

Research paper

Specific PTSD symptom clusters mediate the association of military sexual trauma severity and sexual function and satisfaction in female service members/veterans



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ABSTRACT

Background: Sexual satisfaction and function are vastly understudied in female service members/veterans (SM/Vs). Military sexual trauma (MST) is associated with poorer sexual satisfaction and function, but the mechanism through which MST relates to sexual satisfaction and function is unknown. Posttraumatic stress disorder (PTSD) is one of the most frequent diagnoses following MST, and those with poorer sexual satisfaction and function experience higher PTSD symptoms, particularly numbing and anhedonia symptom clusters. In this study, we examined which symptom clusters (re-experiencing, avoidance, negative alterations in cognition and mood [NACM], anhedonia, dysphoric and anxious arousal) mediated the relationship between MST and sexual satisfaction and function.

Method: Female SM/Vs ($N = 1,189$) completed self-report measures of MST severity (none, harassment only, assault), PTSD, sexual satisfaction, and sexual function, as well as a demographic inventory.

Results: Anhedonia and dysphoric arousal fully mediated the association between assault MST and sexual satisfaction and function. NACM fully mediated the association between harassment and assault MST and sexual satisfaction. Finally, dysphoric arousal significantly mediated the association of harassment MST with sexual satisfaction and function.

Limitations: Data was cross-sectional and based on self-report.

Conclusions: The relationship between MST and sexual satisfaction and function may be mediated through specific PTSD symptom clusters. As there are no evidenced-based treatments to improve sexual satisfaction and function in female SM/Vs, additional research is needed to develop and pilot interventions. Among those with a history of MST, targeting NACM, anhedonia, and dysphoric arousal may be most effective in addressing sexual concerns.

Lack of sexual dysfunction and dissatisfaction are critical elements of healthy human sexuality that are related to overall quality of life (Nunnink et al., 2012; Sadler et al., 2012), reduced risk of mental health diagnoses (Hosain et al., 2013), and lower suicidal ideation in military service members/veterans (SM/Vs; Blais, Monteith, & Kugler, 2018b). Sexual satisfaction and function are largely understudied within the veteran population, in spite of several deployment- and service-related stressors placing SM/Vs at elevated risk for sexual satisfaction and function issues. Such stressors include physical injury (e.g., spinal cord injury; Cuenca et al., 2015), traumatic brain injury (Ponsford et al., 2013), posttraumatic stress disorder (PTSD; Schreiner-Engel and Schiavi, 1986), depression (Perlman et al., 2007), and sexual trauma (Turchik et al., 2012). Moreover, a substantial portion of Iraq and Afghanistan SM/Vs are currently in their peak sexual years and roughly

half of all SM/Vs are married (Patten and Parker, 2011), making a greater understanding of sexual satisfaction and function in SM/Vs a timely issue.

Only a handful of studies to date have examined sexual satisfaction and function in female SM/Vs, resulting in a significant gap in the literature regarding our understanding of this issue in one of fastest growing demographics in the military (Patten and Parker, 2011). Further exploring sexual satisfaction and function in female SM/Vs is critical as female veterans engage in more frequent sexual activity and have more sexual partners relative to their civilian counterparts (e.g., Lehavot et al., 2014). Female veterans also report greater sexual dysfunction relative to their female civilian and male veteran counterparts (see review by Rosebrock and Carroll, 2017). The current study sought to address gaps in our understanding of sexual satisfaction and function

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in female SM/V by identifying determinants of sexual satisfaction and function.

One risk factor for poor sexual satisfaction and function among SM/Vs includes a history of military sexual trauma (MST). According to the [Department of Veterans Affairs \(VA\)](#), MST is defined “psychological trauma... [that] resulted 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, active duty for training, or inactive duty training” ([U.S. Government, 2014](#), p. 285). MST can include, but is not limited to, unwanted touching, pressuring, or corning for sexual favors, and in more extreme cases, forced sexual assault. Recent evidence suggests that SM/Vs may be at heightened risk for sexual trauma relative to their civilian counterparts ([Stander and Thomsen, 2016](#)), thus making sexual trauma, too, an important public health concern to further investigate. Indeed, a meta-analysis conducted in 2003 found that sexual trauma that occurred in the workplace was highest in the military (termed ‘MST’ by the VA) relative to academia, government agencies, or the private sector ([Ilies et al., 2003](#)). Estimates of MST among VA-enrolled female veterans show that 28% report MST during screening (VA, 2017). However, recent research conducted outside VA suggests that this estimate is a drastic underrepresentation of this public health concern. Specifically, a recent review of the literature revealed that ~40% of female veterans experienced MST ([Wilson, 2016](#)). Potential reasons for the discrepant rates include the environment in which the data was collected (e.g., in VA versus outside VA) or the mechanism of data collection (e.g., self-report versus interview; [Wilson, 2016](#)). Indeed, approximately 25% of female veterans do not disclose their sexual trauma during screening ([Blais et al., 2017](#)).

To date, few studies have explored the association of MST with sexual satisfaction and function. Of the available research, findings show that those SM/Vs reporting a history of MST are more likely to report higher sexual dysfunction and lower sexual satisfaction relative to those without a history of MST ([DiMauro et al., 2018; Schnurr et al., 2009; Turchik et al., 2012](#)). Historically, MST is measured as a present/absent phenomenon by asking veterans if they experienced unwanted and uninvited sexual attention (referred to as “harassment”) or force/threat of force to have sexual relations against their will (referred to as “assault”). Regardless of MST severity, veterans are considered to have a positive history of MST if they endorse either harassment or assault MST. Preliminary evidence suggests that assault MST is associated with higher mental health distress in female SM/Vs relative to harassment MST only ([Blais et al., 2018a](#)), suggesting that it is important to distinguish MST severity in studies. One of the aims of the current study was to examine the association of MST severity with sexual satisfaction and function in female SM/Vs in greater detail by distinguishing between harassment and assault.

