RESEARCH ARTICLE

The influence of mindfulness, self-compassion, psychological flexibility, and posttraumatic stress disorder on disability and quality of life over time in war veterans

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The authors do not have any conflict of interests to declare.

Abstract
Objectives Posttraumatic stress disorder (PTSD) strongly predicts greater disability and lower quality of life (QOL). Mindfulness-based and other third-wave behavior therapy interventions improve well-being by enhancing mindfulness, self-compassion, and psychological flexibility. We hypothesized that these mechanisms of therapeutic change would comprise a single latent factor that would predict disability and QOL after accounting for PTSD symptom severity.

Method Iraq and Afghanistan war veterans (N = 117) completed a study of predictors of successful reintegration. Principal axis factor analysis tested whether mindfulness, self-compassion, and psychological flexibility comprised a single latent factor. Hierarchical regression tested whether this factor predicted disability and QOL 1 year later.

Results Mindfulness, self-compassion, and psychological flexibility comprised a single factor that predicted disability and QOL after accounting for PTSD symptom severity. PTSD symptoms remained a significant predictor of disability but not QOL.

Conclusions Targeting these mechanisms may help veterans achieve functional recovery, even in the presence of PTSD symptoms.

KEYWORDS
disability, mindfulness, posttraumatic stress disorder, psychological flexibility, quality of life, self-compassion
1 | INTRODUCTION

Many veterans who served in Iraq and Afghanistan suffer psychiatric consequences from warfare that impede their post-deployment recovery and reintegration. For example, approximately 23% of U.S., Iraq, and Afghanistan veterans were diagnosed with posttraumatic stress disorder (PTSD) (Fulton et al., 2015). PTSD has a significant and well-established negative impact on functional disability and quality of life (QOL) (Rodriguez, Holowka, & Marx, 2012; Schurr, Lunney, Bovin, & Marx, 2009), and more than 20 years longitudinal research with Vietnam veterans suggests that the impact of combat-related PTSD may be lifelong (Marmar et al., 2015). However, there is substantial variation in functioning and QOL among veterans who report PTSD. Whereas some veterans with PTSD have meaningful relationships and employment, others experience disabling impairment that prevents satisfying life engagement. Additionally, many veterans who experience subclinical PTSD symptoms (i.e., symptoms that do not meet full diagnostic criteria) report impairing difficulties in functioning and QOL (Brancu et al., 2016). It is important to identify modifiable factors that can promote QOL and ameliorate disability in veterans experiencing PTSD symptoms.

Individual differences in mindful awareness (i.e., mindfulness, self-compassion, psychological flexibility) are a potential explanatory factor accounting for differences in functional impairment and life satisfaction in the presence of PTSD symptoms. Mindfulness refers to the process of self-regulating attention in the present moment using an accepting, open, and curious stance (Bishop et al., 2004). Self-compassion is comprised of three interacting components: mindful awareness of suffering, self-kindness, and a sense of common humanity based on the recognition that suffering is a universal part of human experience (Neff, 2003a; 2003b). Psychological flexibility describes the ability and willingness to fully contact the present moment, including the thoughts and feelings it contains, and engage in behavior in the pursuit of one’s values (Hayes, Luoma, Bond, Masuda, & Lillis, 2006). These overlapping factors reflect a common core of mindful (i.e., open, willing, nonjudgmental) awareness in relation to emotional distress (Neff & Dahm, 2015). Following trauma exposure, short-term reductions in distress are often accomplished via a range of control- and avoidance-based behaviors such as hypervigilance to minimize feelings of vulnerability, substance misuse to dull dysphoria, avoidance of sleep to reduce exposure to nightmares, and self-blame in order to make sense of the trauma. When relied on in the long-term, these strategies become maladaptive and can contribute to PTSD (Hiraoka et al., 2015; Meyer, Morissette, Kimbrel, Kruse, & Gulliver, 2013; Orcutt, Bonanno, Hannan, & Miron, 2014). Increasingly, mental health providers are turning to mindfulness- and acceptance-based therapies, such as Acceptance and Commitment Therapy (ACT; Hayes, Strosahl, & Wilson, 2012; Hermann, Meyer, Schnurr, Batten, & Walser, 2016; Yadavaia, Hayes, & Vilardaga, 2014) and others (Neff & Germer, 2013; Polusny et al., 2015; Stephenson, Simpson, Martinez, & Kearney, 2016), that seek to bolster mindful awareness in an attempt to counteract these avoidance-based responses to trauma by promoting an adaptive and open stance.

