


Temporal Sequencing of Mental Health Symptom Severity and Suicidal Ideation in Post-9/11 Men and Women Veterans Who Recently Separated from the Military

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Abstract

Background: Despite some evidence for gender differences in associations between military veterans' mental health and suicidal ideation (SI), gender-specific prospective studies are lacking. The aims of this prospective study were to: (1) examine gender differences in veterans' initial status and trajectories of mental health severity and SI status and (2) identify temporal sequencing of mental health predictors of SI.

Methods: Surveys of 1035 US veterans were administered at 3 time-points (T1, T2, T3) over a 7-year period following military separation, with an initial assessment within 2 years of military separation.

Results: Men reported higher baseline PTSD and alcohol misuse severity than women. No baseline gender difference in SI prevalence was detected. Baseline gender differences in mental health severity were maintained over time. For both men and women, remittance of SI was more likely from T1 to T2 than from T2 to T3 while chronic SI was more likely from T2 to T3. The strongest predictors of T3 SI were prior SI followed by alcohol misuse, depression, and PTSD severity with stronger effects for T2 predictors than T1.

Conclusion: The maintenance of baseline gender differences throughout trajectories of mental health predictors of SI supports the need for ongoing gender-specific mental health services. Current governmental interorganizational efforts are focused on suicide prevention during the first year after military service completion. Our findings indicate a need to extend mental health screening and treatment beyond the early post-military period to reduce risk and recurrence of SI for both men and women.

Keywords

posttraumatic stress disorder, suicidal ideation, veterans, depression, alcohol misuse

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Introduction

Suicide rates are significantly higher among United States (US) veterans than nonveterans.¹ In addition, both veteran men and women are more likely to report suicidal ideation (SI) than their nonveteran counterparts.² According to the ideation-to-action framework, SI is a precursor to suicidal behavior typically mediating the relationship between mental health factors and suicide attempts or deaths.^{3,4} Because SI precedes suicide attempt and death in the ideation-to-action framework, understanding the temporality of prospective predictors of SI can inform suicide prevention efforts.

Prospective studies have revealed important associations between mental health symptomatology and SI in veteran samples.^{5–9} For example, in a study of Israeli combat

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veterans, combat stress reaction was associated with higher levels of SI 1 year, 2 years, and 20 years after the Lebanon War.¹⁰ Another study focused on a national sample of US veterans from multiple war eras and examined SI at 2 time points a year apart.¹¹ T1 psychiatric distress predicted chronic SI (positive SI at T1 and T2) as well as both remitted SI (positive SI at T1 but not T2) and SI onset (positive SI at T2 but not T1), while T1 substance misuse history was only associated with chronic SI.¹¹

Although these studies demonstrate the importance of veterans' psychopathology in risk of SI, the majority of research has focused on all-male or predominantly male samples.¹⁰⁻¹² A gender-specific approach to investigating predictors of SI is important given that men and women veterans differ in the prevalence of mental health conditions that may be associated with SI. For example, research has revealed that among post-9/11 veterans, women are more likely to be diagnosed with depression while men are more likely to be diagnosed with alcohol use disorder.^{13,14} Additionally, among post-9/11 veterans ages 18 to 44, men are more likely to be diagnosed with PTSD than women.¹⁴ Finally, gender differences have also been observed regarding prevalence of exposure to deployment stressors with men more likely to experience combat exposure and women more likely to experience sexual and nonsexual harassment^{15,16} as well as military sexual assault.¹⁷ Further, during readjustment, women veterans report more frequent negative personal and family-related experiences such as divorce¹⁸⁻²¹ and challenges with employment.²²

Although gender-specific relationships between mental health and SI have been examined in cross-sectional studies, this research has produced mixed findings. For example, in one study PTSD, depression, and alcohol misuse were significantly associated with SI in men; yet, in women, SI was significantly associated with depression and alcohol misuse but not PTSD.⁵ However, other studies found that PTSD and depression^{23,24} as well as alcohol and substance use were associated with SI regardless of gender.²⁴ While these studies provide clear evidence of a relationship between psychopathology and SI, a better understanding of mental health predictors that give rise to SI in veterans requires gender-specific prospective research.