In some cases, particularly assault MST, the sexual trauma represents a Criterion A event for PTSD, and as such, it is possible that the mechanism through which MST relates to sexual satisfaction and function is via PTSD as a key mediator variable. Indeed, female veterans reporting sexual dysfunction are at heightened risk for PTSD (see review, [Rosebrock and Carroll, 2017](#)), and sexual trauma, relative to other types of trauma, is most closely related to the development of PTSD ([Suris et al., 2004; Yaeger et al., 2006](#)). Among those with PTSD, rates of sexual dysfunction are high. Specifically, studies show that those diagnosed with PTSD are more likely to be diagnosed with sexual dysfunction relative to those without a PTSD diagnosis ([Breyer et al., 2016; Yehuda et al., 2015](#)).

Studies examining the association of PTSD with sexual trauma or sexual satisfaction and function typically examine this association using overall PTSD severity or likelihood of a PTSD diagnosis. However, PTSD is a multifaceted disorder. The Diagnostic and Statistical Manual for Mental Disorders 5 (DSM-5; [American Psychological Association \[APA\], 2013](#)) suggests that PTSD is composed of four symptom clusters or factors, which include (1) re-experiencing, (2) avoidance, (3) negative

alterations in cognitions or mood, and (4) hyper-arousal symptoms. However, factor analyses of the DSM-5 symptom clusters rarely conform to this four-factor solution (e.g., [Armour et al., 2016; Frankfurt et al., 2016](#)). Several authors have suggested alternate factor structures, including the four-factor Dysphoria, five-factor Dysphoric Arousal, six-factor Anhedonia, six-factor Externalizing, and seven-factor Hybrid models ([Armour et al., 2016; Frankfurt et al., 2016](#)). One study was identified that examined the association of specific symptom clusters of PTSD with sexual dysfunction, and findings revealed that numbing (which includes components of anhedonia) and heightened arousal symptoms of PTSD were most closely associated with sexual dysfunction ([Schnurr et al., 2009](#)). A key limitation of this study is that the authors assessed PTSD severity using an earlier version of the DSM (DSM-IV-TR; [APA, 2000](#)), which does not include the symptoms added in DSM-5.

The present study was designed to fill in gaps in our knowledge regarding the association of MST, PTSD symptom clusters, and sexual satisfaction and function. In particular, we sought to identify which symptom clusters of PTSD significantly mediated the associations between MST severity and sexual satisfaction and function. We first determined the most well-fitting factor structure of the PTSD Checklist for DSM-5 (PCL-5) in our sample by examining those novel factor structures proposed in prior research. These factor structures included the DSM-5 four-factor, four-factor Dysphoria, five-factor Dysphoric Arousal, six-factor Anhedonia, six-factor Externalizing, and seven-factor Hybrid models. ([Armour et al., 2016; Frankfurt et al., 2016](#)).

1. Method

1.1. Participants

Female SM/Vs ($N = 1,189$) were primarily recruited via Facebook, an effective strategy for recruiting military service members and veteran samples (c.f. [Pedersen et al., 2015](#)). Data analyzed for the current study were collected as part of a cross-sectional study designed to examine the association of MST, couples' relationship satisfaction, and sexual satisfaction and function in partnered female SM/Vs. As such, the majority of our sample identified as partnered. Advertisements delivered through Facebook targeted partnered females with a history of military service. Those who were interested in participating advanced to a Qualtrics survey and completed screening items confirming female sex, military service, and consenting age (age 18 or greater). Those that met screening criteria were provided with an Institutional Review Board (IRB) Letter of Information (LoI) and study questions. A LoI was used in place of a consent form as the consent form would have been the only record linking names to study participation. However, identifying information and mailing addresses were collected via a separate Qualtrics survey to facilitate compensation of \$15. Identifying information could not be linked to study data in any way. This study was approved by the Utah State University IRB.

1.2. Measures

1.2.1. Demographics

A demographic inventory designed for the current study was used to assess covariates of age, relationship duration, marital status, and history of deployment. Additional demographic information was collected to simply describe sample characteristics (these variables were not included in the analysis): race, income, education, military branch of service, and discharge status. As the majority of the sample identified as White and reported service in the Army, these categories were selected as index terms for these variables. Additional demographic information is available upon request to the first author.

1.2.2. MST

A slightly modified version of the [VA MST Screening Questionnaire](#)

assessed MST severity. Participants indicated via electronic checkmark what forms of harassment they experienced during their military service, including touching, cornering, pressure for sexual favors, or verbal remarks (unlike the harassment screening item in VA, which simply asks participants to respond “yes,” “no,” or “decline to answer”). Endorsement of any of the harassment items resulted in a positive screen for harassment MST. Assault that occurred during military service was assessed via an affirmative response to the question: “When you were in the military, did someone ever use force or threat of force to have sexual contact with you against your will?”

1.2.3. PTSD

PTSD severity was measured using *Posttraumatic Stress Disorders Checklist for DSM-5* (PCL-5; [Weathers et al., 2013](#)). The PCL-5 assesses how bothered a participant was by each of the PTSD symptoms over the past month using a five-point Likert scale of 0 (*not at all*) to 4 (*extremely*). A sample item includes “In the past month, how much were you bothered by repeated, disturbing, and unwanted memories of the stressful experience?” All 20 items are summed for a total score that ranges from 0 to 80, and subscale scores can be calculated to determine symptom cluster severity. Psychometric properties in other samples demonstrated that the PCL-5 shows good internal consistency, test-retest reliability, and adequate convergent and divergent validity ([Blevins et al., 2015](#)). The current sample showed excellent internal reliability (Cronbach's $\alpha = .97$).

