Psychiatry Research 279 (2019) 148–154

Contents lists available at ScienceDirect

Psychiatry Research

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

Depression and PTSD-related anhedonia mediate the association of military sexual trauma and suicidal ideation in female service members/veterans

Rebecca K. Blais*, Christian Geiser

Utah State University, Department of Psychology, Logan, UT, United States

ARTICLE INFO

Keywords:
Suicidal ideation
Military sexual trauma
Female veterans
PTSD
Depression

ABSTRACT

Previous research shows a direct link between military sexual trauma and suicide risk. Little is known about mediators of this association, including posttraumatic stress disorder (PTSD) or depression severity, mental health conditions that are correlated with both suicide risk and military sexual trauma. Moreover, existing studies of military sexual trauma do not distinguish between harassment and assault, resulting in a gap in our knowledge regarding suicide risk as a function of sexual trauma type. We explored whether PTSD symptom clusters and depression mediated the association of military sexual trauma type (none, harassment-only, assault) and suicidal ideation (SI). Female service members/Veterans (n = 1190) completed a demographic inventory, military sexual trauma history and type screening, and PTSD symptom cluster severity, depression severity, and SI measures. Structural equation modeling revealed that the association of military sexual trauma, particularly assault, with SI was mediated by depression severity and PTSD-related anhedonia. Screening for SI among those endorsing a history of military sexual trauma, PTSD-related anhedonia, and depression may help identify those at risk for SI. Therapeutic interventions aimed at reducing PTSD-related anhedonia and depression symptoms may be the most efficient way to mitigate suicide risk in those with histories of assault military sexual trauma.

1. Introduction

Suicide is among the leading causes of preventable death in service members and veterans (Shively, 2010). Risk for suicide among veterans from 2005–2016 increased by almost 26% (Department of Veterans Affairs [VA], 2016). Similarly, suicide among active duty service members increased among most branches from 2017–2018 (Defense Suicide Prevention Office [DSPO], 2018). Recent estimates show that suicide risk is almost 2 times higher among female veterans relative to their civilian counterparts (VA, 2016). Findings underscore the importance of further identifying correlates of suicide in females so that additional preventive measures can be taken to reduce the number of deaths by suicide in this population.

Several military experiences place service members/veterans at risk for suicidal ideation and death by suicide, including military sexual trauma (e.g., Blais and Monteith, 2018a; Kimerling et al., 2016; Monteith et al., 2018). Military sexual trauma is defined as "psychological trauma from a physical assault of a sexual nature, battery of a sexual nature, or sexual harassment which occurred while the veteran was serving on active duty or active duty for training" (U.S. Government, 2014, p. 285). It is estimated that approximately 40% of veterans report a history of MST (Wilson, 2016).

Several studies show that military sexual trauma is a risk factor for suicide cognitions (Holliday et al., 2018b), ideation (Holliday et al., 2018a; Katz et al., 2017; Klingensmith et al., 2014; Monteith et al., 2016; Monteith et al., 2017), attempt (White et al., 2018), and/or death by suicide (Bryan et al., 2015; Kimerling et al., 2016; Klingensmith et al., 2014). Indeed, experiencing military sexual trauma is associated with feelings of hopelessness and powerlessness (e.g., Monteith et al., 2018), beliefs that the trauma is unbearable and can only be solved by suicide (Holliday et al., 2018a), and incidence of psychological disorders (e.g., Kimerling et al., 2010), all factors that can increase the likelihood of experiencing heightened suicide risk. Despite the relatively clear link between military sexual trauma and suicide risk, there are three key limitations in our understanding of this association. First, mediators of this association have not been well established or studied. For many, military sexual trauma is a traumatic event that is associated with several negative mental health outcomes, including posttraumatic stress disorder (PTSD) and depression (Kimerling et al., 2007), which in turn, are associated with increased risk for suicide (Conner et al., 2014; Nock et al., 2013; Pietrzak et al., 2011). Such findings suggest then that the *mechanism* through which MST relates to suicide risk is through mental health distress. One study was identified that demonstrated that the association of military sexual trauma and suicide risk in women was

* Corresponding author at: Utah State University, 2810 Old Main EDUC487, Logan, UT 84321, United States.
E-mail address: Rebecca.blais@usu.edu (R.K. Blais).

https://doi.org/10.1016/j.psychres.2018.12.148
Received 29 May 2018; Received in revised form 5 November 2018; Accepted 28 December 2018
Available online 29 December 2018

partially mediated by depression and PTSD symptoms (Gradus et al., 2013a).

A second limitation is that studies of suicide risk and PTSD generally study PTSD as a unidimensional risk factor when PTSD is a multifaceted condition. Indeed, The Diagnostic and Statistical Manual for Mental Disorders-5 (DSM-5; America Psychological Association [APA], 2013) indicates that PTSD is comprised of four main symptom clusters, which include re-experiencing, avoidance, negative alternations in cognitions or mood, and hyper-arousal symptoms. However, factor analyses of the PTSD Checklist for DSM-5 (PCL-5; Weathers et al., 2013), the most commonly used measure of PTSD, rarely conform to this factor structure (Armour et al., 2016; Blais et al., 2018b; Frankfurt et al., 2016). Toward that end, alternate factor structures have been suggested. Studies show that symptom clusters are differentially associated with MST and its sequelae. For example, one study showed that higher anhedonia, negative alterations in cognition in mood, and dysphoric arousal mediated the association of military sexual trauma type and sexual health concerns in female service members/veterans (Blais et al., 2018b). A second study showed that institutional betrayal following MST was associated with higher re-experiencing, avoidance, negative alterations in cognitions and mood, and dysphoric arousal (Andresen et al., 2019) among female service members and veterans who experienced MST. As heightened sexual health concerns and institutional betrayal are associated with increased suicide risk in service members and veterans (e.g., Blais et al., 2018c; Monteith et al., 2016), such findings underscore the importance of determining whether specific symptom clusters of PTSD mediate the association of military sexual trauma and suicide risk.

