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Differences in protective factors among U.S. Veterans with posttraumatic stress disorder, alcohol use disorder, and their comorbidity: Results from the National Health and Resilience in Veterans Study

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ABSTRACT

Background: Comorbid posttraumatic stress disorder (PTSD) and alcohol use disorder (AUD) are associated with greater clinical and functional impairments than either disorder alone, including higher rates of suicidality and reduced functioning and quality of life. Although PTSD/AUD is associated with more severe risk factors relative to either disorder alone, it is unclear whether PTSD/AUD and its related impairments are also associated with lower levels of protective factors.

Methods: We examined two composite factors of protective qualities derived from exploratory factor analyses—social connectedness (i.e., structural social support, perceived social support, secure attachment style) and protective psychosocial characteristics (i.e., resilience, purpose in life, dispositional optimism and gratitude, and community integration), in a nationally representative sample of U.S. Veterans (using data from the National Health and Resilience in Veterans Study) with PTSD alone, AUD alone, and comorbid PTSD/AUD.

Results: Veterans with PTSD and PTSD/AUD scored significantly lower than those with AUD alone but did not differ from each other on measures of social connectedness and protective psychosocial characteristics (*ps* < .001). Both factors partially mediated the relationship between diagnostic status (PTSD or PTSD/AUD vs. AUD alone) and suicidal ideation (ORs = 0.58-0.62), as well as between diagnostic status and functioning/quality of life (psychosocial protective characteristics, β = 0.39; social connectedness, β = 0.16). Only protective psychosocial characteristics (OR = 0.54) emerged as a partial mediator between diagnostic status and lifetime suicide attempts.

Conclusions: U.S. Veterans with PTSD and PTSD/AUD score lower on measures of protective factors than Veterans with AUD. These factors may be important targets for prevention and treatment efforts.

1. Introduction

Posttraumatic stress disorder (PTSD) and alcohol use disorder (AUD) frequently co-occur in the Veteran population. In a nationally representative sample of Veterans, one of every five Veterans with AUD also screened positive for PTSD (Norman et al., 2018). This rate is even higher among Veterans seeking VA care, with up to two-thirds of Veterans with AUD also having a diagnosis of PTSD (Seal et al., 2011). Comorbid PTSD/AUD is associated with more severe clinical and functional problems relative to PTSD or AUD alone, including increased risk of suicide and reduced functioning and quality of life (Blanco et al., 2013; Norman et al., 2018; Rojas et al., 2014). In a recently published study of a nationally representative sample of U.S. Veterans, those with comorbid PTSD/AUD were more likely than those with AUD alone to report suicidal ideation and suicide attempts, and scored lower on measures of physical, mental, and cognitive functioning, and quality of

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life (Norman et al., 2018). Further, compared to Veterans with PTSD alone, Veterans with comorbid PTSD/AUD were three times more likely to have attempted suicide in their lifetimes. Given that Veterans account for over 14 percent of completed suicides in the U.S. in 2015 (Department of Veterans Affairs, 2018), understanding the relationship between PTSD/AUD and suicidality may be critical to targeting this public health concern.

Although the association between PTSD/AUD and risk of suicidality and reduced quality of life is well-documented (Blanco et al., 2013; Norman et al., 2018), less is known regarding factors which may also contribute to this relationship. While comorbid PTSD/AUD is associated with more severe risk factors in comparison to either disorder alone (e.g., emotion dysregulation; Goldstein et al., 2017; Tripp et al., 2015), it may be that lower levels of protective factors also characterize those with PTSD/AUD and contribute to the greater clinical and functional impairments associated with this comorbidity. Identifying whether lower levels of protective factors contribute to suicidality and reduced quality of life amongst Veterans with PTSD/AUD may help inform preventative and intervention efforts for this at-risk and underserved population.

