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Predictors of lower-than-expected posttraumatic symptom severity in war veterans: The influence of personality, self-reported trait resilience, and psychological flexibility

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ABSTRACT

Resilience following traumatic events has been studied using numerous methodologies. One approach involves quantifying lower-than-expected levels of a negative outcome following trauma exposure. Resilience research has examined personality and coping-related factors. One malleable factor is psychological flexibility, or the context-dependent ability/willingness to contact the present moment, including emotional distress, in order to engage in valued actions. Among 254 war Veterans who participated in a longitudinal study, we operationalized resilience as lower-than-expected PTSD symptoms and PTSD-related functional impairment one-year following an initial post-deployment assessment based on lifetime exposure to childhood trauma, combat trauma, and sexual trauma during military service. We evaluated the contribution of personality factors, self-reported trait resilience, and psychological flexibility, measured using the Acceptance and Action Questionnaire-II, to PTSD-related resilience after accounting for lifetime and current PTSD symptom severity and depression symptom severity. In hierarchical regression analyses, neither specific personality factors nor self-reported resilience predicted PTSD-related resilience at follow-up after accounting for PTSD and depression symptoms. In the final step, psychological flexibility predicted unique variance and was the only significant predictor of PTSD-related resilience aside from baseline PTSD symptom severity. Findings indicate that psychological flexibility is a predictor of resilience that is distinct from psychiatric symptoms, personality, and self-reported resilience. Trauma survivors may benefit from interventions that bolster psychological flexibility.

1. Introduction

War veterans are exposed to a host of stressors and traumatic events as a result of their military deployments (Schell & Marshall, 2008). When compared with the general U.S. civilian population, research indicates that veterans are at greater risk for mental health disorders due to their high levels of exposure to traumatic events (Fulton et al., 2015). Participating in combat, in particular, confers a significantly higher likelihood of adverse mental health outcomes (Cesur, Sabira, & Tekin, 2013; Kimbrel et al., 2015), such as substance abuse, major depression, suicidal ideation (Hoge et al., 2004; Lemaire & Graham, 2011) and posttraumatic stress disorder (PTSD; Seal, Bertentha, Miner, Sen & Marmar, 2007). Despite these challenges, most military service members who have deployed in support of these wars return home without substantial negative mental health consequences (Bonanno et al., 2012; Isaacs et al., 2017; Pietrzak & Cook, 2013). Indeed, substantial variability is observed in mental health and psychosocial functioning outcomes in individuals exposed to similar types of

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stressors and traumatic events, ranging from asymptomatic presentations to clinically severe (Bliese et al., 2007; Bonanno, 2004; Bonanno et al., 2012; Brancu et al., 2015; Fulton et al., 2015; Norris, Murphy, Baker, & Perilla, 2003). Identifying factors that influence variability in resilience, particularly factors that are modifiable, is crucial for informing efforts to assist in preventing PTSD and other common negative mental health and functional outcomes.

2. Resilience: construct and measurement

Much of the research aimed at understanding factors that contribute to adaptive and other non-clinical outcomes following traumatic and other highly stressful events address the construct of resilience. Studying resilience allows for improved understanding of factors that not only mitigate against the development of mental health disorders but also contribute to the development and maintenance of adaptive and healthy levels of functioning in the face of adversity (Seligman & Csikszentmihalyi, 2000). More broadly, focusing on resilience is consistent with efforts to develop strength- and competence-based interventions (e.g., Casey, 2011; Padesky & Mooney, 2012).

Resilience has proven challenging to study due to variability in conceptualizing the construct. The American Psychological Association (2014) defines resilience as "the process of adapting well in the face of adversity, trauma, tragedy, threats or even significant sources of stress." Other researchers have referred to resilience as "the ability to bounce back" (Rutter, 1985), "the ability to maintain a stable equilibrium" (Bonanno, 2004), or demonstrating "better than expected" functioning (Fletcher & Sarkar, 2013) following stress exposure. This conceptual variability, in turn, is associated with variability in research methodology, likely contributing to disparate findings in the resilience literature (Bonanno, 2012; Infurna & Luthar, 2016; Luthar, 1993, 1996; Luthar, Cichetti & Becker, 2000; Masten & Coatsworth, 1998). Lack of consensus regarding the optimal approach to studying resilience encompasses a range of methodological considerations, including whether resilience should be conceptualized as binary (i.e., presence/absence) or continuous, as uniformly exhibited across life domains versus being context-specific, or as a fixed trait or malleable. Moreover, consideration is needed with respect to the outcome or set of outcomes that should be included (i.e., mental health symptoms, functional outcomes, markers of posttraumatic growth, and so forth), the role of the nature and severity of the stressor, and the temporal requirements for studying resilience.

