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Sexual Health in Male and Female Iraq and Afghanistan U. S. War Veterans With and Without PTSD: Findings From the VALOR Cohort

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We sought to determine whether posttraumatic stress disorder (PTSD) was associated with sexual health in returned warzone-deployed veterans from the recent Iraq and Afghanistan conflicts. We studied 1,581 males and females from the Veterans After-Discharge Longitudinal Registry, a gender-balanced U.S. Department of Veterans Affairs registry of health care-seeking veterans with and without PTSD. Approximately one quarter (25.1%) of males ($n = 198$) and 12.7% of females ($n = 101$) had a sexual dysfunction diagnosis and/or prescription treatment for sexual dysfunction. Both genders were more likely to have a sexual dysfunction diagnosis and/or prescription treatment if they had PTSD compared with those without PTSD (male: 27.3% vs. 21.1%, $p = .054$; female: 14.9% vs. 9.4%, $p = .022$). Among the 1,557 subjects analyzed here, males with PTSD had similar levels of sexual activity compared to those without PTSD (71.2% vs. 75.4%, $p = .22$), whereas females with PTSD were less likely to be sexually active compared to females without PTSD (58.7% vs. 72.1%, $p < .001$). Participants with PTSD were also less likely to report sex-life satisfaction (male: 27.6% vs. 46.0%, $p < .001$; female: 23.0% vs. 45.7%, $p < .001$) compared with those without PTSD. Although PTSD was not associated with sexual dysfunction after adjusting for confounding factors, it was significantly negatively associated with sex-life satisfaction in female veterans with a prevalence ratio of .71, 95% confidence interval [.57, .90].

Over 2 million Americans have served in the Iraq and Afghanistan conflicts (Operation Iraqi Freedom [OIF] and Operation Enduring Freedom [OEF]; U.S. Department of Veterans Affairs, 2012). Many returned warzone-deployed veterans suffer from service-related mental illness, the most common being posttraumatic stress disorder (PTSD; U.S. Department of Veterans Affairs, 2012). Growing evidence suggests that PTSD is related to poor sexual health in men and women (Breyer et al., 2013; Cohen et al., 2012; Hosain, Latini, Kauth, Goltz, & Helmer, 2013).

Sexual well-being is of central importance to self-esteem and predicts overall health and quality of life (Kubin, Wagner, & Fugl-Meyer, 2003). Many soldiers are deployed during the period in their lives when they are the most sexually active and interested in sexual activity. There are multiple explanations for how PTSD and other mental illness found in war veterans could adversely affect sexual health. First, after returning from deployment, veterans can experience relational difficulties, reduced intimacy, marital disruption, and lower marital satisfaction (Cameron et al., 2011; Erbes, Meis, Polusny, Compton, & Wadsworth, 2012; Iverson, Resick, Suvak, Walling, & Taft, 2011; Riggs, Byrne, Weathers, & Litz, 1998). Second, veterans who experienced sexual assault during service may experience difficulties with sexual relationships after returning home (McCall-Hosenfeld, Liebschutz, Spiro, & Seaver, 2009). Third, a number of the medications used to treat PTSD symptoms such as selective serotonin receptor

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inhibitors (SSRIs) can have sexual dysfunction side effects including erectile and ejaculatory dysfunction and decreased libido (Rosen, Lane, & Menza, 1999). Fourth, PTSD may negatively impact neuroendocrine, neurobiologic, and autonomic systems essential for proper sexual functioning (Spivak, Maayan, Mester, & Weizman, 2003; Vasterling et al., 2006). For example, in a rat model, chronic stress was positively associated with testicular cell damage and diminished sexual motivation (Hou, Xiong, Wang, Chen, & Yuan, 2014).

To date, most of the research regarding PTSD and sexual health in veterans has centered on men (Wilcox, Redmond, & Hassan, 2014). There is a paucity of female veteran data (Sadler, Mengeling, Fraley, Torner, & Booth, 2012) and most male veteran data come from small, uncontrolled case series (Cosgrove et al., 2002; Hosain et al., 2013). To date, we know of no studies that have compared male and female veterans with respect to PTSD status and sexual health including sexual activity, satisfaction, sexual dysfunction diagnoses, and sexual dysfunction-related prescriptions. In planning health service needs, it is useful to know how sexual health is similar or different in male and female veterans with and without PTSD. Furthermore, understanding how PTSD relates to sexual health could improve clinicians' ability to counsel patients.