Studies using data from the National Health and Resilience in Veterans Study (NHRVS) have examined a comprehensive range of protective factors in Veterans with PTSD (Pietrzak and Cook, 2013; Wisco et al., 2014), but not in Veterans with comorbid PTSD/AUD. Findings from these studies suggest that Veterans with PTSD score lower than those without PTSD on two composite factors that assess protective factors: social connectedness (e.g., structural social support, perceived social support, secure attachment style) and protective psychosocial characteristics (e.g., individual-level characteristics such as perceived resilience, purpose in life and dispositional gratitude; Pietrzak and Cook, 2013; Wisco et al., 2014). Higher scores on these measures were also associated with lower odds of PTSD diagnosis and distinguished between resilient and distressed Veterans even after adjustment for a broad range of sociodemographic, military, and other psychosocial characteristics (Pietrzak and Cook, 2013; Wisco et al., 2014). Given the increased suicide risk and reduced functioning and quality of life associated with PTSD/AUD (Norman et al., 2018; Rojas et al., 2014), it may be that this comorbidity is associated with lower levels of protective factors than PTSD or AUD alone. Understanding whether protective factors differ between those with PTSD/AUD and either disorder alone may advance understanding regarding the greater clinical and functional impairments associated with PTSD/AUD.

Although social connectedness has yet to be examined in Veterans with comorbid PTSD/AUD, converging data suggest that the individual components of social connectedness (i.e., structural social support, perceived social support, secure attachment style) are negatively associated with comorbid PTSD/AUD. With regard to structural and perceived social support, studies utilizing civilian samples have found PTSD/AUD is associated with differences on both forms of social support compared to either disorder alone (Blanco et al., 2013; Drapkin et al., 2011; Dutton et al., 2014; Riggs et al., 2003). For example, civilians with PTSD/AUD are less likely to be living with a romantic partner (Drapkin et al., 2011; Riggs et al., 2003) or be married (Blanco et al., 2013), and are more likely to report apprehension regarding their social network and more problems with family support (Dutton et al., 2014) than those with either disorder alone. Further, attachment style also appears to differ across Veterans with comorbid PTSD/AUD and those with either disorder alone. In one study of treatment-seeking Veterans, Veterans with comorbid PTSD and hazardous substance use (HSU) scored higher on a measure of avoidant attachment than those with HSU alone, although they did not differ from Veterans with PTSD alone (Owens et al., 2014). Collectively, these findings indicate that individuals with PTSD/AUD may have lower levels of social connectedness relative to those with PTSD or AUD alone.

Accumulating evidence suggests that protective psychosocial characteristics, such as perceived resilience, purpose in life, and dispositional gratitude, may be negatively associated with comorbid PTSD/AUD. While studies have not yet compared protective psychosocial characteristics in individuals with PTSD/AUD to those with single disorders, extant research suggests that certain characteristics are negatively associated with PTSD and AUD alone. For example, perceived resilience has been found to be negatively associated with both PTSD and AUD alone. With regard to PTSD, a substantial body of evidence suggests that higher levels of perceived resilience, in conjunction with other protective factors, is associated with lower PTSD symptom severity and reduced odds of having the disorder (Pietrzak et al., 2010, 2009; Wisco et al., 2014). Similarly, both retrospective (Bartone et al., 2017; Green et al., 2014; Green et al., 2010) and longitudinal studies (Green et al., 2014) indicate that perceived resilience is negatively associated with AUD in veteran samples. Taken together, these findings suggest that both social connectedness and protective psychosocial characteristics warrant further investigation in a comorbid PTSD/AUD sample.

To address the aforementioned gaps in the literature, the primary aim of the current study was to compare aspects of social connectedness and protective psychosocial characteristics in a nationally representative sample of U.S. military Veterans with comorbid PTSD/AUD relative to either disorder alone. The secondary aim was to evaluate whether social connectedness and protective psychosocial characteristics may mediate the relation between diagnostic status (PTSD and PTSD/AUD vs. AUD alone) and suicidality (i.e., current suicidal ideation and lifetime suicide attempts) and overall functioning and quality of life. We hypothesized that 1) Veterans with comorbid PTSD/AUD would score lower on measures of social connectedness and protective psychosocial characteristics than those with PTSD or AUD alone; and 2) protective factors would partially mediate the association between diagnostic status and higher rates of current suicidal ideation and lifetime suicide attempts, and lower functioning and quality of life.

