Anger, social support, and suicide risk in U.S. military veterans

Chelsey R. Wilks[a,*], Leslie A. Morland[a,b,c], Kirsten H. Dillon[d,e,f], Margaret-Anne Mackintosh[g], Shannon M. Blakey[h], H. Ryan Wagner[d,e,f], VA Mid-Atlantic MIRECC Workgroup, Eric B. Elbogen[d,e,f]

[a] Veterans Affairs Healthcare System, 3350 La Jolla Village Drive, San Diego, CA, 92161, USA
[b] University of California, San Diego, Department of Psychiatry, 9500 Gilman Dr, La Jolla, CA, 92093, USA
[c] National Center for PTSD, Pacific Islands Division, 3375 Koapaka Street, Honolulu, HI, 96819, USA
[d] Veterans Affairs Mid-Atlantic Mental Illness Research, Education and Clinical Center, 3022 Croasdaile Drive, Durham, NC, 27705, USA
[e] Durham Veterans Affairs Healthcare System, 508 Fulton Street, Durham, NC, 27705, USA
[f] Duke University School of Medicine, 2424 Erwin Rd, Durham, NC, 27705, USA
[g] National Center for PTSD, Dissemination and Training Division, Veterans Affairs Palo Alto Healthcare System, NCPTSD, 334795 Willow Road Menlo Park, CA, 94025, USA
[h] University of North Carolina at Chapel Hill, Dept. of Psychology and Neuroscience, Davie Hall (CB 3270), Chapel Hill, NC, 27599-3270, USA

ARTICLE INFO

ABSTRACT

There have been considerable efforts to understand, predict, and reduce suicide among U.S. military veterans. Studies have shown that posttraumatic stress disorder (PTSD), major depression (MDD), and traumatic brain injury (TBI) increase risk of suicidal behavior in veterans. Limited research has examined anger and social support as factors linked to suicidal ideation, which if demonstrated could lead to new, effective strategies for suicide risk assessment and prevention. Iraq/Afghanistan era veterans ($N = 2467$) were evaluated in the ongoing Veterans Affairs Mid-Atlantic Mental Illness Research, Education and Clinical Center (MIRECC) multi-site Study of Post-Deployment Mental Health on demographic and psychological variables. Analyses revealed that suicidal ideation in veterans was positively associated with anger and negatively associated with social support. These results remained significant in multivariate logistic regression models controlling for relevant variables including PTSD, MDD, and TBI. Examining interrelationships among these variables, the analyses revealed that the association between PTSD and suicidal ideation was no longer statistically significant once anger was entered in the regression models. Further, it was found that TBI was associated with suicidal ideation in veterans with MDD but not in veterans without MDD. These findings provide preliminary evidence that suicide risk assessment in military veterans should include clinical consideration of the roles of anger and social support in addition to PTSD, MDD, and TBI. Further, the results suggest that suicide prevention may benefit from anger management interventions as well as interventions aimed at bolstering social and family support as treatment adjuncts to lower suicide risk in veterans.

1. Introduction

Suicide is among the leading causes of death worldwide (Bertolote and Fleischmann, 2015). Rates of suicide among military veterans have dramatically outpaced rates in the general civilian population (Nock et al., 2013) and have been increasing over the past several years (Kang et al., 2015; Kuehn, 2009), resulting in the United States (U.S.) Department of Veterans Affairs labeling veteran suicide prevention an urgent public health priority (Department of Veterans Affairs, 2017). Previous studies on suicide among active duty and military veterans have increased our understanding of risk factors (Bachynski et al.,

2012) and shown that suicide risk in veterans consistently related to common co-occurring disorders such as posttraumatic stress disorder (PTSD), major depressive disorder (MDD), and traumatic brain injury (TBI; Brenner et al., 2011; Bryan and Clemans, 2013; DeBeer et al., 2014; Stanley et al., 2017). Despite progress identifying suicide risk factors in military populations, suicide remains a growing problem for veterans; thus, there is an urgent need to continue expanding understanding of this phenomenon.

It is crucial to investigate understudied risk factors, which could assist frontline providers to identify and augment care those at high risk for suicide. For example, emerging research has indicated that the

presence of higher levels of anger in veterans could exacerbate suicide risk. Specifically, individuals diagnosed with disorders in which anger or aggression is considered a symptom of the disorder (e.g., antisocial personality disorder, intermittent explosive disorder, PTSD) are at elevated risk for suicide (Chu et al., 2017; Fanning et al., 2016; Kessler et al., 2006; Nock et al., 2014). Anger may be a stronger suicide risk factor among veterans given their training and unique working environments that reinforce inhibition of adaptive emotional responses (e.g., sadness, fear) with the exception of anger (Reyes and Hicklin, 2005; Thompson and McCreary, 2006). As a result, the presence of higher levels of anger has been identified as a potential risk factor for veterans and active duty service members who ideate (Doran et al., 2017), attempt (Nock et al., 2015), and die by suicide (Dobscha et al., 2014). Given the impact of anger on interpersonal relationships, a related variable to consider is social support, which has been shown to be protective factor for veterans at risk for suicide (DeBeer et al., 2014). Theoretically, anger may inadvertently weaken social support by pushing away caretakers, family members, and/or friends, leaving returning veterans with depleted buffers to suicide. However, more research is needed to see the impact of social support as it relates to anger and suicidal ideation (Conner et al., 2003).

