for female survivors of interpersonal violence: Results from a stage I RCT. *Journal of Clinical Psychology, 72*(4), 311–328. <https://doi.org/10.1002/jclp.22273>.
- Keng, S. L., Smoski, M. J., & Robins, C. J. (2011). Effects of mindfulness on psychological health: A review of empirical studies. *Clinical Psychology Review, 31*(6), 1041–1056. <https://doi.org/10.1016/j.cpr.2011.04.006>.
- Kimbrel, N. A., DeBeer, B. B., Meyer, E. C., Silvia, P. J., Beckham, J. C., Young, K. A., et al. (2015). An examination of the broader effects of warzone experiences on returning Iraq/Afghanistan veterans' psychiatric health. *Psychiatry Research, 226*(1), 78–83. <https://doi.org/10.1016/j.psychres.2014.12.007>.
- Kimbrel, N. A., Evans, L. D., Patel, A. B., Wilson, L. C., Meyer, E. C., Gulliver, S. B., et al. (2014). The Critical Warzone Experiences (CWE) Scale: Initial psychometric properties and association with PTSD, anxiety, and depression. *Psychiatry Research, 220*(3), 1118–1124. <https://doi.org/10.1016/j.psychres.2014.08.053>.
- King, A. P., Erickson, T. M., Giardino, N. D., Favorite, T., Rauch, S. A., Robinson, E., et al. (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>.

- Kirby, J. N. (2017). Compassion interventions: The programmes, the evidence, and implications for research and practice. *Psychology and Psychotherapy*, 90(3), 432–455. <https://doi.org/10.1111/papt.12104>.
- Linehan, M. M. (1993). Dialectical behavior therapy for treatment of borderline personality disorder: Implications for the treatment of substance abuse. *NIDA Research Monograph*, 137, 201–201.
- Litz, B. (2017). Who gets better and why: The combined results of STRONG STAR and CAP PTSD trials. *Paper presented at the San Antonino combat PTSD conference* (San Antonio, TX).
- MacBeth, A., & Gumley, A. (2012). Exploring compassion: A meta-analysis of the association between self-compassion and psychopathology. *Clinical Psychology Review*, 32(6), 545–552. <https://doi.org/10.1016/j.cpr.2012.06.003>.
- Marshall, R. D., Olfson, M., Hellman, F., Blanco, C., Guardino, M., & Struening, E. L. (2001). Comorbidity, impairment, and suicidality in subthreshold PTSD. *American Journal of Psychiatry*, 158(9), 1467–1473.
- Meyer, E. C., Frankfurt, S. B., Kimbrel, N. A., DeBeer, B. B., Gulliver, S. B., & Morissette, S. B. (2018a). The influence of mindfulness, self-compassion, psychological flexibility and posttraumatic stress disorder on disability and quality of life over time in war veterans. *Journal of Clinical Psychology*, 74(7), 1272–1280. <https://doi.org/10.1002/jclp.22596>.
- Meyer, E. C., Konecky, B., Kimbrel, N. A., DeBeer, B. B., Marx, B. P., Schumm, J., et al. (2018b). Gender differences in associations between DSM-5 posttraumatic stress disorder symptom clusters and functional impairment in war veterans. *Psychological Services*, 15(2), 230–237. <https://doi.org/10.1037/ser0000171>.
- Meyer, E. C., La Bash, H., DeBeer, B. B., Kimbrel, N. A., Gulliver, S. B., & Morissette, S. B. (2018c). Psychological inflexibility predicts PTSD symptom severity in war veterans after accounting for established PTSD risk factors and personality. *Psychological Trauma: Theory, Research, Practice, and Policy*. <https://doi.org/10.1037/tra0000358>.
- Meyer, E. C., Morissette, S. B., Kimbrel, N. A., Kruse, M. I., & Gulliver, S. B. (2013). Acceptance and Action Questionnaire—II scores as a predictor of posttraumatic stress disorder symptoms among war veterans. *Psychological Trauma: Theory, Research, Practice, and Policy*, 5(6), 521–528. <https://doi.org/10.1037/a0030178>.
- Meyer, E. C., Walser, R. D., Hermann, B., La Bash, H., DeBeer, B. B., Morissette, S. B., et al. (2018d). Acceptance and Commitment Therapy for co-occurring PTSD and alcohol use disorders in veterans: Pilot treatment outcomes. *Journal of Traumatic Stress*, 31(5), 781–789. <https://doi.org/10.1002/jts.22322> October 2018.
- Neff, K. D. (2003). Development and validation of a scale to measure self-compassion. *Self and Identity*, 2(3), 223–250. <https://doi.org/10.1080/15298860309027>.
- Neff, K. D., & Dahm, K. A. (2015). Self-compassion: What it is, what it does, and how it relates to mindfulness. In M. Robinson, B. Meier, & B. Ostafin (Eds.), *Mindfulness and self-regulation* (pp. 121–137). New York, NY: Springer.
- Neff, K. D., & Germer, C. K. (2013). A pilot study and randomized controlled trial of the mindful self-compassion program. *Journal of Clinical Psychology*, 69(1), 28–44. <https://doi.org/10.1002/jclp.21923>.
