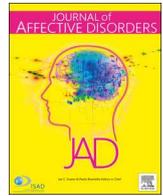




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journal homepage: www.elsevier.com/locate/jad

Research paper

Comorbid PTSD and Depression Diagnoses Mediate the Association of Military Sexual Trauma and Suicide and Intentional Self-Inflicted Injury in VHA-Enrolled Iraq/Afghanistan Veterans, 2004-2014

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ARTICLE INFO

Keywords:

Suicidal ideation
PTSD
depression
veterans
military sexual trauma

ABSTRACT

Background: Exposure to military sexual trauma (MST) in veterans is associated with suicidal ideation. Previous research suggests there are mechanisms of this association, including posttraumatic stress disorder (PTSD) and depression. Research has yet to examine whether comorbid PTSD and depression mediate the association of MST and suicide and intentional self-inflicted injury, and whether this comorbidity confers a greater risk for suicide relative to PTSD-only and depression-only. The current study addressed this gap in our knowledge.

Methods: Screening results identifying MST exposure, PTSD and depression diagnoses, suicide and intentional self-inflicted injury, and demographic covariates in 435,690 Iraq/Afghanistan veterans were extracted from Veterans Health Administration (VHA) medical records. Veterans were included if they attended VHA from 2004-2014. Mediation was tested with path analyses.

Results: Suicide and intentional self-inflicted injury was observed in 16,149 (3.71%) veterans. The indirect effect of suicide and intentional self-inflicted injury, given a positive screen for MST, was highest among veterans with comorbid PTSD and depression diagnoses (indirect effect = 3.18%, 95% confidence interval [CI] [3.01%, 3.32%]), with smaller probabilities observed for both PTSD-only (indirect effect = -0.18%, 95% CI [-0.20%, -0.14%]) and depression-only (indirect effect = 0.56%, 95% CI [0.51%, 0.62%]; $p < .05$).

Limitations: Data were limited to VHA-enrolled Iraq/Afghanistan veterans.

Conclusions: To reduce suicide risk among veterans with a history of MST, treatments may be most effective if they target comorbid PTSD and depression. Future research should examine the mechanisms through which comorbid PTSD and depression result in heightened risk for suicide and intentional self-inflicted injury.

1. Introduction

Suicide is one of the leading causes of preventable death among veterans (Maynard et al., 2018). During the Operation Enduring Freedom (OEF)/Operation Iraqi Freedom (OIF) conflicts, the age- and sex-adjusted suicide mortality rate increased significantly in the Department of Defense from 18.5 (2005) to 27.7 (2017) per 100,000 (U.S. Department of Veterans Affairs [VA], 2019a). Among veterans, the prevalence of suicide has increased 6.1% from 2005 to 2017 (Department of Veterans Affairs, Office of Mental Health & Suicide Prevention 2019a). Moreover, recent estimates suggest veterans die by suicide at 1.5 times the rate of civilians (Department of Veterans Affairs, Office of Mental Health & Suicide Prevention 2019a). Better

understanding risk for suicide among veterans is of critical importance and is identified as a VA “top clinical priority” in 2019 (Department of Veterans Affairs, Office of Health Services Research & Development 2019b).

Several military and deployment experiences, including sexual trauma during military service, elevate risk for suicidal self-directed violence (see review, Monteith, Holliday, Hoyt, & Bahraini, 2019) and suicide and intentional self-inflicted injury (Kimerling et al., 2007). Sexual harassment or trauma that occurred during military service was coined “military sexual trauma” by the VA (MST; U.S. Government 38 U.S.C., 2014). Among all VA-enrolled veterans, 29.1% of females and 1.6% of males report MST (Department of Veterans Affairs, Office of Mental Health & Suicide Prevention 2018b). Among OEF/OIF veterans

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<https://doi.org/10.1016/j.jad.2020.05.024>

Received 5 September 2019; Received in revised form 9 April 2020; Accepted 10 May 2020

Available online 23 May 2020

0165-0327/ © 2020 Published by Elsevier B.V.

who attended the VHA for primary care or mental health services more specifically, 15.1% of females and 0.7% of males reported MST (Kimerling et al., 2010). Risk for suicidal ideation and suicide attempt are prevalent after exposure to MST. One study observed that 75% of veterans endorsed suicidal ideation and 41% reported a suicide attempt following MST exposure (Monteith, Holliday, Schneider, Forster, & Bahraini, 2019). Females who reported that their PTSD symptoms were the result of MST were 2–3 times more likely to report suicidal ideation relative to those that reported other trauma triggers (Blais and Monteith, 2019). Finally, a study conducted on six million VA-enrolled veterans indicated that male and female veterans who experienced MST were 1.7 and 2.3 times more likely to die by suicide relative to those who did not experience MST, respectively (Kimerling et al., 2016).