1.2.4. Sexual function

Sexual function was assessed using the *Female Sexual Function Index* (FSFI; [Rosen et al., 2000](#)) The FSFI is a 19-item self-report inventory assessing overall sexual function (e.g., desire, lubrication, orgasm). Three items were not used in the current study as those items assessed sexual satisfaction, which was captured in the current study using the *Sexual Satisfaction Scale for Women* (described below). A sample item includes “Over the past four weeks, how often did you feel sexual desire or interest?” Items are scored using a variable anchor Likert scale. The 16 items used in the current study were summed for a total score ranging from 1.2 to 30, and higher scores indicate greater sexual function. Psychometric properties in other samples demonstrated that the FSFI shows good internal consistency, test-retest reliability, and adequate construct and divergent validity ([Rosen et al., 2000](#)). The current sample showed excellent internal reliability (Cronbach's $\alpha = .95$).

1.2.5. Sexual satisfaction

Sexual satisfaction was assessed using the *Sexual Satisfaction Scale for Women* (SSS-W; [Meston and Trapnell, 2005](#)). The SSS-W is a 30-item self-report inventory that assesses sexual satisfaction using a variable anchor Likert scale ranging from 1 to 5. A sample item includes “I feel content with my present sexual life.” Responses on all items are summed for a total score and scores range from 24–120. Higher scores are indicative of greater sexual satisfaction. Psychometric properties in another sample demonstrated that the SSS-W shows good internal consistency and validity, as well as the ability to distinguish between women with and without sexual dysfunction ([Meston and Trapnell, 2005](#)). The current sample showed excellent internal reliability (Cronbach's $\alpha = .96$).

1.3. Statistical analyses

Descriptive statistics were computed using a subsample that had no missing data on all observed variables ($n = 732$, 61.56%). Analyses of variances (ANOVA) and chi-square tests were used to identify possible differences among those who completed the MST screening questions ($n = 832$, 69.97%) to those who did not complete the MST screening questions ($n = 357$, 30.02%). ANOVA with posthoc comparisons using Tukey's correction was used to determine differences in mediators and

outcomes among those with no MST, harassment only MST, and assault MST.

We examined the factor structure of the PCL-5 items in the present sample using confirmatory factor analysis for ordinal variables in the software Mplus 8 ([Muthén and Muthén, 1998–2017](#)). For ordinal variables, Mplus provides a mean and variance adjusted weighted least squares (WLSMV) estimator that is based on polychoric correlations and properly accounts for the categorical nature of the items ([Beauducel and Herzberg, 2009](#)). Consistent with approaches in previous studies ([Armour et al., 2016; Frankfurt et al., 2016](#)), we compared the DSM-5 four-factor, four-factor Dysphoria, five-factor Dysphoric Arousal, six-factor Anhedonia, six-factor Externalizing, and seven-factor Hybrid models in terms of their fit to the data. We examined model fit based on the chi-square test of model fit, root mean square error of approximation (RMSEA), comparative fit index (CFI), and Tucker-Lewis index (TLI). Models with smaller chi-square values relative to their degrees of freedom are preferred. In addition, models for which RMSEA $<=.05$, as well as CFI and TLI $>=.95$ are commonly seen as fitting the data well ([Hu and Bentler, 1999](#)).

In our factor analyses, and consistent with the findings of [Armour et al. \(2016\)](#) and [Frankfurt et al. \(2016\)](#), the models with the most favorable chi-square, RMSEA, CFI, and TLI were the Anhedonia and Hybrid models (see Table A1 in the online appendix at <https://osf.io/k3d4f/>). We preferred the Anhedonia model over the Hybrid model (which includes an externalizing subscale) given that women tend to show more internalizing, rather than externalizing, behaviors relative to men and our sample was composed of female SM/Vs only ([Eaton et al., 2012](#)). Thus, to identify which symptom clusters of PTSD significantly mediated the associations between MST severity and sexual satisfaction and function, we created six PTSD subscale scores based on the six-factor Anhedonia model (re-experiencing [items 1 through 5; score range: 0 to 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]).

In the second step, we examined relationships between MST, the different symptom clusters of PTSD (as reflected in the six PCL-5 sum scores), and sexual satisfaction and function using path analysis (see Fig. 1). For the path analysis, we included two dummy variables in the path model to represent MST. The first dummy variable represented harassment only, whereas the second dummy variable represented assault (of note, the majority of individuals who reported assault MST also experienced harassment MST). The “no MST” category served as reference category for both dummy variables. The model included direct paths from both MST dummy variables to all PTSD sum scores.

All six PTSD variables had direct paths onto the sexual satisfaction and function outcome variables. The PTSD variables thus served as mediator variables in the model. No direct effects were allowed between the two MST dummy variables and sexual satisfaction and function outcome variables, thus assuming full mediation (only indirect effects from MST to sexual satisfaction and function via the PTSD mediators). In addition, all PTSD mediators as well as the sexual satisfaction and function outcome variables were regressed on age, marital status, and relationship duration as potential control variables (covariates). The PTSD variables were additionally regressed on deployment history, because it is known from previous studies that deployment history is related to PTSD symptoms in female SM/Vs ([Kline et al., 2013](#)).