To our knowledge, little research has examined the associations of anger and social support to high risk for suicide in veterans. The goal of the current study was to examine the unique association between anger and suicidal ideation when covarying for established risk factors, and protective factors such as social support. Furthermore, we sought to determine whether these predictors were differentially related to suicidal ideation among veterans with and without both depression and PTSD. We also conducted planned exploratory analyses to: (a) examine the unique role of anger to suicidal ideation controlling for other known predictors of suicide (e.g. MDD, PTSD, TBI), (b) evaluate social support as a protective factor for suicide, and (c) to compare suicidal ideation between those with and without a diagnosis of either current MDD or PTSD.

2. Method

2.1. Participants

Participants included *N* = 2467 Iraq/Afghanistan era veterans enrolled in the ongoing Veterans Affairs Mid-Atlantic Mental Illness Research, Education and Clinical Center (MIRECC) multi-site Study of Post-Deployment Mental Health (identified as the "Registry" in previous publications (Brancu et al., 2017). Veterans were recruited through targeted mailings, advertisements, and clinician referrals. To be eligible, participants must have served in the U.S. military after September 11, 2001. The Institutional Review Board at each collaborating MIRECC site approved the study protocol, which involved completing a structured diagnostic interview and battery of self-report measures (described further below), typically within a single study visit. All participants provided written informed consent to participate.

2.2. Diagnostic interview

The Structured Clinical Interview for DSM-IV-TR Axis I Disorders (SCID-I) was used to diagnose current PTSD (absent coded as 0, present coded as 1) and major depressive disorder (MDD; absent coded as 0; present coded as 1) according to DSM-IV criteria (Williams et al., 1992). The SCID-I has demonstrated clinical sensitivity and reliability, with good to excellent interrater reliability for current disorders and moderate test–retest reliability for lifetime disorders (Williams et al., 1992). Trained research personnel—who included Bachelor's level interviewers with at least 5 years of SCID or psychological assessment experience, Master's level social workers with assessment background, and PhD-level clinical and research psychologists (including postdoctoral trainees)—administered the SCID-I to all participants.

Regardless of level of experience and educational background, all interviewers completed a SCID training program and attended biweekly to monthly peer consultation as well as supervision with a licensed psychologist. Additional rater observations were conducted throughout the length of the study to evaluate and correct for any potential rater drift. Inter-rater reliability for any Axis I disorder among research personnel who scored a series of seven SCID-I-based training videos was excellent (Fleiss' kappa = 0.94 for current diagnoses, 0.94 for lifetime, and 0.94 for both). Interviewers also demonstrated excellent mean interrater reliability specifically for current and lifetime PTSD (Fleiss' kappa = 1.00), as well as for current MDD (Fleiss' kappa = 1.00) and lifetime MDD (Fleiss' kappa = 0.88).

2.3. Self-report measures

A demographic form assessed age, gender (0 = female; 1 = male), and race (0 = non-white; 1 = white). Childhood trauma was measured by the number of physical or sexual abuse incidents during childhood reported on the Traumatic Life Events Questionnaire (TLEQ; Kubany and Haynes, 2000). The Combat Exposure Scale (CES; Keane et al., 1989) was used to measure combat exposure. Participants self-reported traumatic brain injury (TBI; defined as experiencing a head injury that was associated with loss of consciousness, loss of memory for events immediately after the head injury, and/or alteration in mental state at the time of injury) (Ivins et al., 2003); and parent history of suicide attempts. The Alcohol Use Disorders Identification Test (AUDIT; Babor et al., 2001) was used to identify alcohol misuse and the Drug Abuse Screening Test (DAST-20; Skinner, 1982) was used to identify drug misuse. Symptom Checklist-90- Revised (SCL-90-R) Hostility Index (GSI; Derogatis, 1994) was used to measure anger. Perceived social support was measured by the Medical Outcomes Study (MOS) social support scale (Sherbourne and Stewart, 1991). Current suicidal ideation was measured with the Beck Scale for Suicide Ideation (BSS) in which a cut-off score of 3 or higher (0 = no suicidal ideation; 1 = suicidal ideation present) was used to denote high risk of suicide, which is consistent with previous research, showing that those scoring above the cutoff are at significantly higher risk for suicide (Brown et al., 2000; Guerra and Calhoun, 2011; Youssef et al., 2013).

2.4. Data analytic strategy

All analyses were conducted using SAS 9.4. Descriptive analyses reported on frequencies of demographic and clinical variables. Spearman correlations were conducted to examine bivariate relationships between study variables and suicidal ideation. We then built logistic regression models to examine the incremental utility of anger and social support in the statistical prediction of suicidal ideation. Finally, because MDD and PTSD have been shown to be strong predictors of suicide, we wanted to explore whether anger and social support were associated with suicidal ideation in the absence of these disorders. Therefore, we conducted additional logistic regression analyses stratifying the sample by whether or not veterans met criteria for current MDD or PTSD.

3. Results

3.1. Clinical characteristics of the sample

Descriptive data for study variables are shown in Table 1. Nearly one third of the sample met diagnostic criteria for current PTSD (*n* = 761; 30.85%) and one fifth met MDD criteria (*n* = 497; 20.15%). Approximately 9% of participants (*n* = 221) met criteria for suicidal ideation.

Table 1
Descriptive statistics.