Though MST appears to confer a direct risk for suicide mortality (Kimerling et al., 2016), nearly half of veterans who die by suicide have a diagnosed mental health condition (Ilgen et al., 2010). Indeed, MST may serve as an index trauma for PTSD (Blais and Monteith, 2019) or a trigger for depression (Department of Veterans Affairs, Mental Health 2019c). A study conducted on 494,822 veterans demonstrated those who reported MST had 4.2 higher odds of PTSD, 2.1 higher odds of depressive disorders, and 5.2 higher odds of comorbid PTSD and depression, relative to those with no history of MST (Gilmore et al., 2016). PTSD and depression, as well as their comorbidity, in turn, are positively associated with suicidal ideation/behavior (Kimbrel et al., 2016; Nichter et al., 2019; Pukay-Martin et al., 2012). That is, risk for suicidal ideation in veterans was 4.8 times higher among those with a PTSD diagnosis, 20.8 times higher among those with a depression diagnosis, and 39.3 times higher among those with comorbid PTSD and depression diagnoses (Arenson et al., 2018). To date, two studies examined the mediating role of PTSD and depression on the association of MST and suicidal ideation. Gradus, Street, Suvak, and Resick (2013) observed that depression mediated the association of sexual harassment during deployment and suicidal ideation for both male and female veterans; however, PTSD mediated this association in males but not females. Blais and Geiser (2019) observed that depression and PTSD-related anhedonia severity mediated the association of assault MST and suicidal ideation. Though informative, these two studies are limited in that they did not include comorbid PTSD and depression diagnoses and the Blais and Geiser (2019) study was limited to females.

The purpose of the current study was to examine whether a PTSD-only diagnosis, a depression-only diagnosis, or comorbid PTSD and depression diagnoses mediated the association of a history of MST and suicide and intentional self-inflicted injury in a sample of OEF/OIF VHA-enrolled veterans. It was hypothesized that comorbid PTSD and depression would confer the greatest risk for suicide among the three diagnostic categories. Covariates of sex, age, race/ethnicity, education level, marital status, military component, military branch, military rank, and combat exposure were included given that male sex (Schoenbaum et al., 2014), ages 18–25 (Maguen et al., 2015), White race (Kaplan, Hugué, McFarland, & Newsom, 2007; Maguen et al., 2015; Schoenbaum et al., 2014), 12+ years of education (Kaplan, Hugué, McFarland, & Newsom, 2007), never married (Maguen et al., 2015), active duty (Maguen et al., 2015), Army/Marine military branches (Kang et al., 2015), lower military rank (Schoenbaum et al., 2014), and reported combat exposure (see meta-analysis, Bryan et al., 2015) have established associations with suicidality, including suicidal ideation, plans, attempts and mortality. With research showing that rates of suicide have increased notably among OEF/OIF veterans (Ramchand et al., 2011), we opted to examine correlates of suicide and intentional self-inflicted injury in this cohort specifically.

2. Methods

2.1. Participants

Participants were OEF/OIF veterans who were enrolled in VHA-care

from 2004–2014. Participants were included in the current study if they were listed in the 2011 OEF/OIF roster file, had VHA clinical records, and if they had at least five-years of follow-up VHA data up until the end of fiscal year 2014. The five-year period was selected to allow for symptom manifestation and documentation. For the purposes of this study, participants were excluded if they declined to answer the VA MST Screening Questionnaire or if they had missing data on their sex ($n = 95,977$). The full sample was comprised of the remaining 435,690 veterans.