Our objective was to analyze a gender-balanced PTSD registry (Rosen et al., 2012) of returned warzone-deployed veterans using patient self-report of sexual function in combination with U.S. Department of Veterans Affairs (VA) electronic medical records (EMR) to better understand the relationship between PTSD and sexual health. In addition to having equal numbers of male and female participants, the Veterans After-Discharge Longitudinal Registry (VALOR) cohort contains well-characterized veterans with and without PTSD that allows stratification by both gender and PTSD status. We hypothesized that PTSD would be positively associated with sexual dysfunction diagnoses, prescription treatment, sexual activity levels, and satisfaction. Furthermore, we expected the positive associations to be more prominent in men than in women.

Method

Participants and Procedure

We derived the study sample from members of the VALOR, a cohort designed to assess trajectories and outcomes of PTSD in returned warzone-deployed OEF/OIF veterans. VALOR contained data from (a) self-administered questionnaires, (b) clinician-administered interviews, and (c) the VA EMR. VALOR design and methods have been previously published (Rosen et al., 2012). VALOR consists of 1,649 male and female returned warzone-deployed U.S. Army and Marine OEF/OIF veterans with and without PTSD who were seeking medical care at a VA facility. The cohort is a gender-balanced, national sample of OEF/OIF veterans targeted to have 1,200 veterans with PTSD and 400 veterans without PTSD. Using lists generated at the VA Environmental Epidemiology Service with specified eligibility criteria, 4,391 individuals were contacted by phone and 62.6% verbally consented to participate. Consented individuals were asked to complete a self-administered questionnaire (online or by mail) and scheduled for a telephone interview with a doctoral-level clinician with specialized training in PTSD assessment. Of consented individuals, 1,649 (60.8%) completed both the questionnaire and the interview. In total, we recruited 1,213 veterans with two or more primary or secondary ICD-9 (International Classification of Diseases, Ninth Revision) codes for PTSD (309.81) in the EMR and 436 veterans without PTSD diagnoses in the EMR since 2001. Although EMR diagnoses were used for targeted recruitment purposes, we used semistructured clinical interviews to assess current and lifetime PTSD, as described below. Data from the self-administered questionnaires, clinician-administered interviews, and the VA EMR were collected between 2009 and 2012. Veterans in the cohort had been under VA care an average of 5.2 years since the last deployment.

We excluded participants with a surgical or trauma history that could lead to changes in sexual health, including those with prostate cancer ($n = 6$), uterine cancer ($n = 6$), vaginal cancer ($n = 0$), cervical ($n = 0$) and traumatic genital injury ($n = 0$) using the following cancer-related ICD-9 codes: 185 prostate, 182 uterine, 180 cervical, and 184 genital other. We examined the relationship between traumatic brain injury and sexual health outcomes and found no independent association (data not shown). We included only participants with complete data on variables of interest, resulting in 1,581 participants for the analysis of sexual dysfunction and 1,557 participants for the analysis of sexual activity and sexual satisfaction. As a sensitivity analysis, we compared descriptive characteristics for those with complete EMR data versus those with complete self-report data and found no statistical differences between the groups.

Descriptive characteristics for the cohort ($N = 1,581$) are presented in Table 1. Most participants were aged 30–39 years, were White/non-Hispanic, and were married or living with a partner. Current PTSD was present in 62.4% of the sample, as assessed by the Structured Clinical Interview for the DSM-IV (SCID; Spitzer, Williams, Gibbon, & First, 1992), whereas probable depression, as assessed by the Patient Health Questionnaire (PHQ; Spitzer, Kroenke, & Williams, 1999), was noted in 41.2% of our veteran cohort. Nonheterosexual veterans were a small portion of the cohort (6.2%); the majority were female. Prescription medication use was common with 64.7% of the sample taking antidepressants, 42.4% antipsychotics, and 41.3% opioids.