Study variable	M (SD) or n (%)
Age	37.48 (10.22)
Gender	
Female	498 (20.19%)
Male	1969 (79.81%)
Race	
White	1241 (50.30%)
African American	1180 (47.95%)
Native American/American Indian	53 (2.15%)
Asian	33 (1.34%)
Pacific Islander CES score	18 (0.73%) 11.06 (10.57)
Family history of suicide	
No	2361 (95.70%)
Yes	106 (4.30%)
TBI history	
No	1695 (68.71%)
Yes	772 (31.29%)
MDD	
No	1970 (79.85%)
Yes	497 (20.15%)
PTSD	
No	1706 (69.15%)
Yes	761 (30.85%)
AUDIT score	4.88 (5.82)
DAST score	1.00 (2.65)
Anger	0.88 (1.05)
Social support	73.54 (26.14)

Note. CES = Combat Exposure Scale; TBI = Traumatic brain injury; MDD = Major depressive disorder; PTSD = Posttraumatic stress disorder; AUDIT = Alcohol Use Disorders Identification Test; DAST = Drug Abuse Screening Test.

3.2. Spearman correlation analyses

Bivariate statistics are presented in Table 2. Screening positive for current suicidal ideation was significantly associated with all study variables except age and gender. Of all study variables, anger was most strongly associated with suicidal ideation ($\rho = 0.30$, $p < .001$). Moreover, perceived social supported was negatively correlation with anger ($\rho = -0.30$, $p < .001$).

3.3. Logistic regression analyses predicting suicidal ideation

3.3.1. Full sample

Table 3 presents multivariate modeling of suicidal ideation among the full sample of 2467 veterans. In Step 1, family history of suicide, TBI history, MDD, PTSD, and alcohol misuse emerged as statistically significant unique predictors of suicidal ideation. Step 2 involved adding anger to the model of demographic and clinical covariates. Anger was

Table 2
Spearman correlations between study variables and suicidal ideation.

Study variable	Suicidal ideation
Age	−0.03
Gender (male)	0.03
Race (white)	0.05*
CES score	0.16**
Family history of suicide	0.08**
TBI history	0.15**
MDD	0.29**
PTSD	0.23**
AUDIT score	0.09**
DAST score	0.09**
Anger	0.30**
Social support	−0.19**

*$p < .01$; **$p < .01$.

found to be statistically associated with higher odds of suicidal ideation ($OR = 1.86$, $p < .001$). Of note, PTSD diagnosis no longer retained its statistical significance after anger was added to the model. In Step 3, perceived social support was added and found to be significantly associated with reduced odds of suicidal ideation ($OR = 0.98$, $p < .001$). MDD status was the strongest unique predictor of suicidal ideation in our final model ($OR = 2.88$, $p < .001$).

In order to evaluate the potential moderating effect of anger on the relationship between social support and suicidal ideation, and interaction term of social support and anger was tested ($p = .07$). In order to further contextualize the moderating effect of social support, anger was stratified into "high anger" and "low anger" groups and tested separately on suicidal ideation. In general, higher social support was found to be protective in both the high anger [$OR = 0.98$, 95% CI (0.98, 0.99)] and the low anger groups [$OR = 0.96$, 95% CI (0.95, 0.98)]. Moreover, In the high anger group, 199 of 1353 cases (17.2%) reported suicidal ideation while in the low anger group, 22 of 1092 (2.0%) reported SI.

3.3.2. comparing veterans with versus without current MDD

Table 4 presents multivariate modeling of suicidal ideation in subsamples of veterans with versus without current MDD. Rates of suicidal ideation were higher among veterans with MDD ($n = 126$; 25.4%) relative to veterans without MDD ($n = 92$; 4.7%). Endorsing greater anger and lower perceived social support in both groups predicted greater likelihood to endorse suicidal ideation. However, whereas alcohol misuse also emerged as a significant unique predictor among veterans without current MDD, TBI history significantly predicted suicidal ideation in veterans with current MDD. In fact, TBI history was the strongest single predictor of suicidal ideation among veterans with current MDD ($OR = 2.23$, $p = .001$).

3.3.3. Comparing veterans with versus without current PTSD

Table 5 presents multivariate modeling of suicidal ideation in subsamples of veterans with versus without current PTSD. The presence of suicidal ideation was higher among veterans with PTSD ($n = 141$; 18.73%) compared to veterans without PTSD ($n = 77$; 4.82%). Meeting diagnostic criteria for MDD, endorsing greater anger, and lower perceived social support in both groups predicted greater likelihood to endorse suicidal ideation. Among individuals with PTSD, being older, family history of suicide, and TBI history also significantly predicted suicidal ideation.

4. Discussion

Among a large sample of Iraq/Afghanistan era veterans, we found a robust relationship between anger and suicide, even when covarying for other established predictors of suicide (e.g., gender, family history of suicide, depression). Furthermore, we found a significant unique relationship between perceived social support and suicidal ideation. That levels of anger and social support predicted suicidal ideation when stratifying by MDD diagnosis (none vs. current) and PTSD diagnosis (none vs. current) bolster previous arguments implicating these two constructs in the development of suicidal ideation (e.g. Doran et al., 2017; Jakupcak et al., 2009). There was also a marginally significant ($p = .07$) interaction between anger and social support predicting suicidal ideation. Specifically, higher perceived social support was protective for veterans with both high and low levels of anger, but this benefit was greater among those with low anger.