2.2. Procedure

Data from the 2011 OEF/OIF roster file and VHA clinical records were merged to create the current dataset. The 2011 OEF/OIF roster file included veterans who deployed to post-9/11 conflicts and separated from the military between 2004–2011. This roster file provided data on demographic and military service characteristics. The VHA clinical records included *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM) codes for suicide and intentional self-inflicted injury and mental health diagnoses. Mental health diagnoses were assigned by licensed clinicians. VHA clinical data were collected from the Corporate Data Warehouse.

Approval for this study was granted from the Institutional Review Board for the University of Utah School of Medicine and Research and Development Committee for the Veterans Affairs (VA) Salt Lake City Health Care System.

2.3. Measures

2.3.1. Suicide and intentional self-inflicted injury, PTSD, and depression

Evidence of suicide and intentional self-inflicted injury and PTSD and depression diagnoses, as identified by ICD-9-CM codes, were extracted from the VHA clinical records. ICD-9-CM codes were defined and grouped using the Healthcare Costs and Utilization Project Clinical Classification Software (HCUP-CCS). HCUP-CCS assigns ICD-9-CM codes to categories, which have been used in previous research (e.g., Brignone et al., 2016; Gundlapalli et al., 2017; Hand, et al., 2019; Livingston et al., 2019). Suicide and intentional self-inflicted injury were identified using HCUP-CCS category 5.13 (suicide and intentional self-inflicted injury). Depression was identified using HCUP-CCS category 5.8.2 (depressive disorders). PTSD was identified using ICD-9-CM code 309.81. The presence of suicide and intentional self-inflicted injury was individually dummy coded as 1 (present) and 0 (absent).

In order to examine PTSD-only, depression-only, and comorbid PTSD and depression diagnoses as possible mediators of the association of MST and suicide and intentional self-inflicted injury in the same model, variables were transformed from the original PTSD and depression variables identified by the ICD-9-CM codes to dummy codes. The first dummy code reflected veterans who had only a PTSD diagnosis and was coded as follows: 1 (PTSD-only diagnosis) and 0 (depression-only, comorbid PTSD and depression, or no PTSD and depression). The second dummy code reflected veterans who had only a depression diagnosis and was coded as follows: 1 (depression-only diagnosis) and 0 (PTSD-only, comorbid PTSD and depression, or no PTSD and depression). The third dummy code reflected veterans who had comorbid PTSD and depression diagnoses and was coded as follows: 1 (comorbid PTSD and depression diagnoses) and 0 (PTSD-only, depression-only, or no PTSD and depression).

2.3.2. MST

The VA *MST Screening Questionnaire* was used to assess MST. All veterans are screened for MST upon initiating VHA care. The screening items include the following two questions: “While you were in the military... (1) did you receive uninvited and unwanted sexual attention, such as touching, cornering, pressure for sexual favors, or verbal remarks? (2) did someone ever use force or threat of force to have sexual contact with you

against your will?” Response options to both questions include “yes,” “no,” or “decline.” Responses to the two items are not recorded separately in the VHA clinical record. Rather, affirmative responses to one or both items are recorded as a positive MST screen.

2.3.3. Covariates

Demographic and military characteristics were included as covariates. Demographic covariates included sex (female, male), age, race/ethnicity (White, Black, Hispanic, other, unknown), education level (high school, beyond high school), and marital status (divorced/other, married, never married). Military covariates included component (active duty, Guard, Reserve), military branch (Army, Navy/Coast Guard, Marines, Air Force), military rank (enlisted, officer/warrant), and combat exposure (“yes”, “no”).

2.4. Analytic Plan

Descriptive statistics were calculated for all study variables and stratified by presence or absence of suicide and intentional self-inflicted injury and MST screen result. To examine whether PTSD-only, depression-only, or comorbid PTSD and depression diagnoses mediated

the association of MST and suicide and intentional self-inflicted injury, path analysis was utilized. MST was included as an independent, exogenous variable and suicide and intentional self-inflicted injury was included as a dependent, endogenous variable. Dummy codes reflecting no diagnoses, a PTSD-only diagnosis, depression-only diagnosis, and comorbid PTSD and depression diagnoses were included as mediators (no diagnoses served as the reference category). Direct effects of MST, diagnostic groups, and covariates on suicide and intentional self-inflicted injury and indirect effects of MST on suicide and intentional self-inflicted injury via diagnostic groups were specified. The model tested is depicted in Figure 1. Results are presented as percentages in the manuscript and probabilities in the tables. Nagelkerke tests were calculated for each path. Analyses were completed in the R environment (R Core Team, 2018), and path analysis was completed with the Marginal Mediation package in R (Barrett et al., 2019).

