2017

Self-Reported Pain in Male and Female Iraq/Afghanistan-Era Veterans: Associations with Psychiatric Symptoms and Functioning

Jennifer C. Naylor

H. Ryan Wagner

Mira Brancu

Megan Shepherd-Banigan

Eric Elbogen

See next page for additional authors

Original Publication Citation

Naylor, J. C., Wagner, H. R., Brancu, M., Shepherd-Banigan, M., Elbogen, E., Kelley, M., . . . Veter, V. A. M.-A. M. W. (2017). Self-reported pain in male and female Iraq/Afghanistan-era veterans: Associations with psychiatric symptoms and functioning. *Pain Medicine, 18*(9), 1658-1667. doi:10.1093/pm/pnw308

Authors
Jennifer C. Naylor, H. Ryan Wagner, Mira Brancu, Megan Shepherd-Banigan, Eric Elbogen, Michelle Kelley, Teresa Fecteau, Karen Goldstein, Nathan A. Kimbrel, and Christine E. Marx

Pain Medicine 2017; 18: 1658–1667
doi: 10.1093/pm/pnw308

OXFORD

PSYCHOLOGY, PSYCHIATRY, IMAGING & BRAIN NEUROSCIENCE SECTION

Original Research Article

Self-Reported Pain in Male and Female Iraq/Afghanistan-Era Veterans: Associations with Psychiatric Symptoms and Functioning

Jennifer C. Naylor, PhD,[*,†,‡,§] H. Ryan Wagner, PhD,[†,‡] Mira Brancu, PhD,[†,‡] Megan Shepherd-Banigan, PhD,[¶] Eric Elbogen, PhD,[†,‡,§] Michelle Kelley, PhD,[‖] Teresa Fecteau, PhD[§] Karen Goldstein, MD,[¶,|||] Nathan A. Kimbrel, PhD[*,†,‡] Christine E. Marx, MD,[*,†,‡,§] VA Mid-Atlantic MIRECC Work Group,[‡] VA Mid-Atlantic MIRECC Women Veterans Work Group,[‡] and Jennifer L. Strauss, PhD[†,]**

[*]Research and Development; [§]Mental Health Service Line, and; [¶]Health Services Research & Development, Durham Veterans Affairs Medical Center, Durham, North Carolina; [†]Department of Psychiatry and Behavioral Sciences and [|||]Division of General Internal Medicine, Duke University Medical Center, Durham, North Carolina; [‡]VA Mid-Atlantic Mental Illness, Research Education and Clinical Center (MIRECC), Durham, North Carolina; [‖]Department of Psychology, Old Dominion University, Norfolk, Virginia; [**]Department of Veterans Affairs, Mental Health Services, Washington, DC, USA

Correspondence to: Jennifer C. Naylor, PhD, Durham VA Medical Center, Duke University Medical Center, 508 Fulton St., Durham, NC 27705, USA. Tel: 919-286-0411; Fax: 919-416-5912; E-mail: Jennifer.naylor2@va.gov/naylorjc@duke.edu.
Funding sources: This work was supported by the VA Mid-Atlantic Mental Illness Research Education and Clinical Center (MIRECC) of the Department of Veterans Affairs Office of Mental Health Services and the VA Mid-Atlantic Healthcare Network (VISN 6). Dr. Naylor (1IK2RX000908) and Dr. Van Voorhees (1K2RX001298) are funded by a Department of Veterans Affairs Rehabilitation Research and Development Career Development Awards. Dr. Kimbrel (IK2CX000525) and Dr. Dedert (IK2CX000718) are funded by Department of Veterans Affairs Clinical Science Research and Development Career Development Award. Dr. Goldstein is funded by a VA Health Services Research and Development Career Development Award (1IK2HX001540, CDA 13-263). Dr. Shepherd-Banigan is supported by a VA OAA HSR&D PhD Fellowship (TPP 21-027) from the US Department of Veterans Affairs, Health Services Research and Development Service.

Conflicts of interest: The views expressed in this article are those of the authors and do not necessarily reflect the position or policy of the Department of Veterans Affairs or the United States government. The VA Mid-Atlantic MIRECC workgroup includes: Jean C. Beckham, PhD; Patrick S. Calhoun, PhD; Kathleen P. Decker, MD; Eric Dedert, PhD; John A. Fairbank, PhD; Kimberly T. Green, PhD; Jason D. Kilts; Angela Kirby, MA; Scott D. Moore, MD, PhD; Larry A. Tupler, PhD; Richard D. Weiner, MD, PhD; Robin Hurley, MD; Gregory McCarthy, PhD; Scott D. McDonald, PhD; Katherine H. Taber, PhD; Marinell Miller-Mumford, PhD; Scott D. Moore, MD, PhD; Rajendra Morey, MD; Treven C. Pickett, PsyD; Jennifer J. Runnals, PhD; Jared Rowland, PhD; Cindy Swinkels, PhD; Steve Szabo, MD, PhD; Elizabeth Van Voorhees, PhD; and Ruth Yoash-Gantz, PhD. The VA Mid-Atlantic MIRECC Women Veterans Workgroup includes: John D. Curry, PhD; Kathleen Decker, MD; Mary Driscoll, PhD; Jessica Kinsaul, PhD; and Christi Ulmer, PhD.