Recommendations for what types of stressful events should qualify as an index event in the study of resilience suggest focusing on events that confer an established and particularly high risk for a given outcome (Luthar, 1993; Luthar, Cicchetti, & Becker, 2000). Whereas some studies have examined resilience as a cross-sectional outcome (Pietrzak & Southwick, 2011), it is generally preferred to study it over time (Bonanno et al., 2012; Isaacs et al., 2017; Ryan et al., 2007). Most studies have examined resilience in terms of the presence or absence of psychopathology. Fewer studies have examined resilience as a multidimensional construct, despite the potential to gain a richer understanding of how resilience manifests itself in individuals by examining indicators of both psychopathology and functional outcomes (Lam, Shing, Bonnano, Mancini, & Fielding, 2012; Zautra, Hall, & Murray, 2010). Another approach to measuring resilience involves assessing peoples' perceived ability to cope with adversities (Connor & Davidson, 2003; Friborg, Hjemdal, Rosenvinge, & Martinussen, 2003; Smith et al., 2008; Zang et al., 2017). However, this approach has been called into question based on potential for errors in self-perception, reporting bias, and overlap between the content of self-reported resilience scales and personality factors (Amstader, Myers & Kendler, 2014; Bonanno, 2012). One novel approach conceptualizes resilience as the difference between individuals' actual scores and their predicted scores on relevant outcome measures, given their degree of exposure to stressors (Amstader et al., 2014; Kim-Cohen, Moffitt, Caspi, & Taylor, 2004). This approach may be viewed as more objective in terms of statistically quantifying a continuum of functioning ranging from resilience to vulnerability.

3. Factors associated with resilience

Prior research efforts have examined factors associated with resilience from a variety of analytic levels, including genetic (Lemery-Chalfant, Clifford, McDonald, O'Brien, & Valiente, 2013; Nievergelt et al., 2015), epigenetic (Dudley, Li, Kobor, Kippin, & Bredy, 2011; Franklin et al., 2010; Groger et al., 2016), developmental (Luthar, 2006; Masten, 2001), and cultural approaches (Arrington & Wilson, 2000; Hebbani & Srinivasan, 2016; Singh, 1995). Prior research has also focused on personality variables such as neuroticism, which has consistently been negatively associated with resilience, as well as extraversion, conscientiousness, and agreeableness, which have been positively related to resilience (Campbell-Sills, Cohan, & Stein, 2006; Carter et al., 2016; Isaacson et al., 2017; Rudow, Iacoviello, & Charney, 2014; Shi, Liu, Wang, & Wang, 2015), including studies in which personality was measured prior to the occurrence of the stressor (Gupta & Bonanno, 2010; Nolen-Hoeksema & Morrow, 1991). In prior reports from an earlier phase of this program of research, we found that an a priori resilient personality prototype, characterized by low levels of negative emotionality and high levels of positive emotionality, predicted better adjustment at 8-month follow-up in war veterans (Elliott et al., 2015; 2016). However, limiting the study of resilience to personality factors has been critiqued for accounting for relatively little variance in resilience (Bonanno, Brewin, Kaniasty, & LaGreca, 2010; Bonanno, 2012), particularly when a multi-dimensional approach is used to measure resilience (i.e., going beyond defining resilience in terms of low mental health symptoms). Moreover, to the extent that personality reflects a fixed set of traits, particularly among adults (McCrae et al., 2000; Roberts, Walton, & Viechtbauer, 2006), examining personality does not address the role of malleable factors that likely influence resilience over time (Bonanno, 2012).

Examining malleable psychological factors appears to be important for advancing the study of resilience, both in terms of identifying predictors of resilience and pointing the way toward interventions that bolster resilience. Several malleable factors have been investigated as for promoting resilience, including psychological flexibility (Waugh & Koster, 2015). Psychological flexibility is a malleable factor that has been established as a cornerstone of mental and physical health, including among trauma survivors (Bonanno & Burton, 2013; Bond et al., 2011; Hayes, Luoma, Bond, Masuda, & Lillis, 2006; Kashdan & Rottenberg, 2010; Meyer, Morissette, Kimbrel, Kruse, & Gulliver, 2013). Psychological flexibility has proven challenging to define, and there are multiple conceptualizations of this construct. A review of this literature describes psychological flexibility as shifting mental or behavioral repertoires in accordance with situational demands, maintaining balance among life domains, and committing to values-congruent behaviors (Kashdan & Rottenberg, 2010). One prominent conceptualization of psychological flexibility is based on the model of psychopathology and psychotherapy associated with Acceptance and Commitment Therapy (ACT; Bond et al., 2011; Hayes et al., 2006; Hayes, Strosahl, & Wilson, 2012). Hayes et al. (2006) define psychological flexibility as "the ability to fully contact the present moment and the thoughts and feeling it contains without needless defense, and, depending on what the situation affords, persisting in or changing behavior in the pursuit of goals and values." Thus, in this definition, psychological flexibility represents the link between experiential contact with unwanted internal experiences and values-based action (Hayes et al., 2012). In this conceptualization, psychological flexibility encompasses the narrower construct of experiential avoidance, which refers to a characteristic tendency to attempt to avoid, control, or alter unwanted internal experiences (i.e., negatively evaluated cognitions, emotions, and physiological sensations). Such unwanted internal experiences may include, but, importantly, are broader than trauma-