The study was approved by the institutional review boards of the VA Boston Healthcare System and New England Research Institutes, Inc., and the Human Research Protection Office of the U.S. Army Medical Research and Materiel Command. Verbal consent was obtained from participants at initial telephone contact as described above.

Measures

PTSD diagnostic status was assessed by trained doctoral-level clinicians using the SCID PTSD module (Spitzer et al., 1992).

Table 1
Descriptive Characteristics for the Total Sample and by Dysfunction Status within Gender

			Men ($n = 787$)				Women ($n = 794$)			
	Total ($N = 1,581$)		No dysfunction ($n = 589$)		Sexual dysfunction ($n = 198$)		No dysfunction ($n = 693$)		Sexual dysfunction ($n = 101$)	
Variable	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
Age (years)										
< 30	421	26.6	181	30.7	21	10.6	202	29.1	17	16.8
30–39	552	34.9	220	37.4	35	17.7	264	38.1	33	32.7
40–49	392	24.8	131	22.2	86	43.4	142	20.5	33	32.7
50–69	216	13.7	57	9.7	56	28.3	85	12.3	18	17.8
White	1,063	67.2	448	76.1	134	67.7	414	59.7	67	66.3
Married/partner	924	58.4	395	67.1	137	69.2	347	50.1	45	44.6
Major depression	652	41.2	230	39.0	114	57.6	256	36.9	52	51.5
Diabetes	96	6.1	24	4.1	38	19.2	29	4.2	5	5.0
Hypertension	386	24.4	136	23.1	102	51.5	126	18.2	22	21.8
Smoking	404	25.6	175	29.7	62	31.3	143	20.6	24	23.8
Antidepressants	1,023	64.7	318	54.0	152	76.8	462	66.7	91	90.1
Antipsychotics	670	42.4	209	35.5	116	58.6	284	41.0	61	60.4
Opioids	653	41.3	202	34.3	111	56.1	275	39.7	65	64.4
Serious ALCL use	483	30.6	231	39.2	64	32.3	167	24.1	21	20.8
Drug use disorder	29	1.8	16	2.7	3	1.5	9	1.3	1	1.0
Current PTSD	987	62.4	372	63.2	140	70.7	404	58.3	71	70.3
Unwanted SA	192	12.1	5	0.8	12	6.1	148	21.4	27	26.7
Lifetime PTSD	1,214	76.8	448	76.1	157	79.3	522	75.3	87	86.1
Sexual orientation										
Homosexual	51	3.2	1	0.2	0	0.0	45	6.5	5	5.0
Heterosexual	1,212	76.7	462	78.4	165	28.0	508	73.3	77	76.2
Bisexual	35	2.2	3	0.5	2	0.3	27	3.9	3	3.0
Other	12	0.8	2	0.3	2	0.3	5	0.7	3	3.0
Don't know	5	0.3	1	0.2	0	0.0	4	0.6	0	0.0

Note. ALCL = alcohol; SA = sexual activity; PTSD = posttraumatic stress disorder.

The SCID PTSD module is a validated, clinician-administered semistructured interview that assesses the presence of current PTSD symptoms in the past month based on the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., *DSM-IV*; American Psychiatric Association, 1994) criteria. Each symptom was coded as present or absent to determine current (i.e., past 30 days) PTSD. Lifetime PTSD was also assessed during the SCID evaluation, but only current PTSD status was used for these analyses because lifetime PTSD included nonmilitary traumas and episodes of PTSD that may have occurred many years prior to military service.