2. Material and method

2.1. Participants and procedure

Data were analyzed from the National Health and Resilience in Veterans Study (NHRVS), which surveyed a nationally representative sample of U.S. veterans. Participants were recruited through GfK Knowledge Networks, Inc.'s KnowledgePanel, which is a research panel that covers approximately 98% of U.S. adults. GfK Knowledge Networks randomly samples households using the U.S. Postal Service's Deliver Sequence File (DSF), which includes individuals with and without listed telephone numbers, computers, and internet access. GfK provides computers and internet access to participants when necessary. A detailed description of GfK's methodology may be found elsewhere (GfK, 2013). Poststratification weights were computed based on the demographic distribution of U.S. Veterans to ensure generalizability of the results to the U.S. Veteran population. At the time of the study, GfK's research panel included 4750 Veterans who were identified using demographic questionnaires. Of the 3408 Veterans who responded to the invitation to participate in this study, 3188 met study eligibility (current or former active military status), and 3157 completed the online survey. Study participants were compensated $30 for their participation.

2.2. Assessments

2.2.1. Posttraumatic stress disorder

The PTSD Checklist-Specific (PCL-S; Weathers et al., 1993) was used to assess DSM-IV PTSD symptoms within the past month in relation to a veteran's "worst" traumatic event as assessed using the Trauma History Screen (Carlson et al., 2011). The PCL-S includes 17-items and scores range from 17-85. Probable PTSD was operationalized as a score of ≥ 30, which has been recommended in studies on the diagnostic utility of

the measure in non-treatment seeking, population-based samples (McDonald and Calhoun, 2010; Terhakopian et al., 2008). Cronbach's α in this sample was 0.95.

2.2.2. Alcohol use disorder

The Alcohol Use Disorder Identification Test-Consumption (AUDIT-C; Bush et al., 1998) is a three-item measure that screens for AUD within the past year. Probable AUD was classified as an AUDIT-C score of ≥ 5 (range = 0–12). This threshold has been utilized in a number of studies of Veteran (Chen et al., 2018; Hawkins et al., 2010) and civilian samples (Dawson et al., 2005, 2012) and found to be optimal for detecting AUD in a representative sample of US adults (Dawson et al., 2005). Cronbach's α in the study sample was 0.77.

2.2.3. Suicidality

Veterans were considered to screen positive for suicidal ideation if they responded "several days" or more in regard to frequency on item 9 ("How often have you had thoughts that you would be better off dead, or of hurting yourself") of the Patient Health Questionnaire-9 (PHQ-9; Kroenke et al., 2001). Veterans who responded 'yes' to the question, "Have you ever tried to kill yourself?" were considered to have a lifetime suicide attempt.

2.2.4. Functioning and quality of life

Physical and mental functioning were assessed using the Short Form 8 Health Survey, with lower scores indicating worse functioning (SF-8; Ware et al., 2001). Cognitive functioning was assessed using the Medical Outcomes Study Cognitive Functioning Scale (Stewart et al., 1992). Quality of life was assessed using the Quality of Life Enjoyment and Satisfaction Questionnaire-Short Form (Q-LES-Q-SF; Endicott et al., 1993). Given the high correlations amongst these measures (Pietrzak et al., 2014), we conducted an exploratory factor analysis with promax rotation in the study sample, which yielded a single factor reflecting overall functioning/quality of life (eigenvalue = 2.67, 66.7% total variance explained), with factor loadings ranging from 0.643 for physical functioning to 0.923 for quality of life.

2.2.5. Protective factors

The NHRVS assessed a range of protective factors utilizing a number of different scales and items (see Pietrzak and Cook, 2013 for a detailed description). These constructs were reduced to two overarching factors using exploratory factor analyses with oblique rotation, social connectedness and psychosocial protective characteristics.

The social connectedness factor includes individual items and scales that assessed three different aspects of social support: 1) structural support (i.e., "About how many close friends and relatives do you have [people you feel at ease with and can talk to about what is on your mind]"); 2) perceived social support (5 items from the Medical Outcomes Study Social Support Scale; Sherbourne and Stewart, 1991), and 3) secure attachment style (i.e., "Feeling that it is easy to get close to others and feeling comfortable with them;" Hazan and Shaver, 1990). In the current sample, this factor had an eigenvalue of 1.83, 61.1% cumulative variance explained, and factor loadings ranging from 0.748-0.801.