A third limitation in our existing understanding of the association of military sexual trauma with suicide risk is that previous studies have largely used the VA military sexual trauma screening measure, which combines both harassment (e.g., unwanted sexual pressure, cornering, and verbal remarks) and assault (e.g., attempted and/or forced sexual contact/rape) military sexual trauma into a single variable reflective of overall military sexual trauma exposure. However, recent research in female service members/veterans observed that assault, relative to harassment-only, military sexual trauma was significantly associated with higher PTSD, depression, sexual dysfunction, and suicidal ideation relative to harassment-only MST (Blais et al., 2018b; Blais et al., 2019). Such findings suggest that it is critical to distinguish between harassment and assault in studies of military sexual trauma and its sequelae.

The current study sought to address these three limitations in a sample of female service members/veterans given their increased suicide risk relative to civilian female counterparts (VA, 2016). In particular, we sought to determine whether the association between type of military sexual trauma and suicidal ideation was mediated by specific PTSD symptom clusters and depression severity after accounting for established covariates of military sexual trauma and suicide, including deployment history (e.g., Barth et al., 2016), race (e.g., Corson et al., 2013), marital status (e.g., Ashrafioun et al., 2016), and age (e.g., Maguen et al., 2015). We also co-varied for branch of service given recent research showing escalating suicide risk among those reporting service in the Army (DSPO, 2018; Nock et al., 2013). Finally, we covaried for discharge status given differences in reported rates of suicide among those actively serving and those who have discharged from service (DSPO, 2018; VA, 2018)

2. Method

2.1. Participants

Participants (N = 1190) self-identified as female service members/veterans and were recruited via Facebook and listservs directed toward female service members/veterans.

2.2. Procedure

Data for the current study were extracted from another study that sought to better understand the association of military sexual trauma, sexual dysfunction, and relationship satisfaction among partnered female service member/veterans (Blais, 2019). Advertisements targeted partnered females with a history of military service. Those interested in participating were directed to a secure online website (i.e., Qualtrics) where they completed screening questions confirming female sex, military service, and consenting age (age ≥ 18 years). Those meeting screening criteria advanced to the survey. Identifying information was not collected with survey data to main anonymity; however, those wishing to receive $15 compensation were directed to a separate Qualtrics survey to enter identifying information. Identifying information collected for payment purposes could not be linked with responses to study measures. This study was approved by the IRB of Utah State University.

2.3. Measures

A demographic inventory assessed covariates of study variables including age, race (White = 1, other = 0) marital status (married = 1, other = 0), military branch (Army = 1, other = 0), veteran status (yes = 1, no = 0), and number of deployments. White race and Army were selected as the comparison race and branch, respectively, as the majority reported their race as “White” and identified as current or past members of the Army (see Table 1). Other demographic information was collected (e.g., income, education level) for the sole purpose of describing sample characteristics.

Suicidal ideation was measured via Item 9 of the *Patient Health Questionnaire-9* (PHQ-9; Kroenke and Spitzer, 2002), which asks: “During the past two weeks, how often have you been bothered by thoughts that you would be better off dead or hurting yourself in some way?” Participants rate their experience using an ordinal scale of 0 (not at all) to 3 (nearly every day). The PHQ-9 Item 9 has been shown to predict increased risk for suicide in veteran samples (Louzon et al., 2016).

Military sexual trauma type was assessed using a modified version the *VA Military Sexual Trauma Screening Questionnaire*. Participants indicated via checkbox whether they experienced uninvited and unwanted sexual attention, including touching, cornering, pressure for sexual favors, or verbal remarks. Any endorsement indicated a history of harassment military sexual trauma. Assault military sexual trauma was assessed via an affirmative response to: *Did someone ever use force or threat of force to have sexual contact with you against your will?”*

PTSD symptom severity was assessed via the *Posttraumatic Stress Disorders Checklist for DSM-5* (PCL-5; Weathers et al., 2013), a 20-item measure of PTSD symptoms experienced over the past month. Items are rated on a Likert Scale ranging from 0 (not at all) to 4 (extremely), and are subsequently summed for a total severity score. Higher scores indicate greater distress. A factor analysis using the current sample was conducted for a different study and revealed that the six-factor anhedonia model was an adequate fit to the data relative to alternate models ($\chi^2(155,\ N = 872) = 619.05,\ p = .002$; RMSEA = 0.06; CFI = 0.99; TLI = 0.99; Blais et al., 2018b; full results also available: https://osf.io/3c4bw/). In this model, the following symptom clusters are identified: re-experiencing (items 1 through 5; score range: 0–20), avoidance (items 6 and 7; score range: 0 to 8), negative alterations in cognition or mood (items 8 through 11; score range: 0 to 16), anhedonia (items 12 through 14; score range: 0 to 12), dysphoric arousal (items 15, 16 and 19, 20; score range: 0 to 16), and anxious arousal (items 17 and 18; score range: 0 to 8). These symptom clusters were used in place of overall PTSD symptom severity to determine whether specific clusters mediated the association of MST severity and SI. Items within each cluster were summed to create a severity score. The current sample showed adequate internal reliability across all symptom subscales,

Table 1
Correlations, means, and standard deviations for all variables used in the path model (N = 1190).

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Depression	—															
2. Suicidal ideation	0.51	—														
3. Re-experiencing	0.59	0.35	—													
4. Avoidance	0.55	0.29	0.84	—												
5. Negative affect/cognition changes	0.62	0.38	0.83	0.83	—											
6. Anhedonia	0.71	0.44	0.71	0.69	0.78	—										
7. Dysphoric arousal	0.72	0.40	0.76	0.73	0.80	0.83	—									
8. Anxious arousal	0.57	0.29	0.76	0.74	0.76	0.69	0.79	—								
9. Age in years	0.04	0.00	−0.03	0.00	−0.02	0.01	−0.02	0.00	—							
10. Race (1 = white)	−0.06	−0.08	−0.08	−0.11	−0.08	−0.06	−0.04	−0.04	0.05	—						
11. Army service (1 = yes)	0.00	0.01	0.02	0.02	0.01	0.02	0.03	0.03	−0.06	0.01	—					
12. Number of deployments	0.03	−0.03	0.01	0.01	0.03	0.04	0.05	0.05	0.14	0.02	0.07	—				
13. Veteran status (1 = yes)	0.22	0.11	0.13	0.17	0.15	0.13	0.15	0.16	0.26	0.02	−0.07	0.03	—			
14. Married (1 = yes)	0.03	−0.02	−0.02	−0.02	−0.02	−0.03	−0.01	−0.01	0.17	0.03	−0.02	0.03	0.10	—		
15. Harassment (1 = yes)	−0.16	−0.12	−0.24	−0.25	−0.22	−0.18	−0.19	−0.19	−0.01	0.01	0.00	0.01	−0.03	0.04	—	
16. Assault (1 = yes)	0.27	0.20	0.40	0.43	0.41	0.32	0.34	0.37	0.03	−0.04	0.01	0.02	0.09	0.00	−0.68	—
M	9.72	0.37	5.64	2.82	4.82	3.97	5.03	2.56	32.18	0.78	0.54	0.70	0.72	0.74	0.48	0.33
SD	7.17	0.79	6.11	2.94	5.09	4.08	4.65	2.79	7.58	0.41	0.50	0.87	0.45	0.44	0.50	0.47