related internal experiences (e.g., intrusive memories, emotional distress, physiological hyperarousal). Another prominent conceptualization of psychological or regulatory flexibility includes the sequentially engaged components of context sensitivity, recruitment and engagement of a diverse range of regulatory strategies, and responsivity to feedback (Bonanno & Burton, 2013). Thus, in relation to resilience, following stressor exposure, psychological flexibility likely reflects an ongoing process in which people acknowledge and experientially contact emotional distress, yet persist in responding in ways that are consistent with their values, in accordance with fluctuating contextual demands. However, there have been few empirical studies of psychological flexibility in relation to resilience. We previously found that the effect of an a priori resilient personality prototype on self-reported mental health symptoms was mediated by psychological flexibility (Elliott et al., 2015).

In the current study, we examined predictors of resilience conceptualized as "lower than expected" level of PTSD symptom severity and related functional impairment following cumulative exposure to childhood trauma and military-related trauma, including both combat exposure and military sexual trauma. This approach to conceptualizing resilience has been used in studying levels of psychiatric symptoms given varying levels of exposure to adverse childhood experiences, but has not been used in studying among trauma-exposed adults. There is a strong, well-established relationship between level of trauma exposure and risk for PTSD (Brewin, Andrews, & Valentine, 2000; Ozer, Best, Lipsey, & Weiss, 2003; Xue et al., 2015). Thus, the degree to which a person exhibits better-than-expected mental health and functional outcomes over time based on their level of trauma exposure reflects greater resilience. We constructed a multidimensional measure of PTSD-related impairment that included PTSD symptom severity, as well as level of social and occupational impairment directly related to PTSD symptoms. Once we calculated resilience scores in this manner, we examined intrapsychic factors that predicted resilience.

We were interested in directly comparing our main hypothesized predictor, psychological flexibility, as conceptualized by Hayes and colleagues (Bond et al., 2011; Hayes et al., 2006; 2012), with other factors that reflect different approaches to studying resilience in the literature.

We used the Acceptance and Action Questionnaire-II (AAQ-II; Bond et al., 2011), which primarily indexes experiential avoidance as one component of the broader construct of psychological inflexibility. We tested whether AAQ-II scores would predict unique variance in resilience after accounting for the effects of personality factors and self-reported resilience. Consistent with prior research, we expected that personality factors, particularly low levels of neuroticism and high levels of extraversion, conscientiousness, and agreeableness would predict PTSD-related resilience. We hypothesized that self-reported trait resilience would not predict resilience above and beyond the effects of personality based on the conceptual and empirical overlap between these constructs (Bonanno, 2012; Smith et al., 2008). Our main hypothesis was that psychological flexibility as indexed by AAQ-II scores would predict unique variance in PTSD-related resilience at one-year follow-up after accounting for personality factors and self-reported trait resilience, as well as after accounting for lifetime and current PTSD symptom severity and current depression symptom severity. The current study extends our prior research in this area (Elliott et al., 2015; 2016) in several ways, including conceptualizing resilience as better-than-expected levels of the outcome based on cumulative exposure to several different trauma types; constructing a multi-dimensional outcome comprised of PTSD symptoms and functioning; examining personality based on the big five model; studying a larger sample of war veterans; and using a clinician administered interview rather than a self-report instrument to assess PTSD symptoms.