The psychosocial protective characteristics factor assessed individual-level qualities that are negatively associated with psychopathology, including 1) resilience (Connor-Davidson Resilience-Scale-10; Connor and Davidson, 2003); 2) purpose in life (Purpose in Life Test-Short Form; Schulenberg et al., 2010); 3) dispositional optimism (i.e., "In uncertain times, I usually expect the best;" Scheier et al., 1994); 4) dispositional gratitude (i.e., "I have so much in life to be thankful for;" McCullough et al., 2002); 5) curiosity ("I frequently find myself looking for new opportunities to grow as a person [e.g., information, people, resources]; Kashdan et al., 2009); and 6) community integration (i.e., "I feel well integrated in my community"). In the current sample, this factor had an eigenvalue of 3.72, 62.0% cumulative variance explained, and factor loadings ranging from 0.692-0.843.

2.3. Data analysis

Data analyses proceeded in three steps. First, descriptive analyses were conducted to examine the prevalence of comorbid PTSD/AUD, PTSD alone, and AUD alone in the full sample. Second, multivariate analyses of covariance (MANCOVA) were conducted to compare the three groups on the individual measures that loaded onto the social connectedness factor (i.e., structural social support, perceived social support, secure attachment style) and the protective psychosocial characteristics factor (i.e., resilience, purpose in life, dispositional optimism, dispositional gratitude, curiosity, and community integration), while adjusting for sociodemographic, military, and clinical characteristics that differed across groups at the .05 level in bivariate analyses. Post-hoc Least Significant Difference tests were conducted to identify group differences in individual measures. Third, we conducted mediation analyses using Mplus version 7 (Muthén and Muthén, 1998-2012) to evaluate whether scores on measures of protective factors mediated the association between diagnostic status (PTSD or PTSD/AUD vs. AUD alone) and measures of suicidality and overall functioning/quality of life. When one or both emerged as a significant mediator/partial mediator, we conducted post-hoc path analyses to identify component measures(s) that drove these associations. Alpha was set to 0.01 in these analyses to reduce the probability of Type I error.

3. Results

In the full sample, the majority of participants identified as Caucasian (weighted 70.2%) and male (weighted 88.4%). Weighted prevalence analyses revealed that 13.7% screened positive for current PTSD alone, 10.8% for AUD alone, and 2.8% for comorbid PTSD/AUD. Table 1 provides a detailed summary of the sociodemographic, clinical, and military characteristics of the sample by PTSD and AUD status. The groups differed on a number of variables, including age, gender, marital and employment status, education level, annual household income, and history of combat exposure.

After adjustment for sociodemographic and military variables that differed by AUD and PTSD status, results from the MANCOVAs revealed significant group differences on both the social connectedness ($F = 9.26$, $p < .001$) and protective psychosocial characteristics factors ($F = 6.55$, $p < .001$). Pairwise contrasts revealed that the comorbid PTSD/AUD ($p < .001$, $d = .33$) and PTSD groups ($p < .001$, $d = .27$) scored significantly lower than the AUD group, but did not differ from each other, on the social connectedness factor. The PTSD/AUD ($p < .001$, $d = .34$) and PTSD groups ($p < .001$, $d = .23$) also obtained significantly lower scores than the AUD group, but did not differ from each other, on the protective psychosocial characteristics factor. Post-hoc analyses revealed that the groups varied on perceived social support and secure attachment style constructs from the social connectedness factor ($ps < .001$) and on all of the six constructs on the psychosocial protective characteristics factor ($ps < .04$). Pairwise contrasts revealed that both the comorbid PTSD/AUD and PTSD groups scored significantly lower than the AUD group (but did not differ from each other) on each of the constructs measured across the two factors, except for curiosity and structural social support (Table 2).