Note. Estimates are based on FIML estimation (N = 1190). All correlations ≥ |.10| are significant at $p \leq 0.001$. All correlations ≥ |.07| are significant at $p \leq 0.05$.

Cronbach's αs ranged from 0.84–95.

Depression severity was assessed using the *PHQ-8* (Kroenke et al., 2009), an 8-item inventory that assesses severity of depressive symptoms over the past two weeks using a Likert scale of 0 (not at all) to 3 (nearly every day). Items are summed for a total score that ranges from 0–24, and higher scores indicate higher depression. The current sample showed adequate internal reliability (Cronbach's α = 0.92).

2.4. Statistical analyses

Sample characteristics were examined using descriptive statistics. We conducted tests of statistical mediation (indirect effects) via path analysis in the software Mplus 8 (Muthén & Muthén, 1998–2017). The path analytic model is depicted in Fig. 1. Two dummy code variables were created to evaluate the association of military sexual trauma type with suicidal ideation. The first dummy variable reflected a positive history of harassment (history of harassment military sexual trauma = 1; no military sexual trauma = 0). The second dummy variable reflected a positive history of assault (history of assault military sexual trauma = 1; no military sexual trauma = 0) military sexual trauma. Depression severity and the six PTSD symptom cluster severities served as mediator variables. The suicidal ideation variable served as the outcome. In addition, we included age, race, marital status, army service, veteran status, and deployment history as covariates in the model. Specifically, we included all direct paths between the covariates and the seven mediator variables as well as the suicidal ideation outcome variable in the model. All exogenous variables in the model (including the covariates and military sexual trauma variables) were allowed to freely correlate. We also allowed for all residual correlations between the seven mediator variables.

We estimated the path model in Fig. 1 using full information maximum likelihood (FIML) estimation to take all available data points into account. FIML is preferred to other, more ad hoc missing data handling techniques as it uses all available data, maximizes statistical power, and reduces bias in parameter estimates (Enders, 2010). We tested for mediated effects by computing 95% confidence intervals (CIs) for the indirect effects based on bias-corrected bootstrapping with 10,000 bootstrap samples (MacKinnon, 2008).

3. Results

3.1. Missing data analysis

Thirty-two different missing data patterns were observed, with the complete-data pattern being the most frequently observed one (n = 694, 58.3%). The second most common missing data pattern was one with complete data only for the covariates (n = 275, 23.1%). The third most frequent pattern had complete data for all variables except depression and suicidal ideation (n = 71, 6%). All other missing data patterns were observed for less than 5% of cases, respectively. Given that the model included many highly correlated variables, our inclusive FIML analysis strategy should result in reduced bias and increased power due to the use of information from many variables (Enders, 2010). Given the rate of missing data observed in the current sample (41.7%), we conducted bivariate tests to determine whether there were demographic differences among those with complete data relative to those with some level of missing data. No significant differences were observed with regard to age, branch of service (Army versus other), race (White versus other), marital status (married versus other) or presence of suicidal ideation ($ps > 0.05$). Those who had complete data were more likely to have deployed (n = 358, 61.7%) relative to those who did not have complete data (n = 222, 38.3%; $\chi^2(1, N = 1190) = 5.39$, $p = .01$).

3.2. Demographics and descriptive statistics

Means, standard deviations, and correlations for all variables used in the path model (including covariates) are presented in Table 1. The majority of the sample completed at least some college (n = 1070; 89.9%; 2 participants did not report education level) and reported incomes of at least $50,000/year ($n$ = 724; 60.8%; 5 participants did not report income level). Of those with complete military sexual trauma screening data (n = 832; 69.97%), 18.4% (n = 153) reported no history of military sexual trauma, 47.6% (n = 396) reported harassment only military sexual trauma, and 34.0% (n = 283) reported assault military sexual trauma. Of those who completed our measure of suicidal ideation (n = 770; 64.76%), the majority reported no suicidal ideation (n = 601; 78.1%), while 11.6% (n = 89), 5.6% (n = 43), and 4.8% (n = 37) reported being bothered by suicidal thoughts some of the days, more than half the days, and nearly every day, respectively.

It can be seen from Table 1 that suicidal ideation showed the highest correlations with depression (r = 0.51, $p < .001$) and the PTSD anhedonia symptom cluster (r = 0.44, $p < .001$). Correlations between suicidal ideation and other PTSD facets were also significant, but lower in magnitude (see Table 1). The different PTSD symptom cluster subscores were highly correlated with one another as well as with depression. The dummy variable indicating assault military sexual trauma was significantly and fairly substantially correlated with the PTSD