For this study, sexual health was defined to include EMR-defined sexual dysfunction and self-reported sexual activity and satisfaction. Sexual dysfunction was defined by an ICD-9 code given by a clinician or a medical prescription for sexual dysfunction. Because sexual dysfunction diagnoses have a relatively low prevalence and may not be consistently coded in the medical record, we created a binary composite outcome variable for sexual dysfunction that captured one or more of the sexual dysfunction diagnostic codes or one or more of the prescription medications for sexual dysfunction, or both, as described elsewhere (Breyer et al., 2013). Male-specific ICD-9 codes included 257.2-other testicular hypofunction; 302.70-psychosexual dysfunction, unspecified; 302.71-hypoactive sexual desire disorder; 607.84-impotence of organic origin; 302.72-psychosexual dysfunction with inhibited sexual excitement (impotence); 302.74-male orgasmic disorder; 302.75-premature ejaculation; and 302.79-psychosexual dysfunction, with other specified psychosexual dysfunctions. Female-specific codes included 302.7-sexual dysfunction, 799.81-sexual dysfunction, 625-female genital pain and other symptoms, 302.76-dyspareunia, and 625.0-dyspareunia. Prescriptions for sexual dysfunction medications were phosphodiesterase inhibitors (vardenafil, sildenafil), alprostadil

Table 2
Sexual Health by PTSD Status within Gender

	Men ($n = 787$)				Women ($n = 794$)			
	No PTSD ($n = 275$)		PTSD ($n = 512$)		No PTSD ($n = 319$)		PTSD ($n = 475$)	
Variable	*n*	%	*n*	%	*n*	%	*n*	%
Sexual dysfunction	58	21.1	140	27.3*	30	9.4	71	14.9*
Sexual dysfunction Dx	49	17.8	104	20.3	30	9.4	70	14.7*
Hypogonadism	11	4.0	21	4.1	–		–	
Erectile dysfunction	18	6.5	54	10.5	–		–	
Premature ejaculation	1	0.4	0	0.0	–		–	
Male other	24	8.7	50	9.8	–		–	
Female genital pain	–		–		26	8.2	57	12.0
Dyspareunia	–		–		10	3.1	14	2.9
Low libido	–		–		4	1.3	6	1.3
Female other	–		–		0	0.0	6	1.3
Sexual dysfunction meds	44	16.0	122	23.8**	0	0.0	2	0.4

Note. Percentages are within subcategory. PTSD = posttraumatic stress disorder; Dx = diagnosis; Meds = medications.
*$p < .05$. **$p < .01$.

(suppository or injection), and supplemental testosterone therapy; they were identified in the VA Decision Support System pharmacy database. Participants were asked in the self-administered questionnaire to describe "their current satisfaction with their sex life" (1 = *not at all*, 2 = *somewhat dissatisfied*, 3 = *neither satisfied nor dissatisfied*, 4 = *somewhat satisfied*, 5 = *completely satisfied*) and "whether they had been sexually active in the past 3 months" (y/n). Similar self-report items have been used in previous epidemiologic studies to assess sexual activity and satisfaction (Heiman et al., 2011; Laumann, Paik, & Rosen, 1999; Lutfey, Link, Rosen, Wiegel, & McKinlay, 2009).

Demographic covariates included age (< 30; 30–39; 40–49; 50–69 years), race/ethnicity (White/Hispanic/Black/Other), and partner status (married/living with partner [y/n]). Major depressive disorder was assessed by the PHQ (Spitzer et al., 1999). We obtained EMR data on comorbidities commonly associated with sexual dysfunction, including diabetes (y/n) and hypertension (y/n). Substance use was assessed, including current smoking, using ICD-9 code 305.1 (y/n); hazardous alcohol use (y/n) by the Alcohol Use Disorder Identification Test, defined as ≥8 points (Reid, Fiellin, & O'Connor, 1999); drug use disorder using ICD-9 codes 305.20 through 305.93, and code 304 (y/n). We assessed medication use associated with sexual dysfunction such as antidepressants(y/n), antipsychotics (y/n), or opioids (y/n) by using linked outpatient pharmacy records. Unwanted sexual activity (y/n) was obtained by a single item: "I experienced unwanted sexual activity as a result of force, threat of harm, or manipulation" from the Deployment Risk and Resilience Inventory Post Battle Experiences Scale (King, King, Vogt, Knight, & Samper, 2006). Sexual orientation was obtained by self-report (Lesbian, Gay, or Homosexual; Straight or Heterosexual; Bisexual; Other; Don't Know).