Conceptually, it is possible that veterans with anger difficulties experience an erosion of social support, which makes them particularly vulnerable to suicide. For example, individuals with heightened levels of anger and aggression may have more reactive social support networks (Conner et al., 2003), thus diminishing known protective factors for suicide (Kleiman et al., 2012). This conceptualization may be in line with Joiner's (2005) interpersonal-psychological theory of suicide

Table 3
Logistic regression analyses predicting suicidal ideation in a sample of 2467 U.S. veterans.

Variable	Step 1: Demographic and Clinical Covariates			Step 2: SCL-90 Anger Hostility Subscale Added to Model			Step 3: MOS Social Support Scale Added to Model		
	χ^2 (10) = 246.61, p < .001 $R^2 = 0.21$			χ^2 (11) = 296.05, p < .001 $R^2 = 0.26$			χ^2 (12) = 325.63, p < .001 $R^2 = 0.28$		
	OR	95% CI	p	OR	95% CI	p	OR	95% CI	p
Age	1.01	[0.99, 1.02]	.450	1.01	[0.10, 1.03]	.098	1.01	[1.00, 1.03]	.109
Gender	1.00	[0.66, 1.52]	.998	1.00	[0.65, 1.53]	.989	1.08	[0.70, 1.67]	.719
Race	1.32	[0.96, 1.81]	.083	1.37	[0.99, 1.90]	.057	1.47	[1.06, 2.04]	.022
CES score	1.01	[1.00, 1.03]	.131	1.00	[0.99, 1.02]	.891	1.00	[0.98, 1.02]	.952
Family history of suicide	2.28	[1.30, 4.02]	.004	2.13	[1.19, 3.81]	.011	2.01	[1.11, 3.63]	.022
TBI history	1.60	[1.17, 2.18]	.003	1.43	[1.04, 1.98]	.028	1.53	[1.11, 2.12]	.010
MDD	4.26	[3.04, 5.96]	< .001	3.17	[2.24, 4.49]	< .001	2.88	[2.03, 4.08]	< .001
PTSD	1.92	[1.32, 2.79]	.001	1.20	[0.81, 1.78]	.354	1.12	[0.76, 1.66]	.575
AUDIT score	1.04	[1.02, 1.07]	< .001	1.03	[1.01, 1.05]	.011	1.03	[1.00, 1.05]	.028
DAST score	1.01	[0.97, 1.07]	.573	1.00	[0.95, 1.05]	.926	1.00	[0.95, 1.05]	.973
Anger	–	–	–	1.86	[1.59, 2.16]	< .001	1.80	[1.55, 2.10]	< .001
Social support	–	–	–	–	–	–	0.98	[0.98, 0.99]	< .001

Note. R^2 = Adjusted R-squared; OR = Odds ratio; CI = Confidence interval.

Table 4
Logistic regression analyses predicting suicidal ideation among veterans with versus without current MDD.

Variable	No MDD			Current MDD		
	χ^2 (11) = 111.94, p < .001 $R^2 = 0.18$			χ^2 (11) = 72.66, p < .001 $R^2 = 0.20$		
	OR	95% CI	p	OR	95% CI	p
Age	1.02	[0.99, 1.04]	.203	1.02	[0.99, 1.04]	.155
Gender	0.92	[0.48, 1.74]	.792	1.36	[0.75, 2.48]	.318
Race	1.60	[0.99, 2.59]	.058	1.42	[0.90, 2.24]	.136
CES score	1.02	[0.99, 1.04]	.142	0.99	[0.96, 1.01]	.208
Family history of suicide	2.02	[0.91, 4.48]	.085	2.08	[0.81, 5.33]	.129
TBI history	0.93	[0.57, 1.52]	.764	2.23	[1.41, 3.53]	.001
PTSD	1.30	[0.78, 2.17]	.311	0.90	[0.50, 1.63]	.733
AUDIT score	1.05	[1.01, 1.08]	.005	1.00	[0.97, 1.03]	.990
DAST score	0.99	[0.91, 1.06]	.711	1.02	[0.95, 1.09]	.626
Anger	1.89	[1.52, 2.35]	< .001	1.79	[1.43, 2.23]	< .001
Social support	0.99	[0.98, 1.00]	.002	0.98	[0.98, 0.99]	< .001

Note. R^2 = Adjusted R-squared.

(IPTS). According to the IPTS, individuals who believe that they are a burden upon others ("perceived burdensomeness") and lack social connectedness ("thwarted belongingness") are at the highest risk of desiring suicide. Prior research in a civilian sample has found that the relationship between anger and suicide ideation was fully mediated by thwarted belongingness and perceived burdensomeness (Hawkins et al., 2014).

Given that our study used a cross-sectional design, we cannot make

Table 5
Logistic regression analyses predicting suicidal ideation among veterans with versus without current PTSD.