4. Methods

4.1. Participants and procedures

The parent study from which these data are drawn is known as Project SERVE (Study Evaluating Returning Veterans Experiences; NCT01123642). The study was approved by the local Institutional Review Board. Eligible U.S. military Veterans who served in the wars in Iraq and Afghanistan following the September 11, 2001 terrorist attacks (N = 345) who were registered for healthcare at a Veterans Affairs Healthcare System in the Southwestern United States were recruited to participate in a study of predictors of post-deployment adjustment patterns that began after the veterans returned from deployment. Participants were recruited through advertising at enrollment sites, presentations to clinical staff, and direct mailings. Consistent with the broader goals of the parent study, recruitment was targeted toward over-sampling for veterans with a history of one or more non-excluded mental health diagnosis (targeted proportion: 75% with a probable lifetime diagnosis), and toward over-sampling for women veterans (target: 30%). Exclusion criteria included the presence of a current or lifetime psychotic disorder, bipolar disorder, suicidal or homicidal ideation warranting 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, leaving 309 eligible participants. The majority (68%) of these participants were male. Average age of the sample was 38.83 years ($S.D.$ = 9.87). Most participants identified themselves as Caucasian (56.8%) or African-American (33.7%). With respect to ethnicity, 19.8% identified as Hispanic/Latino veterans. The majority had served in the Army (n = 216, 85%) and had been active-duty (n = 239, 94%). Most had served in Iraq or Afghanistan (n = 231, 91%).

Written informed consent was obtained at the outset of the in-person baseline assessment. Participants completed a clinical interview and self-report questionnaires in private offices at the medical center. Interviews were conducted by master's level assessment technicians or doctoral level psychologists who completed comprehensive assessment training. Clinical psychologists with significant PTSD assessment experience led weekly diagnostic review groups during which diagnostic consensus was reached for each case. 274 (89%) participants were retained at one-year follow-up, of whom 254 (93%) completed the follow-up PTSD clinical interview and were included in the current analyses. Participants received financial compensation for their participation at each time-point. At baseline, half (50.5%) met full diagnostic criteria for lifetime PTSD and 28.5% met criteria for current PTSD. At one-year follow-up, 35.3% met criteria for current PTSD.

4.2. Measures

4.2.1. Excluded diagnoses

The Mini International Neuropsychiatric Interview (MINI; Sheehan, Lecrubier, & Harnett-Sheehan, 1998) was administered to screen for the excluded diagnoses of psychotic or bipolar disorders based on the Diagnostic and Statistical Manual for Mental Health Disorders, 4th Edition (DSM-IV; APA, 2000).

4.2.2. PTSD symptoms and related functional impairment

The Clinician Administered PTSD Scale (CAPS-IV; Blake et al., 1995) is widely considered the gold-standard diagnostic interview for PTSD. The CAPS-IV was administered, as this study was conducted prior to the release of DSM-5. The CAPS exhibits excellent reliability and validity (Weathers, Keane, & Davidson, 2001) and yields a continuous measure of PTSD symptom severity in addition to assessing full diagnostic criteria. This interview also includes measures of severity of social and occupational impairment directly tied to PTSD symptoms. The Criterion A "three event" form from the CAPS-IV was used in conjunction with administration of self-report checklists assessing combat

exposure and military sexual trauma described below to identify the most traumatic experience that occurred during warzone service, which was the focus of the interview. Current PTSD diagnoses were based on meeting full criteria within the past month; lifetime PTSD diagnoses were based on the 30-day period in which participants reported experiencing their highest symptom level. The CAPS yields both a categorical PTSD diagnosis and a continuous symptom severity score for each period assessed (i.e., current and lifetime). Weekly diagnostic review groups reached diagnostic consensus in all cases. Consensus was also reached on individual symptom ratings that were critical in making diagnoses (e.g., when the minimum number of symptoms was met within a symptom cluster). Given this intensive review at the item level, formal inter-rater reliability ratings were not conducted. Internal consistency for symptom severity ratings in the current study was $\alpha = 0.93$.

4.2.3. Combat exposure

The Critical War Experiences scale (CWE; Kimbrel et al., 2014) is a 7-item version of the widely-used U.S. Army and Marine Corps Mental Health Advisory Team's Combat Experiences Scale, which has been used in numerous studies of Iraq/Afghanistan veterans (e.g., Guyker et al., 2013; Hoge et al., 2004; Morissette et al., 2011). Kimbrel et al. (2014) found that the CWES demonstrated good internal consistency (average $\alpha = 0.83$), test-retest reliability ($r = 0.73$), and concurrent validity with longer measures of combat and warzone experiences (average $r = 0.74$). The Critical Warzone Experiences scale also demonstrated a unidimensional factor structure and was associated with a number of key clinical outcomes, including clinician-rated PTSD symptom severity and global functional impairment.