Abstract

Objective. To examine pain symptoms and co-occurring psychiatric and functional indices in male and female Iraq/Afghanistan-era veterans.

Design. Self-reported data collection and interviews of Iraq/Afghanistan-era veterans who participated in a multisite study of postdeployment mental health.

Setting. Veterans were enrolled at one of four participating VA sites.

Subjects. Two thousand five hundred eighty-seven male and 662 female Iraq/Afghanistan-era veterans.

Methods. Nonparametric Wilcoxon rank tests examined differences in pain scores between male and female veterans. Chi-square tests assessed differences between male and female veterans in the proportion of respondents endorsing moderate to high levels of pain vs no pain. Multilevel regression analyses evaluated the effect of pain on a variety of psychiatric and functional measures.

Results. Compared with males, female veterans reported significantly higher mean levels of headache ($P < 0.0001$), muscle soreness ($P < 0.008$), and total pain ($P < 0.0001$), and were more likely to report the highest levels of headache ($P < 0.0001$) and muscle soreness ($P < 0.0039$). The presence of pain symptoms in Iraq/Afghanistan-era veterans was positively associated with psychiatric comorbidity and negatively associated with psychosocial functioning. There were no observed gender differences in psychiatric and functional indices when levels of pain were equated.

Conclusions. Although female Iraq/Afghanistan-era veterans reported higher levels of pain than male veterans overall, male and female veterans experienced similar levels of psychiatric and functional problems at equivalent levels of reported pain. These findings suggest that pain-associated psychological and functional impacts are comparable and consequential for both male and female veterans.

Key Words. Pain Disorder; Veteran; Function; Mental Health; Gender; Female; Male

Introduction

The previous ban on women serving in direct military combat roles was lifted in 2013, ushering in an unprecedented level of women's involvement in the US military, including an increased female presence in the combat theater and risk for physical injury and pain conditions. Approximately 15% of active duty military and 20% of new military recruits are now female [1], and female Iraq/Afghanistan-era veterans are using Department of Veterans Affairs (VA) services at increasing and significantly higher rates than prior-era female veterans [2]. Male and female veterans of recent conflicts in Iraq and Afghanistan report high rates of pain symptoms, and the risk of commonly occurring pain conditions, particularly for female veterans, increases with time following return from deployment [3]. Given the high prevalence of pain among recent veterans and the potential for increasing incidence of pain among female veterans, additional research concerning pain and effective pain treatment for both male and female veterans is imperative.

Although there is a substantial civilian literature documenting gender differences in pain perception and prevalence, there are limited data examining gender differences in pain in recent-era veterans. Pain tolerance and thresholds tend to be lower in women compared with men [4,5], and women are more likely than men to report tension [6] and migraine headaches [7], orofacial pain [8,9], fibromyalgia symptoms [10], and musculoskeletal pain [11]. Additionally, women's pain reports are more severe and longer in duration [12,13]. Conversely, in Iraq/Afghanistan-era veterans the findings are limited and mixed: Some investigations have found that female veterans report more musculoskeletal [14], back [14,15], joint [14], headache [15], and persistent pain [16] than male veterans, while others have found that female veterans are less likely than male veterans to report any type of pain symptoms [17,18]. Other investigations have failed to find differences between female and male veterans on rates of reported pain [18].

In addition to potential gender differences with respect to pain experiences and reporting, prior research has consistently demonstrated a positive association between pain chronicity and emotional distress, impaired function, and health care utilization [19–21]. Iraq/Afghanistan-era veterans reporting pain symptoms often have comorbid mental health problems, such as posttraumatic stress disorder (PTSD) [15,22], depression [15], traumatic brain injury [22–24], substance use disorders [25], and increased rates of suicidal ideation [26–28]. However, few studies have evaluated gender differences in chronic pain and comorbid psychiatric symptoms and function. An early investigation in a predominantly male veteran sample found that chronic widespread pain was prevalent in Iraq/Afghanistan-era veterans and resulted in poorer function, regardless of comorbid mental health symptoms [20]. A more recent study found that Iraq/Afghanistan-era veterans with chronic pain were more likely to be female than male and report higher rates of PTSD, mood disorders, anxiety disorders, and substance use disorders than veterans without chronic pain [16]. Overall, although the literature consistently indicates that pain is associated with increased psychiatric symptoms and functional impairment [15,16,20,22,27], findings remain unresolved regarding gender differences for pain and psychiatric comorbidity in Iraq/Afghanistan-era veterans.