3. Results

Sample characteristics stratified by presence of suicide and intentional self-inflicted injury and MST screen result are presented in Table 1. Of the included 435,690 OEF/OIF VHA-enrolled veterans,

Table 1
Demographic Characteristics Among VHA-Enrolled Veterans with and without SISII and MST

	SISII		No SISII	
	MST (n = 1,303)	No MST (n = 14,846)	MST (n = 15,281)	No MST (n = 404,260)
PTSD Only Diagnosis				
No	1,262 (96.85%)	14,165 (95.41%)	13,521 (88.48%)	348,161 (86.12%)
Yes	41 (3.15%)	681 (4.59%)	1,760 (11.52%)	56,099 (13.88%)
Depression Only Diagnosis				
No	1,183 (90.79%)	12,959 (87.29%)	12,807 (83.81%)	361,778 (89.49%)
Yes	120 (9.21%)	1,887 (12.71%)	2,474 (16.19%)	42,482 (10.51%)
Comorbid PTSD and Depression Diagnoses				
No	170 (13.05%)	2,900 (19.53%)	8,632 (56.49%)	311,374 (77.02%)
Yes	1,133 (86.95%)	11,946 (80.47%)	6,649 (43.51%)	92,886 (22.98%)
Biological Sex				
Female	851 (65.31%)	807 (5.44%)	11,511 (75.33%)	40,500 (10.02%)
Male	452 (34.69%)	14,039 (94.56%)	3,770 (24.67%)	363,760 (89.98%)
Race/Ethnicity				
Black	299 (22.95%)	2,046 (13.78%)	3,840 (25.13%)	67,811 (16.77%)
Hispanic	119 (9.13%)	1,500 (10.10%)	1,685 (11.03%)	44,043 (10.89%)
Other	37 (2.84%)	385 (2.59%)	553 (3.62%)	13,501 (3.34%)
Unknown	27 (2.07%)	209 (1.41%)	443 (2.90%)	11,921 (2.95%)
White	821 (63.01%)	10,706 (72.11%)	8,760 (57.33%)	266,984 (66.04%)
Education				
High School	1,072 (82.27%)	13,134 (88.47%)	11,843 (77.50%)	320,022 (79.16%)
More than HS	207 (15.89%)	1,515 (10.20%)	3,231 (21.14%)	78,988 (19.54%)
Missing	24 (1.84%)	197 (1.33%)	207 (1.35%)	5,250 (1.30%)
Marital Status				
Divorced/Other	102 (7.83%)	561 (3.78%)	1,323 (8.66%)	18,069 (4.47%)
Married	473 (36.30%)	5,906 (39.78%)	5,476 (35.84%)	175,844 (43.50%)
Never Married	723 (55.49%)	8,363 (56.33%)	8,421 (55.11%)	209,702 (51.87%)
Missing	5 (0.38%)	16 (0.11%)	61 (0.40%)	645 (0.16%)
Age	30.12 (7.95)	29.76 (7.79)	31.21 (8.67)	32.15 (9.35)
Military Component				
Guard	299 (22.95%)	4,108 (27.67%)	2,835 (18.55%)	108,817 (26.92%)
Reserve	818 (62.78%)	9,096 (61.27%)	9,809 (64.19%)	233,368 (57.73%)
Active Duty	186 (14.27%)	1,642 (11.06%)	2,637 (17.26%)	62,075 (15.36%)
Branch				
National/Coast Guard	219 (16.81%)	1,275 (8.59%)	2,827 (18.50%)	51,337 (12.70%)
Marines	88 (6.75%)	2,129 (14.34%)	977 (6.39%)	60,071 (14.86%)
Air Force	139 (10.67%)	883 (5.95%)	1,977 (12.94%)	40,583 (10.04%)
Army	857 (65.77%)	10,559 (71.12%)	9,499 (62.16%)	252,266 (62.40%)
Missing	0 (0.00%)	0 (0.00%)	1 (0.01%)	3 (0.00%)
Rank				
Officer	40 (3.07%)	255 (1.72%)	991 (6.49%)	27,247 (6.74%)
Enlisted	1,263 (96.93%)	14,591 (98.28%)	14,290 (93.51%)	377,013 (93.26%)
Combat Exposure				
No	762 (58.48%)	9,010 (60.69%)	9,266 (60.64%)	253,347 (62.67%)
Yes	541 (41.52%)	5,836 (39.31%)	6,015 (39.36%)	150,913 (37.33%)