Data Analysis

We assessed the distributions of covariates by sexual dysfunction as indicated by the medical record, as well as associations between PTSD and measures of sexual dysfunction from the medical records and self-report. Statistical differences in categorical variables were assessed with the Pearson's χ^2 test. Multivariable associations between PTSD and the sexual dysfunction outcomes were estimated using separate Poisson regression models for each outcome, which provided prevalence ratios. Models were hierarchically adjusted for known or suspected confounders of the relationship between PTSD and sexual health. Models were adjusted for sociodemographic and deployment variables (age in categories, race, marital status), unwanted sexual activity, comorbidities (depression, hazardous alcohol use, diabetes, hypertension, smoking), and drugs (antipsychotic use, antidepressant use, and opioid medication use). All analyses were stratified by gender. Statistical significance for all testing was considered at the $\alpha = .05$ level. Analyses were conducted in SAS 9.1.3 (SAS Institute, Cary, NC).

Results

The overall percentage of an EMR sexual dysfunction diagnosis and/or prescription drug treatment was 18.9% ($n = 299$) including 25.1% of males ($n = 198$) and 12.7% of females ($n = 101$). Table 2 provides the sexual dysfunction outcomes stratified by current PTSD status within gender. Both genders were more likely to have an EMR sexual dysfunction diagnosis

Table 3
Sexual Activity and Satisfaction by PTSD Status within Gender

	Men				Women			
	No PTSD ($n = 272$)		PTSD ($n = 504$)		No PTSD ($n = 315$)		PTSD ($n = 465$)	
Variable	*n*	%	*n*	%	*n*	%	*n*	%
Active in last 3 months	205	75.4	359	71.2	227	72.1	273	58.7***
Somewhat/completely satisfied	125	46.0	139	27.6***	144	45.7	107	23.0***

Note. PTSD = posttraumatic stress disorder.
*** $p < .001$.

and/or prescription treatment if they had PTSD compared with those without PTSD (male: 27.3% vs. 21.1%, $p = .054$; female: 14.9% vs. 9.4%, $p = .022$). Male veterans with PTSD were more likely to be prescribed medications for sexual dysfunction, whereas female veterans received very few prescriptions ($n = 2$; men: 23.8% vs. 16.0%, $p = .010$; female 0.4% vs. 0%, $p = .246$). Unwanted sexual activity was reported by 2.2% of male and 22.0% of female participants and was significantly associated with sexual dysfunction among male veterans, prevalence ratio (*PR*) = 1.87, 95% confidence interval (CI) [1.26, 2.78], but not among female veterans, *PR* = 0.96, 95%CI [0.64, 1.45].

Only female veterans with PTSD were less likely overall to be sexually active relative to those without PTSD (see Table 3); this difference was not statistically significant in males (male: 71.2% vs 75.4%, $p = .217$, female: 58.7% vs 72.1%, $p < .001$). This finding was despite similar partner relationship statuses in those with and without PTSD. Overall, male and female veterans with PTSD were significantly less likely to report satisfaction with their sex life compared with those without a PTSD diagnosis (for males, 27.6% vs. 46.0%, $p < .001$, for females, 23.0% vs. 45.7%, $p < .001$).

We also examined self-reported sexual activity frequency and satisfaction in veterans with and without sexual dysfunction determined by EMR diagnosis and/or prescriptions received for phosphodiesterase type 5 inhibitor, alprostadil, or testosterone. Men with an EMR sexual dysfunction diagnosis and/or prescription treatment were less likely to be sexually active in the past 3 months compared with men without sexual dysfunction (64.6% vs. 75.1%, $p = .005$) and were more likely to be dissatisfied with their sex life (77.3% vs. 62.5%, $p < .001$). Female veterans with an EMR sexual dysfunction diagnosis and/or prescription treatment, on the other hand, had similar rates of sexual activity in the past 3 months as did female veterans without a dysfunction diagnosis (63.4% vs. 63.9%, $p = .925$). Female veterans with an EMR sexual dysfunction diagnosis and/or prescription treatment reported similar rates of sexual dissatisfaction compared with female veterans without sexual dysfunction (72.3% vs 67.4%, $p = .325$).