All exogenous variables (MST dummies and covariates) in the path model were allowed to correlate freely. Residual variables associated with the PTSD mediators were allowed to correlate with one another as were the residual variables associated with the sexual satisfaction and function outcomes. The statistical significance of the path coefficients and indirect (mediated) effects was assessed through bias-corrected bootstrapping as recommended by [MacKinnon \(2008\)](#).

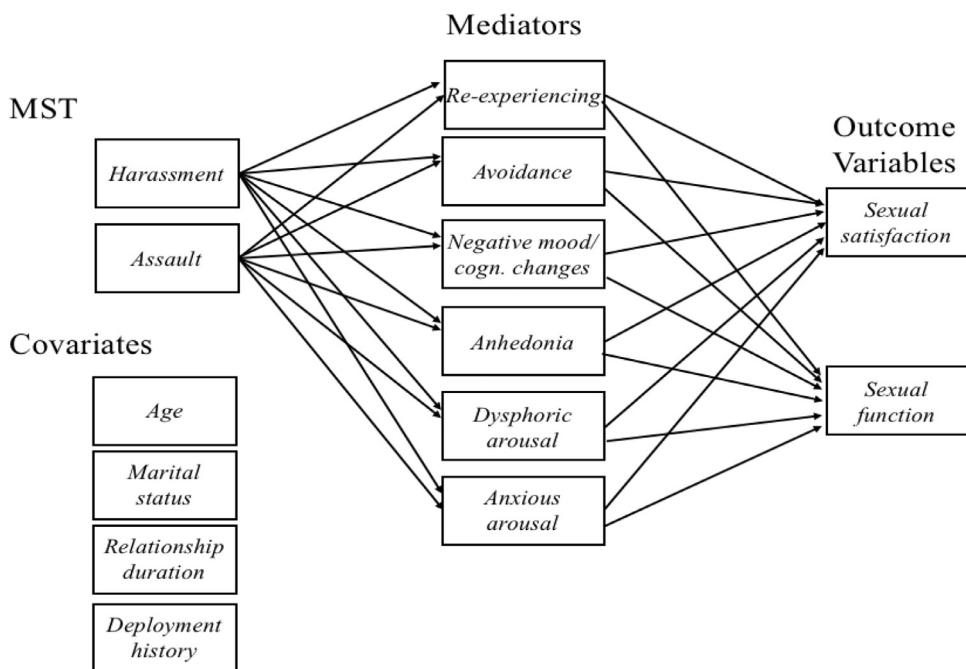


Fig. 1. Path analytic model analyzed in the present study. Due to space constraints, paths from the covariates are not shown in the picture (see text for a detailed description). Estimated correlations between exogenous variables and residuals have also been omitted from the picture, but are discussed in the text.

Table 1

Means and standard deviations in those with observed data on PTSD symptom clusters, sexual satisfaction, and sexual function stratified by MST history type ($n = 832$).

	No MST ($n = 153$) <i>M (SD)</i>	Harassment MST ($n = 396$) <i>M (SD)</i>	Assault MST ($n = 283$) <i>M (SD)</i>	Test of difference
Sexual satisfaction	89.71 ^a (22.42)	86.43 ^a (22.15)	77.61 ^b (24.12)	$F(2,782) = 16.96, p < 0.001$
Sexual function	19.89 ^a (8.52)	19.24 ^a (8.08)	16.42 ^b (8.36)	$F(2,819) = 12.55, p < 0.001$
Re-experiencing	3.35 ^a (5.49)	4.26 ^a (5.19)	9.19 ^b (6.25)	$F(2,826) = 80.29, p < 0.001$
Avoidance	1.65 ^a (2.49)	2.11 ^a (2.55)	4.64 ^b (2.89)	$F(2,827) = 95.17, p < 0.001$
Negative alteration cognition/mood	2.63 ^a (4.13)	3.83 ^b (4.41)	7.87 ^c (5.26)	$F(2,820) = 84.39, p < 0.001$
Anhedonia	2.68 ^a (3.68)	3.28 ^a (3.77)	5.88 ^b (4.21)	$F(2,822) = 47.81, p < 0.001$
Dysphoric arousal	3.43 ^a (4.22)	4.23 ^a (4.19)	7.38 ^a (4.71)	$F(2,823) = 56.60, p < 0.001$
Anxious arousal	1.43 ^a (2.26)	2.09 ^b (2.60)	4.09 ^c (2.79)	$F(2,824) = 68.41, p < 0.001$

Note. PTSD = Posttraumatic stress disorder; MST = Military sexual trauma; *M* = Mean; *SD* = Standard deviation. Means in the same row that do not share a superscript letter are statistically different at $p < .05$.

In the path analysis, we used full information maximum likelihood (FIML) estimation to account for missing data. FIML estimation is preferred over more ad hoc procedures to deal with missingness, because it reduces bias in statistical estimates and improves statistical power by taking into account all available data points (Enders, 2010; Schafer and Graham, 2002).

2. Results

Thirty-six patterns of missing data were identified. The most frequent pattern was complete data (no missing scores on any of the variables included in the model; $n = 732$, 61.56%). The second most common pattern of missingness revealed that 194 participants (16.32%) completed the demographic inventory and then discontinued their participation. Overall, of the 35 patterns of missing data (excluding the pattern with no missingness), 10 patterns indicated missingness on only one variable/item ($n = 93$, 7.82%), and 10 other patterns indicated missing data on only two variables/items ($n = 32$, 2.69%).