Theory pertaining to gender and suicide emphasizes the importance of a gender-specific approach to investigating suicidality in military veterans. Cultural scripts theory describes the phenomenon of individuals drawing from local cultural narratives around gender and suicidal behavior including gender-specific aspects of how stories of suicidal behavior are narrated, characteristics of precipitants, methods, events within the scenario that garner attention, and the interpretations and conclusions drawn from the stories.^{25,26}

For nearly a half-century, anthropological studies have documented the cultural patterning of suicidal behavior^{25,27-29} revealing that one constant across cultures and throughout history is the association between cultural

narratives and epidemiological patterns.^{25,30,31} Notably, current trends in the increasing suicide rate among women veterans do not reflect those of civilian women in the US. Therefore, it may be useful to adapt a cultural perspective to understand suicidal behavior³¹ in military service members and veterans. Military culture is based on masculinity, a hierarchical command structure, deindividuation/self-sacrifice, and a high degree of social and emotional control,^{32,33} which contrasts with civilian culture in western societies. It is possible that the effect of the masculine military socio-cultural environment may be more likely to lead to thwarted belongingness in women during military service. Notably, qualitative studies of female service members conveyed themes of failed belongingness, feeling like an outsider, and feeling like a burden if unable to meet the high bar they set for themselves.³⁴ According to the Interpersonal-Psychological Theory of Suicide, such feelings of disconnection and burdensomeness are antecedents to suicidal behavior.^{34,35} Therefore, men and women may experience military culture differently.

Qualitative findings revealed that post-9/11 veteran men and women report identity crises, loss of sense of belonging, and disconnection upon reintegration.³⁶ However, women veterans revealed their experience of an additional layer of identity transition wherein both civilian and female identities needed to be shed to take on the soldier identity upon entering the military and then, the reverse of that process was needed again upon military separation and reintegration into civilian life.^{36,37} Therefore, in contrast to men, women service members may have earlier experiences of failed belongingness that occur during military service and then reoccur during reintegration, potentially translating to gender differences in temporal sequencing of mental health symptomatology including SI.

Here, we sought to provide a clearer understanding of the prospective relationships among mental health symptom severity and SI in a cohort of men and women veterans who had recently separated from the military. Specifically, we set out to investigate whether initial status and trajectories of mental health conditions differ by gender, and to identify temporal sequencing of mental health predictors of SI among men and women veterans of the post-9/11 era. We had no specific hypotheses regarding gender differences in trajectories as this is the first study to examine gender by time interactions for these conditions in recently separated veterans. Given the consistent association between psychopathology and SI in cross-sectional studies^{5-7,9,24} and RCTs,^{38,39} we hypothesized that increased PTSD, depression, and alcohol misuse symptom severity as well as prior SI,⁴⁰ would predict future SI, regardless of gender.

Method

Longitudinal relationships among mental health factors and subsequent SI were investigated utilizing secondary data on

recently separated veterans. Sample ascertainment and assessment methods have been described previously^{18,41} and a brief description is provided here.

Procedure and Participant Characteristics

A Department of Defense roster was used to identify a sample of veterans who had served in support of either Operation Enduring Freedom (OEF) in Afghanistan or Operation Iraqi Freedom (OIF) in Iraq and who were within 2 years of military separation (2008-2010). Random sampling and stratification by deployment component (50% deployed from Active Duty, 50% from National Guard/Reservist units) and gender (50% men; 50% women), were used. Data on gender were obtained by self-report. Veterans completed surveys at 3 time points (T1, T2, T3) over 7 years following military separation: (1) T1 was completed by 1046 veterans within 2 years of military separation, of whom 1035 veterans identified their gender, (2) T2 was completed approximately three and a half years later by 522 veterans, and (3) approximately 2 years subsequent to T2, 455 veterans completed the T3 survey (Figure 1). The Institutional Review Board at VA Boston Healthcare System provided study approval.

Cohort retention. Of the 1035 veterans at T1, 491 responded at T2 (47%), and 432 at T3 (42%). To evaluate the potential for nonresponse bias, we examined differences in demographic and clinical characteristics for responders and nonresponders. Pearson's correlation coefficients were used for continuous variables and Cramer's V with p -values calculated using Pearson's χ^2 tests were used for categorical variables. We compared those who responded at T1 and T2 to those who responded at T1 but not T2 and found that attrition at T2 was significantly but weakly associated with younger age ($r=0.137$, $P<.001$), non-White race ($V=0.074$, $P=.021$), a lower level of education ($V=0.178$, $P<.001$), and presence of a probable mental health diagnosis at T1 ($V=0.125$, $P=.013$). There were no significant differences between individuals who responded at T2 and T3 compared to those who responded at T2 but not at T3. SI status did not significantly differ between responders and nonresponders at T2 ($P=.065$) or at T3 ($P=.811$), nor between those who responded at T2 and T3 versus those who responded at T2 but not T3 ($P=.946$).