To assess the relationship between current PTSD and an EMR sexual dysfunction diagnosis and/or prescription drug treatment, we performed univariate and multivariable modeling stratified by gender (Table 4). In the univariate analysis for men, the prevalence of an EMR sexual dysfunction diagnosis and/or prescription treatment was 1.3 times greater among those with current PTSD than those without PTSD, 95% CI [0.99, 1.70]. After multivariable adjustment, the risk estimate was reduced and was not significant. Similar findings were observed when we examined the frequency of prescriptions for an erectogenic drug (e.g., Viagra, Cialis) alone as the outcome (data not shown).

Furthermore, PTSD status did not directly influence the level of self-reported sexual activity among male veterans, about three quarters of whom reported being sexually active at the time of the study. Conversely, we found that PTSD status was strongly associated with decreased sexual satisfaction in the univariate analyses, *PR* = 0.60, 95% CI [0.50, 0.73]. This risk association was attenuated after adjustment and was not significant in the fully adjusted model that included drugs associated with PTSD treatment and sexual dysfunction, adjusted *PR* = 0.83, 95% CI [0.68, 1.02]. As shown in Table 3, PTSD status strongly influenced sexual satisfaction ratings in most multivariate models, but did not affect activity rates or rates of dysfunction diagnoses in the medical record.

We performed similar modeling in the female cohort. In contrast to male veterans, PTSD status did not increase the risk of an EMR sexual dysfunction diagnosis and/or prescription drug treatment in the univariate and multivariable models (Table 3). PTSD was associated with a small decreased *PR* for self-reported sexual activity in female veterans, adjusted *PR* = 0.96, 95%CI [0.92, 1.0]. Similar to males, in female veterans, PTSD was associated with decreased sexual satisfaction and this association remained highly significant after full adjustment for potential covariates, adjusted *PR* = 0.71, 95% CI [0.57, 0.90].

Discussion

In a well-characterized cohort of warzone-deployed male and female OEF/OIF veterans with and without PTSD, we found PTSD to be a strong, negative predictor of sexual satisfaction in both genders. Consistent with our hypothesis, we found

Table 4
Association by Gender Between Current PTSD and Sexual Dysfunction, Activity, and Satisfaction

	Sexual dysfunction		Sexually active		Sex-life satisfaction	
Variable	*PR*	95% CI	*PR*	95% CI	*PR*	95% CI
			Men ($n = 787$)			
M1	1.30	[0.99, 1.70]	0.98	[0.94, 1.01]	0.60	[0.50, 0.73]***
M2	1.26	[0.98, 1.62]	0.98	[0.94, 1.01]	0.61	[0.51, 0.73]***
M3	1.27	[0.99, 1.63]	0.98	[0.94, 1.01]	0.61	[0.51, 0.73]***
M4	0.95	[0.73, 1.23]	1.01	[0.98, 1.05]	0.79	[0.65, 0.97]*
M5	0.93	[0.72, 1.21]	1.01	[0.98, 1.05]	0.83	[0.68, 1.02]
			Women ($n = 794$)			
M1	1.59	[1.06, 2.38]*	0.92	[0.89, 0.96]***	0.50	[0.41, 0.62]***
M2	1.48	[0.98, 2.23]	0.95	[0.91, 0.98]**	0.56	[0.46, 0.69]***
M3	1.42	[0.93, 2.17]	0.94	[0.91, 0.98]***	0.57	[0.46, 0.71]***
M4	1.11	[0.73, 1.69]	0.96	[0.92, 1.00]	0.71	[0.57, 0.90]**
M5	1.07	[0.71, 1.61]	0.96	[0.92, 1.00]*	0.71	[0.57, 0.90]**

Note. PTSD = posttraumatic stress disorder; *PR* = prevalence ratio; CI = confidence interval; M = model; sociodemographics = age, race/ethnicity, and marital status; comorbidities = depression/use of antidepressants, diabetes, hypertension, smoking diagnosis; drugs = hazardous alcohol use, antipsychotics, and opioids; M1 = PTSD only; M2 = M1+ sociodemographics; M3 = M2 + unwanted sexual activity; M4 = M3 + comorbidities; M5 = M4 + drugs.
*$p < .05$. **$p < .01$. ***$p < .001$.