4.2.4. Military sexual Trauma

Deployment Risk and Resilience Inventory–Relationships Within Unit (DRRI-RWU; King, King, & Vogt, 2003). The DRRI-RWU is an eight-item scale that assesses exposure to unwanted sexual touching or inappropriate attention by members of the participant's unit, commanding officers, or civilians in a combat zone. Examples of items include "Threatened me with some sort of retaliation for not being sexually cooperative," "Made unwanted attempts to have sex with me," and "Forced me to have sex." Research suggests adequate internal consistency (i.e., most Cronbach's alpha coefficients above 0.85), adequate test-retest reliability (i.e., average 1-month test-rest coefficient of 0.86), and evidence of good scale validity (King et al., 2003; King, King, Vogt, Knight, & Samper, 2006). As per Wilson, Kimbrel, Meyer, Young, and Morissette (2015), participants endorsing one or more of the DRRI-RWU items were classified as having experienced military sexual trauma (MST). This is consistent with the Department of Defense (2012) definition of MST, which includes both sexual harassment and sexual assault. MST was coded as present (1) or absent (0). As with our prior study, when categorizing MST as present or absent, we excluded one item tapping exposure to sexual comments deemed to not meet this definition.

4.2.5. Childhood Trauma

The Traumatic Life Events Questionnaire (TLEQ; Kubany et al., 2000) is a self-report measure of exposure to 23 types of potentially traumatic events including natural disasters, physical abuse, and sexual abuse. The TLEQ has demonstrated strong convergent validity with other trauma measures and test-retest reliability (Kubany et al., 2000). For each event, respondents are asked to provide the number of times it occurred (ranging from "never" to "more than 5 times"). Respondents are also asked about their age upon first occurrence and date of last occurrence. We used this information to create a continuous childhood trauma exposure score (TLEQ-C), which assessed exposure to traumatic events prior to age 18.

4.2.6. Personality

The NEO Five-Factor Inventory-Revised (NEO—FFI—R; McCrae & Costa, 2004) was used to assess the "Big Five" personality dimensions of neuroticism, extroversion, openness to experience, agreeableness, and conscientiousness. The internal consistency of the 60-item self-report measure in the current study for the five subscales ranged from adequate to good (Neuroticism $\alpha = 0.87$, Conscientiousness $\alpha = 0.83$, Extroversion $\alpha = 0.80$, Agreeableness $\alpha = 0.71$), with the exception of the openness to experience ($\alpha = 0.62$).

4.2.7. Self-reported resilience

The Brief Resilience Scale (BRS; Smith et al., 2008) is a six-item measure used to assess self-reported trait resilience. Sample items include "I tend to bounce back quickly after hard times" and "I usually come through difficult times with little trouble." The BRS demonstrated good internal consistency (α ranged from 0.80 to 0.91), convergent validity, and discriminant validity (Smith et al., 2008). Strong positive associations with positive affect and strong negative associations with negative affect were also reported (Smith et al., 2008). Internal consistency in the current study was $\alpha = 0.89$.

4.2.8. Depression symptoms

The Beck Depression Inventory-II (BDI-II; Beck, Steer, & Brown, 1996) is a widely-used 21-item measure of current depressive symptoms with strong psychometric properties. Internal consistency for the scale in the current study was 0.95.

4.2.9. Psychological flexibility

Acceptance and Action Questionnaire-II (AAQ-II; Bond et al., 2011) was used to assess psychological flexibility. The AAQ–II is a seven-item self-report measure that primarily emphasizes the narrower construct of experiential acceptance (i.e., lack of willingness to remain in contact with unwanted thoughts, emotions, or physiological sensations) as the major component of psychological inflexibility. Items are rated on a 7-point Likert scale (1 = *never true*, 7 = *always true*). Sample items include "I am afraid of my feelings" and "Emotions cause problems in my life." AAQ-II items particularly emphasize how people relate and respond to unwanted internal experiences (Meyer et al., 2013). We previously showed that this construct, as assessed using the AAQ-II, may be differentiated from neuroticism in a trauma-exposed population (Meyer et al., 2013). The AAQ-II was reverse-scored such that higher scores reflected greater psychological flexibility. The AAQ–II exhibits good internal consistency, test–retest reliability, and convergent associations with measures of thought suppression, depression, anxiety, and global distress (Bond et al., 2011). Findings from earlier phases of this research program indicate strong associations between AAQ-II scores and PTSD symptom severity in war veterans (Elliott et al., 2016, 2015; Meyer et al., 2013). Internal consistency in the current study was $\alpha = 0.93$.

4.3. Data analysis plan

We first examined the pattern of correlations between the independent and dependent variables (Table 1). Principal components analysis (PCA) was then used to create a PTSD-related impairment factor score. This score was comprised of three scores drawn from the CAPS conducted at one-year follow-up: the total PTSD symptom severity score, the occupational impairment score, and the social impairment score. Resilience was operationalized as the residual of the PTSD-related functional impairment factor score after regressing out the effects of traumatic life events (i.e., the difference between the actual and the predicted PTSD severity factor score based on total amount of trauma exposure). Specifically, we entered the CWE, MST, and TLEQ-C scores, measured at baseline, in a multiple regression analysis with simultaneous entry. This regression yielded a residual score that represented participants' level of resilience. If a participant's PTSD-related impairment factor score was lower than predicted by the

Table 1
Descriptive statistics and correlations among study variables.