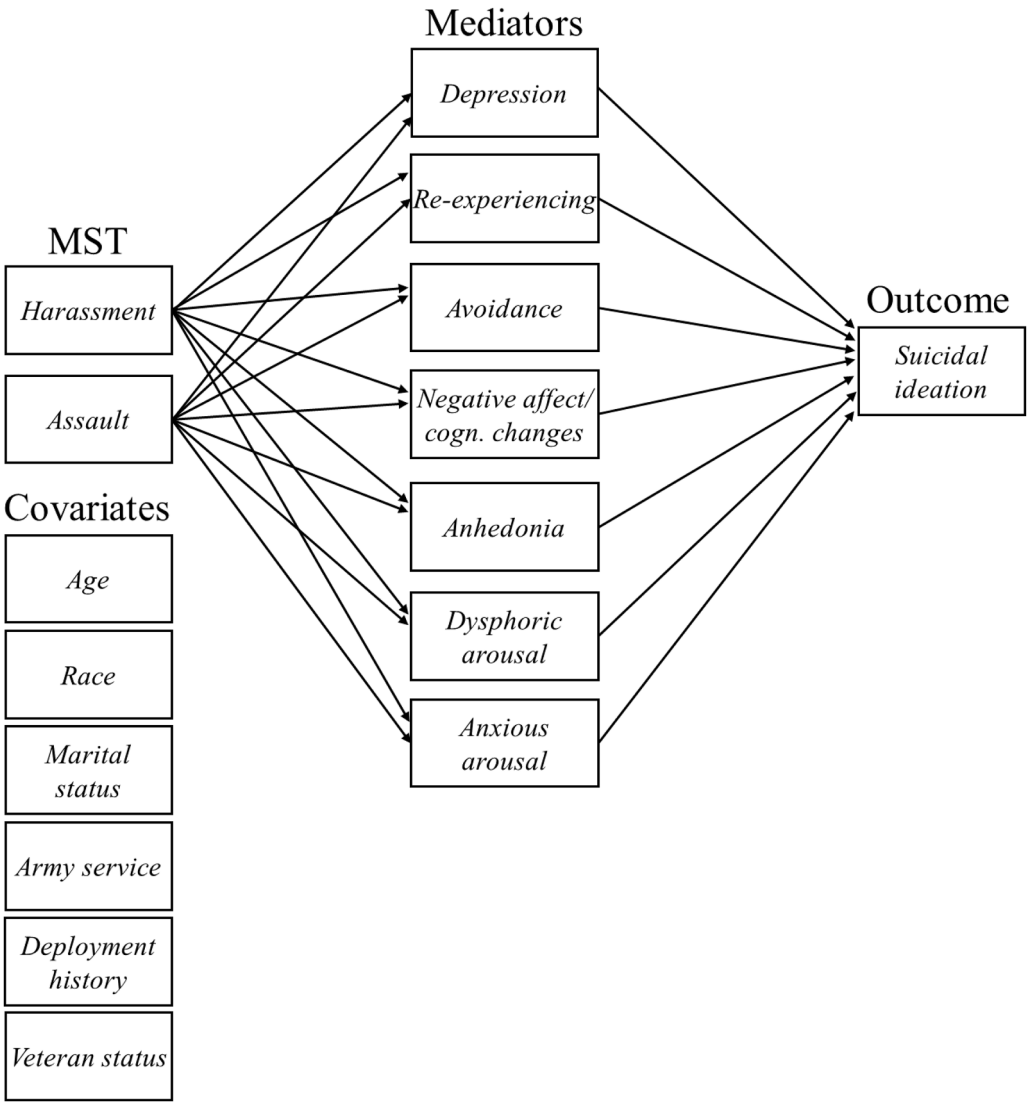

Fig. 1. Path analytic model tested in the present study. MST = Military sexual trauma. All covariates had direct paths on both the mediator variables and suicidal ideation outcome variable. All exogenous variables (MST and covariates) were allowed to correlate. Coding of dichotomous variables (i.e., Veteran status, Army service, White race, and marital status) can be seen in Table 2.

symptom cluster subscores and showed lower correlations with depression and suicidal ideation. Most covariates showed small and non-significant correlations with the variables of interest.

3.3. Path analysis

The path analytic model in Fig. 1 fit the data very well, $\chi^2(2, N = 1190) = 2.97$, $p = .23$, CFI = 1.00, RMSEA = 0.02, SRMR = 0.005. Estimated unstandardized (*B*) and standardized (β) path coefficients are shown in Table 2. (The complete Mplus output file including confidence intervals for all model parameters can be found at https://osf.io/qvp58/.) It can be seen that most direct paths from harassment to the hypothesized mediator variables were non-significant, with the exception of the paths from harassment to negative alterations in cognition and mood and anxious arousal. In contrast, *all* direct paths from assault to the mediators were strong and highly statistically significant. In summary, whereas harassment was either not or only weakly related to the mediator variables, assault was strongly associated with each potential mediator considered in this study.

In terms of covariate effects, veteran status was significantly positively associated with all mediator variables but not suicidal ideation, indicating that veterans tended to report higher levels of PTSD symptom clusters than non-veterans. The only other significant covariate paths were found between age and re-experiencing as well as race and avoidance. All residual correlations between the mediator variables were strong, ranging between $r = 0.51$ and $r = 0.81$ (all $ps < 0.001$). This indicated that the exogenous variables accounted for only a small amount of the associations between the mediators.

Suicidal ideation was significantly positively related to depression severity and anhedonia. Standardized path coefficients indicated that depression severity (β = 0.40, $p < .001$) was a stronger predictor of suicidal ideation than anhedonia (β = 0.17, $p = .03$). In addition, we found a significant negative path coefficient (β = –0.16, $p = .02$) for the relationship between suicidal ideation and avoidance. Given that the bivariate correlation between suicidal ideation and avoidance was positive as one would expect ($r = 0.29$, $p < .001$, see Table 1), the occurrence of a negative path coefficient indicated the presence of a suppression effect (MacKinnon et al., 2000).

The only significant indirect (mediated) paths were found between military sexual trauma assault and suicidal ideation via depression severity (estimate = 0.19, 95% CI = [0.12, 0.28], standardized estimate = 0.11), avoidance (estimate = –0.12, 95% CI = [–0.23, –0.02], standardized estimate = –0.07), and anhedonia (estimate = 0.10, 95% CI = [0.01, 0.20], standardized estimate = 0.06). Given that the

Table 2
Estimated path coefficients.