Variable	No PTSD			Current PTSD		
	χ^2 (11) = 109.94, p < .001 $R^2 = 0.24$			χ^2 (11) = 84.74, p < .001 $R^2 = 0.21$		
	OR	95% CI	p	OR	95% CI	p
Age	0.99	[0.97, 1.02]	.661	1.03	[1.01, 1.06]	.008
Gender	1.67	[0.81, 3.48]	.167	0.82	[0.47, 1.44]	.493
Race	1.74	[1.02, 2.97]	.044	1.34	[0.88, 2.03]	.177
CES score	1.01	[0.98, 1.03]	.689	1.00	[0.98, 1.02]	.972
Family history of suicide	1.38	[0.48, 3.90]	.547	2.56	[1.19, 5.49]	.016
TBI history	1.18	[0.69, 2.02]	.545	1.65	[1.09, 2.51]	.018
MDD	4.44	[2.52, 7.83]	< .001	2.28	[1.49, 3.49]	.001
AUDIT score	1.04	[1.00, 1.08]	.051	1.02	[0.99, 1.05]	.171
DAST score	0.99	[0.90, 1.09]	.862	1.01	[0.95, 1.07]	.833
Anger	1.87	[1.46, 2.37]	< .001	1.75	[1.43, 2.12]	< .001
Social support	0.98	[0.97, 0.99]	< .001	0.99	[0.98, 0.99]	.001

Note. R^2 = Adjusted R-squared.

causal conclusions; indeed, the presence of suicidal ideation could have preceded any erosion in social support. Previous research has noted the relationship between social withdrawal and suicidal ideation (e.g. Stroebe et al., 2005; Teo et al., 2018), and in this sample, social withdrawal among supportive figures may lead to elevated frustration, thus exacerbating thinking about suicide. Our findings offer preliminary, indirect support that these two factors may be important to consider when assessing suicidal ideation among veterans as well.

These findings have several potentially important implications. Anger difficulties are the most commonly reported reintegration concern among Iraq and Afghanistan era veterans (Sayer et al., 2010) and are associated with numerous negative outcomes (e.g., poor physical health, social and functional impairments, aggression). In a nationally representative survey, 61.2% of U.S. Veterans reported experiencing difficulties controlling anger and 23.9% reported experiencing aggressive urges over a two-year period (Sippel et al., 2016). Our results suggest that anger is also associated with suicidal ideation, above and beyond depression and other well-studied risk factors. Given our findings and the increasing rates of suicide among military samples, the current data strongly suggest we focus more attention on anger as a risk factor for suicide. Additional research examining the mechanism(s) underlying the relationship between anger and suicide is needed. At the very least, our findings suggest that anger is an important variable to assess and target in suicide risk assessments and interventions for veterans.

Our findings also suggest that amount and quality of perceived social support is an important variable to consider when assessing veterans' suicide risk, particularly among veterans with high anger and other risk factors. Interventions that aim to enhance social support (e.g., peer support groups, family/couples therapy) may reduce risk of suicide. Yet, more research is needed to understand what aspects of social support (e.g. tangible support, emotional support) are prominent in reducing risk for suicide. Along those lines, in active duty service members of the U.S. Army, rates of suicidal behavior (ideation, plans, and attempts) were higher among married soldiers than unmarried soldiers (Nock et al., 2014), indicating that the quality of social support might be more influential than the mere existence of a support figure.

With respect to PTSD and suicidal ideation, the current analyses revealed that although PTSD diagnosis was significantly associated with suicidal ideation, this relationship was no longer statistically significant after controlling for anger in the logistic regression model. PTSD has been strongly associated with suicide risk in prior research with veterans (Jakupcak et al., 2009; Lemaire and Graham, 2011; Sher et al., 2012) but our results suggest the need to further elucidate this link, as well as identify mechanisms explaining the association between PTSD and suicidal ideation. Our results suggest that the association between PTSD and suicide is, in part, attributable to increased anger. Other PTSD symptoms might play a role in this association as well (e.g., foreshortened future). Further research is necessary to examine this relationship and to determine whether anger and other PTSD symptoms mediate the relationship between PTSD as a diagnosis and suicide, as well as examine the contributing role of anger among individuals with PTSD to suicidal ideation in veterans.

TBI history was significantly associated with increased suicidal ideation in the depressed sub-sample, but this association did not emerge among our sub-sample of veterans without depression. Prior research has documented a relationship between history of TBI and suicide risk (Brenner et al., 2011; Bryan and Clemans, 2013), but our results suggest that this relationship is moderated by depression status, such that those with TBI in addition to depression are more likely to experience suicidal ideation relative to those without depression. To note, TBI status has been associated with elevated emotion dysregulation and impulsivity (Miles et al., 2016), which are also predictive for suicide (Klonsky et al., 2017). Additional research is required to elucidate the circumstances under which TBI relates to increased risk for suicide among veterans, particularly the temporal relationship between

TBI, onset of depressive symptoms, and suicidal ideation, attempts, and/or deaths.

Finally, our analyses highlighted several factors association with suicidal ideation for veterans without MDD. Although risk for suicide has been popularly conceptualized as a symptom of MDD, many veterans who die by suicide do not meet criteria for MDD (Chu et al., 2017) and many preventive interventions for suicide rely on treating depression (Fanning et al., 2016). This suggests a need to delve more deeply and investigate other variables that potentially relate to suicidal ideation in veterans. In particular, the presence of anger in the absence of MDD may be an artifact of how negative affect manifests in certain individuals, particularly among males or masculine cultures (Addis, 2008; Nolen-Hoeksema, 2008). This phenomenon has large research and treatment implications, especially given the growing suicide rate among returning veterans. More research should examine veterans who ideate about suicide but who not meet criteria for MDD to examine the function of suicidal thoughts in non-clinical populations.