To examine whether the PTSD/AUD group main effect was robust to depression, we incorporated current depression status, assessed using the Patient Health Questionnaire-2 (Kroenke et al., 2003), into the MANCOVA. Results of this analysis revealed that the PTSD/AUD group main effect remained significant in predicting scores on the social connectedness ($F = 16.28$, $p < .001$) and protective psychosocial characteristics factors ($F = 9.94$, $p < .001$). Pairwise contrasts revealed that both comorbid PTSD/AUD ($p < .001$, $d = .34$) and PTSD groups ($p < .001$, $d = .28$) continued to score significantly lower than

Table 1
Demographic and Military Characteristics by PTSD and AUD screening status.

Veteran characteristics	AUD Only (1) $N = 320$ weighted 39.7% Weighted mean (*SD*) or *N* (weighted %)	PTSD Only (2) $N = 383$ weighted 50.2% Weighted mean (*SD*) or *N* (weighted %)	PTSD/AUD (3) $N = 77$ weighted 10.1% Weighted mean (*SD*) or *N* (weighted %)	Test of difference F or X^2, p	Pairwise contrasts
Age	57.7 (15.3)	53.6 (15.9)	46.6 (14.7)	18.21, < 0.001	3 < 2 < 1
Male sex	305 (95.0%)	306 (83.1%)	68 (88.5%)	26.44, < 0.001	2 < 1,3
Caucasian race	273 (73.4%)	285 (68.2%)	59 (67.8%)	2.72, 0.26	–NS
Some college or higher education	264 (62.2%)	330 (71.0%)	66 (79.3%)	12.24, 0.002	1 < 2,3
Married or living with partner	244 (69.2%)	259 (61.9%)	57 (79.3%)	11.55, 0.003	2 < 3
Currently employed	144 (47.5%)	152 (37.6%)	36 (54.0%)	12.27, 0.002	2 < 1,3
Annual household income > 60k	192 (50.1%)	138 (31.8%)	77 (33.3%)	28.33, < 0.001	2,3 < 1
Enlisted into military	277 (88.9%)	349 (92.8%)	70 (96.6%)	6.88, 0.032	–NS
Combat veteran	120 (33.4%)	165 (46.6%)	39 (46.0%)	14.55, 0.001	1 < 2

Note. Weighted prevalence estimates are within the NHRVS subsample of veterans with PTSD only, AUD only, and PTSD/AUD. *SD* = standard deviation; NS = not significant.

the AUD group, but did not differ from each other, on the social connectedness factor. Similarly, the PTSD/AUD ($p < .002$, $d = .26$) and PTSD groups ($p < .001$, $d = .22$) obtained significantly lower scores than the AUD group, but did not differ from each other, on the protective psychosocial characteristics factor. Current depression was also associated with lower scores on both social connectedness ($d = .41$, $p < .001$) and protective psychosocial characteristics ($d = .67$, $p < .001$).

Mediation analyses revealed that social connectedness (Wald = 18.53, $p < .001$; OR = 0.58, 95%CI = 0.45-0.74) and protective psychosocial characteristics (Wald = 21.31, $p < .001$; OR = 0.62, 95%CI = 0.51-0.76) partially mediated the relation between PTSD and PTSD/AUD vs. AUD alone and current SI. Post-hoc analyses revealed that these associations were driven by greater perceived social support (Wald = 21.14, p < .001; OR = 0.92, 95%CI = 0.89-0.95) and purpose in life (Wald = 6.02, $p = 0.010$; OR = 0.95, 95%CI = 0.91-0.99).

Protective psychosocial characteristics (Wald = 31.93, p < .001; OR = 0.54, 95%, CI = 0.44-0.67), but not social connectedness (Wald = 0.58, $p = .44$; OR = 0.91, 95%CI = 0.71-1.16), partially mediated the association between PTSD and PTSD/AUD vs. AUD alone and lifetime suicide attempts. Post-hoc analyses revealed that this association was driven by dispositional gratitude (Wald = 13.61, $p < .001$; OR = 0.77, 95%CI = 0.67-0.88) and psychological resilience (Wald = 11.48, $p = .001$; OR = 0.95, 95%CI = 0.93-0.98).