The current investigation was designed to replicate prior findings of pain symptoms and commonly comorbid psychiatric symptoms and to expand those findings across gender in Iraq/Afghanistan-era veterans. Informed by prior studies in civilian samples and the limited findings in recent veteran samples, it was hypothesized that a greater number of female veterans compared with male veterans would report pain symptoms and that female veterans would report greater pain severity than male veterans. In addition, it was hypothesized that among those with high levels of pain, female veterans would report more psychiatric distress and functional impairment than male veterans.

Methods

Study Population

Participants included 2,587 male and 660 female Iraq/Afghanistan-era veterans who participated in an ongoing multisite VA Mid-Atlantic Mental Illness, Research, Education and Clinical Center (MIRECC) Study of Post-Deployment Mental Health (PDMH Study) between 2005 and 2012. Approximately 90% of participants were enrolled in VA health care at the time of recruitment, and all participants provided written informed consent prior to implementation of study procedures. The study protocol was approved by the local institutional review boards at the Durham, Hampton, Hunter Holms McGuire, and W. G. (Bill) Hefner Veterans Affairs Medical Centers.

Recruitment strategies included targeted mailings, advertisements, and clinician referrals. Eligibility was limited to participants serving in the United States military after September 11, 2001. Participants meeting inclusion criteria completed several self-report measures during a one-day interview process.

Measures

Pain symptoms were assessed with three items from the Symptom Checklist 90-R, a 90-item, self-report measure of psychiatric symptoms. The three selected items assess severity of headache, low back pain, and muscle soreness on a five-point scale, ranging from 0 (not at all) to 4 (extremely). Instructions were to select the response that best described the level of distress (for each symptom) experienced over the past seven days. In the current study, these three items were modeled both individually and summed to form an overall composite rating of pain. For bivariate analyses, dichotomous proxy variables based on the individual items were coded for "high pain" if the top two levels (ratings of 3 and 4) were endorsed and contrasted with "no pain" if level 0 was endorsed. An additional dichotomous proxy variable was coded positive for level 3 or 4 endorsement on any of the three pain items (headache, low back pain, muscle soreness), with veterans endorsing any high pain again contrasted against subjects endorsing no pain on any of the three items.

An additional set of analyses assessed differences in psychiatric and functional measures as a function of pain level. Variables examined included: depression symptoms (21-item Beck Depression Inventory, Second Edition [BDI-II] [29]); suicidal ideation (21-item Beck Scale for Suicide Ideation [BSS] [30]); PTSD symptoms (17-item Davidson Trauma Scale [DTS] [31]); resilience (25-item Connor-Davidson Resilience Scale [CDRISC] [32]); and a dichotomous measure of mental health care utilization (coded positive for subjects endorsing a history of any outpatient mental health care). Functional measures included: sleep quality (19-item Pittsburgh Sleep Quality Index [PSQI] [33]); perceived social support (19-item Medical Outcomes Social Support Survey [MOS] [34]); dichotomous measures of self-reported full-time employment; VA-rated disability (defined as a treatment-seeking population with substantial medical and psychiatric morbidities; meeting eligibility requirements means testing, based on income thresholds, or military service-related disability status); and perpetrated violence within the past year. It was hypothesized that these functional measures may be impacted by pain and associated psychiatric factors.

Analyses

For analyses of pain, means and standard deviations were computed for each pain item and for the total composite pain score. As both individual items and the total pain summation scales failed to meet distributional criteria for normality, bivariate tests for differences in levels of endorsement between male and female respondents were based on nonparametric Wilcoxon rank tests. Bivariate tests of differences between male and female veterans in the proportion of respondents endorsing high levels of pain vs no pain were assessed using standard chi-square tests.

To test the effects of pain on psychiatric and functional status, a series of generalized linear regression models were estimated regressing each of the 10 individual psychiatric and functional measures noted above (depression, suicidal ideation, PTSD symptoms, resilience, perceived social support, sleep quality, outpatient mental health utilization, full-time employment, VA-rated disability, and past-year history of violent behavior) on a model containing main effect dichotomous variables denoting gender and high pain. In separate models, the analyses were repeated after inclusion of an interaction term crossing gender and pain to test for differential effects of pain on function by gender. Based on distributional characteristics, generalized regression models for ordinal items were estimated assuming a gamma distribution with a logarithmic link; dichotomous measures were estimated under an assumed binomial distribution with a logit link (logistic regression). Mean levels and standard errors of the various measures were computed and compared across factorial combinations of gender and high pain. Bivariate levels of outcomes between male and female veterans were compared in the high pain condition using nonparametric Wilcoxon rank procedures due to distributional characteristics.

All analyses were conducted using SAS 9.4 (SAS Institute, Cary, NC, USA) statistical software.