Note. SISII = suicide and intentional self-inflicted injury; VHA = Veterans Health Administration; MST = military sexual trauma

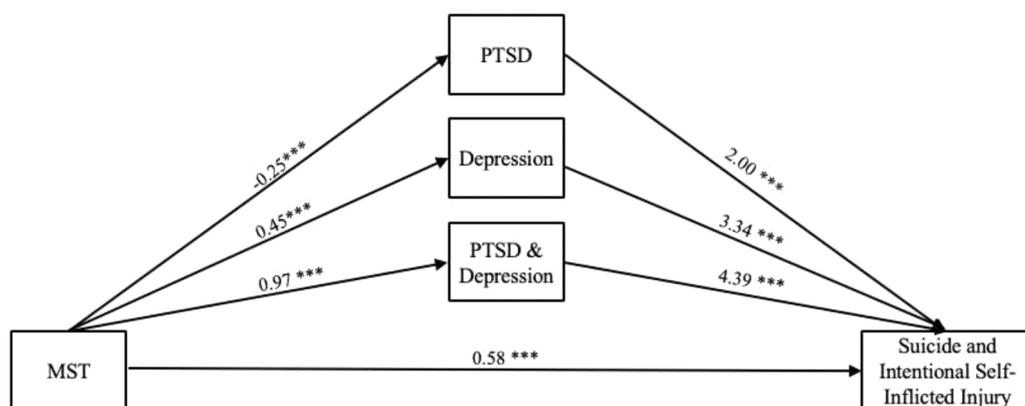


Figure 1. Model of PTSD, Depression, and Comorbid PTSD and Depression Diagnoses as Mediators of MST and Suicide and Intentional Self-Inflicted Injury in VHA-Enrolled Veterans ($N = 435,690$).

Note. PTSD = posttraumatic stress disorder, MST = military sexual trauma. The model was adjusted for covariates of biological sex, age, race/ethnicity, education, marital status, military component, military branch, and military rank. All path estimates can be found in Table 2.

16,149 (3.71%) veterans reported suicide and intentional self-inflicted injury and 16,584 (3.81%) reported history of MST. Further, 58,581 (13.45%) had a diagnosis of PTSD-only, 46,963 (10.78%) depression-only, and 112,614 (25.85%) comorbid PTSD and depression. Nearly 50% ($n = 217,532$; 49.93%) did not have a PTSD and/or depressive diagnosis. The majority of the sample identified as male, White, high school as their last educational level, never married, previously active duty, in the Army branch, enlisted, and no history of combat exposure, with an average age of 32.03 (standard deviation [SD] = 9.29).

Path estimates reported as probabilities, 95% confidence intervals (CI), significance results, and Nagelkerke values for all paths are reported in Table 2. All direct paths from MST to each mediator, as well as each mediator to suicide and intentional self-inflicted injury were positive and significant, except for the path from MST to PTSD, which was negative. All indirect paths through PTSD-only, depression-only, and comorbid PTSD and depression diagnoses were also significant. The indirect effect or probability of suicide and intentional self-inflicted injury, given a positive screen for MST, was largest among veterans with comorbid PTSD and depression diagnoses (indirect effect = 3.18%, 95% CI [3.01%, 3.32%]). The indirect effect of suicide and intentional self-inflicted injury given a positive screen for MST was significant but lower in magnitude among veterans with PTSD-only (indirect effect = -0.18%, 95% CI [-0.20%, -0.14%]) and depression-only diagnoses (indirect effect = 0.56%, 95% CI [0.51%, 0.62%], $ps < .05$). All covariates were significantly associated with suicide and intentional self-inflicted injury ($ps < .05$), except for divorced/other marital status as compared to never married. Specifically, males relative to females, National/Coast Guard and Air Force relative to Army, Guard and Reserve relative to Active Duty, and enlisted relative to officer status were positively associated with suicide and intentional self-inflicted injury. Conversely, older age, Black, Hispanic, other, and unknown race/ethnicity relative to White, beyond high school education relative to only high school education, married relative to never married, Marines relative to Army, and combat exposure relative to no combat exposure were negatively associated with suicide and intentional self-inflicted injury.