Path	*B*	*SE*(*B*)	β	*p*	R^2
Depression severity regressed on					
Harassment	0.55	0.66	0.04	.405	
Assault	4.22	0.71	0.28	< 0.001	
Age	−0.02	0.03	−0.02	.579	
Race (1 = white)	−0.96	0.58	−0.06	.101	
Army service (1 = yes)	0.09	0.48	0.01	.859	
Number of deployments	0.15	0.30	0.02	.603	
Veteran status (1 = yes)	3.10	0.56	0.20	.000	
Married (1 = yes)	0.24	0.53	0.02	.649	.12
Re-experiencing regressed on					
Harassment	0.82	0.52	0.07	.112	
Assault	5.63	0.57	0.44	.000	
Age	−0.06	0.03	−0.07	.051	
Race (1 = white)	−0.94	0.46	−0.06	.040	
Army service (1 = yes)	0.22	0.37	0.02	.558	
Number of deployments	0.07	0.22	0.01	.755	
Veteran status (1 = yes)	1.61	0.43	0.12	.000	
Married (1 = yes)	−0.32	0.46	−0.02	.490	.18
Avoidance regressed on					
Harassment	0.38	0.24	0.07	.110	
Assault	2.84	0.27	0.46	.000	
Age	−0.02	0.01	−0.05	.168	
Race (1 = white)	−0.67	0.22	−0.09	.002	
Army service (1 = yes)	0.15	0.18	0.03	.398	
Number of deployments	0.01	0.11	0.00	.945	
Veteran status (1 = yes)	0.97	0.20	0.15	.000	
Married (1 = yes)	−0.14	0.21	−0.02	.497	.22
Negative affect/cognition changes regressed on					
Harassment	1.08	0.40	0.11	.006	
Assault	5.06	0.45	0.47	.000	
Age	−0.04	0.02	−0.06	.065	
Race (1 = white)	−0.71	0.37	−0.06	.058	
Army service (1 = yes)	0.06	0.31	0.01	.842	
Number of deployments	0.15	0.19	0.03	.448	
Veteran status (1 = yes)	1.45	0.35	0.13	.000	
Married (1 = yes)	−0.33	0.37	−0.03	.379	.20
Anhedonia regressed on					
Harassment	0.50	0.35	0.06	.157	
Assault	2.99	0.39	0.35	.000	
Age	−0.01	0.02	−0.03	.501	
Race (1 = white)	−0.45	0.32	−0.05	.160	
Army service (1 = yes)	0.19	0.26	0.02	.472	
Number of deployments	0.17	0.16	0.04	.292	
Veteran status (1 = yes)	1.01	0.30	0.11	.001	
Married (1 = yes)	−0.32	0.31	−0.04	.295	.12
Dysphoric arousal regressed on					
Harassment	0.68	0.41	0.07	.093	
Assault	3.72	0.45	0.38	.000	
Age	−0.04	0.02	−0.06	.077	
Race (1 = white)	−0.28	0.35	−0.03	.417	
Army service (1 = yes)	0.28	0.29	0.03	.329	
Number of deployments	0.25	0.18	0.05	.151	
Veteran status (1 = yes)	1.38	0.34	0.13	.000	
Married (1 = yes)	−0.16	0.35	−0.02	.655	.14
Anxious arousal regressed on					
Harassment	0.59	0.22	0.11	.007	
Assault	2.52	0.25	0.43	.000	
Age	−0.02	0.01	−0.05	.200	
Race (1 = white)	−0.17	0.21	−0.03	.412	
Army service (1 = yes)	0.18	0.17	0.03	.302	
Number of deployments	0.15	0.11	0.05	.162	
Veteran status (1 = yes)	0.85	0.19	0.14	.000	
Married (1 = yes)	−0.11	0.20	−0.02	.578	.16
Suicidal ideation regressed on					
Depression severity	0.04	0.01	0.40	.000	
Re-experiencing	0.01	0.01	0.10	.223	
Avoidance	−0.04	0.02	−0.16	.023	
Negative affect/cognition changes	0.02	0.01	0.12	.140	
Anhedonia	0.03	0.02	0.17	.032	
Dysphoric arousal	0.00	0.02	0.00	.998	
Anxious arousal	−0.03	0.02	−0.10	.163	
Age	0.00	0.00	−0.01	.732	
Race (1 = white)	−0.10	0.07	−0.05	.119	
Army service (1 = yes)	0.02	0.05	0.01	.654	
Number of deployments	−0.04	0.03	−0.04	.215	
Veteran status (1 = yes)	0.05	0.05	0.03	.361	
Married (1 = yes)	−0.04	0.06	−0.02	.522	.29

Note. *B* = unstandardized path coefficient. *SE* = standard error. β = standardized path coefficient. R^2 values are based on the overall set of predictor variables included for a given mediator or outcome variable. $N = 1190$.

avoidance variable acted as a suppressor, the corresponding negative indirect path is not substantively meaningful (see discussion). There were no significant indirect (mediated) paths for the relationship between military sexual trauma harassment and suicidal ideation. Overall, 29% of the variability in suicidal ideation was explained in the path model.

4. Discussion

The purpose of the current study was to determine whether specific symptom clusters of PTSD and depression severity mediated the association of military sexual trauma type with suicidal ideation. Findings revealed that the association of military sexual trauma, particularly assault, with suicidal ideation was mediated by depression severity and the anhedonia symptom cluster of PTSD. The indirect effect of avoidance on the association of assault military sexual trauma and suicidal ideation was likely the result of suppression, thus, rendering this effect uninterpretable. Suppression effects are not uncommon in regression and path models (MacKinnon et al., 2000) and can occur when independent variables are strongly correlated, as was the case for all PTSD facets and depression severity in the present study. Suppressor variables improve the overall prediction of an outcome variable by suppressing irrelevant variance components in other predictors, but lead to uninterpretable path coefficients for the suppressor variables themselves (Maassen and Bakker, 2001). The avoidance subscore thus improved the overall prediction of suicidal ideation indirectly, that is, by suppressing irrelevant variance components in the other PTSD symptom clusters with which avoidance was highly correlated. Maassen and Bakker (2001) recommended that the signs of the path coefficients estimated for suppressor variables should not be substantively interpreted.

The association between PTSD-related anhedonia and suicide is consistent with previous research that demonstrated that PTSD-related emotional numbing was associated and suicidal ideation (Guerra and Calhoun, 2011). Emotional numbing, as assessed using DSM-IV-TR criteria (APA, 2000), includes items now captured in the current anhedonia symptom cluster. Our findings are partially consistent with Legarreta et al. (2015), who found similar associations among specific symptoms and suicide using the standard DSM-5 symptom clusters, including items currently captured in the anhedonia symptom cluster. However, our results differ from other studies that observed re-experiencing symptoms were most closely associated with suicidal ideation (Barr et al., 2016; Bell and Nye, 2007). The discrepancy between our findings and these latter studies may be attributed to gender differences in sampling (Bell and Nye, 2007), differences in war-era cohorts (Barr et al., 2016; Bell and Nye, 2007), and different measures of suicide risk and PTSD (Barr et al., 2016; Bell and Nye, 2007). Future research replicating these findings or other findings could help elucidate the nature of these differences.