	Mean (SD)	2	3	4	5	6	7	8	9	10	11
1. Neuroticism	1.76 (0.8)	-.55**	-.17**	-.52**	-.57**	-.74**	-.76**	.37**	.57**	.73**	-.57**
2. Extraversion	2.06 (0.6)	–	.30**	.52**	.40**	.54**	.51**	-.33**	-.51**	-.48**	.43**
3. Openness	2.09 (0.5)		–	.20**	.16**	.16**	.14*	-.09	-.18**	-.19**	.20**
4. Agreeableness	2.30 (0.5)			–	.36**	.39**	.50**	-.34**	-.53**	-.44**	.34**
5. Conscientiousness	2.78 (0.6)				–	.54**	.41**	-.19**	-.31**	-.41**	.36**
6. Trait resilience (BRS)	20.13 (5.1)						.62**	-.32**	-.45**	-.52**	.50**
7. Psychological flexibility (AAQ-II)	20.89 (9.9)						–	-.43**	.64**	.77**	.62**
8. Lifetime PTSD symptom severity (CAPS-IV)	59.96 (33.2)							–	.64**	.42**	-.32**
9. Current PTSD symptom severity (CAPS-IV)	34.68 (28.0)								–	.72**	-.45**
10. Current depression symptoms (BDI-II)	16.45 (13.4)									–	-.52**
11. PTSD-related resilience	0 (0.9)										–

Note: BRS = Brief Resilience Scale; AAQ-II = Acceptance and Action Questionnaire-II; CAPS-IV = Clinician Administered PTSD Scale for DSM-IV; BDI-II = Beck Depression Inventory-II.
*$p < .05$, **$p < .01$.

regression model, this would result in a negative residual score; lower residuals reflected higher resilience. This score was then reverse-coded for ease of interpretation such that higher scores indicated greater resilience. A small proportion of data (1.8%) were missing across the three trauma exposure measures, which we handled using mean substitution. Next, the resilience score was used as the dependent variable in a hierarchical regression model. We entered the following variables measured at baseline: step 1 - CAPS lifetime and current PTSD symptom severity and current depression symptom severity; step 2 - personality dimensions (neuroticism, extraversion, openness to experience, agreeableness, conscientiousness); step 3 - self-reported resilience; step 4 - psychological flexibility as indexed by AAQ-II scores. There was some degree of multicollinearity that was unlikely to influence the results between the AAQ-II and both neuroticism (Variance Inflation Factor; VIF = 2.8) and the BRS (VIF = 2.4). Data were analyzed using SPSS 21.0.

6. Results

Pearson-product moment correlations among the predictors and resilience are presented in Table 1. Overall, all study variables were significantly correlated with one another at $p < .05$.

A single PTSD-related impairment factor accounting for 88% of the variance was extracted from the PCA. All three components loaded highly onto the factor (CAPS-IV Total Severity = 0.91, CAPS-IV Occupational Impairment = 0.82, CAPS-IV Social Impairment = 0.88).

The regression model predicting level of PTSD-related impairment at one-year follow-up based on cumulative trauma exposure measured at baseline accounted for 23% of the variance. All three types of trauma exposure were significant predictors. Level of combat exposure was the strongest predictor ($\beta = 0.40$, $p < .001$), followed by MST ($\beta = 0.24$, $p < .001$), and childhood trauma ($\beta = 0.13$, $p = .017$). Residual scores reflecting level of resilience were obtained from this analysis. These resilience scores followed a normal distribution ($\mu = 2.52E\text{-}16$, $SD = 0.88$) where scores represented differences from the expected value on the PTSD-related impairment factor.

The results of the hierarchical regression analysis predicting PTSD-related resilience at one-year follow-up are presented in Table 2. The model accounted for 46.8% of the variance in PTSD-related resilience ($p < .001$). As expected, in the first step, the combination of PTSD and depression symptoms accounted for a large proportion of the variance in PTSD-related resilience ($\Delta R^2 = 0.346$, $p < .001$, Cohen's $f^2 = 0.53$, large effect). Baseline PTSD and depression symptom severity were significant predictors, whereas lifetime PTSD symptoms severity was not. In step 2, as a whole, personality accounted for additional unique variance in PTSD-related resilience ($\Delta R^2 = 0.033$, $p = .045$, Cohen's $f^2 = 0.06$), though no individual personality factor was a significant predictor. Baseline PTSD and depression symptom severity remained significant predictors. In step 3, self-reported trait resilience did not account for unique variance in PTSD-related resilience. Baseline PTSD and depression symptoms remained significant predictors. In the final step, psychological flexibility, as measured by the AAQ-II, predicted unique variance in PTSD-related resilience ($\Delta R^2 = 0.021$, $\beta = 0.256$, $p = .007$, Cohen's $f^2 = 0.04$, small effect) such that those who were more psychologically flexible were more resilient with respect to lower-

Table 2
Results of hierarchical regression predicting PTSD-related resilience at one year follow-up.