Results

Participant Demographic Characteristics

Overall Cohort

The average age for veterans participating in this study was 37.48 years (SD = 10.24 years) (Table 1). Approximately one-half the sample was white (48.12%), and slightly more than one-half were married (53.24%). Average education was 13.48 years, indicating many

Table 1 Cohort characteristics by gender in Iraq/Afghanistan-era veterans

	Complete cohort (N = 3247)		Male (N = 2587)		Female (N = 660)			
	Freq or mean	% or SE	Freq or mean	% or SE	Freq or mean	% or SE	ChiSq	Prob
Age	37.48	10.24	37.61	10.30	37.00	10.02	1.44	0.2308
Race: Caucasian	1,546	48.12%	1,335	52.05%	211	32.56%	78.67	<.0001
African American	1,534	47.74%	1,127	43.94%	407	62.81%	73.84	<.0001
Married	1,726	53.24%	1,528	59.13%	198	30.09%	191.06	<.0001
Education, years	13.48	3.65	13.37	3.61	13.90	3.80	78.94	<.0001
Full-time employment	1,621	50.08%	1,319	51.14%	302	45.90%	13.65	0.0011
Cigarette smoker	819	25.36%	688	26.74%	131	19.97%	12.65	0.0004
Violent acts	296	9.14%	243	9.41%	53	8.07%	1.13	0.2869
Incarceration (jail)	733	22.63%	664	25.72%	69	10.50%	71.87	<.0001
CES	11.34	10.65	12.64	10.85	6.22	7.99	200.54	<0.0001
TLEQ criterion A	3.93	3.48	3.58	3.23	5.32	4.02	109.11	<0.0001
MOS social support	73.54	26.15	74.01	25.92	71.70	26.98	2.34	0.126
NVVRS physical diagnoses	1.02	1.18	1.03	1.19	1.00	1.12	2.78	0.0952
Service-connected disability	1,864	57.41%	1467	57.04%	397	60.80%	3.02	0.0824
Outpatient mental health treatment	1,647	52.01%	1,284	50.95%	363	56.11%	8.49	0.0369
SCL-90: general stress	0.91	0.84	0.90	0.83	0.93	0.87	0.46	0.4954
DTS	40.82	39.98	41.05	39.91	39.92	40.29	0.42	0.5173
BDI-II	14.47	12.75	14.21	12.58	15.49	13.37	3.91	0.0479
BSS	0.97	3.19	1.01	3.28	0.84	2.81	0.00	0.9961

Beck Depression Inventory, Second Edition (BDI-II), Beck Suicide Scale (BSS), Davidson Trauma Scale (DTS), Medical Outcomes Social Support Survey (MOS), National Vietnam Veterans, Readjustment Study (NVVRS), Symptom Checklist-90-Revised (SCL-90), Traumatic Life Events Checklist (TLEQ).

veterans had completed some post–high school education. Fifty percent of veterans reported full-time employment (although the percentage with full-time employment was significantly lower for females: 45.90% vs 50.08%, $P = 0.0011$). Veterans categorized as unemployed or less than full-time employed may have been receiving VA-rated disability benefits.

On average, respondents reported with one physical health problem diagnosed by a physician in the prior year (National Vietnam Veterans Readjustment Study, NVVRS measure adapted from Kulka et al. 1990 [35]) and more than 57% reported a VA-rated disability. Over 50% of respondents reported attending at least one outpatient mental health appointment in the prior year.

Sex Differences

Approximately one-third of female veterans were white (32.56%), and less than one-third of female veterans reported being married (30.09%). Male veterans had significantly greater levels of combat exposure (Combat Exposure Scale, $P = 0.0001$), and females reported greater numbers of traumatic events (lifetime, TLEQ, $P = 0.0001$). Males were more likely to smoke ($P = 0.0004$) and to have been incarcerated ($P = 0.0001$). Females reported higher levels of depressive symptoms (BDI-II, $P = 0.0479$) and reported more prior mental health treatment ($P = 0.036$).

Pain Symptom Reports and Prevalence by Gender

Overall, higher levels of SCL-90-R pain symptoms were reported by female Iraq/Afghanistan-era veterans compared with male veterans (Table 2). Specifically, female veterans reported significantly higher levels of headache and muscle soreness, with the greatest differences noted for headache. For headache, although average pain ratings were overall within the mild to moderate range, pain among female veterans ($M = 1.69$, $SD = 1.35$) was elevated approximately 36% above levels reported by male veterans ($M = 1.25$, $SD = 1.23$, $P = 0.0001$). A similar pattern emerged among the other pain variables: Level of muscle soreness was 17% higher among females (females: $M = 1.32$, $SD = 1.39$; males: $M = 1.13$, $SD = 1.26$, $P = 0.008$), and low back pain, the most widely endorsed category of pain for both sexes, was 7% higher among female veterans (females: $M = 1.85$, $SD = 1.44$; males: $M = 1.73$, $SD = 1.44$), although gender differences for low back pain did not meet statistical significance ($P = 0.069$). The overall composite pain measure formed from the