- Orcutt, H. K., Bonanno, G. A., Hannan, S. M., & Miron, L. R. (2014). Prospective trajectories of posttraumatic stress in college women following a campus mass shooting. *Journal of Traumatic Stress*, 27(3), 249–256. <https://doi.org/10.1002/jts.21914>.
- Owens, G. P., Walter, K. H., Chard, K. M., & Davis, P. A. (2012). Changes in mindfulness skills and treatment response among veterans in residential PTSD treatment. *Psychological Trauma: Theory, Research, Practice, And Policy*, 4(2), 221–228. <https://doi.org/10.1037/a0024251>.
- Ozer, E. J., Best, S. R., Lipsey, T. L., & Weiss, D. S. (2003). Predictors of posttraumatic stress disorder and symptoms in adults: A meta-analysis. *Psychological Bulletin*, 129(1), 52–73. <https://doi.org/10.1037/0033-2909.129.1.52>.
- Polusny, M. A., Erbes, C. R., Thuras, P., Moran, A., Lamberty, G. J., Collins, R. C., & Lim, K. O. (2015). Mindfulness-based stress reduction for posttraumatic stress disorder among veterans: A randomized clinical trial. *Journal of the American Medical Association*, 314(5), 456–465. <https://doi.org/10.1001/jama.2015.8361>.
- Reijnen, A., Rademaker, A. R., Vermetten, E., & Geuze, E. (2015). Prevalence of mental health symptoms in Dutch military personnel returning from deployment to Afghanistan: A 2-year longitudinal analysis. *European Psychiatry*, 30(2), 341–346. <https://doi.org/10.1016/j.eurpsy.2014.05.003>.
- Schell, T. L., Marshall, G. N., & Jaycox, L. H. (2004). All symptoms are not created equal: The prominent role of hyperarousal in the natural course of posttraumatic psychological distress. *Journal of Abnormal Psychology*, 113, 189–197. <https://doi.org/10.1037/0021-843X.113.2.189>.
- Schwab, K. A., Baker, G., Ivins, B. J., Sluss-tiller, M., Lux, W., & Warden, D. (2006). The Brief Traumatic Brain Injury Screen (BTBIS): Investigating the validity of a self-report instrument for detecting traumatic brain injury (TBI) in troops returning from deployment in Afghanistan and Iraq. *Neurology*, 66(5), A235.
- Simon, R. I. (1999). Chronic posttraumatic stress disorder: A review and checklist of factors influencing prognosis. *Harvard Review of Psychiatry*, 6(6), 304–312.
- Steenkamp, M. M., Litz, B. T., Hoge, C. W., & Marmar, C. R. (2015). Psychotherapy for military-related PTSD: A review of randomized clinical trials. *Journal of the American Medical Association*, 314(5), 489–500. <https://doi.org/10.1001/jama.2015.8370>.
- Vogt, D., Smith, B. N., Fox, A. B., Amoroso, T., Taverna, E., & Schnurr, P. P. (2017). Consequences of PTSD for the work and family quality of life of female and male US Afghanistan and Iraq war veterans. *Social Psychiatry and Psychiatric Epidemiology*, 52(3), 341–352. <https://doi.org/10.1007/s00127-016-1321-5>.
- Wahbeh, H., Lu, M., & Oken, B. (2011). Mindful awareness and non-judging in relation to posttraumatic stress disorder symptoms. *Mindfulness*, 2(4), 219–227. <https://doi.org/10.1007/s12671-011-0064-3>.
- Weathers, F. W., Keane, T. M., & Davidson, J. R. (2001). Clinician-administered PTSD scale: A review of the first ten years of research. *Depression and Anxiety*, 13(3), 132–156. <https://doi.org/10.1002/da.1029>.
- White, H. R., & Labouvie, E. W. (1989). Towards the assessment of adolescent problem drinking. *Journal of Studies on Alcohol*, 50(1), 30–37. <https://doi.org/10.15288/jsa.1989.50.30>.
- Wolgast, M. (2014). What does the Acceptance and Action Questionnaire (AAQ-II) really measure? *Behavior Therapy*, 45(6), 831–839.
- Xue, C., Ge, Y., Tang, B., Liu, Y., Kang, P., Wang, M., et al. (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>.
- Yadavaia, J. E., Hayes, S. C., & Vilardaga, R. (2014). Using acceptance and commitment therapy to increase self-compassion: A randomized controlled trial. *Journal of Contextual Behavioral Science*, 3(4), 248–257. <https://doi.org/10.1016/j.jcbs.2014.09.002>.
- Zeller, M., Yuval, K., Nitzan-Assayag, Y., & Bernstein, A. (2015). Self-compassion in recovery following potentially traumatic stress: Longitudinal study of at-risk youth. *Journal of Abnormal Child Psychology*, 43(4), 645–653.
- Zlotnick, C., Warshaw, M., Shea, M. T., Allsworth, J., Pearlstein, T., & Keller, M. B. (1999). Chronicity in posttraumatic stress disorder (PTSD) and predictors of course of PTSD in patients with anxiety. *Journal of Traumatic Stress*, 12(1), 89–100. <https://doi.org/10.1023/A:1024746316245>.