Measures

Gender was assessed at baseline (T1) with the question "What is your gender?" and responses included "male" or "female" options. Utilizing the PTSD Checklist-Military Version (PCL-M), PTSD symptom severity was assessed at T1, T2, and T3. The PCL-M consists of 17 items rated from 1 (not at all) to 5 (extremely), representing degree of distress corresponding to specific symptoms during the past

3 months. Higher scores indicate greater symptom severity. The PCL-M has strong psychometric properties⁴²⁻⁴⁵ and good internal consistency with alphas ranging from 0.75⁴⁵ to 0.96 and 0.97^{43,44} among veteran samples (current study $\alpha=T1: 0.96$, T2: 0.96, T3: 0.96). Furthermore, studies have reported good convergent validity among veteran samples⁴³⁻⁴⁵ with sensitivity and specificity scores from 0.81⁴⁶ to 0.83.⁴⁴

Severity of depressive symptoms in the past 3 months was evaluated at T1, T2, and T3 using a modified version of the Beck Depression Inventory-Primary Care (BDI-PC)⁴⁷ composed of 7 items scored from 1 (strongly disagree) to 5 (strongly agree). Higher scores indicate greater symptom severity. Among studies with medical patient samples, excellent internal consistency scores have been reported with alphas from 0.86^{47,48} to 0.88.⁴⁹ In the current study, the item asking about suicidal thoughts was removed from Aim 2 analyses involving the primary study outcome (see information further below), to avoid overlap. Internal consistency of the 6-item BDI-PC was excellent in the current study ($\alpha=T1: 0.91$, T2: 0.92, T3: 0.93).

SI was the primary outcome of this study and was measured with the following item from the BDI-PC⁴⁷ (ie, "In the last 3 months, I have had thoughts about killing myself."). Endorsement of either "agree" or "strongly agree" was considered a positive SI status. Although single-item measurements of SI have limitations, the BDI SI item is face valid, highly correlated with items 1 to 5 of Beck's Scale for SI ($r=0.48$),⁵⁰ and has been used in prior research on SI (eg, Refs.^{23,39}). We categorized the course of SI into 3 SI status groups: new onset SI (SI at T2 but not T1 or SI at T3 but not T2), chronic SI (SI at T1 and T2 or T2 and T3), and remitted SI (SI at T1 but not T2 or SI at T2 but not T3).

The Alcohol Use Disorders Identification Test for Consumption (AUDIT-C) was used to measure alcohol misuse over the past 3 months. The scale range is 0 to 12 with higher scores indicating increased severity. The AUDIT-C has demonstrated high validity,^{51,52} sensitivity and specificity^{51,53} and has been validated among military populations.^{54,55} Prior studies using the AUDIT-C have demonstrated good internal consistency with alphas ranging from 0.75 to 0.97^{52,56} (current study $\alpha=T1: 0.84$, T2: 0.79, T3: 0.79). In addition, probable traumatic brain injury (TBI) was measured with an adapted version of the Brief Traumatic Brain Injury Screen.⁵⁷

Analyses

Proportions and average scores were calculated to describe demographic characteristics and SI status. For Aim 1, gender differences in initial status of PTSD, depression, alcohol misuse severity, and SI status were investigated using independent samples t -tests and chi-square tests, respectively. Gender differences in trajectories of the 4 mental health factors were investigated using mixed effects

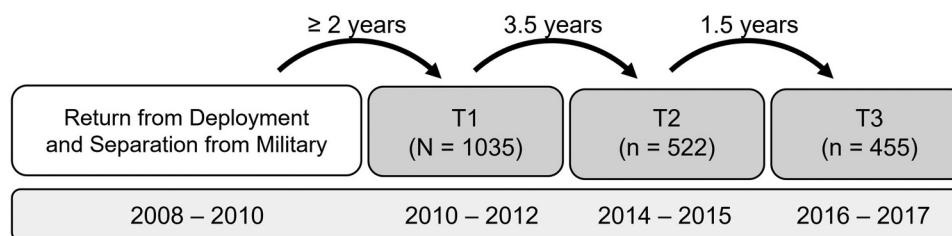


Figure 1. Timeline of study.

regression models with maximum likelihood (ML) estimation. Separate models were fit for each mental health factor. Sensitivity analyses adjusted for demographic factors that differed by gender including age, race, education, marital status, and probable TBI status. Random intercepts were included for each individual to account for the correlation that exists between repeated observations made on the same individual. ML estimation was used because it is robust to missingness, allowing for all available observations at each time point to be included. The residuals of all mixed effect models were examined for departures from normality; in the case of a significant departure from normality, an appropriate transformation was applied to the outcome.