Both social connectedness (β = 0.16, t = 5.38, $p < .001$) and protective psychosocial characteristics (β = 0.39, t = 13.64, $p < .001$) partially mediated the relation between PTSD and PTSD/AUD vs. AUD alone and functioning/quality of life composite scores. Post-hoc analyses revealed that these associations were driven by psychological resilience (β = 0.33, t = 10.31, $p < .001$), perceived social support (β = 0.17, t = 6.18, $p < .001$), purpose in life (β = 0.12, t = 3.44, $p < .001$), and community integration (β = 0.09, t = 3.35, $p = .001$).

4. Discussion

The purpose of this study was to evaluate the relation between PTSD, AUD, and comorbid PTSD/AUD and scores on measures of social

Table 2
Protective factors by PTSD and AUD screening status.

	AUD Only (1) $N = 320$ Weighted 39.7%	PTSD Only (2) $N = 383$ weighted 50.2%	PTSD/AUD (3) $N = 77$ weighted 10.1%	Post-hoc Analyses			
	Mean (*SE*)	Mean (*SE*)	Mean (*SE*)	*F*	*p*	Pairwise contrasts	
Protective Psychosocial Factor							
Community Integration	4.10(.18)	3.39(.16)	3.67(.25)	10.45	< .001	1 > 2	
Curiosity	5.25(.15)	5.11(.14)	4.73(.22)	3.23	.04	1,2 > 3	
Dispositional Gratitude	6.19(.14)	5.86(.12)	5.55(.19)	7.47	.001	1 > 2,3	
Dispositional Optimism	4.63(.16)	4.09(.15)	4.11(.23)	7.83	< .001	1 > 2,3	
Purpose in Life	21.38(.52)	19.36(.47)	18.81(.72)	12.06	< .001	1 > 2,3	
Resilience	29.71(.80)	25.50(.73)	24.33(1.12)	21.86	< .001	1 > 2,3	
Social Connectedness Factor							
Structural Social Support	7.72(.88)	6.49(.79)	7.43(.12)	1.48	.23	NS	
Perceived Social Support	18.36(.55)	15.99(.49)	14.72(.77)	17.31	< .001	1 > 2,3	
Secure Attachment Style	n (%)	n (%)	n (%)	X^2	*p*		Multivariable analysis
	230 (69.0%)	139 (32.3%)	18 (27.9%)	115.62	< 0.001		PTSD alone vs. AUD alone: OR = 0.26, 95%CI = 0.18-0.37, $p < 0.001$ PTSD/AUD vs. AUD alone: OR = 0.15, $p < 0.001$

Note. Weighted prevalence estimates are within the NHRVS subsample of veterans with PTSD only, AUD only, and PTSD/AUD. *SE* = standard error; OR = odds ratio; 95%CI = 95% confidence interval. Odds ratios and means were adjusted for sociodemographic, military, and clinical variables that differed bivariately between groups.

connectedness and protective psychosocial characteristics in a nationally representative sample of Veterans. We also evaluated whether lower levels of these protective factors contributed to the relationship between PTSD/AUD, and suicide risk and reduced functioning/quality of life.

In partial support of the first hypothesis, Veterans with PTSD/AUD scored significantly lower on both social connectedness and protective psychosocial characteristics relative to those with AUD alone. We observed small effect size differences when comparing the comorbid PTSD/AUD and PTSD groups to the AUD group. These results are consistent with previous studies that have found that lower scores on these factors were associated with higher odds of PTSD (Wisco et al., 2014). However, contrary to our hypothesis, Veterans with PTSD/AUD did not score lower on these measures than those with PTSD alone. Although previous studies have found that PTSD/AUD is associated with lower scores on measures of certain protective factors (e.g., perceived social support) in comparison to those with PTSD or AUD alone (Drapkin et al., 2011; Dutton et al., 2014), those studies primarily utilized treatment-seeking or civilian samples to examine a small number of protective factors. Our findings converge with studies using Veteran samples, however, which have observed that Veterans with PTSD and comorbid disorders (substance and non-substance use disorders) do not differ from those with PTSD alone on measures of social support and attachment style (Brancu et al., 2014; Owens et al., 2014). These mixed findings may be due to variability in how protective factors were measured across studies, as well as differences in the study samples (e.g., clinical versus non-treatment seeking samples, civilians versus Veterans). However, the fact that Veterans with PTSD and PTSD/AUD scored lower on protective factors, even when controlling for depression, provides further evidence that PTSD treatment for those with PTSD/AUD may be important to overall recovery (Roberts et al., 2015; Simpson et al., 2017).