Strengths of this study included a large sample size and the use of both interviewer-rated and self-report measures of clinical outcomes across multiple domains. The primary limitation is the use of a cross-sectional design, which limits our ability to make causal inferences about the associations between study variables. Additional studies using a longitudinal design could serve to reduce this limitation in future research. Another consideration is that although suicidal ideation may be a precursor to suicidal attempt, there are many individuals with scores of 3 or above on the BSS who never attempt suicide (Nock et al., 2008). Moreover, higher risk for suicide as defined by scoring at or above a 3 on the BSS relative to no ideation is not the same as high risk for suicide overall. Although this limits our ability to make inferences from our data regarding who is likely to attempt or die by suicide, identifying suicide risk behaviors—even if we cannot guarantee they are the same risk factors for actual suicide attempts—is important. Along those lines, recent work by Klonsky and May (2014) highlights the need to identify factors that predict higher levels of suicide risk (i.e. attempts, death) among ideators; however, more research is needed to elucidate when and how individuals transition from ideation to attempt. Nonetheless, suicidal ideation continues to be a robust predictor of suicide attempt. Additional research is necessary to examine whether anger differentiates between veterans who ideate from those who attempt suicide. Finally, while this study uncovered some interesting relationships between anger, social support, and suicidal ideation, the magnitude of the effects were relatively small, which points to a need for replication in a variety of samples.

In sum, the current study provides preliminary evidence that suicide risk assessment in military veterans should include clinical consideration of the roles of anger and social support. Furthermore, the results suggest that suicide prevention may benefit from anger management interventions as well as interventions aimed at bolstering social and family support as treatment adjuncts to lower risk in veterans. By expanding our knowledge of risk and protective factors, it is hoped that we can identify a wider range of interventions and strategies to reduce suicidal behavior in military veterans.

Acknowledgement

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jpsychires.2018.11.026.

References

Addis, M.E., 2008. Gender and depression in men. Clin Psychol-Sci Pr 15, 153–168.

https://doi.org/10.1111/j.1468-2850.2008.00125.x.

Babor, T.F., Higgins-Biddle, J.C., Saunders, J.B., Monteiro, M.G., Organization, W.H., 2001. AUDIT: the Alcohol Use Disorders Identification Test: Guidelines for Use in Primary Health Care, second ed. World Health Organization, Geneva.

Bachynski, K.E., Canham-Chervak, M., Black, S.A., Dada, E.O., Millikan, A.M., Jones, B.H., 2012. Mental health risk factors for suicides in the US Army, 2007-8. Inj. Prev. 18, 405–412.

Bertolote, J.M., Fleischmann, A., 2015. A global perspective in the epidemiology of suicide. Suicidologi 7, 6–8. https://doi.org/10.5617/suicidologi.2330.

Brancu, M., Wagner, H.R., Morey, R.A., Beckham, J.C., Calhoun, P.S., Tupler, L.A., Marx, C.E., Taber, K.H., Hurley, R.A., Rowland, J., McDonald, S.D., Hoerle, J.M., Moore, S.D., Kudler, H.S., Weiner, R.D., Workgroup, V.A.M.-A.M., Fairbank, J.A., 2017. The Post-Deployment Mental Health (PDMH) study and repository: a multi-site study of US Afghanistan and Iraq era veterans. Int. J. Methods Psychiatr. Res. 26. https://doi.org/10.1002/mpr.1570.

Brenner, L.A., Ignacio, R.V., Blow, F.C., 2011. Suicide and traumatic brain injury among individuals seeking Veterans Health Administration services. J. Head Trauma Rehabil. 26, 257–264. https://doi.org/10.1097/HTR.0b013e31821fdb6e.

Brown, G.K., Beck, A.T., Steer, R.A., Grisham, J.R., 2000. Risk factors for suicide in psychiatric outpatients: a 20-year prospective study. J. Consult. Clin. Psychol. 68, 371–377. https://doi.org/10.1037/0022-006X.68.3.371.

Bryan, C.J., Clemans, T.A., 2013. Repetitive traumatic brain injury, psychological symptoms, and suicide risk in a clinical sample of deployed military personnel. JAMA Psych 70, 686–691. https://doi.org/10.1001/jamapsychiatry.2013.1093.

Chu, C., Buchman-Schmitt, J.M., Joiner, T.E., Rudd, M.D., 2017. Personality disorder symptoms and suicidality: low desire and high plans for suicide in military inpatients and outpatients. J. Pers. Disord. 31, 145–155. https://doi.org/10.1521/pedi_2016_30_241.

Conner, K., Duberstein, P., Conwell, Y., Caine, E., 2003. Reactive aggression and suicide: theory and evidence. Aggress. Violent Behav. 8, 413–432. https://doi.org/10.1016/S1359-1789(02)00067-8.

DeBeer, B.B., Kimbrel, N.A., Meyer, E.C., Gulliver, S.B., Morissette, S.B., 2014. Combined PTSD and depressive symptoms interact with post-deployment social support to predict suicidal ideation in Operation Enduring Freedom and Operation Iraqi Freedom veterans. Psychiatr. Res. 216, 357–362. https://doi.org/10.1016/j.psychres.2014.02.010.

Department of Veterans Affairs, 2017. VA Releases Veteran Suicide Statistics by State. Office of Public Affairs Media Relations.