associations between PTSD and sexual health that varied by gender. Sexual activity rates were similarly high in male veterans with and without a PTSD diagnosis, three fourths of whom were sexually active at the time of the survey. In contrast, in our sample of warzone-deployed female veterans, PTSD status was negatively associated with sexual activity rates. After adjusting for relevant covariates and risk factors, current PTSD was not associated with a clinician diagnosis or prescription to treat sexual dysfunction in either gender. This was likely due to substantial underreporting of sexual problems by veterans to health care providers, or failure of the latter to appropriately assess sexual problems in veterans (Wilcox et al., 2014). Marital status also was not associated with an EMR sexual dysfunction diagnosis and/or prescription drug treatment. Not surprisingly, however, being married or living with a partner was associated with higher rates of sexual activity and satisfaction in both male and female veterans. Unwanted sexual activity, another important covariate, did not have an independent relationship with PTSD and sexual activity or satisfaction, as satisfaction and activity in both male and female veterans were influenced significantly by PTSD status with or without unwanted sexual activity.

Overall, our male cohort had a higher prevalence of sexual dysfunction defined by an EMR sexual dysfunction diagnosis and/or prescription treatment compared with a recent analysis with similar criteria of the broader OEF/OIF population (Breyer et al., 2013). In that group of recently returned OEF/OIF veterans, male sexual dysfunction was found in 5.3% compared with 25.1% in our population (Breyer et al., 2013). This higher prevalence of sexual dysfunction in the VALOR cohort may be related to differing periods of patient accrual. Providers may be asking about sexual health more frequently given recent research findings on the topic. Participants in VALOR may differ from the greater VA population. Furthermore, we expanded the criteria of sexual dysfunction prescriptions to include testosterone supplementation in the present analysis. Wilcox et al. (2014) performed a cross-sectional survey that included 367 male active duty service members and recent veterans aged 40 years and under. Sexual dysfunction was classified using the 5-item Arizona Sexual Experience Scale that assesses for sex drive, sexual arousal, penile erection, ability to reach organism, and satisfaction (McGahuey et al., 2000), whereas erectile dysfunction was classified using the International Index of Erectile Function-5 (Rosen, Cappelleri, Smith, Lipsky, & Pena, 1999). They found a prevalence of sexual dysfunction of 8.5% and erectile dysfunction of 33.2%. Our under 40-year old-male veterans had a 4.1% prevalence of an EMR sexual dysfunction diagnosis and/or prescription drug treatment.

Few studies have characterized sexual health in female veterans or the relationship between PTSD and sexual dysfunction in combat-exposed women. Cohen et al. (2012) examined returned OEF/OIF female veterans and found those with mental health diagnoses were more likely to report vaginal pain and other sexual problems. In previous work concerning women with PTSD related to violent crime, PTSD status was associated with fear of sex, sexual disinterest, arousal problems, and painful vaginal intercourse (Letourneau, Resnick, Kilpatrick, Saunders, & Best, 1996). In the present cohort, PTSD was associated with decreased sexual activity in female veterans, as well as decreased sex-life satisfaction. The sexual dysfunction diagnosis rate in our sample was markedly higher in male

compared to female veterans. Our EMR data for sexual dysfunction diagnosis and/or prescription treatment outcomes could be subject to floor effects in the female veterans, making differences between the PTSD and no-PTSD groups less than significant (Fries, Rose, & Krishnan, 2011). Furthermore, women with a sexual dysfunction diagnosis and/or prescription treatment had similar rates of sex-life satisfaction compared to women without sexual dysfunction diagnosis and/or prescription treatment. This finding may be related to reduced awareness among providers about female sexual health or a reluctance to inquire about a condition with few approved medical treatments.

Compared with population rates from epidemiological studies, rates of sexual dysfunction in community-dwelling women have been estimated in some studies to be as high as 43% (Laumann et al., 1999). In comparison, the rates of sexual dysfunction diagnoses are very low in our study. Based on self-reported sexual activity and satisfaction, female veterans with PTSD in the VALOR cohort were affected sexually; it is likely that a substantial number would be candidates for pharmacological therapy, if this were an option. Given the paucity of available treatments, however, providers may simply not inquire about female veteran sexual health. Patients may resist discussing sexual problems or dissatisfaction out of embarrassment or stigma. The low levels of sex-life satisfaction coupled with low diagnosis and treatment rates indicate significant undertreatment of sexual dysfunction. Recent U.S. Food and Drug Administration approval of a medication for female sexual desire disorder may encourage patient and provider awareness and treatment.