Mindfulness- and acceptance-based treatment packages scaffold the mindful awareness constructs (i.e., mindfulness, self-compassion, psychological flexibility) off one another to build clients’ well-being and engagement in meaningful activities. A recent randomized control trial of ACT compared to a waitlist control found that participants in the intervention had significant improvements in self-compassion, general psychological distress, anxiety, and depression from pretreatment to follow-up, and that increases in psychological flexibility mediated these changes (Yadavaia et al., 2014). Moreover, in this study, people with greater exposure to trauma benefited more from the ACT intervention. Thus, mindfulness- and acceptance-based therapies such as ACT may also hold promise for improving overall well-being in ways that are not limited to symptom reduction.

Although acceptance- and mindfulness-based interventions that target these mindful-awareness factors (i.e., mindfulness, self-compassion, and psychological flexibility) in combination with one another are increasing in popularity, few empirical studies have examined the relationships among these proposed mechanisms of therapeutic change. One study examined mindfulness, self-compassion, and psychological flexibility in a sample of nonclinical university students; however, neither the relative contribution of each factor to psychological well-being nor the inter-correlations between these factors were reported (Woodruff et al., 2013). Additionally, few studies have examined these factors in trauma-exposed populations. In a sample of trauma-exposed undergraduate students, mindfulness was significantly correlated with psychological flexibility (higher scores reflected lower psychological flexibility; $r’s = −.37$ to $−.57$,
In a cross-sectional study based on the baseline assessment with the current sample, mindfulness and self-compassion were associated with one another ($r = .62, p < .001$), and higher levels of mindfulness and self-compassion were each associated with disability after accounting for PTSD symptom severity (Dahm et al., 2015).

To our knowledge, no other studies have directly examined the impact of these treatment mechanisms on outcomes other than symptom reduction, such as disability and QOL, in trauma-exposed populations. Our study contributes the most comprehensive test of the impact of these treatment mechanisms targeted in third-wave behavior therapies on holistic well-being outcomes (i.e., functional impairment, QOL) in a trauma-exposed population. Moreover, we test this relationship prospectively using two time points of data 1 year apart (i.e., Time 1 [T1] and Time 2 [T2]) while accounting for PTSD symptom severity. Thus, the current study represents an innovative test of the potential utility of such interventions for promoting recovery in trauma-exposed veterans.

The current study had two objectives. Our first objective was to model the relations among proposed mechanisms of therapeutic change (i.e., mindfulness, self-compassion, psychological flexibility) utilized in clinical practice in third-wave behavioral therapies. To the best of our knowledge, no previous study has examined the latent relations among these three constructs. We hypothesized that mindfulness, self-compassion, and psychological flexibility would form a single factor which we called "mindful awareness." Our second objective was to test whether these mechanisms predicted global disability and QOL over time in U.S., Iraq, and Afghanistan war veterans after accounting for PTSD symptom severity. Our outcomes included a behaviorally anchored measure of disability and a subjective measure of life satisfaction. We expected that PTSD symptom severity at T1 would predict greater disability and lower QOL at T2. Finally, we hypothesized that the mindful-awareness factor at T1 would be associated with less disability and greater QOL at T2 even after accounting for PTSD symptom severity at T1.

2 | METHODS

2.1 | Participants and procedures

The parent study was approved by the local institutional review board. U.S., Iraq, and Afghanistan war veterans ($N = 117$; T1 sample) registered for healthcare at a Veterans Affairs Healthcare System in the Southwestern United States were recruited to participate in a multiphase study of factors impacting psychosocial readjustment following warzone service. Eligible participants reported being exposed to one or more potentially traumatic events that met Diagnostic and Statistical Manual for Mental Health Disorders, fourth edition (DSM-IV) (American Psychiatric Association, 2000) criterion A for PTSD during their military service. Exclusion criteria included the presence of a current or lifetime psychotic disorder, bipolar disorder, current suicidal or homicidal ideation warranting a crisis intervention, recently initiating or stopping psychiatric medication or psychotherapy, 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. Recruitment was targeted toward oversampling for veterans with PTSD.

Written informed consent was obtained at the outset of the parent study. Participants completed the clinical interviews and self-report questionnaires at the medical center. Interviews were conducted by master’s level technicians or licensed or license-eligible psychologists who completed comprehensive assessment training. Clinical psychologists with significant PTSD assessment experience led weekly diagnostic review groups during which diagnostic consensus was reached in each case. The disability and QOL measures were repeated at 1-year follow-up during an in-person assessment by 97 (83%) participants (T2 sample). Participants received financial compensation for their participation at each time point.