Our findings further suggest that studies of military sexual trauma and its sequelae should distinguish between harassment-only and assault military sexual trauma. Harassment military sexual trauma was either not or only weakly related to PTSD symptom clusters and

depression severity, whereas assault was strongly associated with PTSD symptom clusters and depression severity. Relying on a military sexual trauma screener that combines both harassment-only and assault military sexual trauma into a single variable screening item may obscure this measure's ability to detect those at greatest risk for mental health problems, and in turn, suicidal ideation.

Our findings suggest that the mechanism through which assault military sexual trauma relates to suicidal ideation is through the distress that might follow military sexual trauma, particularly depressive and anhedonic symptoms among those with a history of assault military sexual trauma (e.g., Surís et al., 2011). As suicidal ideation is considered part of the depression syndrome, these results are not surprising, but they have important implications for suicide prevention and intervention efforts. Indeed, service members/veterans who endorse military sexual trauma and depression should be promptly screened for suicide if suicide screening is not part of routine health care. Special outreach efforts to reduce suicide risk may be needed for those with a history of military sexual trauma and concurrent depression who are not formally engaged in mental health care. Therapeutic interventions specifically aimed at reducing anhedonia and depression symptoms may be the most efficient way to mitigate suicide risk in those with histories of assault military sexual trauma (e.g., Surís et al., 2013). Behavioral activation is shown to be particularly helpful in reducing depressive symptoms in service members/veterans (Jakupcak et al., 2010), and behavioral activation with exposure has shown promise in addressing both depression and PTSD severity (Gros et al., 2012). However, its efficacy in reducing suicide risk is not well established. Research further shows that helping service members/veterans decrease suicide cognitions, such as unlovability, unbearability, and unsolvability, may be particularly critical (e.g., Wiblin et al., 2018). Emerging research shows that trauma-specific interventions such as Cognitive Processing Therapy were effective in reducing these cognitions and suicidal ideation in those with histories of military sexual trauma (e.g., Gradus et al., 2013b; Holliday et al., 2018b).

There are limitations of the current study design to consider. The study was based on cross-sectional self-report data collected from a convenience sample of female service members/veterans who self-reported being in a romantic relationship. Future studies should explore these associations in unpartnered service members and veterans who may have fewer support resources and therefore have increased risk for suicide. Given the cross-sectional nature of our data, we cannot confirm the direction of the associations tested in the current study. Suicidal ideation was assessed using the PHQ-9 Item 9, which does not assess history of suicide attempts or risk for death by suicide. The sample was also circumscribed to females. Future research should examine these associations using a longitudinal data design in a representative sample of both male and female service members/veterans and should use additional measures of suicide risk. Our sample also included both active duty service members and veterans. Though we covaried for veteran status in our analyses,[1] future studies may consider modeling these two groups separately to identify possible differences in suicide risk in these two military samples. Finally, our measure of military sexual trauma type was based on the VA Military Sexual Trauma screener, which asks veterans to endorse whether harassment or assault experiences happened to them during their service. It is possible that some of the items captured in the harassment question (e.g., "cornering") could actually represent assault-like experiences. Future studies should use additional measures to screen for specific military sexual trauma experiences and researchers may consider the utility of using factor analysis to determine latent variables that represent "harassment" and "assault" variables.

Findings from the current study show that the mechanism through which assault military sexual trauma relates to suicidal ideation is through PTSD-related anhedonia symptoms and depression severity. Findings suggest that if suicide screening is not part of routine clinical care, service members and veterans who endorse assault military sexual trauma, depression, and PTSD-related anhedonia should be promptly screened for suicide risk. Findings further suggest that screenings for military sexual trauma should distinguish between trauma type as only assault military sexual trauma had an indirect association with suicidal ideation.

[1] We also conducted analyses excluding the veteran status variable. Results were identical in the two models, suggesting that veteran status may not change the associations we observed in the current sample.

Funding

Funding for this study was provided to Dr. Blais by the American Psychological Association – Division 19 (Society for Military Psychology).

Authors' contributions

Dr. Blais had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Study concept and design: Author 1
Acquisition, analysis, or interpretation of data: Author 1, 2
Drafting of the manuscript: Author 1, 2
Statistical analysis: Author 2
Obtaining funding: Author 1
Administrative, technical, or material support: Author 1
Study supervision: Author 1

Acknowledgment

The authors wish to thank Dr. Rick Cruz for statistical consultation.

Conflict of interest

The views expressed are that of the authors. The authors have no conflicts of interest to report.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.psychres.2018.12.148.

References

American Psychiatric Association, 2000. Diagnostic and Statistical Manual of Mental Disorders, fourth ed. text rev. Author, Washington, DC.

American Psychiatric Association, 2013. Diagnostic and Statistical Manual of Mental Disorders, fifth ed. Author. Washington, DC.

Andresen, F.J., Monteith, L.L., Kugler, J., Cruz, R.A., Blais, R.K., 2019. Institutional betrayal following military sexual trauma is associated with more severe depression and specific PTSD symptom clusters. J. Clin. Psychology. https://doi.org/10.1002/jclp.22773.

Armour, C., Contractor, A., Shea, T., Elhai, J.D., Pietrzak, R.H., 2016. Factor structure of the PTSD checklist for DSM-5: relationships among symptom clusters, anger, and impulsivity. J. Nerv. Ment. Des. 204, 108–115. https://doi.org/10.1097/NMD.0000000000000430.

Ashrafioun, L., Pigeon, W.R., Conner, K.R., Leong, S.H., Oslin, D.W., 2016. Prevalence and correlates of suicidal ideation and suicide attempts among veterans in primary care referred for a mental health evaluation. J. Affect. Disorders 189, 344–350. https://doi.org/10.1016/j.jad.2015.09.014.

Blais, R.K., Monteith, L., 2018a. Suicide ideation in female survivors of military sexual trauma: The trauma source matters. Suicide Life Threat. Behav Available online ahead of print.