4. Discussion

Results from the current study suggest the highest probability of suicide and intentional self-inflicted injury, given a positive screen for MST, is in OEF/OIF VHA-enrolled veterans with comorbid PTSD and depression diagnoses. The probability of suicide and intentional self-inflicted injury, given a positive screen for MST, was also found in OEF/OIF VHA-enrolled veterans with PTSD-only and depression-only; however, the effect was lower in magnitude. Additionally, PTSD had a negative indirect effect on the association of MST and suicide and intentional self-inflicted injury, which differed from the positive indirect effects found among OEF/OIF VHA-enrolled veterans with either

comorbid PTSD and depression diagnoses or a depression-only diagnosis. Our findings have important implications for screening and treatment interventions.

Our results suggest that early detection of comorbid PTSD and depression diagnoses is crucial for the identification of veterans with elevated risk for suicide and intentional self-inflicted injury. While VHA clinics screen for both PTSD and depression as they enact measurement based care (Department of Veterans Affairs 2016), not all non-VHA specialty clinics or trauma centers screen for these two disorders. Indeed, Love and Zatzick (2014) reported that of 391 non-VA trauma centers from across the U.S., only 7% screened for PTSD and 23% screened for depression. Our results suggest clinics that provide PTSD- or depression-related services to veterans should conduct early screens for these conditions. Fortunately, there are brief valid screening measures for PTSD and depression that would be useful for non-VHA specialty clinics or trauma centers to implement. Indeed, the Primary Care PTSD Screen for DSM-5 (PC-PTSD-5) shows strong diagnostic accuracy and includes only five items, which minimizes burden to clinicians who need to screen for several possible concerns (Prins et al., 2016). Additionally, the Patient Health Questionnaire-2 includes two items to screen for depression and previous research indicates that it has strong sensitivity and specificity to detect depression in the primary care settings (Kroenke, et al., 2003). Use of such brief measures may provide early detection of comorbid PTSD and depression symptoms, allowing for further assessment of these mental health concerns and potential identification of veterans at higher risk for suicide and intentional self-inflicted injury.

Our findings also suggest that it is critical to treat comorbid PTSD and depression among MST survivors to effectively reduce suicide risk. Evidence-based treatments for comorbid PTSD and depression have particular utility as 36% of veterans seeking VA primary health care screened positive for comorbid PTSD and depression symptoms (Campbell et al., 2007). Research indicates that evidence-based treatments for PTSD also reduce symptoms of depression among veterans who report MST. Indeed, a randomized control trial conducted on 86 veterans with MST-related PTSD observed that both PTSD and depression symptoms decreased significantly following Cognitive Processing Therapy (Surís, et al., 2013). Other treatments have also been found to simultaneously reduce PTSD and depressive symptoms, including Prolonged Exposure (Aderka et al., 2013; Foa et al., 2005), Cognitive Behavioral Therapy (Litz, et al., 2007), Behavioral Activation (Jakupcak et al., 2010), behavioral activation with therapeutic exposure (Gros et al., 2012), and behavioral activation with exposure therapy and cognitive restructuring (Nixon & Nearmy, 2011). Conversely, there is evidence that among sexual assault survivors, the presence of baseline depressive symptoms in those with PTSD was associated with treatment non-response to evidence-based treatments for PTSD relative to those with no baseline depressive symptoms (Stein et al., 2012). Given these discrepant results, additional research

Table 2

Path Coefficients for Model of PTSD, Depression, and Comorbid PTSD and Depression Diagnoses as Mediators of the Association between MST and SISII (N = 435,690).