An unexpected finding was the lack of association in men between their PTSD status and self-reported sexual activity. Although female veterans with PTSD had markedly lower rates of sexual activity than those without a PTSD diagnosis, this association was not observed in the men. Approximately three quarters of the men reported current sexual activity with no difference in the proportions who were sexually active in the past 3 months (71.2% vs. 75.4%). We hypothesize that men with PTSD may use masturbation or other sexual activities, in addition to intercourse, as a means of coping with physiologically raised stress levels. Women may be less likely to masturbate in response to traumatic stress, as masturbation frequencies in population studies are typically lower in women compared to men (Laumann et al., 1994).

Taken together, our findings highlight challenges and complexities in understanding the impact of PTSD on sexual health in men and women. In both genders, a diagnosis of PTSD was associated with decreased sexual satisfaction, independent of medications used to treat PTSD, such as opioids and SSRIs. We do see risk-estimate attenuation, implicating these drugs as confounders in the relationship between PTSD and our outcomes. Whereas dissatisfaction and sexual dysfunction are likely correlated, they represent separate but overlapping constructs.

Our study was the first of which we are aware to examine a unique gender-balanced geographically varied PTSD registry of veterans with and without-PTSD that included self-reported sexual activity and satisfaction, along with EMR-diagnosed sexual dysfunction and treatment. Limitations of the analysis merit mention. Findings from this cohort designed to study PTSD in VA health-care-seeking veterans may not be reflective and generalizable to the broader veteran or nonveteran population. Furthermore, VALOR consisted of a self-selected group of participants that may bias associations if factors associated with PTSD (e.g., sexual dysfunction) were associated with decisions to participate. Although we obtained valuable self-reported sexual activity and sexual satisfaction data in a large well-defined cohort of returned warzone-deployed veterans with PTSD, our outcomes were relatively narrow in scope and did not explore multiple facets of sexual health, such as body image or partner satisfaction. Self-reports of sexual satisfaction and activity may be under- or overreported due to stigmatization. Our non-self-report outcomes relied on ICD-9 coding and prescription drug records to detect sexual dysfunction. Using prescription drug records as a surrogate for dysfunction may incorrectly attribute the treating purpose of the prescription, such as the veteran diagnosed with hypogonadism taking testosterone who may not have sexual dysfunction. Furthermore, relying on prescriptions may be especially problematic in women for whom sexual dysfunction is underdiagnosed and poorly characterized, and for whom few medical treatments are available. Moreover, to ensure that we corrected for potential underreporting of medical record codes, we opted for a relatively large time window for assessing diagnosis or treatment of sexual dysfunction in the medical record. We did not include SCID assessment of lifetime PTSD status as this would have included predeployment and noncombat-related traumas, which are not the focus of the current study. Future analyses should investigate the influence of comorbidities and PTSD treatment outcomes on sexual dysfunction in male and female veterans using validated instruments in a prospective fashion. Our findings also highlight the need for clinicians to consider sexual health outcomes among the multiple areas of quality of life that are frequently affected by PTSD in both male and female veterans. The discrepancies we observed between self-report and EMR data on sexual health underscore the need for clinicians to enquire proactively about this important facet of postdeployment adjustment. Future analysis in the longitudinal cohort of the VALOR registry is uniquely suited to answer questions regarding the influence of PTSD treatment on sexual dysfunction, activity, and satisfaction.

PTSD appears to negatively influence sex-life satisfaction in male and female veterans. In our cohort, after adjusting for confounding, PSTD was not associated with sexual dysfunction as identified by a treating clinician or sexual dysfunction-related medication. Male veterans with PTSD were as likely to be sexually active as those without PTSD, whereas female veterans with PTSD were less likely to be sexually active than those without PTSD.

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