Findings from the mediation analyses provided partial support for the second hypothesis. While both social connectedness and protective psychosocial characteristics partially mediated the association between diagnostic group (PTSD and PTSD/AUD vs. AUD alone) and current suicidal ideation and functioning/quality of life, only the protective psychosocial characteristics emerged as a partial mediator of lifetime suicide attempts. The finding that both factors may contribute to suicidal ideation and reduced functioning/quality of life aligns with a growing body of research showing that certain protective factors (e.g., social support, purpose in life, resilience) are associated with reduced suicidal ideation and enhanced well-being (Bronk et al., 2009; DeBeer et al., 2014; Fanning and Pietrzak, 2013; Kleiman and Beaver, 2013; Kleiman et al., 2014; Pietrzak et al., 2010, 2011; Windsor et al., 2015). The fact that social connectedness did not mediate the relationship between diagnostic status and lifetime suicide attempts was unexpected, given research that has found an inverse relationship between social support and lifetime suicide attempts in civilian and Veteran samples (Kleiman and Liu, 2013; Lemaire and Graham, 2011). It may be that the suicide attempts occurred long before participants completed the study measures, such that current psychopathology and social connectedness were no longer relevant. Further, prior studies have shown that PTSD reduces the protective influence of social support on suicidal behavior amongst treatment-seeking Veterans (Jakupcak et al., 2010; Pietrzak et al., 2011). Thus, it may be that social connectedness does not confer protection against suicide attempts in Veterans with PTSD and AUD.

The fact that both social connectedness and protective psychosocial characteristics partially mediated the relationship between diagnostic group and current suicidal ideation underscores the importance of evaluating protective factors in conjunction with risk factors in Veterans at risk for suicide. Although the VA/DoD Clinical Practice Guideline for Assessment and Management of Patients at Risk for Suicide (2013) recommends evaluating protective factors in suicide risk assessments, the guideline acknowledges that the literature on protective factors and suicidality is in its infancy. Nonetheless, our results provide preliminary evidence for the utility of assessing for protective factors in Veterans with PTSD and AUD.

Our findings also suggest that enhancing protective factors within treatment may contribute to better clinical outcomes in a difficult to treat population. For instance, utilizing strength-based interventions that aim to foster pre-existing protective factors may prove to be an effective approach when treating Veterans with PTSD and AUD. Although gold-standard treatments for PTSD (i.e., prolonged exposure and cognitive processing therapy) can significantly improve functional difficulties associated with PTSD (Foa et al., 2005; Wachen et al., 2014), previous findings suggest that improvements in quality of life are most likely to occur when patients no longer meet diagnostic criteria for PTSD after completion of treatment (Schnurr and Lunney, 2016). Given that an appreciable proportion of individuals retain a PTSD diagnosis upon treatment completion (Steenkamp et al., 2015), future research should examine whether directly addressing protective factors in conjunction with evidence-based treatments for PTSD may help enhance clinical and functional outcomes in Veterans with PTSD and PTSD/AUD. To this end, researchers are evaluating the efficacy of interventions to enhance protective factors in Veterans with PTSD and in-service members (e.g., resilience; Kent et al., 2011; Meredith et al., 2011). Given the paucity of research on clinical interventions aimed at increasing protective factors in Veterans with comorbid PTSD/AUD, it will be important to continue to extend this research in Veterans with this comorbidity.