	PTSD-related resilience	
Predictor	ΔR^2	β
Step 1: PTSD and depression symptoms	.408***	
CAPS-IV LT symptom severity		-.013
CAPS-IV BL symptom severity		-.345***
BDI-II BL symptom severity		-.336***
Step 2: Personality	.033*	
CAPS-IV LT symptom severity		-.007
CAPS-IV BL symptom severity		-.363***
BDI-II BL symptom severity		-.222*
Neuroticism		-.091
Extraversion		.082
Openness		.055
Agreeableness		-.133
Conscientiousness		.112
Step 3: Trait resilience	.005	
CAPS-IV LT symptom severity		-.002
CAPS-IV BL symptom severity		-.357***
BDI-II BL symptom severity		-.229*
Neuroticism		-.029
Extraversion		.061
Openness		.057
Agreeableness		-.120
Conscientiousness		.090
Trait resilience (BRS)		.111
Step 4: Psychological flexibility	.021**	
CAPS-IV LT symptom severity		.013
CAPS-IV BL symptom severity		-.340**
BDI-II BL symptom severity		-.125
Neuroticism		.049
Extraversion		.045
Openness		.062
Agreeableness		-.130
Conscientiousness		.085
Trait resilience (BRS)		.102
Psychological flexibility (AAQ-II)		.256**
Total R^2	.468***	

Note: Regression coefficients are standardized. CAPS-IV = Clinician Administered PTSD Scale for DSM-IV; BRS = Brief Resilience Scale; AAQ-II = Acceptance and Action Questionnaire-II.
*$p < .05$; **$p < .01$; ***$p < .001$.

than-expected PTSD symptoms and functional impairment at follow-up over and above baseline PTSD and depression symptom severity, personality, and self-reported trait resilience. When all predictors were included in the final step, psychological flexibility and baseline PTSD symptom severity were the only significant predictors, whereas depression became non-significant.

7. Discussion

The present research used a novel approach to studying resilience among trauma-exposed war veterans by examining predictors of PTSD-related resilience quantified by calculating the difference between their expected and actual level of PTSD-related impairment based on cumulative level of trauma exposure. We compared the incremental utility of three different types of predictors: personality traits, self-reported trait resilience, and psychological flexibility. We accounted for lifetime and baseline PTSD symptom severity as well as baseline depression symptom severity in the model, as we expected that these symptoms would be a strong predictor of PTSD-related resilience. Although personality accounted for unique variance in PTSD-related resilience after accounting for PTSD and depression symptoms, no individual personality factor was a significant predictor. This finding was contrary to our expectation based on prior research (Campbell-Sills et al., 2006; Carter et al., 2016; Isaacs et al., 2017; Rudow et al., 2014; Shi et al., 2015) and may have been due to the inclusion of both PTSD and depression symptom severity as covariates. Self-reported trait resilience did not predict any unique variance in PTSD-related resilience after accounting for personality factors, suggesting that self-appraisal of trait resilience does not provide any information that is distinct from personality. Psychological flexibility predicted unique variance in PTSD-related resilience at follow-up even after accounting for PTSD and depression symptom severity, personality factors, and self-reported trait resilience. Moreover, when all predictors were included in the final step of the regression analysis, psychological flexibility was the only predictor that accounted for unique variance in resilience aside from baseline PTSD symptom severity, though the magnitude of the effect in this rigorous test was small.

The current findings suggest that psychological flexibility, as measured by the AAQ-II may contribute to resilience among trauma-exposed war veterans. These findings are clinically important because prior research demonstrates that psychological flexibility is a malleable construct that can be modified using a range of psychosocial interventions (Armstrong, Galligan, & Critchley, 2011; Hayes et al., 2006; 2012; Walser et al., 2015). ACT, in particular, is designed to bolster psychological flexibility in order to improve functioning in people experiencing a range of mental health challenges including posttraumatic stress (Hayes et al., 2012; Walser et al., 2015; Walser & Westrup, 2007). This fits with conceptualizations emphasizing that resilience is not merely a low level of psychopathology, but also reflects intact functioning in important life domains (Bonanno, 2012). The current findings are consistent with those of a study that assessed participants before and after exposure to a mass shooting indicates that pre-trauma level of psychological flexibility is a key factor influencing post-trauma adaptation (Kumpula, Orcutt, Bardeen, & Varkovitzky, 2011; Orcutt, Bonanno, Hanna, & Miron, 2014). Taken together, these findings suggest that enhancing psychological flexibility may be effective in bolstering resilience in people exposed to trauma.