Table 2 Gender differences in mean SCL-90R pain symptoms

	Male			Female				
	Mean	SD	N	Mean	SD	N	|Z|	Prob |Z|
Headache	1.247	1.229	2,587	1.691	1.345	660	7.669	<0.0001
Low back pain	1.733	1.442	2,587	1.853	1.484	660	1.821	0.069
Muscle soreness	1.133	1.258	2,585	1.321	1.391	660	2.641	0.008
Total pain	1.371	1.060	2,587	1.622	1.135	660	5.023	<0.0001

Table 3 Proportion of male and female veterans reporting high levels of pain

	Male				Female					
	No pain N		High pain N		No pain N		High pain N		χ^2 =	Prob χ^2
Headache	931	65.33	494	34.67	166	44.39	208	55.61	54.64	<.0001
Low back pain	731	45.10	560	54.90	177	40.97	255	59.03	2.35	0.1252
Muscle soreness	1,119	71.18	453	28.82	271	63.92	153	36.08	8.34	0.0039

summing of individual items was also significantly elevated (18%) in female veterans (M = 1.62, SD = 1.14) relative to males (M = 1.37, SD = 1.06, $P < 0.0001$).

Gender differences were also examined in the frequency of pain severity reported for each of the three SCL-90-R items (Table 3). Consistent with observations reported above, the proportion of veterans reporting pain at either of the highest two levels (ratings of 3 or 4) was significantly greater among female veterans for both headache and muscle soreness. Specifically, approximately 56% of female veterans reported moderate to severe headaches compared with only 35% of male veterans, and 36% of female veterans endorsed high levels of muscle soreness as compared with 29% of male veterans.

Gender, Pain Symptoms, Psychiatric Ratings, and Functional Status

Associations between pain and indices of mental health and functional status were also examined (Table 4). Relative to those with no pain, participants with moderate to severe pain ratings (SCL-90-R ratings of 3 or 4) reported more psychiatric problems and lower functional status. In all instances, psychiatric indices (i.e., depression, suicidal ideation, PTSD symptoms, sleep) were elevated and protective indices (i.e., resilience and social support) diminished by comorbid reports of moderate to severe pain. These findings were manifest in multilevel regression analyses through estimated coefficients associated with the dichotomous proxy measure denoting high pain: In each of the 10 estimated models, the coefficient was highly significant. That is, for all indices examined, the statistical main effect of moderate to severe pain was significantly associated with adverse psychiatric and functional ratings (Table 4).

Despite the adverse associations of pain on psychiatric symptoms and function, and despite elevated reported pain among female veterans, in no instances did the multivariate interaction terms crossing the bivariate proxies for gender and high pain (specifically designed to test for a differential effect of gender on the association between pain and adverse ratings) attain statistical significance (Table 4). In a more direct test for differential effects of pain on function by gender, gender differences in levels of psychiatric and functional indices were tested among a subset of subjects endorsing either of the two highest pain levels (ratings of 3 or 4) on any of the three individual SCL-90-R pain items. In all instances, excepting PTSD, differences between male and female veterans on tested indices were nonsignificant. For PTSD, male veterans reported significantly higher mean DTS scores than females (M = 63.46, SD = 1.20; M = 57.43, SD = 2.24, respectively, $P = 0.016$) (Table 5).

Discussion

To our knowledge, this is the first examination of gender differences in psychiatric and functional impairment in veterans reporting equivalent pain ratings. Our findings indicate that male and female Iraq/Afghanistan-era veterans reporting similar levels of pain have similar psychiatric and functional impairments. Our findings also confirm earlier reports that female veterans endorse higher mean levels of pain compared with male veterans and that as pain severity increases so does psychiatric comorbidity and functional impairment, regardless of gender. Taken together, these results have important implications for the assessment and treatment of pain-related disorders and psychiatric comorbidities in Iraq/Afghanistan-era veterans.