For Aim 2, predictors of T3 SI were investigated using fixed effects binary logistic regression models to examine the effect of T1 to T2 mental health symptom severity or T1 to T2 SI status on T3 SI status. Separate models were fit for each mental health factor. Interaction terms between gender and the primary predictor variables were included to test if the effect of the predictor on the outcome differed between genders; if the interaction failed to reach statistical significance, then it was removed from the model prior to reporting regression results. Sensitivity analyses adjusted for marital status and probable TBI, as these factors were statistically significantly associated with SI status. Statistical significance was set at $P < .05$. All analyses were performed in R programming language, version 3.6.3 (R Core Team, 2017).⁵⁸ All mixed models were fit using the R package lme4, version (1.1-21).⁵⁹

Results

As shown in Table 1, men and women veteran participants differed significantly such that, on average, women were younger and more highly educated than men, and more likely to be non-White, Black, and divorced/widowed/separated or single than men. With respect to military branch, the highest proportion of both genders served in the Army while men were more likely to have served in the Marines and women were more likely to have served in the Air Force or Navy. Finally, men were more likely to have served in combat arms roles while women were more likely to have served in combat support or service support roles.

Effects of Gender on Initial Status and Trajectories of Mental Health Symptom Severity

We examined initial status and trajectories of 4 mental health factors including severity of PTSD, depression, alcohol misuse, and SI status. Gender differences were detected for initial status on severity of PTSD and alcohol misuse. At T1, PTSD symptom severity was significantly higher ($P = .013$) in men [Mdn = 34, IQR = 23-50] than women [Mdn = 29, IQR = 22-44]. Alcohol misuse was also significantly higher ($P < .001$) in men [Mdn = 4, IQR = 2-6] than women [Mdn = 2, IQR = 1-4] at T1. The proportion of men (14.1%) and women (12.6%) who endorsed SI at baseline did not significantly differ ($P = .542$).

Scores for several factors did change significantly over time within-gender. In men, scores for severity of PTSD [T1 Mdn = 34, IQR = 23-50; T2 Mdn = 32, IQR = 21-47; T3 Mdn = 31, IQR = 20.2-49.8, $P = .002$], depression [T1 Mdn = 21.5, IQR = 15-26; T2 Mdn = 19.5, IQR = 13-24.8; T3 Mdn = 19, IQR = 12-25, $P < .001$], and alcohol misuse [T1 Mdn = 4, IQR = 2-6; T2 Mdn = 3, IQR = 2-5; T3 Mdn = 3, IQR = 1-5, $P < .001$] symptom severity improved at T2 and T3 relative to T1. As previously reported,⁶⁰ in women, scores for depression severity improved at T2 and T3 relative to T1. Women also showed a decrease in the odds of reporting SI at T2 (OR = 0.177, 95% CI: 0.058, 0.493; $P = .001$) and T3 (OR = 0.225; 95% CI: 0.074, 0.625; $P = .006$), relative to T1. Despite the within-gender changes in multiple factors, no significant gender by time interactions was observed.

There was no statistically significant gender difference in SI status within a given time-point (Table 2) or across T1 to T2 and T2 to T3 patterns of SI (Table 2). As displayed in Table 2, at baseline (T1), 13.3% of veterans in the overall sample endorsed experiencing SI over the prior 3 months, followed by 8.3% at T2 and 9.6% at T3. SI status remitted at T2 for 7.2% of individuals who had a positive status at T1 and who reported their status at T2. SI status remitted at T3 for 3.3% of individuals who had a positive status at T2 and who reported their status at T3. Almost 5% of individuals who had not endorsed SI at T1 reported new onset SI at T2 and the same proportion of new onset cases were reported at T3. A relatively small proportion of individuals (3.7% from T1 to T2 and 5% from T2 to T3) were classified as

Table 1. Demographic Characteristics of Recently Separated OEF/OIF Veterans, by Gender (N = 1035).