These findings are also consistent with emerging theory regarding the role of flexibility as a crucial aspect of resilience (Bonanno & Burton, 2013). Research examining flexibility as a predictor of resilience following stress exposure is nascent. Studies among trauma-exposed populations are even more limited. Thus, the current study contributes significantly to this literature. As noted by Bonanno and Burton (2013), further conceptual refinement of the flexibility construct is warranted. We echo this conclusion. Flexibility appears to represent an amalgam of context-specific abilities and trait-like qualities, of which context sensitivity is a core aspect (Bonanno & Burton, 2013). The AAQ-II was used in this study to measure psychological flexibility in accordance with the conceptualization of this construct from an ACT perspective. Although this conceptualization alludes to context sensitivity (i.e., “depending on what the situation affords”; Hayes et al., 2006), the AAQ-II items do not directly tap context sensitivity. Rather, the AAQ-II primarily taps experiential avoidance as one element of the broader construct. Consistent with our prior work (Meyer et al., 2013; 2018), the current findings indicate that although psychological flexibility as indexed by the AAQ-II has clear overlap with personality traits, particularly lower levels of neuroticism, it appears to be more strongly related to PTSD-related outcomes than neuroticism. Neuroticism reflects a typical set of emotional experiences, predominantly involving negative affect; however, adaptive emotional responses are inherently context-dependent (Bonanno & Burton, 2013; Goldsmith & Davidson, 2004), as evidenced by research showing that context insensitivity is associated with mental health symptoms including depression and anxiety (Bylsma, Morris, & Rottenberg, 2008). Despite evidence that AAQ-II scores may be differentiated from neuroticism, this measure has been criticized for being perhaps too closely related to measures of distress (Wolgast, 2014). Thus, it is possible that the strong relationships between AAQ-II and PTSD-related outcomes observed in this and prior studies could be due to it indexing distress, albeit different aspects of distress than are captured in measures of psychopathology.

Additional research is warranted that examines facets of flexibility based on alternate conceptualizations (i.e., context sensitivity, engaging a varied repertoire of coping skills, and feedback responsivity; Bonanno & Burton, 2013) in trauma-exposed populations. Assessment approaches that offer multiple assessments and minimize retrospective recall bias would also be advantageous. For example, Machell, Goodman, and Kashdan (2015) used the both a self-report questionnaire and a daily diary method to assess psychological flexibility. They found significant associations with the outcomes using both methods, though the daily diary method was superior. Methods such as random momentary assessment may also be useful. Such approaches may be particularly beneficial in terms of tapping present moment awareness of unwanted internal experiences, which is not sufficiently addressed by the AAQ-II items. A more recently developed measure, the Brief Experiential Avoidance Questionnaire (Gámez et al., 2014) may offer certain advantages compared to the AAQ-II in terms of measuring aspects of psychological flexibility.

There are several advantages to the approach to operationalizing and quantifying PTSD-related resilience used in the current study. It allows for quantification of a continuum from resilience to vulnerability and acknowledges that resilience is not merely the absence of mental health symptoms. Our multidimensional operationalization of the outcome, based on a gold-standard clinical interview and comprising PTSD symptom severity and social and occupational impairment, was based on literature emphasizing the importance of multidimensionality in resilience (Lam et al., 2012; Zautra et al., 2010). Considering that functioning is a complex construct and can be conceptualized in a number of ways, our operationalization lends a more comprehensive assessment of functioning in the context of exposure to trauma and thus may be a more accurate representation of resilience. We followed methodological recommendations (Luthar, 1993; Luthar et al., 2000) by studying index stressors that are strongly associated with risk for adverse outcomes by taking into account exposure to childhood trauma, combat exposure, and military sexual trauma. Additional strengths of the current study included a relatively large sample size and the longitudinal study design. In terms of limitations, the sample was comprised of veterans enrolled for VA healthcare in the Southwestern U.S. Thus, the generalizability of the findings to other samples is unknown.

In conclusion, the current findings underscore the importance of psychological flexibility for understanding PTSD-related resilience following trauma exposure. These findings also highlight the potential

utility of interventions aimed at enhancing psychological flexibility for promoting resilience among trauma survivors. Ongoing inquiry into the effects of psychological flexibility on post-trauma adjustment will facilitate refinement of interventions aimed at bolstering flexibility.

Conflicts of interest

The authors declare no conflict of interest.

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