Blais, R.K., Geiser, C., Cruz, R.A., 2018b. Specific PTSD symptom clusters mediate the association of military sexual trauma severity and sexual function and satisfaction in female service members/veterans. J Affect. Disord. 238, 680–688.

Blais, R.K., Monteith, L., Kugler, J., 2018c. Sexual dysfunction is associated with suicidal ideation in female service members and veterans. J. Affect. Disord. 226, 52–57.

Blais, R.K., Brignone, E., Fargo, J.D., Andresen, F.J., Livingston, W.S., 2019. The importance of distinguishing between harassment and assault military sexual trauma during screening. Military Psychology.
Blais, R.K., 2019. Lower sexual satisfaction and function mediate the association of assault military sexual trauma and relationship satisfaction in partnered female service members/veterans. Family Process.
Barr, N.U., Sullivan, K., Kintzle, S., Castro, C.A., 2016. PTSD symptoms, suicidality and non-suicidal risk to life behavior in a mixed sample of pre- and post-9/11 veterans. Soc. Work. Ment. Health 14 (5), 465–473. https://doi.org/10.1080/15332985.2015.1081666.
Barth, S.K., Kimerling, R.E., Pavao, J., McCutcheon, S.J., Batten, S.V., Dursa, E., ..., Schneiderman, A.I., 2016. Military sexual trauma among recent veterans: correlates of sexual assault and sexual harassment. Am. J. Prev. Med. 50 (1), 77–86. https://doi.org/10.1016/j.amepre.2015.06.012.
Bell, J.B., Nye, E.C., 2007. Specific symptoms predict suicidal ideation in Vietnam combat veterans with chronic post-traumatic stress disorder. Mil. Med. 172 (11), 1144–1147. https://doi.org/10.7205/MILMED.172.11.1144.
Bryan, C.J., Bryan, A.O., Clemans, T.A., 2015. The association of military and premilitary sexual trauma with risk for suicide ideation, plans, and attempts. Psych. Res. 227 (2-3), 246–252. https://doi.org/10.1016/j.psychres.2015.01.030.
Conner, K.R., Bossarte, R.M., He, H., Arora, J., Lu, N., Tu, X.M., Katz, I.R., 2014. Posttraumatic stress disorder and suicide in 5.9 million individuals receiving care in the veterans health administration health system. J. Affect Disord. 166, 1–5. https://doi.org/10.1016/j.jad.2014.04.067.
Corson, K., Denneson, L.M., Bair, M.J., Helmer, D.A., Goulet, J.L., Dobscha, S.K., 2013. Prevalence and correlates of suicidal ideation among operation enduring freedom and operation Iraqi freedom veterans. J. Affect Disord. 149 (1-3), 291–298. https://doi.org/10.1016/j.jad.2013.01.043.
Department of Defense Suicide Prevention Office, 2018. Department of defense quarterly suicide report. 1st Quarter, CY 2018. Retrieved from: http://www.dspo.mil/Portals/113/Documents/QSR_CY2018_Q1.pdf?ver=2018-07-10-105341-687, Accessed date: 10 December 2018.
Enders, C.K, 2010. Applied Missing Data Analysis. Guilford, New York.
Frankfurt, S.B., Armour, C., Contractor, A.A., Elhai, J.D., 2016. Do gender and directness of trauma exposure moderate PTSD's latent structure? Psych. Res. 245, 365–370. https://doi.org/10.1016/j.psychres.2016.08.049.
Gradus, J.L., Street, A.E., Suvak, M.K., Resick, P.A., 2013a. Predictors of suicidal ideation in a gender-stratified sample of OEF/OIF veterans. Suicide Life Threat. Behav. 43 (5), 574–588.
Gradus, J.L., Suvak, M.K., Wisco, B.E., Marx, B.P., Resick, P.A., 2013b. Treatment of posttraumatic stress disorder reduces suicidal ideation. Depress Anxiety 30, 1046–1053. https://doi.org/10.1002/da.22117.
Gros, D.F., Price, M., Strachan, M., Yuen, E.K., Milanak, M.E., Acierno, R., 2012. Behavioral activation and therapeutic exposure: An investigation of relative symptom changes in PTSD and depression during the course of integrated behavioral activation, situational exposure, and imaginal exposure techniques. Behav. Mod. 36 (4), 580–599. https://doi.org/10.1177/0145445512448097.
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 (1), 12–18. https://doi.org/10.1016/j.janxdis.2010.06.025.
Holliday, R., Holder, N., Monteith, L.L., Surís, A., 2018b. Decreases in suicide cognitions after Cognitive Processing Therapy among veterans with posttraumatic stress disorder due to military sexual trauma. A preliminary examination. J. Nerv. Ment. Des. 206, 575–578. https://doi.org/10.1097/NMD.0000000000000840.
Holliday, R., Smith, N.B., Monteith, L.L., 2018a. An initial investigation of nonsuicidal self-injury among male ad female survivors of military sexual trauma. Psych. Res. 268https://doi.org/10.1016/j.psychres.2018.07.033. 335-229.
Jakupcak, M., Wagner, A., Paulson, A., Varra, A., McFall, M., 2010. Behavioral activation as a primary care-based treatment for PTSD and depression among returning veterans. J. Trauma Stress 23 (4), 491–495. https://doi.org/10.1002/jts.20543.
Katz, L.S., 2017. In her own words: Semi-structured interview of women veterans who experienced military sexual assault. J. Contemp. Psychother. 47 (3), 181–189.
Kimerling, R., Gima, K., Smith, M.W., Street, A., Frayne, S., 2007. The veterans health administration and military sexual trauma. Am. J. Public Health 97 (12), 2160–2166. https://doi.org/10.2105/AJPH.2006.092999.
Kimerling, R., Makin-Byrd, K., Louzon, S., Ignacio, R.V., McCarthy, J.F., 2016. Military sexual trauma and suicide mortality. Am. J. Prev. Med. 50 (6), 684–691. https://doi.org/10.1016/j.amepre.2015.10.019.
Kimerling, R., Street, A.E., Pavao, J., Smith, M.W., Cronkite, R.C., Holmes, T.H., Frayne, S.M., 2010. Military-related sexual trauma among veterans health administration patients returning from Afghanistan and Iraq. Am. J. Public Health 100, 1409–1412. https://doi.org/10.2105/AJPH.2009.171793.