Demographic characteristic	Overall	Men	Women	<i>t</i> / χ^2
Age in years, mean (SD)	35.3 (10.5)	36.7 (11.0)	34.1 (10.0)	3.91*
Race, % (n)				
White	76.0 (781)	81.2 (388)	71.5 (393)	12.70*
Black	13.8 (142)	8.8 (42)	18.2 (100)	18.18*
Asian	4.1 (42)	3.3 (16)	4.7 (26)	0.916
Native American	3.5 (36)	2.5 (12)	4.4 (24)	2.08
Pacific Islander	1.8 (19)	1.5 (7)	2.2 (12)	0.384
Other	2.4 (25)	2.5 (12)	2.4 (13)	0.00
Hispanic ethnicity	12.0 (123)	10.0 (48)	13.6 (75)	2.81
Education, % (n)				24.31*
High school (grad or some)	9.5 (98)	13.4 (64)	6.1 (34)	
Some post-high school	52.5 (542)	54.3 (260)	51.0 (282)	
4-year college degree	16.1 (166)	15.2 (73)	16.8 (93)	
Post-graduate education	21.9 (226)	17.1 (82)	26.0 (144)	
Marital status, % (n)				20.07*
Married/living as a couple	59.4 (609)	66.3 (315)	53.4 (294)	
Divorced/widowed/separated	19.5 (200)	14.5 (69)	23.8 (131)	
Single/never married	21.2 (217)	19.2 (91)	22.9 (126)	
Military branch, % (n)				30.01*
Marines	7.1 (73)	11.5 (55)	3.3 (18)	
Air force	12.7 (131)	10.2 (49)	14.9 (82)	
Army	64.8 (667)	64.3 (308)	65.2 (359)	
Navy	15.4 (159)	14.0 (67)	16.7 (92)	
Military job, % (n)				191.12*
Combat arms	18.7 (184)	36.7 (169)	2.9 (15)	
Combat support	46.2 (455)	39.9 (184)	51.7 (271)	
Service support	35.1 (346)	23.4 (108)	45.4 (238)	
T1 months since deployment, mean (SD)	32.7 (13.7)	33.1 (15.2)	32.3 (12.2)	1.012
T2 months since deployment, mean (SD)	70.6 (15.9)	71.4 (19.0)	70.0 (12.8)	0.986
T3 months since deployment, mean (SD)	90.2 (16.1)	91.1 (19.3)	89.4 (12.7)	1.121

Demographics collected at Time 1 (T1) except for months since deployment at T2 and T3; gender comparisons were performed using *t*-test for age and time since deployment and chi-square tests for all other characteristics; at T1 men's *n* ranged from 435 to 481 and women's *n* ranged from 524 to 554; race/ethnicity categories are not mutually exclusive and chi-square tests were performed as the listed racial category versus all other categories by gender.

**P* < .05.

having a chronic pattern of SI (Table 2). Overall, the odds of SI endorsement decreased at T2 (OR = 0.279; 95% CI: 0.131, 0.568; *P* = .001) and T3 (OR = 0.321; 95% CI: 0.151, 0.656; *P* = .002), relative to T1.

Mental Health Predictors of SI

To identify mental health predictors of future SI, we examined prediction of T3 SI by T1 and T2 symptom severity of PTSD, depression, and alcohol misuse, as well as T1 to T2 SI status. Gender by predictor (ie, T1 and T2 severity of PTSD, depression, alcohol misuse, or SI status) interaction effects on T3 SI were not statistically significant indicating that the effect of these mental health predictors on T3 SI did not differ significantly by gender. Therefore, that interaction term was removed from subsequent regression models. Statistically significant (*P* < .05) predictors of T3 SI included the following (Table 3). For every one-point increase in T1

PTSD score, the odds of endorsing SI at T3 were 4.0% higher and a one-point increase in PTSD score at T2 was associated with 5.9% greater odds of endorsing T3 SI. For every one-point increase in T1 depression or alcohol misuse score, the odds of endorsing SI at T3 were 13.5% higher and the odds of endorsing SI at T3 were 18.4% higher for every one-point increase in T2 depression score. Finally, for every one-point increase in the T2 alcohol misuse score, the odds of endorsing SI at T3 were 23.2% higher.

T1 to T2 SI status predicted future SI at T3. Compared to individuals who did not endorse SI at T1 or T2, the odds of endorsing SI at T3 were 14 times higher among those with remitted SI, nearly 47 times higher among those with new onset SI, and 51 times higher among those with chronic SI (Table 3). Note that for all regression models predicting T3 SI, inclusion of marital status and probable TBI in sensitivity analyses yielded similar results.

Table 2. Temporal SI Status and Pattern by Gender (N = 1035).

SI status/pattern	Overall % (frequency)	Men % (frequency)	Women % (frequency)	χ^2
SI at any time-point	16.8 (172/1025)	18.1 (86/475)	15.6 (86/550)	0.943
T1 SI	13.3 (136/1020)	14.1 (67/474)	12.6 (69/546)	0.511
T2 SI	8.3 (43/519)	9.3 (22/237)	7.4 (21/282)	0.594
T3 SI	9.6 (43/447)	10.5 (22/209)	8.8 (21/238)	0.392
T1 to T2 SI pattern				1.105
No SI	84.4 (434/514)	84.3 (199/236)	84.5 (235/278)	
Remitted SI	7.2 (37/514)	6.4 (15/236)	7.9 (22/278)	
New onset SI	4.7 (24/514)	5.5 (13/236)	4.0 (11/278)	
Chronic SI	3.7 (19/514)	3.8 (9/236)	3.6 (10/278)	
T2 to T3 SI pattern				0.77
No SI	86.9 (313/360)	86.1 (143/166)	87.6 (170/194)	
Remitted SI	3.3 (12/360)	3.0 (5/166)	3.6 (7/194)	
New onset SI	4.7 (17/360)	4.8 (8/166)	4.6 (9/194)	
Chronic SI	5.0 (18/360)	6.0 (10/166)	4.1 (8/194)	

Remitted, new onset, and chronic refer to SI status during T1 to T2 or T2 to T3 as labeled. SI status is based on participants' report of experiencing SI over the prior 3-month period.