	Unstandardized Estimate	95% Confidence Interval	p-value	R ²
PTSD only regressed on MST (ref = no MST)	-0.25	[-0.30, -0.20]	<.001	.0004
Depression only regressed on MST (ref = no MST)	0.45	[0.41, 0.49]	<.001	.002
Comorbid PTSD & depression regressed on MST (ref = no MST)	0.97	[0.94, 1.01]	<.001	.01
SISII regressed on MST (ref = no MST)	0.58	[0.51, 0.66]	<.001	.25
PTSD only (ref = no PTSD)	2.00	[1.87, 2.13]	<.001	
Depression only (ref = no depression)	3.34	[3.23, 3.46]	<.001	
Comorbid PTSD & depression (ref = NCPD)	4.39	[4.28, 4.50]	<.001	
Biological sex (ref = female)	0.51	[0.45, 0.58]	<.001	
Age	-0.03	[-0.03, -0.02]	<.001	
Black (ref = White)	-0.19	[-0.23, -0.14]	<.001	
Hispanic (ref = White)	-0.15	[-0.21, -0.10]	<.001	
Other race/ethnicity (ref = White)	-0.14	[-0.25, -0.04]	.007	
Unknown race/ethnicity (ref = White)	-0.35	[-0.49, -0.22]	<.001	
Beyond HS education (ref = only HS)	-0.17	[-0.23, -0.11]	<.001	
Divorced/other marital status (ref = never married)	-0.02	[-0.11, 0.06]	.6	
Married (ref = never married)	-0.04	[-0.08, -0.00]	.048	
National/Coast Guard (ref = Army)	0.12	[0.06, 0.18]	<.001	
Marines (ref = Army)	-0.22	[-0.27, -0.16]	<.001	
Air Force (ref = Army)	0.13	[0.06, 0.02]	<.001	
Guard (ref = Active Duty)	0.21	[0.15, 0.27]	<.001	
Reserve (ref = Active Duty)	0.08	[0.03, 0.14]	.004	
Rank (ref = officer)	0.47	[0.35, 0.61]	<.001	
Combat exposure (ref = no)	-0.05	[-0.09, -0.02]	.002	

Note. MST = military sexual trauma; SISII = suicide and intentional self-inflicted injury; PTSD = posttraumatic stress disorder; NCPD = no comorbid PTSD and depression; HS = high school. Analyses were bootstrapped 50 times.

would be beneficial to determine specific and effective evidence-based treatments for improving symptoms of comorbid PTSD and depression in veterans with histories of MST and, in turn, reducing risk of suicide and intentional self-inflicted injury.

Results from the current study showed a negative relationship between MST and PTSD among OEF/OIF VHA-enrolled veterans, which is contradictory to previous research that observed that a history of MST is associated with higher odds of a PTSD diagnosis among veterans (Gilmore et al., 2016; Himmelfarb et al., 2006; Kimerling et al., 2007), and that symptoms of PTSD are worse when the index trauma is MST relative to non-MST related events (e.g., combat; Blais & Monteith, 2019). It is possible that the significance of this effect is an artifact of studying such a large sample (which was necessary in order to obtain a sufficient sample size of those with a history of suicide and intentional self-inflicted injury). Indeed, this association was the smallest effect observed in the model in terms of magnitude (-.25) and accounted for the smallest proportion of variance in suicide and intentional self-inflicted injury ($R^2 = .0004$). As veterans with depression were removed from the PTSD-only variable used in the current study, it is possible that the variance in PTSD in previous studies was accounted for by the depressive symptoms that were included in the diagnostic groups. In fact, research conducted outside of VA examining specific PTSD symptom clusters and their association with psychological distress and suicide risk revealed that it is largely the depressive symptom clusters of PTSD that elevate risk for distress and dysfunction (Blais & Geiser, 2019; Blais, Geiser, & Cruz, 2018). At the same time, this association could be explained by the diagnostic composition of the current sample. That is, 13.55% ($n = 56,780$) of veterans who reported no history of MST had a PTSD-only diagnosis, whereas 10.86% ($n = 1,801$) of veterans who reported a history of MST had a PTSD-only diagnosis.