Of those with no missing observed data ($n = 732$; 61.56%), the majority of the sample reported attending at least some college ($n = 665$, 91.6%). Of those, 152 (22.86%) completed an associate's

degree, 187 (28.12%) completed a bachelor's degree, and 93 (14.44%) completed an advanced degree. The majority reported a household income $\geq \$50,000$ ($n = 434$; 59.78%). The majority identified as White ($n = 564$, 77.69%). The majority of the sample reported service in the Army ($n = 389$, 53.58%) and indicated they were discharged from service ($n = 538$, 71.10%).

Eight hundred thirty-two (69.97%) SM/Vs provided MST screening data. Of those, 153 (18.39%) reported no history of MST, 396 reported harassment only MST (47.60%), and 283 (34.01%) reported that their MST involved assault (of those 283, 277 [97.88%] reported that their MST involved both harassment and assault). There were no significant differences observed between those with and without MST screening data with regard to demographic variables of age, marital status, duration of relationship, number of deployments, or race ($p > .05$). Those with MST screening data were more likely to have completed some college (91.59%, $n = 762$) but less likely to have annual incomes $\geq \$50,000/\text{year}$ (58.77%, $n = 489$) than those without MST screening data (86.03%, $n = 308$; $\chi^2[2, N = 1,189] = 8.58, p = .01$, 65.64%, $n = 235$; $\chi^2[2, N = 1,189] = 7.67, p = .02$, respectively). Table 1 shows means and standard deviations for PTSD symptom clusters, sexual satisfaction, and sexual function stratified by MST type (no MST, harassment, assault). Overall, those who reported assault MST

Table 2Correlations, means, and standard deviations for all variables used in the path model ($N = 1,189$).

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Harassment	—													
2. Assault	−0.68	—												
3. Re-experiencing	−0.24	.40	—											
4. Avoidance	−0.25	.43	.84	—										
5. Negative affect/cognition changes	−0.22	.41	.83	.83	—									
6. Anhedonia	−0.18	.32	.71	.69	.78	—								
7. Dysphoric arousal	−0.19	.34	.76	.73	.80	.83	—							
8. Anxious arousal	−0.19	.37	.76	.74	.76	.69	.78	—						
9. Sexual satisfaction	.09	−0.19	−0.28	−0.29	−0.38	−0.45	−0.41	−0.29	—					
10. Sexual function	.09	−0.16	−0.25	−0.25	−0.30	−0.36	−0.33	−0.26	.58	—				
11. Relationship duration	.01	−0.05	−0.07	−0.07	−0.07	−0.06	−0.08	−0.06	−0.17	−0.16	—			
12. Marital status	.04	.00	−0.02	−0.02	−0.02	−0.03	−0.01	−0.01	−0.21	−0.10	.37	—		
13. Deployment history	.01	.02	.01	.01	.03	.04	.05	.05	−0.03	−0.06	.02	.03	—	
14. Age	.02	.03	−0.02	.00	−0.02	.01	−0.01	.00	−0.11	−0.08	.47	.13	.10	—
<i>M</i>	0.48	0.33	5.63	2.81	4.81	3.95	5.01	2.56	84.88	18.58	74.51	0.74	0.70	32.63
<i>SD</i>	0.50	0.48	6.11	2.94	5.09	4.08	4.64	2.79	23.17	8.34	67.99	0.44	.87	9.59

Note. NACM = negative alterations in cognition and mood; *M* = Mean; *SD* = Standard deviation. All correlations $> |.07|$ are significant at $p \leq .05$. All correlations $\geq |.09|$ are significant at $p \leq .01$. All correlations $\geq |.13|$ are significant at $p \leq .001$.

relative to harassment or no MST reported significantly higher scores on all PTSD symptom clusters and lower scores on sexual satisfaction and function. In addition, those who reported harassment MST relative to no MST scored higher on negative alterations in cognition and mood and anxious arousal.

As can be seen from the zero-order correlations in Table 2, which also displays means and standard deviations for all variables included in Fig. 1, all symptom clusters were positively correlated with each other with large effect sizes. Sexual satisfaction and sexual function were associated with MST severity with small effect sizes and with PTSD symptom clusters with small-to-large effect sizes. Older age was associated with history of deployment, and lower sexual satisfaction and function, with small effect sizes. Longer relationship duration was associated with lower re-experiencing symptoms, avoidance, negative alterations in cognition and mood, and dysphoric arousal, as well as lower sexual satisfaction and function with small effect sizes, and older age with a large effect size. Being married was associated with lower sexual satisfaction, lower sexual function, older age, and longer relationship duration, with small-to-medium effect sizes.

2.1. Path analysis

The path analytic model in Fig. 1 fit the data very well as indicated by a non-significant chi-square test of model fit and descriptive indices, $\chi^2(6, N = 1,189) = 8.04, p = .24, CFI = 1.00, RMSEA = 0.017, SRMR = 0.008$. This indicated that the assumption of full mediation was supported by the data (there were no significant direct paths between MST and the sexual satisfaction and function outcomes). The model estimates revealed that many of the covariates had regression coefficients close to zero that were not statistically significant. To make the model more parsimonious and to simplify the presentation of the results, we trimmed all non-significant covariate effects from the final model. The final model also fit the data very well, $\chi^2(17, N = 1,189) = 13.06, p = .73, CFI = 1.00, RMSEA < 0.001, SRMR = 0.017$.

Estimated unstandardized (*b*) and standardized (β) path coefficients for the final model are shown in Table 3. It can be seen that most direct paths from harassment to the PTSD mediators 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 PTSD mediators were strong and highly statistically significant. In summary, whereas harassment was either not or only weakly related to the PTSD symptom clusters, assault was strongly associated with each PTSD symptom cluster considered in this study.