Discussion

The primary goal of this study was to elucidate gender-specific prospective relationships between mental health severity and future SI in recently separated men and women veterans.

Effects of Gender on Initial Status and Trajectories of Mental Health Symptom Severity

In agreement with prior gender-stratified research⁵ in OEF/OIF veterans, we found no significant gender difference in proportion of men and women veterans reporting SI;

Table 3. Prediction of T3 Suicidal Ideation by T1 and T2 Mental Health Symptom Severity Score.

Mental health symptom severity	Odds ratio	95% CI	P
T1 PTSD	1.040	1.022, 1.058	<.001*
T1 depression	1.135	1.074, 1.208	<.001*
T1 alcohol misuse	1.135	1.013, 1.267	.026*
T2 PTSD	1.059	1.037, 1.082	<.001*
T2 depression	1.184	1.111, 1.274	<.001*
T2 alcohol misuse	1.232	1.084, 1.401	.001*
Remitted SI	14.140	4.792, 41.763	<.001*
New onset SI	46.759	14.82, 160.292	<.001*
Chronic SI	51.213	14.382, 202.958	<.001*

Separate models were fit for each factor; sensitivity analyses were conducted with inclusion of marital status and probable TBI due to the association of these covariates with T3 SI, and yielded similar results.

*P < .05.

however, relative to the study by Gradus et al. (2013),⁵ our study revealed relatively fewer veterans reporting SI at baseline, approximately 20% versus 13%, respectively. It is possible that this is a true difference in the samples. However, another possibility is the difference in timeframe of measurement of SI. The current study queried SI within the past 3 months for each time-point whereas Gradus et al. (2013)⁵ queried SI during the time-period since the last deployment, which was approximately 49 months, on average. Thus, the time coverage of SI measurement differed significantly.

In the current study, we found that men had greater baseline average PTSD and alcohol misuse severity than women. This was expected given epidemiological findings on gender differences in risk of incident PTSD and alcohol use disorder for similarly aged samples of post-9/11 veterans.¹⁴ Interestingly, baseline gender differences in mental health severity were maintained longitudinally, with no significant gender by time interaction occurring. The maintenance of baseline gender differences underscores the need for a gender-specific approach to research and mental health services.

Although trajectories of the odds of SI did not differ by gender in the current study, it is possible that gender differences exist with respect to the severity of SI or that patterns differ within shorter time windows such as between T1, T2, and T3 time-points investigated in our study. Additionally, although we did not detect significant interaction of gender with mental health symptom severity to predict future SI, prior research suggests that women and men differ with respect to the causes of mental health symptoms that we found to be associated with future SI, such as likelihood of exposure to combat versus sexual harassment and/or assault¹⁵⁻¹⁷ and experiences within military culture from a cultural scripts theory perspective.^{34,36,37} For example,

research has shown that PTSD, depression, and alcohol misuse symptom severity were significantly associated with prior exposure to deployment sexual harassment in women veterans; yet, in veteran men, prior exposure to deployment sexual harassment was significantly associated with future PTSD symptom severity but not depression or alcohol misuse severity.⁴¹

While we did not observe statistically significant differences in the mental health symptom severity trajectories of men and women, significant changes were observed within gender. Importantly though, these within-gender changes were clinically modest for PTSD and depression. In men, PTSD, depression, and alcohol misuse declined over time. Despite the improvement, depression symptom severity scores remained in the moderate clinical range⁶¹ and the decrease in mean PTSD severity scores did not meet the 10-point minimum required to be considered clinically meaningful.⁶² However, in men, the decrease in alcohol misuse score from T1 to T2 translated to a change from “at-risk” to a “lower-risk” classification⁶³ which was maintained at T3. In women, as previously reported, the statistically significant decrease in depression severity, while an improvement, represented scores that remained in the moderate severity range.⁶⁰

For men and women, the T1 to T2 decrease in odds of SI is noteworthy and suggests a propensity for improvement during the first approximately 5 years following military separation. In contrast, SI persistence around approximately the 5-year post-separation mark (T2) may suggest a risk for a chronicity of SI extending beyond this timeframe. This is reflected in our findings that remittance of SI was more likely to occur from T1 to T2 than from T2 to T3 and a chronic pattern was more likely to occur from T2 to T3 than from T1 to T2. This finding underscores the importance of early intervention to address SI as well as a need for longer-term continuation of screening, especially given other research indicating that suicide death risk remains elevated even 6 years after military separation.⁶⁴