Klingensmith, K., Tsai, J., Mota, N., Southwick, S.M., Pietrzak, R.H., 2014. Military sexual trauma in US veterans: results from the national health and resilience in veterans study. J. Clin. Psychiatry 75 (10), e1133–e1139. https://doi.org/10.4088/JCP.14m09244.
Kroenke, K., Spitzer, R.L., 2002. The PHQ-9: a new depression diagnostic and severity measure. Psych. Ann. 32 (9), 509–515. https://doi.org/10.3928/0048-5713-20020901-06.
Kroenke, K., Strine, T.W., Spitzer, R.L., Williams, J.B.W., Berry, J.T., Mokdad, A.H., 2009. The PHQ-8 as a measure of current depression in the general population. J. Affect. Disord. 114 (1-3), 163–173. https://doi.org/10.1016/j.jad.2008.06.026.
Legarreta, M., Graham, J., North, L., Bueler, C.E., McGlade, E., Yurgelun-Todd, D., 2015. DSM–5 posttraumatic stress disorder symptoms associated with suicide behaviors in veterans. Psychol. Trauma 7 (3), 277–285. https://doi.org/10.1037/tra0000026.
Louzon, S.A., Bossarte, R., McCarthy, J.F., Katz, I.R., 2016. Does suicidal ideation as measured by the PHQ-9 predict suicide among VA patients? Psychiatr. Serv. 67 (5), 517–522.
Maassen, G.H., Bakker, A.B., 2001. Suppressor variables in path models. Sociol. Methods Res. 30, 241–270.
MacKinnon, D.P., 2008. Introduction to Statistical Mediation Analysis. Lawrence Erlbaum and Associates, New York.
MacKinnon, D.P., Krull, J.L., Lockwood, C.M., 2000. Equivalence of the mediation, confounding, and suppression effect. Prev. Sci. 1, 173–181.
Maguen, S., Madden, E., Cohen, B.E., Bertenthal, D., Neylan, T.C., Seal, K.H., 2015. Suicide risk in Iraq and Afghanistan veterans with mental health problems in VA care. J. Psych. Res. 68, 120–124. https://doi.org/10.1016/j.jpsychires.2015.06.013.
Monteith, L.L., Bahraini, N.H., Matarazzo, B.B., Gerber, H.R., Soberay, K.A., Forster, J.E., 2016. The influence of gender on suicidal ideation following military sexual trauma among veterans in the veterans health administration. Psych. Res. 244, 257–265. https://doi-org.dist.lib.usu.edu/10.1016/j.psychres.2016.07.036.
Monteith, L.L., Bahraini, N.H., Menefee, D.S., 2017. Perceived burdensomeness, thwarted belonging, and fearlessness about death: Associations with suicidal ideation among female veterans exposed to military sexual trauma. J Clin. Psychol. 73, 1655–1669. https://doi.org/10.1002/jclp.22462.
Monteith, L.L., Gerber, H.R., Brownstone, L.M., Soberay, K.A., Bahraini, N.H., 2018. The phenomenology of military sexual trauma among male veterans. Psychol. Men. Masc Epub ahead of print.
Muthén, L.K., Muthén, B.O., 1998. Mplus User's Guide, eighth ed. Muthén & Muthén, Los Angeles, CA.
Nock, M.K., Deming, C.A., Fullerton, C.S., Gilman, S.E., Goldenberg, M., Kessler, R.C., Stanley, B., 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.
Pietrzak, R.H., Russo, A.R., Ling, Q., Southwick, S.M., 2011. Suicidal ideation in treatment-seeking Veterans of Operations Enduring Freedom and Iraqi Freedom: The role of coping strategies, resilience, and social support. J. Psych. Res. 45 (6), 720–726. https://doi.org/10.1016/j.jpsychires.2010.11.015.
Shively, L., 2010. Suicide preventable, though third leading cause of death among Army personnel. https://www.army.mil/article/45632/suicide-preventable-through-third-leading-cause-of-death-among-army-personnel, Accessed date: 10 December 2018.
Surís, A., Link-Malcolm, J., Chard, K., Ahn, C., North, C.S., 2013. A randomized clinical trial of cognitive processing therapy for veterans with PTSD related to military sexual trauma. J. Trauma Stress. 26, 28–37. https://doi.org/10.1002/jts.21765.
Surís, A., Link-Malcolm, J., North, C.S., 2011. Predictors of suicidal ideation in veterans with PTSD related to military sexual trauma. J Trauma Stress 24, 605–608. https://doi.org/10.1002/jts.20674.
U.S. Department of Veterans Affairs, 2016. VA suicide prevention program facts about veteran suicide: July 2016. Retrieved from. https://www.va.gov/opa/publications/factsheets/Suicide_Prevention_FactSheet_New_VA_Stats_070616_1400.pdf, Accessed date: 2 February 2017.
U.S. Government, 2014. Veterans' Benefits: Counseling and Treatment For Sexual trauma, 38 USC §1720D. U.S. Government Printing Office, Washington, DC Retrieved from. https://www.gpo.gov/fdsys/pkg/USCODE-2014-title38/pdf/USCODE-2014-title38-partII-chap17-subchapII-, Accessed date: 10 October 2018 sec 1720D.pdf.
Weathers, F.W., Litz, B.T., Keane, T.M., Palmieri, P.A., Marx, B.P., Schnurr, P.P., 2013. The PTSD Checklist for DSM-5 (PCL-5). Scale available from the National Center for PTSD at. www.ptsd.va.gov.
White, K.L., Harris, J.A., Bryan, A.O., Reynolds, M., Fuessel-Herrmann, D., Bryan, C.J., 2018. Military sexual trauma and suicidal behavior among national guard personnel. Comp. Psych. 87, 1–6. https://doi.org/10.1016/j.comppsych.2018.08.008.
Wiblin, J., Holder, N., Holliday, R., Suris, A., 2018. Predictors of unbearability, unlovability, and unsolvability in veterans with military sexual trauma-related posttraumatic stress disorder. J. Interpers. Violence. https://doi.org/10.1177/0886260518777554. Epub ahead of print.
Wilson, L.C., 2016. The prevalence of military sexual trauma: a meta-analysis. Trauma Violence Abuse. https://doi.org/10.1177/1524838016683459. Advanced online publication.