Regression residuals for the PTSD symptom clusters were positively

Table 3Estimated path coefficients for the model in Fig. 1 ($N = 1,189$).

Path	<i>b</i>	SE(<i>b</i>)	β	<i>P</i>	R^2
Re-experiencing regressed on					
Harassment	0.91	0.52	0.08	0.08	
Assault	5.84	0.57	0.45	< 0.001	0.17
Avoidance regressed on					
Harassment	0.45	0.24	0.08	0.06	
Assault	2.98	0.27	0.48	< 0.001	0.19
Negative affect/cognition changes regressed on					
Harassment	1.17	0.40	0.12	0.003	
Assault	5.25	0.45	0.49	< 0.001	0.18
Anhedonia regressed on					
Harassment	0.58	0.35	0.07	0.10	
Assault	3.15	0.38	0.37	< 0.001	0.10
Dysphoric arousal regressed on					
Harassment	0.77	0.40	0.08	0.054	
Assault	3.90	0.44	0.40	< 0.001	0.12
Anxious arousal regressed on					
Harassment	0.65	0.22	0.12	0.004	
Assault	2.63	0.25	0.45	< 0.001	0.14
Sexual satisfaction regressed on					
Re-experiencing	0.69	0.22	0.18	0.002	
Avoidance	0.36	0.46	0.05	0.44	
Negative affect/cognition changes	−1.02	0.31	−0.22	0.001	
Anhedonia	−1.87	0.33	−0.33	< 0.001	
Dysphoric arousal	−1.13	0.31	−0.23	< 0.001	
Anxious arousal	0.85	0.43	0.10	0.049	
Relationship duration	−0.05	0.01	−0.14	< 0.001	
Marital status	−8.08	1.46	−0.15	< 0.001	0.29
Sexual function regressed on					
Re-experiencing	0.13	0.09	0.09	0.14	
Avoidance	0.05	0.17	0.02	0.79	
Negative affect/cognition changes	−0.18	0.11	−0.11	0.11	
Anhedonia	−0.52	0.12	−0.25	< 0.001	
Dysphoric arousal	−0.26	0.12	−0.14	0.03	
Anxious arousal	0.06	0.17	0.02	0.72	
Relationship duration	−0.02	0.004	−0.19	< 0.001	0.17

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. Table entries are based on the final model in which non-significant covariate effects were deleted. Italicized entries indicate significant path coefficients with counterintuitive sign (suppression effects).

correlated (*r* values ranging from 0.69 to 0.84, all $ps < .001$), indicating that associations between the mediator variables were not fully accounted for by the harassment and assault dummy variables. Overall, between 10% and 19% of the variability in the mediator variables was

explained in the model.

In terms of associations between PTSD symptom clusters and sexual satisfaction, all direct paths from PTSD symptom clusters to sexual satisfaction were statistically significant except for avoidance. In addition, sexual satisfaction was significantly negatively related to relationship duration and marital status (married individuals tended to be less satisfied). The paths from negative alterations in cognition and mood, anhedonia, and dysphoric arousal were negative (as expected) and substantial in absolute magnitude, whereas the paths from re-experiencing and anxious arousal were positive (and weaker in absolute size). This counter-intuitive finding indicated the presence of suppression effects, given that all PTSD facets showed *negative* zero-order correlations with the sexual satisfaction outcome in the present data as one would expect.

This phenomenon can be explained by the fact that all PTSD symptom clusters were very strongly positively correlated with one another (see Table 2). The re-experiencing and anxious arousal variables thus improved the overall prediction of sexual satisfaction by suppressing irrelevant variance components in the other PTSD symptom clusters with which they were highly correlated. Such suppressor effects are not uncommon in regression and path analyses and can lead to complications in the interpretation of the results due to the unexpected opposite sign of the path coefficients (Maassen and Bakker, 2001). Maassen and Bakker (2001) recommended that the signs of the path coefficients estimated for suppressor variables should not be substantively interpreted.

Direct paths running from anhedonia and dysphoric arousal to sexual function were statistically significant but generally weaker than the same paths for sexual satisfaction. Similar to sexual satisfaction, those in longer relationships reported poorer sexual function. Regression residuals for sexual satisfaction and sexual function were positively correlated ($r = .58, p < .001$), indicating that the mediator variables and covariates did not fully account for the covariance between these variables. Overall, 29% of the variability in sexual satisfaction and 17% of the variability in sexual function were explained in the model.

We tested the statistical significance of indirect (mediated) variable effects from MST to sexual satisfaction and function via PTSD symptom clusters by computing bias-corrected bootstrap confidence intervals (CIs) for the indirect effects as recommended by MacKinnon (2008). Table 4 shows the unstandardized and standardized indirect effect estimates as well as 95% CIs for the unstandardized estimates. Statistically significant mediated effects are indicated by 95% CIs that do not include zero.

The effect of harassment only and assault on sexual satisfaction was significantly mediated by the re-experiencing, negative alterations in cognition and mood, dysphoric arousal, and anxious arousal symptom clusters, again keeping in mind that re-experiencing and anxious arousal symptom clusters acted as suppressor variables with path coefficients of opposite sign, making the corresponding indirect effects uninterpretable. The effect of assault MST on sexual satisfaction was also mediated by the anhedonia symptom cluster. The effect of harassment and assault on sexual function was significantly mediated by the dysphoric arousal symptom cluster. The effect of assault MST on sexual function was also mediated by anhedonia.