Mental Health Predictors of SI

Our hypothesis that increased PTSD, depression, and alcohol misuse severity as well as prior SI would predict future SI, regardless of gender, was supported. We found no significant gender by mental health factor interactions in predicting T3 SI. Of all the mental health predictors examined, the strongest predictor of T3 SI was prior SI. Specifically, chronic and new onset SI had the strongest effects yielding 51- and 47-times higher odds of future SI, respectively, followed by remitted SI which yielded 14 times higher odds of future SI. Of the mental health conditions examined, the strongest mental health symptom severity predictors of T3 SI, in descending order, were: T2 alcohol misuse, T2 depression, T1 depression, T1 alcohol misuse, T2 PTSD, and T1 PTSD. Importantly, a one-point increase in T2 alcohol misuse

score increased the odds of T3 SI by 23.2%. This strong relationship between alcohol misuse and future SI underscores the importance of intervening to address alcohol misuse in veterans, even 5 to 6 years after military separation. In addition, although we did not find statistically significant gender by predictor interaction effects on T3 SI, the finding that men had higher baseline alcohol misuse than women and have higher rates of probable alcohol use disorder^{13,14} suggests that continued long-term targeting of alcohol misuse may be particularly important to veteran men. Finally, while men and women did not differ significantly with respect to depression severity, women veterans exhibit higher rates of depressive disorders than veteran men,^{13,14} therefore, longer-term screening and treatment of depression is warranted in women.

Overall, mental health symptomatology at T2, the time-point more proximal to T3 SI, had the strongest association with T3 SI. Similarly, a study of mental health clinic outpatients with frequent, nearly daily, SI compared to those without SI, exhibited increased odds of future suicidality with the greatest odds occurring within 1 month followed by persisting but decreasing odds within the remainder of the year-long study window.⁶⁵ The strongest predictors of SI identified in the current prospective study were also identified as significant predictors of suicide attempt in a 2-year, 2 time-point study of phone-interviewed OEF/OIF veterans, oversampled for those with a PTSD diagnosis.⁶⁶ Taken together, our findings, in concordance with other research, underscore the importance of early screening for SI in veterans with PTSD, depression, or alcohol misuse as well as psychoeducation on open communication around SI with partners and therapists to allow early intervention and to prevent potential progression along the ideation-to-action continuum. Building on prior studies, our findings indicate the importance of continued screening and intervention for alcohol misuse, even 5 to 6 years after military separation, for prevention of SI.

Given our finding that remittance of SI was more likely to occur from T1 to T2 than from T2 to T3 and that chronic SI was more likely to occur from T2 to T3 than from T1 to T2 coupled with the finding that future SI is predicted by PTSD, depression, and alcohol misuse severity as well as prior SI, early and longer-term engagement in mental health care with implementation of screening and referral methods for these factors is warranted. Prior epidemiological studies of suicide death have identified a risk peak early following military separation.^{64,67,68} While our study begins within 2 years of military separation, and therefore is not specifically focused on the earliest time window, it does show the pattern of higher rates of SI earlier with a subsequent decrease in the odds of endorsing SI within 3.5 years of T1. While most veterans did not endorse SI at any time-point, of those who did, remission was most likely to occur earlier from T1 to T2 whereas chronic SI was most likely to occur later from T2 to T3, which was approximately 5-years post-

military service. The latter finding on chronic SI aligns with prior research showing increased suicide risk continuing out to 6-years post-military.⁶⁴

Within the T2 to T3 (5-year post-military service) window, our findings indicated that, other than prior SI, alcohol misuse severity was the strongest predictor of future SI. Whether individuals with alcohol misuse problems are engaging into alcohol-related treatment in this time window is unknown. Research is lacking regarding prospective associations between types of mental health service use and specific psychiatric diagnoses in recently separated post-9/11 veterans, either within or outside of the VA. However, one exception is an epidemiological study which used data from the VA Corporate Data Warehouse and found that among Iraq and Afghanistan war veterans who used VA and screened positive for alcohol misuse (AUDIT-C ≥ 5), 9% to 24% of women and 8.5% to 16% of men visited the VA addiction treatment clinic at least once within 90 days of screening positive for alcohol misuse.⁶⁹ Additional studies of service use rates specific to diagnostic need and extending beyond a short post-separation period are needed.