Table 4 Regression analysis of psychiatric and functional measures by indices of high pain, gender, and pain by gender in Iraq/Afghanistan-era veterans

	Psychiatric indices						Functional indices				
	Parameter	Est	SE	ChiSq	Type 3 prob		Parameter	Est	SE	ChiSq	Type 3 prob
BDI	Int	1.82	0.09			Disable%	Int	3.73	0.15		
	Female	−0.04	0.10	0.21	0.6434		Female	0.01	0.16	0.00	0.9642
	High pain	1.29	0.10	343.34	<0.0001		High pain	0.33	0.16	12.56	0.0004
	High pain X fem	0.01	0.11	0.01	0.9183		High pain X fem	−0.02	0.17	0.01	0.9104
BSS	Int	0.06	0.10			PSQI	Int	1.86	0.05		
	Female	0.17	0.11	2.34	0.1259		Female	0.00	0.06	0.00	0.965
	High pain	0.74	0.11	119.67	<0.0001		High pain	0.71	0.06	365.17	<0.0001
	High pain X fem	0.01	0.12	0.01	0.9304		High pain X fem	−0.02	0.06	0.15	0.7009
DTS	Int	2.30	0.12			Employed	Int	0.99	0.25		
	Female	0.16	0.13	1.37	0.2426		Female	−0.21	0.27	0.59	0.4431
	High pain	1.75	0.13	297.78	<0.0001		High pain	−0.94	0.27	31.92	<0.0001
	High pain X fem	−0.06	0.15	0.14	0.7044		High pain X fem	0.26	0.30	0.74	0.3889
MH outpatient	Int	−0.92	0.25			MOS	Int	4.38	0.06		
	Female	−0.11	0.27	0.16	0.6907		Female	0.00	0.07	0.00	0.979
	High pain	1.68	0.27	137.36	<0.0001		High pain	−0.16	0.07	13.99	0.0002
	High pain X fem	0.00	0.30	0.00	0.9923		High pain X fem	0.04	0.08	0.25	0.6164
CD-RISC	Int	4.42	0.03			Violent	Int	−4.38	1.01		
	Female	0.00	0.04	0.01	0.9225		Female	0.39	1.08	0.14	0.7077
	High pain	−0.19	0.04	80.99	<0.0001		High pain	2.41	1.02	49.87	<0.0001
	High pain X fem	−0.01	0.04	0.04	0.8409		High pain X fem	−0.13	1.09	0.01	0.9027

BDI = Beck Depression Inventory, Second Edition; BSS = Beck Suicide Scale; CD-RISC = Connor Davidson Resilience Scale; DISABIL% = VA-rated disability; DTS = Davidson Trauma Scale; Employed = full-time employment; Est = estimate; Int = intercept; MH = Mental Health Care Utilization; MOS = Medical Outcomes Social Support Survey; PSQI = Pittsburg Sleep Quality Index; Violent = perpetrated violence in past year.

Self-Reported Pain Symptoms in Male and Female Iraq/Afghanistan-Era Veterans

In the current sample, female Iraq/Afghanistan-era veterans reported higher levels of pain than male veterans. Specifically, compared with males, mean pain scores were higher in female veterans for headache, muscle soreness, and total pain (three individual pain items summed to form an overall composite rating of pain). These findings are consistent with other reports in both veteran and civilian literatures that women report more headaches [6,7,15,36] and musculoskeletal pain [13–15] than men. Although there was no significant gender difference in mean pain scores for low back pain in the current study, differences trended in a similar direction as other findings. Other research has found that women report significantly higher rates of back pain compared with men in both civilian and veteran populations, including Iraq/Afghanistan-era veterans [14,15].

Pain and Psychiatric Comorbidity in Male and Female Iraq/Afghanistan-Era Veterans

Consistent with other reports in the literature, our findings indicate that the presence of pain symptoms is positively associated with psychiatric comorbidity and negatively associated with indices of psychosocial function [15,16,20,22,27]. As female veterans report higher levels of pain and are at greater risk for several psychiatric disorders in general [37,38], we hypothesized that female veterans reporting pain symptoms would also experience elevated rates of comorbid psychiatric disorders and functional impairment. Unexpectedly, our findings did not support this hypothesis. In fact, in this sample, there were almost no gender-related

Table 5 Gender differences in psychiatric and functional indices by indices of high pain in Iraq/Afghanistan-era veterans

	Male			Female			Difference			
Measure	Mean	SE	N	Mean	SE	N	Mean	SE	|Z|	Prob |Z| <
BDI	21.53	0.38	1,130	22.27	0.73	351	−0.74	0.80	0.81	0.416
BSS	2.64	0.12	1,127	2.22	0.18	351	0.43	0.24	−1.12	0.261
DTS	63.46	1.20	1,118	57.43	2.24	349	6.03	2.49	−2.42	0.016
MH outpatient	0.66	0.01	1,090	0.68	0.03	341	−0.02	0.03	0.80	0.424
CD-RISC	67.95	0.56	1,131	68.79	1.08	351	−0.85	1.17	0.86	0.389
Disability%	57.01	1.06	742	57.69	1.81	249	−0.67	2.11	0.43	0.664
PSQI	12.73	0.14	984	13.08	0.24	321	−0.34	0.28	0.96	0.337
Employed	0.52	0.01	1,126	0.51	0.03	351	0.01	0.03	−0.39	0.693
MOS	71.04	0.92	833	68.22	1.68	261	2.82	1.89	−1.43	0.154
Violent	0.15	0.01	1,128	0.12	0.02	351	0.03	0.02	−1.39	0.164