3. Discussion

The current study examined the associations of MST severity, PTSD symptom clusters, and sexual satisfaction and function in a sample of female SM/Vs. Findings revealed that one possible mechanism through which MST related to sexual satisfaction and function was through specific symptom clusters of PTSD. In particular, anhedonia and dysphoric arousal fully mediated the association between assault MST and sexual satisfaction and function. NACM fully mediated the association between harassment and assault MST and sexual satisfaction. Finally,

dysphoric arousal significantly mediated the association of harassment MST with sexual satisfaction and function. The indirect effects of re-experiencing and anxious arousal with sexual satisfaction with either form of MST were significant, but were the result of suppression effects rendering these associations uninterpretable. Our findings have important clinical implications such that interventions aimed at reducing the sexual satisfaction and function concerns experienced by MST survivors should focus on certain components of PTSD, particularly anhedonia, negative alterations in cognition and mood, and dysphoric arousal symptom clusters.

Our findings are consistent with a recent meta-analysis examining interpersonal functioning and PTSD symptoms clusters, which demonstrated that symptoms of emotional numbing (which includes components of anhedonia as assessed in the current factor model) were associated with higher intimacy issues (Birkley et al., 2016). In fact, while numbing was associated with poorer relationship functioning in both male and female veterans and their partners, the effects were heightened in female veterans and female partners relative to male veterans and male partners (Renshaw et al., 2014). Conclusions from these studies indicate that when working with females, it is imperative to treat the interpersonal symptoms of PTSD, including feelings of detachment. These findings lend support for the potential utility of couples'-based interventions for the treatment of PTSD, sexual trauma, and sexual health concerns. Interventions that may be particularly relevant include, but are not limited to, Cognitive-Behavioral Conjoint Therapy for PTSD (Monson and Fredman, 2012).

It is possible that sexual satisfaction and function are most closely associated with anhedonia, negative alterations in cognition and mood, and dysphoric arousal due to the interpersonal nature of some of the symptoms of anhedonia, including difficulty connecting with others, difficulty being present in the moment due to dysphoric arousal, and maladaptive thinking patterns due to negative alterations in cognition and mood. Other symptoms of PTSD may reflect more individualistic experiences (e.g., re-experiencing symptoms, avoidance of traumatic reminders) that are not directly related to interpersonal functioning. Indeed, previous models of PTSD using DSM-IV-TR (APA, 2000) criteria identified some anhedonia and dysphoric arousal symptoms observed in the current model as "emotional numbing," which in women is identified as a critical component of sexual intimacy (Renshaw et al., 2014).

Though these findings suggest that one way to reduce the negative sequelae of MST on sexual satisfaction and function is to reduce PTSD severity, there are no known evidenced-based treatments to improve sexual satisfaction and function in veterans regardless of trauma status. Moreover, previous research examining trauma-focused treatment efficacy in veterans with PTSD, histories of sexual trauma, and sexual satisfaction and function concerns indicated that treatments were effective in reducing PTSD distress but not sexual health concerns (see review, O'Driscoll and Flanagan, 2016). Given this, an important next step within this line of research may be to further identify correlates of sexual function and satisfaction to promote the development of adequate screening and interventions.

At present, sexual satisfaction and function concerns are not part of routine screening in PTSD, general mental health, or marital therapy programs within VA, the largest provider of mental health care to the veteran population. Overall, this means that sexual satisfaction and function concerns are likely overlooked in many of those seeking care. Indeed, research has shown that up to 60% of practicing clinicians do not or infrequently query their patients about sexual satisfaction and function concerns (Reissing and Giulio, 2010). Given the interpersonal nature of sexual satisfaction and function concerns, clinics providing marital therapy may be the most effective location to start screening and treating veterans with histories of MST who are at risk or who are experiencing sexual satisfaction and function concerns. Recent research suggests that including psychoeducation about PTSD and the sexual response cycle, teaching relaxation training and sensate focus for use

Table 4Estimated indirect (mediated) variable effects ($N = 1,189$).

Indirect (mediated) effect	Unstandardized estimate	Standardized estimate	95% CI for unstandardized estimate
Harassment to sexual satisfaction via			
Re-experiencing	0.63*	0.01	[0.01, 1.72]
Avoidance	0.16	0.003	[-0.19, 0.87]
Negative affect/cognition changes	-1.18*	-0.03	[-2.60, -0.33]
Anhedonia	-1.08	-0.02	[-2.62, 0.13]
Dysphoric arousal	-0.87*	-0.02	[-2.11, -.04]
Anxious arousal	0.55*	0.01	[0.04, 1.49]
Assault to sexual satisfaction via			
Re-experiencing	4.04*	0.08	[1.57, 6.82]
Avoidance	1.06	0.02	[-1.72, 3.78]
Negative affect/cognition changes	-5.33*	-0.11	[-8.95, -2.16]
Anhedonia	-5.88*	-0.12	[-8.84, -3.63]
Dysphoric arousal	-4.41*	-0.09	[-7.21, -1.99]
Anxious arousal	2.24*	0.05	[0.06, 4.65]
Harassment to sexual function via			
Re-experiencing	0.12	0.01	[-0.02, 0.43]
Avoidance	0.02	0.001	[-0.13, 0.26]
Negative affect/cognition changes	-0.21	-0.01	[-0.64, 0.02]
Anhedonia	-0.30	-0.02	[-0.77, 0.03]
Dysphoric arousal	-0.20*	-0.01	[-0.62, -0.001]
Anxious arousal	0.04	0.002	[-0.16, 0.32]
Assault to sexual function via			
Re-experiencing	0.74	0.04	[-0.27, 1.71]
Avoidance	0.14	0.008	[-0.90, 1.15]
Negative affect/cognition changes	-0.95	-0.05	[-2.19, 0.20]
Anhedonia	-1.62*	-0.09	[-2.65, -0.85]
Dysphoric arousal	-1.01*	-0.06	[-2.04, -0.10]
Anxious arousal	0.16	0.009	[-0.69, 1.08]