Future studies should also examine service use by post-9/11 veterans who do not use VA health services. Importantly, from 2017 to 2018, the suicide rate decreased by 2.4% for VA users but increased by 2.5% for those who do not use VA.⁷⁰ Notably, not all veterans are enrolled in the VA health system and among post-9/11 enrollees, approximately 40% do not use VA health services.⁷¹ Therefore, a better understanding of levels and types of service use and association with psychiatric diagnoses is needed to prevent suicide in veterans who do not use VA services.

The goal of a recent interorganizational effort is to fill gaps in access to mental health support and suicide prevention during the first-year military to civilian transition. However, our findings indicate the need for such programming to extend beyond the first year. The “Joint Action Plan for Supporting Veterans During Their Transition From Uniformed Service to Civilian Life” was required by Executive Order 13822 in 2018.⁷² The plan organizes strategies for suicide prevention with clearly stated goals, metrics, and targets organized into 3 tiers—*universal*, *selective*, and *indicated*—stratified by risk-level. Agencies implementing these strategies include VA, DoD, and Department of Homeland Security (DHS). For example, VA and DoD will lead a *universal* strategy of outbound calling to service members prior to military separation and at 90-, 180-, and 365-days post-separation to provide information on peer support, mental healthcare resources, healthcare eligibility, VA benefits if applicable, and a point of contact for acute needs. For selected populations, mental health screening and identification will be conducted by DoD prior to separation and by VA after separation within the first-year post-separation. However, those outside of VA care may not receive the post-separation screening under this particular

strategic mechanism. For *indicated* individuals at the highest risk level, increased monitoring of VA healthcare users will be performed during the first-year post-separation with assessments for suicide risk, depression, sleep, and chronic pain. Examples of other strategies targeting higher risk individuals are the enhancement of Military OneSource nonmedical counseling services during 6 to 12 months post-deployment as well as the expansion of partnership models with Vet Centers and non-VA community providers supported by increasing department personnel (VA/DoD/DHS) trained on referral to community support resources and including follow up phone-calls during first year post-deployment.

The goals and strategies of the Joint Action Plan are focused on the first-year post-military because research has indicated the importance of early risk identification and intervention. Our findings of chronic SI persistence at 5-to-6-years post-military indicate that there may be a need to continue the efforts for selected or indicated populations, such as those with alcohol misuse, into the longer-term. Most of the Joint Action Plan strategies were rolled out in 2018 with the goal of full implementation before December 2019. Given the time required to detect prospective associations, future research should re-evaluate SI patterns following the December 2019 implementation of these policies to discern potential amelioration of SI.

Limitations

Several limitations of this study are worth noting. The finding that veterans who were younger, of non-White race, had a lower level of education, and/or reported a mental health diagnosis at T1 were slightly more likely to drop out at T2 suggests that longitudinal outcomes may somewhat underrepresent findings for these individuals. However, the estimated correlations between these variables suggest weak associations and SI status did not differ among responders and nonresponders at any time point. Together these findings suggest that this bias was unlikely to substantially impact results.

It is also important to consider the context of the SI measure when interpreting SI status group outcomes. The assessment of SI in the current study queried SI over the past 3 months whereas the timing between assessments spanned years. Therefore, it is possible that SI could have remitted or persisted between assessment time-points. Additionally, suicide prevalence and patterns can change over time requiring a need for continued study. Findings should also be interpreted with the caveat that the final data collection occurred several years ago in 2017.

Finally, while there are limitations to assessing SI with a single item, studies have demonstrated that this item is strongly associated with items 1 to 5 of the Beck’s Scale for SI ($r=0.48$), and is therefore considered a justified

method of measuring SI.⁵⁰ Additionally, previous studies have utilized this item to investigate SI.^{23,39}

Conclusion

The finding that baseline gender differences in mental health symptom severity, wherein men reported higher PTSD and alcohol misuse severity, were maintained over time supports the need for gender-specific mental health services. Although no gender by time interactions for mental health symptom severity or SI status were observed, and associations between mental health symptom severity and future SI were similar for men and women, significant within-gender changes included decreased PTSD, depression, and alcohol misuse symptom severity in men and decreased odds of SI as well as depression symptom severity in women. The first several years following military separation represent a period of particular vulnerability to SI. Screening and treatment efforts targeted at PTSD, depression, and alcohol misuse are important in the early post-military phase but should also be conducted over the longer term to reduce the risk and/or recurrence of SI to prevent potential future suicidality.

Author Contributions

The data collection for the present study was part of a larger parent project developed by D. Vogt and B.N. Smith. K.A. Lawrence developed the design for this particular study with consultation from B.N. Smith. K.A. Lawrence, A.J. Dugan, and S. Nigam conducted the study analyses with input from B.N. Smith and E. Slade. K.A. Lawrence drafted the manuscript, and all authors provided critical review. All authors approved the final version of the manuscript for submission.

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The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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