Derogatis, L.R., 1994. Symptom Checklist-90-revised: Administration, Scoring, and Procedures Manual, third ed. National Computer Systems, Inc., Minneapolis, MN.

Dobscha, S.K., Denneson, L.M., Kovas, A.E., Teo, A., Forsberg, C.W., Kaplan, M.S., Bossarte, R., McFarland, B.H., 2014. Correlates of suicide among veterans treated in primary care: case-control study of a nationally representative sample. J. Gen. Intern. Med. 29, 853–860. https://doi.org/10.1007/s11606-014-3028-1.

Doran, N., Brikmanis, K., Pittman, J., Floto, E., Afari, N., 2017. Predictors of suicide risk in Iraq and Afghanistan veterans. Milit Beh Health 1–11. https://doi.org/10.1080/21635781.2017.1379453.

Fanning, J.R., Lee, R., Coccaro, E.F., 2016. Comorbid intermittent explosive disorder and posttraumatic stress disorder: clinical correlates and relationship to suicidal behavior. Compr. Psychiatry 70, 125–133. https://doi.org/10.1016/j.comppsych.2016.05.018.

Guerra, V.S., Calhoun, P.S., 2011. Examining the relation between posttraumatic stress disorder and suicidal ideation in an OEF/OIF veteran sample. J. Anxiety Disord. 25, 12–18. https://doi.org/10.1016/j.janxdis.2010.06.025.

Hawkins, K.A., Hames, J.L., Ribeiro, J.D., Silva, C., Joiner, T.E., Cougle, J.R., 2014. An examination of the relationship between anger and suicide risk through the lens of the interpersonal theory of suicide. J. Psychiatr. Res. 50, 59–65. https://doi.org/10.1016/j.jpsychires.2013.12.005.

Ivins, B.J., Schwab, K.A., Warden, D., Harvey, L.T., Hoilien, M.A., Powell, C.O., Johnson, C.S., Salazar, A.M., 2003. Traumatic brain injury in U.S. Army paratroopers: prevalence and character. J. Trauma 55, 617–621. https://doi.org/10.1097/01.TA.0000052368.97573.D4.

Jakupcak, M., Cook, J., Imel, Z., Fontana, A., Rosenheck, R., McFall, M., 2009. Posttraumatic stress disorder as a risk factor for suicidal ideation in Iraq and Afghanistan War veterans. J. Trauma Stress 22, 303–306. https://doi.org/10.1002/jts.20423.

Joiner, T., 2005. Why people die by suicide, first ed. Harvard University Press, Cambridge, MA.

Kang, H.K., Bullman, T.A., Smolenski, D.J., Skopp, N.A., Gahm, G.A., Reger, M.A., 2015. Suicide risk among 1.3 million veterans who were on active duty during the Iraq and Afghanistan wars. Ann. Epidemiol. 25, 96–100. https://doi.org/10.1016/j.annepidem.2014.11.020.

Keane, T.M., Fairbank, J.A., Caddell, J.M., Zimering, R.T., Taylor, K.L., Mora, C., 1989. Clinical evaluation of a measure to assess combat exposure. J. Consult. Clin. Psychol. 1, 53–55.

Kessler, R.C., Coccaro, E.F., Fava, M., Jaeger, S., Jin, R., Walters, E., 2006. The prevalence and correlates of DSM-IV intermittent explosive disorder in the National Comorbidity Survey Replication. Arch. Gen. Psychiatr. 63, 669–678. https://doi.org/10.1001/archpsyc.63.6.669.

Kleiman, E.M., Riskind, J.H., Schaefer, K.E., Weingarden, H., 2012. The moderating role of social support on the relationship between impulsivity and suicide risk. Crisis 33, 273–279. https://doi.org/10.1027/0227-5910/a000136.

Klonsky, E.D., May, A.M., 2014. Differentiating suicide attempters from suicide ideators: a critical frontier for suicidology research. Suicide Life-Threat 44, 1–5. https://doi.org/10.1111/sltb.12068.

Klonsky, E.D., Qiu, T., Saffer, B.Y., 2017. Recent advances in differentiating suicide attempters from suicide ideators. Curr. Opin. Psychiatr. 30, 15–20. https://doi.org/10.1111/sltb.12068.

Kubany, E.S., Haynes, S.N., 2000. Development and preliminary validation of a brief broad-spectrum measure of trauma exposure: the Traumatic Life Events Questionnaire. Psychol. Assess. 12, 210–214. https://doi.org/10.1097/YCO.0000000000000294.

Kuehn, B.M., 2009. Soldier suicide rates continue to rise. J. Am. Med. Assoc. 301, 1111–1113. https://doi.org/10.1037/1040-3590.12.2.210.

Lemaire, C.M., Graham, D.P., 2011. Factors associated with suicidal ideation in OEF/OIF veterans. J. Affect. Disord. 130, 231–238. https://doi.org/10.1016/j.jad.2010.10.021.

Miles, S.R., Menefee, D.S., Wanner, J., Teten Tharp, A., Kent, T.A., 2016. The relationship between emotion dysregulation and impulsive aggression in veterans with posttraumatic stress disorder symptoms. J. Interpers Violence 31, 1795–1816. https://doi.org/10.1177/0886260515570746.