Given increased clinical and functional difficulties associated with PTSD/AUD relative to PTSD alone (Blanco et al., 2013; Bowe and Rosenheck, 2015; Riggs et al., 2003), future studies should also continue to examine the role of protective, as well as risk factors. Although we did not find differences between Veterans with PTSD/AUD and PTSD alone, it may be that protective and risk factors interact to contribute to the heightened impairment associated with the comorbidity. That is, individuals with the comorbidity may have a clinical profile that is characterized by lower levels of protective characteristics and heightened risk factors, the combination of which may result in worse outcomes than those with PTSD alone. For instance, it may be that differences in PTSD and AUD symptom profiles interact with protective factors to contribute to worse clinical and functional outcomes in Veterans with the comorbidity. Indeed, previous research has highlighted the synergistic nature of both risk and protective factors (Grosso et al., 2014; Isaacs et al., 2017; Kleiman et al., 2013; Pietrzak et al., 2010). The finding that current depression was also associated with lower scores on social connectedness and protective psychosocial factors supports the need to examine how depression and other psychiatric risk factors, directly and interactively, may relate to protective psychosocial characteristics. In particular, prospective studies that utilize gold-standard instruments (e.g., Clinician Administered PTSD Scale for DSM-5; Weathers et al., 1993) should examine how a comprehensive range of both risk (e.g., maladaptive coping strategies, additional psychiatric comorbidities) and protective factors, independently and interactively, relate to the development, maintenance, and comorbidity of PTSD and AUD in Veterans and other at-risk populations.

A number of limitations of the current study should be noted. First, although the study utilized a nationally representative sample, the majority of participants were older, Caucasian, and male; our findings may thus not be generalizable to more diverse samples of Veterans. Second, the NHRVS survey utilized self-report measures and, in some cases, single items to assess multidimensional constructs. While this method allowed for the assessment of a comprehensive range of protective factors, it is possible that certain facets were not captured given the complex nature of these constructs. Further, although self-report is currently the most widely used method to assess protective factors, it is important to note that there are no agreed upon gold-standard measures for many of the protective factors that we assessed (e.g., resilience) and that self-report measures may be influenced by response

biases. Moreover, while the AUDIT-C has been shown to detect alcohol use disorders as well as the lengthier AUDIT in Veteran samples (Bradley et al., 2007; Crawford et al., 2013), the brevity of the instrument may limit our ability to identify differences in diagnostic features across the groups. Third, while mediation analyses may be applied in cross-sectional designs based on sound theories or hypotheses in order to elucidate relationships between variables, results may not be used to infer causality (Hayes, 2018). Thus, the results of this study cannot provide information regarding temporal relationships. Nonetheless, the findings suggest that longitudinal studies are warranted in order to elucidate temporal associations among PTSD, AUD, and protective factors, such as social connectedness and protective psychosocial characteristics, in the development and clinical course of PTSD/AUD.

4.1. Conclusions

The present study is one of the first to examine protective factors in Veterans with PTSD/AUD compared to those with either disorder alone. Findings from this study revealed that Veterans with comorbid PTSD/AUD score significantly lower on measures of social connectedness and protective psychosocial characteristics than those with AUD alone, but do not differ from those with PTSD alone. These findings suggest that PTSD may be driving the low levels of protective factors observed in Veterans with PTSD/AUD. Results further indicate that these protective factors partially mediate the relationship between diagnostic status (PTSD and PTSD/AUD vs. AUD alone) and prevalent clinical and functional problems (i.e., suicidal ideation, lifetime suicide attempts, and reduced functioning/quality of life) associated with this comorbidity. Collectively, these results underscore the need to examine the relationship between protective factors and diagnostic status in Veterans with comorbid PTSD/AUD and PTSD alone using a longitudinal design. Future research is also needed to examine the effectiveness of preventive and intervention approaches targeting protective factors in this population.

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Contributors

Author ES drafted primary manuscript, participated in conceptualization of study, and contributed to interpretation of findings. SBN and MH conceived of study aims and hypotheses, interpreted study findings, and provided editing of manuscript. JLH and SMS provided editing of full manuscript. RHP and SMS acquired the data. RHP conceived of study aims and hypotheses, conducted the statistical analyses, interpreted the data, and edited the manuscript. All authors contributed and approved of the final manuscript.

Conflict of interest

The authors have no known conflicts of interest to disclose.

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