BDI = Beck Depression Inventory, Second Edition; BSS = Beck Suicide Scale; CD-RISC = Connor Davidson Resilience Scale; Disability% = VA-rated disability; DTS = Davidson Trauma Scale; Employed = full-time employment; Est = estimate; Int = intercept; MH = Mental Health Care Utilization; MOS = Medical Outcomes Social Support Survey; PSQI = Pittsburg Sleep Quality Index; Violent = perpetuated violence.

differences in psychiatric and function ratings when pain levels were equal. The lack of gender differences after equating for pain is an unexpected and new finding. Additionally, in the single instance in which psychiatric status differed by gender (PTSD symptoms), males, contrary to our initial hypotheses, were significantly more impacted. This finding suggests that pain symptoms may have a large impact on PTSD status, particularly for male Iraq/Afghanistan-era veterans.

Overall, these findings have significant implications for the role of gender in the clinical evaluation and treatment of pain and associated psychiatric comorbidities and functional impairments in veterans. Specifically, our findings that male and female veterans with similar pain ratings report similar psychiatric symptoms suggest that neither pain management nor psychiatric treatments would be expected to differ between genders. Although the literature on gender differences in pain treatments and prescribing practices for veterans is limited, there may be gender-based differences. For example, a recent study reported that female veterans receiving chronic opioid therapy are more likely than their male counterparts to receive the potentially dangerous combination of additional sedating medications [39]. Within civilian samples, women's pain reports are more likely than men's to be interpreted by providers as somatization. Thus, women may consequently be less likely than men to receive analgesic medications such as opioids [40] and more likely to be treated with sedatives and anxiolytics [41]. Although there are several potential interpretations of these practices, this pattern of care may be an indicator of gender bias among prescribers. At a minimum, our findings highlight the importance of objectively assessing men and women for comorbid mental health symptoms and functional impairment and remaining mindful of gender-based assumptions.

From a broader medical health care perspective, these findings support continued efforts to provide veterans with integrated mental and physical health care, and for all providers to routinely assess for pain symptoms. Colocated collaborative care and care management efforts have been a VA priority since 2008 [42], and a variety of models are currently being successfully implemented within the VA [43]. These delivery platforms have been developed to improve care for commonly occurring psychiatric conditions and physical health problems, such a chronic pain, and are associated with increased access to mental health treatment, service utilization, and engagement [40,44–47].

Limitations

Athough these findings are generally consistent with the existing literature and provide a unique perspective with respect to gender and psychiatric comorbidity and functional status, several limitations should be considered. First, this is not a completely representative sample of Iraq/Afghanistan-era veterans and may not be generalizable to national Iraq/Afghanistan-era cohorts. Veteran information in this data set has been collected from a regional mid-Atlantic sample of veterans responding to a study advertisement. Because the SCL-90-R assesses seven-day history of pain symptoms only, the chronicity of participants' reported pain symptoms cannot be determined and initial conclusions drawn from these data will require validation in a larger cohort. In addition, not all psychiatric conditions, including anxiety and substance use, were included in this analysis and warrant further investigation. Finally, as a cross-sectional study, associations between variables of interest are described, but causative factors cannot be determined. Future prospective investigations are warranted to explore the role of gender and pain in psychiatric symptoms and functioning.

Acknowledgments

The authors would like to thank Dr. Susan McCutcheon RN, EdD, VA National Mental Health Director for Family Services, Women's Mental Health, and Military Sexual Trauma, for her assistance in conceptualization and development of this manuscript.

References

1 National Center for Veteran Analysis and Statistics. America's women veterans: Military service history and VA benefit utilization statistics. Washington, DC: National Center for Veteran Analysis and Statistics, Department of Veterans Affairs; 2011.

2 VHA Epidemiology Program. Post-Deployment Health Group, Office of Public Health, Veterans Health Administration, Department of Veterans Affairs. (2013). Analysis of VA Health Care Utilization among Operation Enduring Freedom, Operation Iraqi Freedom, and Operation New Dawn Veterans, from 1st Qtr FY 2002 through 1st Qtr FY 2013. Washington, DC.

3 Haskell SG, Ning Y, Krebs E, et al. Prevalence of painful musculoskeletal conditions in female and male veterans in 7 years after return from deployment in Operation Enduring Freedom/Operation Iraqi Freedom. Clin J Pain 2012;28:163–7.

4 Fillingim RB. Sex, gender, and pain: Women and men really are different. Curr Rev Pain 2000;4: 24–30.

5 Paller CJ, Campbell CM, Edwards RR, Dobs AS. Sex-based differences in pain perception and treatment. Pain Med 2009;10:289–99.