2.2 | Measures

The Mini International Neuropsychiatric Interview (MINI; Sheehan et al., 1998) was administered to screen for the excluded diagnoses of psychotic or bipolar disorders based on the DSM-IV (American Psychiatric Association, 2000).
The Clinician-Administered PTSD Scale for DSM-IV (CAPS; Blake et al., 1995) is a structured clinical interview that assesses full PTSD diagnostic criteria and yields a continuous measure of symptom severity. Interviews were based on the criterion A event identified by each participant as the worst that occurred during their military service, which virtually 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). Current PTSD diagnoses were based on meeting all diagnostic criteria within the past 30 days. In the present study, the CAPS exhibited adequate internal consistency at T2 (α = .93).

The Mindfulness Attention Awareness Scale (MAAS; Brown & Ryan, 2003) is a 15-item unidimensional 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). Sample items include, “I find myself doing things without paying attention,” and “I find myself preoccupied with the future or the past.” In this study, internal consistency was Cronbach’s α = .94.

The Self-Compassion Scale (SCS; Neff, 2003b) is a widely used 26-item self-report measure of self-compassion (MacBeth & Gumley, 2012). Items are rated on a scale from 1 (Almost never) to 5 (Almost always). Sample items include “I am tolerant of my own flaws and inadequacies,” “I try to be loving towards myself when I am feeling emotional pain,” and “When I am down and out, I remind myself that there are lots of other people in the world feeling like I am.” Higher scores indicate greater levels of self-compassion. The SCS demonstrated high internal consistency in the current sample (Cronbach’s α = .95).

The Acceptance and Action Questionnaire-II (AAQ-II; Bond et al., 2011) is a seven-item self-report measure that assesses psychological flexibility. Items are rated on a 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.” Internal consistency in the current study was Cronbach’s α = .95.

The World Health Organization Disability Assessment Schedule 2.0 (WHODAS 2.0; Üstün, 2010) is a 36-item self-report measure that assesses functional disability in the past 30 days. The WHODAS 2.0 is based on the International Classification of Functioning, Disability, and Health (ICF) framework (WHO; 2001). The Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-V; APA, 2013) recommends using the WHODAS 2.0 to assess disability related to mental disorders (Konecky, Meyer, Marx, Kimbrel, & Morissette, 2014). Items are rated on a scale from 1 (No difficulty) to 5 (Extreme difficulty or inability to perform the activity). Sample items include “Analyzing and finding solutions to problems in day-to-day life” and “Getting out of your home.” We calculated a mean score that indexed disability across six life domains: mobility, self-care, cognition, getting along with others, participation in society, and life activities. Higher scores reflect greater levels of disability. Total disability score (mean item score) exhibited adequate internal consistency Cronbach’s α = .97 at T2.

The Quality of Life Scale (QOLS; Burckhardt & Anderson, 2003) is a 16-item self-report measure that assesses life satisfaction during the past year in 16 life domains, including health, participation in community and relationships, and creative expression. Items are rated on a scale from 1 (Delighted) to 7 (Terrible). Cronbach’s α was .94 at T2.

### 2.3 Data analysis plan

First, the pattern of correlations between independent and dependent variables was examined (Table 1). Next, we used principal axis factor analysis to model the latent relations among mindfulness, self-compassion, and psychological flexibility and to test whether these constructs would form a single latent factor. Lastly, hierarchical linear regression was used to predict functional disability and QOL at T2. PTSD symptom severity was entered in the first step and the latent mindful awareness factor score was entered in the second block. A small proportion of data were missing on the self-compassion (1.7%), psychological flexibility (1.7%), and mindfulness (14.5%) measures at T1. Missing data was handled using mean substitution to retain these participants. The Variance Inflation Factor (VIF) was calculated to assess for multicollinearity PTSD and the latent mindful responding factors core. The VIF score was 2.15, which suggested that multicollinearity was unlikely to affect the results.
### TABLE 1  Descriptive statistics and correlations among variables