Note. CI = confidence interval based on bias-corrected bootstrap. * indicates indirect effects for which the 95% confidence interval does not include zero ($p < .05$). Italicized entries indicate significant indirect effects with counterintuitive sign due to suppression effects that should not be substantively interpreted.

during sexual activity, and exposure exercises to feared sexual stimuli (O'Driscoll and Flanagan, 2016) may be most effective in treating sexual satisfaction and function concerns among those who have history of sexual trauma. It is possible that existing interpersonal PTSD treatments (e.g., Cognitive Behavioral Conjoint Therapy for PTSD; Monson and Fredman, 2012) could be modified to include these components.

Though PTSD is often viewed as a fear-based reaction to a traumatic experience (APA, 2013), many individuals who experience PTSD symptoms may also experience notable shame and guilt (e.g., Dorahy et al., 2013; Leskela et al., 2002), particularly those who experienced sexual assault (Amstadter and Vernon, 2008). This has important clinical implications. Indeed, though no evidenced-based treatments exist for veterans with sexual satisfaction or function concerns, PTSD treatments that incorporate an exploration of shame and guilt may be particularly effective in reducing distress or dysfunction. Relatedly, in addition to the topics suggested by O'Driscoll and Flanagan (2016), explicit discussion of how post-traumatic cognitions and feelings relate to shame and guilt may prove beneficial.

Our findings underscore the importance of distinguishing between harassment and assault MST during screening as the association of MST and sexual satisfaction and function was generally circumscribed to assault MST. The heightened level of dysfunction observed in those experiencing more severe forms of sexual trauma in the current sample is consistent with civilian literature, which demonstrates that greater severity of sexual trauma is associated with higher sexual dysfunction and related sequelae (i.e., risky sexual behavior) in male and female college students (Johnson and Johnson, 2013; Turchik and Hassija, 2014; Turchik, 2013). Much of what is understood about the impact of MST on individual functioning comes from VA administrative data, which combines both harassment and assault MST screening items into a single variable. Continual reliance on a single variable of MST exposure may reduce the sensitivity of this screening item to distinguish between those with and without risk for sexual satisfaction and function concerns. Future research should consider distinguishing between these

kinds of MST but also consider developing measures that allow for the study of frequency of MST events and how bothered an individual was by the given experience. It is possible that some SM/Vs find certain types of harassment more distressing than others or it could be that repeated instances of harassment lead to more distress or dysfunction over time. From a clinical perspective, conducting a more thorough mental health evaluation among those reporting more severe forms of MST may be warranted given our findings and the aforementioned trends regarding dysfunction following more severe sexual assaults observed in civilian samples.

There are limitations to consider in the current study. The sample was a convenience sample and measures of MST, PTSD, and sexual satisfaction and function were based on self-report. Recruitment efforts were largely based on social media advertising and thus may have resulted in a biased sampling. Indeed, only 76% of female internet users use social media (Pew Research Center, 2014). Data was also cross-sectional so definitive causal conclusions cannot be drawn. For example, it is possible that issues related to sexual satisfaction and function increase PTSD symptoms, particularly among those who have been sexually assaulted. Indeed, engagement in less than satisfying or dysfunctional sexual activities could trigger a flashback of the MST, thereby increasing PTSD severity. Additional research using longitudinal designs would be helpful in testing alternate models or replicating the current findings.

Future research should also more fully explore the relative contribution of certain demographic characteristics on the association of MST and sexual satisfaction and function, including age and race. The average age of participants in the current study was approximately 32-years-old and there is evidence that sexual satisfaction and function changes over the life-span in females, particularly following childbirth (Barrett et al., 1999) and menopause (Burri et al., 2015). Thus, the current findings may not generalize to older female SM/Vs. In addition, recent research shows that the association between mental health distress (e.g., PTSD, depression) and sexual concerns differs for White and African American women, such that both PTSD and depression were

related to sexual concerns in African American women but only PTSD was related to sexual concerns in White women (Gobin and Allard, 2016). Future research should also co-vary for depression given high rates of comorbid PTSD and depression observed in military samples (Stander et al., 2014) as well as increased risk for sexual concerns among veterans with comorbid PTSD and depression (Cohen et al., 2012). The addition of three new symptoms in the PTSD diagnosis in DSM-5 might make disentangling the unique effects of PTSD and depression difficult as the three new PTSD symptoms are largely depressogenic in nature. Other psychological disorders may be important to consider given their association with sexual dysfunction observed in civilian samples, including obsessive-compulsive disorder and panic disorder (Aksøy et al., 2012). Future research should also examine these associations in male SM/Vs to better understand their unique sexual concerns.

Notwithstanding the aforementioned limitations, the current study provides preliminary information about the associations of MST severity, PTSD symptom clusters, and sexual satisfaction and function. It is critical that clinics providing care to partnered female SM/Vs provide screening for sexual concerns, and the field more generally identifies evidenced-based treatments to improve sexual satisfaction and function.

Declarations of interest

None.

Author statement

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Author 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: Blais

Acquisition, analysis, or interpretation of data: Blais, Geiser, Cruz

Drafting of the manuscript: Blais, Geiser

Critical revision of the manuscript for important intellectual content:

Blais, Geiser, Cruz

Statistical analysis: Geiser, Cruz

Obtaining funding: Blais

Administrative, technical, or material support: Blais

Study supervision: Blais

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Supplementary materials

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