The current study has limitations. Data were from a national sample of OEF/OIF VHA-enrolled veterans. It is possible that these results do not generalize to the 38% of OEF/OIF/Operation New Dawn veterans or other service-era veterans who do not attend the VHA for their health care needs (Department of Veterans Affairs 2017). The variable used in

the current study to capture suicide and intentional self-inflicted injury does not distinguish between suicidal ideation, behaviors, and intent. Theory on suicide indicates that suicidal ideation and suicidal behaviors should be considered distinct but related concepts (Joiner, 2005; Klonsky & May, 2015). Future research examining mediators of the association of MST and suicide should model these facets of suicide separately. The current study used the VA MST Screener to identify those that experienced MST. It is possible that the prevalence of MST observed in this study is an underestimate due to screening reporting barriers. Indeed, research indicates that higher perceived stigma is associated with nondisclosure of MST during screening (Andresen & Blais, 2019; Blais, Brignone, Fargo, Galbreath, & Gundlapalli, 2018).

Additional limitations should be considered. PTSD and depression diagnoses were established after the diagnoses were documented only once in the medical record. Some epidemiological studies use at least 2 instances of a diagnosis to establish its presence (e.g., Maguen et al., 2019), but we felt confident with only one documentation given that it was made by a licensed professional. Future research examining mediators of the association of MST and suicidal risk may consider additional evidence of psychological diagnoses. Lastly, while MST is a historical event and mental health diagnoses were measured concurrently, causality cannot be inferred. Future research may further explore the mechanism through which comorbid PTSD and depression diagnoses increase risk of suicide and intentional self-inflicted injury among veterans who experienced MST. For example, specific symptoms of PTSD and depression may be responsible for the increased risk for suicide among MST survivors. Indeed, Blais and Geiser (2019) observed that higher depression and PTSD-related anhedonia were related to suicidal ideation in female service members/veterans who reported that their MST exposure included assault. Though informative, this study was circumscribed to suicidal ideation. Moreover, there is evidence that depression symptoms may be better captured using a multi-factored approach over a single factor solution (Elhai et al., 2012). To our knowledge, this multi-factored approach to depression has yet to be studied in relation to MST and suicide risk. Finally, the current study

relied on the VA MST screener, which does not distinguish between harassment-only and assault MST. Blais and colleagues (2019) observed that assault MST was associated with higher PTSD and depression symptoms, as well as increased risk for suicide relative to harassment-only MST. Future studies in this domain would be strengthened by assessing severity of MST as not all exposures rise to the level of sexual trauma or violence (Williamson et al., 2017).

Findings from the current study show novel results that OEF/OIF VHA-enrolled veterans with history of MST and who are diagnosed with comorbid PTSD and depression disorders have a higher probability of suicide and intentional self-inflicted injury than those veterans solely diagnosed with PTSD or depression. Results suggest that implementation of screening for comorbid PTSD and depression within trauma centers are necessary steps for early identification of risk for suicide and intentional self-inflicted injury. Results further suggest additional research would aid in determining evidence-based treatments for improving symptoms of comorbid PTSD and depression in veterans with histories of MST and, in turn, reducing risk of suicide and intentional self-inflicted injury.

Author Statement

Contributors: All authors have reviewed and approved the final article.

Whitney S. Livingston – Wrote the manuscript, conducted all statistical analyses

Jamison D. Fargo – Supervised statistical analyses and data interpretation

Adi V. Gundlapalli – Provided data and resources for study

Emily Brignone – Organized data and created included variables

Rebecca K. Blais – Primary academic advisor to first author, developed concept for study, co-wrote key elements of the manuscript

Funding Sources

Research was supported by grant IIR 12-084 (PI: A.V.G.), and VA Center of Innovation Award #150HX001240 from the Health Services Research and Development of the Office of Research and Development of the US Department of Veterans Affairs.

Declaration of Competing of interest

All authors declare they have no conflicts of interest.

Acknowledgements

The authors wish to thank Ying Suo for organizing the data that were used in this study.

Limitations

Data were limited to VHA-enrolled Iraq/Afghanistan veterans.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.jad.2020.05.024](https://doi.org/10.1016/j.jad.2020.05.024).

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