<table>
<thead>
<tr>
<th></th>
<th>Mean (SD)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>CAPS-T1</td>
<td>42.21 (29.12)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>MAAS-T1</td>
<td>3.62 (1.14)</td>
<td>–.57</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>AAQ-II-T1</td>
<td>4.60 (1.68)</td>
<td>–.71</td>
<td>.63</td>
<td></td>
<td></td>
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<tr>
<td>4.</td>
<td>SCS-T1</td>
<td>2.98 (8.1)</td>
<td>–.64</td>
<td>.62</td>
<td>.74</td>
<td>–</td>
</tr>
<tr>
<td>5.</td>
<td>WHODAS 2.0</td>
<td>.91 (70)</td>
<td>.62</td>
<td>–.53</td>
<td>–.52</td>
<td>–.51</td>
</tr>
<tr>
<td>6.</td>
<td>QOLS-T2</td>
<td>4.80 (1.87)</td>
<td>–.57</td>
<td>.52</td>
<td>.63</td>
<td>.63</td>
</tr>
</tbody>
</table>

Note. CAPS-T1, Clinician Administered PTSD Schedule; MAAS, Mindfulness Attention Awareness Scale; AAQ-II, Acceptance and Action Questionnaire-II; SCS, Self-Compassion Scale; WHODAS 2.0, World Health Organization Disability Assessment Schedule; QOLS, Quality of Life Scale; T1, Time 1; T2, Time 2. Ns = 95–117 due to missing data at T2. All correlations were significant at p < .01 (two-tailed).

### TABLE 2  Results of hierarchical linear regression analyses predicting disability and quality of life at 1-year follow-up

<table>
<thead>
<tr>
<th></th>
<th>WHODAS 2.0</th>
<th>QOLS T2</th>
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<tbody>
<tr>
<td></td>
<td>Model 1</td>
<td>Model 2</td>
</tr>
<tr>
<td>CAPS T1</td>
<td>.62**</td>
<td>.44**</td>
</tr>
<tr>
<td>Mindful Attitudes Factor T1</td>
<td>–.25*</td>
<td></td>
</tr>
<tr>
<td>Total R²</td>
<td>.39***</td>
<td>.42***</td>
</tr>
<tr>
<td>ΔR²</td>
<td>.03*</td>
<td></td>
</tr>
<tr>
<td>Effect size for ΔR² (f²)</td>
<td>.05 (small)</td>
<td></td>
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</tbody>
</table>

Note. Regression coefficients are standardized. WHODAS 2.0, World Health Organization Disability Assessment Scale; QOLS, Quality of Life Scale; CAPS, Clinician Administered PTSD Scale for DSM-IV; T1, Time 1; T2, Time 2. **p < .001, *p < .01, *p < .05.

### 3 | RESULTS

The majority (n = 98; 83.8%) of participants were male, which is consistent with the distribution among the broader population of Iraq and Afghanistan war veterans. Average age of the sample was 37.33 years (SD = 10.15). The majority of participants identified themselves as Caucasian (n = 68; 58.1%). African American veterans were also well represented (n = 29; 24.8%), as were Hispanic/Latino veterans (n = 36; 30.8%). The majority of participants served in the Army (n = 100, 85.5%) and had been on active duty (n = 111, 94.9%). Most participants served in the Iraq or Afghanistan war zone (n = 89, 76.1%). Nearly half of the sample (n = 48; 41.0%) met criteria for current military-related PTSD and 62.4% (n = 73) met lifetime criteria for military-related PTSD.

Pearson-product moment correlations for the study variables are presented in Table 1. Overall, all study variables were moderately to strongly correlated with one another (all p-values < .01). A principal axis factor analysis of the mean scores of the MAAS, SCS, and AAQ-II was conducted. The Kaier-Meyer Olkin (KMO) measure of sampling adequacy suggested that the sample was factorable (KMO = .702). Bartlett’s test of sphericity suggested that the correlation matrix was not an identity matrix (X² (3) = 119.91, p < .001). One component was extracted; thus the solution was not rotated. The initial Eigen values showed that this single factor explained 75.49% of the variance. Factor loadings = .68 (MAAS), .84 (SCS), and .87 (AAQ-II). These analyses indicated that a common factor that we called “mindful awareness” underlay the MAAS, SCS, and AAQ-II; thus, we conducted the hierarchical linear regression analyses using this mindful awareness factor as a predictor.