Nock, M.K., Borges, G., Bromet, E.J., Alonso, J., Angermeyer, M., Beautrais, A., Bruffaerts, R., Chiu, W.T., De Girolamo, G., Gluzman, S., 2008. Cross-national prevalence and risk factors for suicidal ideation, plans and attempts. Br. J. Psychiatr. 192, 98–105. https://doi.org/10.1192/bjp.bp.107.040113.

Nock, M.K., Deming, C.A., Fullerton, C.S., Gilman, S.E., Goldenberg, M., Kessler, R.C., McCarroll, J.E., McLaughlin, K.A., Peterson, C., Schoenbaum, M., Stanley, B., Ursano, R.J., 2013. Suicide among soldiers: a review of psychosocial risk and protective factors. Psychiatry 76 (2), 97–125. https://doi.org/10.1521/psyc.2013.76.2.97.

Nock, M.K., Stein, M.B., Heeringa, S.G., Ursano, R.J., Colpe, L.J., Fullerton, C.S., Hwang, I., Naifeh, J.A., Sampson, N.A., Zaslavsky, A.M., Kessler, R.C., Army, S.C., 2014. Prevalence and correlates of suicidal behavior among soldiers: results from the army study to assess risk and resilience in servicemembers (army STARRS). JAMA Psychiatry 71, 514–522. https://doi.org/10.1001/jamapsychiatry.2014.30.

Nock, M.K., Ursano, R.J., Heeringa, S.G., Stein, M.B., Jain, S., Raman, R., Sun, X., Chiu, W.T., Colpe, L.J., Fullerton, C.S., Gilman, S.E., Hwang, I., Naifeh, J.A., Rosellini, A.J., Sampson, N.A., Schoenbaum, M., Zaslavsky, A.M., Kessler, R.C., Army, S.C., 2015. Mental disorders, comorbidity, and pre-enlistment suicidal behavior among new soldiers in the US army: results from the army study to assess risk and resilience in servicemembers (army STARRS). Suicide Life-Threat 45 (5), 588–599. https://doi.org/10.1111/sltb.12153.

Nolen-Hoeksema, S., 2008. It is not what you have; it is what you do with it: support for Addis's gendered responding framework. Clin Psychol-Sci Pr 15, 178–181. https://doi.org/10.1111/j.1468-2850.2008.00128.x.

Reyes, V.A., Hicklin, T.A., 2005. Anger in the combat zone. Mil. Med. 170, 483–487. https://doi.org/10.7205/MILMED.170.6.483.

Sayer, N.A., Noorbaloochi, S., Frazier, P., Carlson, K., Gravely, A., Murdoch, M., 2010. Reintegration problems and treatment interests among Iraq and Afghanistan combat veterans receiving VA medical care. Psychiatr. Serv. 61, 589–597. https://doi.org/10.1176/ps.2010.61.6.589.

Sher, L., Braquehais, M.D., Casas, M., 2012. Posttraumatic stress disorder, depression, and suicide in veterans. Cleve. Clin. J. Med. 79 (2), 92. https://doi.org/10.3949/ccjm.79a.11069.

Sherbourne, C.D., Stewart, A.L., 1991. The MOS social support survey. Soc. Sci. Med. 32, 705–714. https://doi.org/10.1016/0277-9536(91)90150-B.

Sippel, L.M., Mota, N.P., Kachadourian, L.K., Krystal, J.H., Southwick, S.M., Harpaz-Rotem, I., Pietrzak, R.H., 2016. The burden of hostility in US veterans: results from the national health and resilience in veterans study. Psychiatr. Res. 243, 421–430. https://doi.org/10.1016/j.psychres.2016.06.040.

Skinner, H.A., 1982. The drug abuse screening test. Addict. Behav. 7, 363–371. https://doi.org/10.1016/0306-4603(82)90005-3.

Stanley, I.H., Joiner, T.E., Bryan, C.J., 2017. Mild traumatic brain injury and suicide risk among a clinical sample of deployed military personnel: evidence for a serial mediation model of anger and depression. J. Psychiatr. Res. 84, 161–168. https://doi.org/10.1016/j.jpsychires.2016.10.004.

Stroebe, M., Stroebe, W., Abakoumkin, G., 2005. The broken heart: suicidal ideation in bereavement. Am. J. Psychiatry 162, 2178–2180. https://doi.org/10.1176/appi.ajp.162.11.2178.

Teo, A.R., Marsh, H.E., Forsberg, C.W., Nicolaidis, C., Chen, J.I., Newsom, J., et al., 2018. Loneliness is closely associated with depression outcomes and suicidal ideation among military veterans in primary care. J. Affect. Disord. 230, 42–49. https://doi.org/10.1016/j.jad.2018.01.003.

Thompson, M.M., McCreary, D.R., 2006. Enhancing Mental Readiness in Military Personnel. Defence Research And Development, Toronto (Canada).

Williams, J.B., Gibbon, M., First, M.B., Spitzer, R.L., Davies, M., Borus, J., Howes, M.J., Kane, J., Pope Jr., H.G., Rounsaville, B., 1992. The structured clinical interview for DSM-III-R (SCID). II. Multisite test-retest reliability. Arch. Gen. Psychiatr. 49, 630–636. https://doi.org/10.1001/archpsyc.1992.01820080038006.

Youssef, N.A., Green, K.T., Beckham, J.C., Elbogen, E.B., 2013. A 3-year longitudinal study examining the effect of resilience on suicidality in veterans. Ann. Clin. Psychiatr. 25 (1), 59–66.