The results of the regression analyses predicting disability and QOL at T2 are presented in Table 2. The model accounted for 42% of the variance in disability at T2 (p < .001). As expected, in the first step, T1 PTSD symptom severity predicted T2 greater disability (large effect size). After accounting for the large effect of T1 PTSD symptom severity, the T1 mindful awareness factor score predicted lower disability at T2 (β = –.25, ΔR² = .03, p = .017, f² = .05, small effect).
As expected, PTSD symptom severity remained a significant predictor of disability at T2. The model also accounted for 46% of the variance in QOL at T2 ($p < .001$). Again, in the first step, T1 PTSD symptom severity predicted lower QOL at T2 (large effect size). After accounting for the large effect of T1 PTSD symptom severity, the T1 mindful attitudes factor score predicted greater QOL at T2 ($\beta = .52$, $\Delta R^2 = .14$, $p < .001$, $f^2 = .26$, medium effect). Unexpectedly, when all predictors were included in the model, PTSD symptom severity was no longer a significant predictor of QOL.

4 | DISCUSSION

The current study tested whether the latent associations among a set of conceptually linked “mindful awareness” variables (i.e., mindfulness, self-compassion, and psychological flexibility) reflect the clinical usage of these variables as overlapping mechanisms of therapeutic change in third-wave behavioral interventions. We next tested whether this mindful awareness latent factor predicted disability and QOL at a one year follow-up even after accounting for the large, well-established relationship between PTSD symptom severity and these outcomes. Functional disability and QOL reflected complementary objective and subjective aspects of well-being. Results supported both of our hypotheses. First, a single latent factor model consisting of mindfulness, self-compassion and psychological flexibility, that we labeled “mindful awareness,” fit our data well. Second, the T1 latent mindful attitudes factor score predicted less disability and greater QOL at T2, even after accounting for T1 PTSD symptom severity. Results indicated that the latent mindful awareness factor had a stronger relationship with QOL, relative to PTSD symptom severity. Unexpectedly, the association between PTSD and QOL became nonsignificant when the latent mindful attitudes factor was included in the model. This result was surprising given the extensive literature documenting a strong association between PTSD and decreased QOL (Schnurr, Lunney, Bovin, & Marx, 2009); however, interpretation of this finding is tempered by the large proportion of variance accounted for by PTSD in the first step of the regression model. The current findings suggest that greater levels of mindful awareness, comprised of mindfulness, self-compassion, and psychological flexibility, influence levels of disability and QOL over time, and that this relationship is distinct from the impact of PTSD symptoms.

Importantly, mindfulness, self-compassion, and psychological flexibility are modifiable via interventions such as ACT and other third-wave behavioral therapies. Indeed, these constructs represent the proposed mechanisms of therapeutic change in these interventions. The practice of mindfulness forms the basis of many third-wave behavior therapies, including mindfulness-based stress reduction (MBSR; Kabat-Zinn, 1982), dialectical behavior therapy (Linehan, 1993), mindfulness-based cognitive therapy (Kuyken et al., 2010), and ACT. The current results shed light on why mindfulness- and acceptance-based interventions may have utility for alleviating suffering and disability in people with PTSD. Findings from several studies suggest that mindfulness-based treatments have several salutary benefits for traumatized populations, including civilians (Kelly & Garland, 2016) and veterans (Polusny et al., 2015; Stephenson et al., 2016). Taken together, current and past findings suggest that mindfulness-based interventions have potential for assisting veterans in achieving meaningful functional recovery following warzone trauma exposure. However, few studies have examined the impact of these interventions on outcomes such as disability and QOL in people with PTSD. The current results suggest there is reason to be hopeful that these interventions help to improve well-being in these domains.

This study had several strengths, including the multiple time-point design and use of psychometrically sound measures. In addition, we used a clinician-administered interview to assess PTSD. However, findings must be interpreted in light of several limitations. First, the sample was primarily comprised of male veterans enrolled in the Veteran Affairs Healthcare System who served in support of the wars in Iraq and Afghanistan. Thus, findings may not generalize to women veterans, those not enrolled in the Veteran Affairs Healthcare System, or veterans of other war theatres.

In conclusion, the current findings suggest that an attitudinal and behavioral stance characterized by mindfulness, self-compassion, and psychological flexibility reflects healthy adaptation following trauma exposure. These findings also support the use of mindfulness-based and other third-wave behavioral interventions that target these variables as core mechanisms of therapeutic change. As the mental health treatment field moves towards tailoring treatment, clinicians will benefit from information about such individual differences that contribute to well-being beyond level of
symptom severity. Although future exploration is warranted, these results suggest that mindfulness-based interventions hold promise for improving the long-term well-being of traumatized veterans.

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