6 Schwartz BS, Stewart WF, Simon D, Lipton RB. Epidemiology of tension-type headache. JAMA 1998;279:381–3.

7 Lipton RB, Bigal ME, Stewart WF. Clinical trials of acute treatments for migraine including multiple attack studies of pain, disability, and health-related quality of life. Neurology 2005;65:S50–8.

8 Rauhala K, Oikarinen KS, Jarvelin MR, Raustia AM. Facial pain and temporomandibular disorders: An epidemiological study of the Northern Finland 1966 Birth Cohort. Cranio 2000;18:40–6.

9 Stavropoulos F, Hastie BA. Chronic facial pain in the female patient: Treatment updates. Oral Maxillofac Surg Clin North Am 2007;19:245–58.

10 Wolfe F, Ross K, Anderson J, Russell IJ, Hebert L. The prevalence and characteristics of fibromyalgia in the general population. Arthritis Rheum 1995;38: 19–28.

11 Ruau D, Liu LY, Clark JD, Angst MS, Butte AJ. Sex differences in reported pain across 11,000 patients captured in electronic medical records. J Pain 2012; 13:228–34.

12 Cepeda MS, Carr DB. Women experience more pain and require more morphine than men to achieve a similar degree of analgesia. Anesth Analg 2003;97:1464–8.

13 Crook J, Rideout E, Browne G. The prevalence of pain complaints in a general population. Pain 1984; 18:299–314.

14 Haskell SG, Mattocks K, Goulet JL, et al. The burden of illness in the first year home: Do male and female VA users differ in health conditions and healthcare utilization. Womens Health Issues 2011; 21:92–7.

15 Runnals JJ, Van Voorhees E, Robbins AT, et al. Self-reported pain complaints among Afghanistan/ Iraq era men and women veterans with comorbid posttraumatic stress disorder and major depressive disorder. Pain Med 2013;14:1529–33.

16 Higgins DM, Kerns RD, Brandt CA, et al. Persistent pain and comorbidity among Operation Enduring Freedom/Operation Iraqi Freedom/Operation New Dawn veterans. Pain Med 2014;15:782–90.

17 Haskell SG, Brandt CA, Krebs EE, et al. Pain among veterans of operations enduring freedom and Iraqi freedom: Do women and men differ? Pain Med 2009;10:1167–73.

18 Haskell SG, Gordon KS, Mattocks K, et al. Gender differences in rates of depression, PTSD, pain, obesity, and military sexual trauma among Connecticut War Veterans of Iraq and Afghanistan. J Womens Health (Larchmt) 2010;19:267–71.

19 Suggested citation from publication is: Epidemiology Program, Post-Deployment Health Group, Office of Public Health, Veterans Health Administration, Department of Veterans Affairs. (2015). Analysis of VA Health Care Utilization among Operation Enduring Freedom, Operation Iraqi Freedom, and Operation New Dawn Veterans, from 1st Qtr FY 2002 through 2nd Qtr FY 2015. Washington, DC.

20 Helmer DA, Chandler HK, Quigley KS, et al. Chronic widespread pain, mental health, and physical role function in OEF/OIF veterans. Pain Med 2009;10: 1174–82.

21 Outcalt SD, Ang DC, Wu J, et al. Pain experience of Iraq and Afghanistan veterans with comorbid chronic pain and posttraumatic stress. J Rehabil Res Dev 2014;51:559–70.

22 Lew HL, Otis JD, Tun C, et al. Prevalence of chronic pain, posttraumatic stress disorder, and persistent postconcussive symptoms in OIF/OEF veterans: Polytrauma clinical triad. J Rehabil Res Dev 2009;46: 697–702.

23 Gironda RJ, Clark ME, Ruff RL, et al. Traumatic brain injury, polytrauma, and pain: Challenges and treatment strategies for the polytrauma rehabilitation. Rehabil Psychol 2009;54:247–58.

24 Taylor BC, Hagel EM, Carlson KF, et al. Prevalence and costs of co-occurring traumatic brain injury with and without psychiatric disturbance and pain among Afghanistan and Iraq War veteran VA users. Med Care 2012;50:342–6.

25 Caldeiro RM, Malte CA, Calsyn DA, et al. The association of persistent pain with out-patient addiction treatment outcomes and service utilization. Addiction 2008;103:1996–2005.

26 Finley EP, Bollinger M, Noel PH, et al. A National Cohort Study of the association between the polytrauma clinical triad and suicide-related behavior among US veterans who served in Iraq and Afghanistan. Am J Public Health 2015;105:380–7.

27 Ilgen MA, Zivin K, Austin KL, et al. Severe pain predicts greater likelihood of subsequent suicide. Suicide Life Threat Behav 2010;40:597–608.

28 Pietrzak RH, Russo AR, Ling Q, Southwick SM. Suicidal ideation in treatment-seeking veterans of operations enduring freedom and Iraqi freedom: The role of coping strategies, resilience, and social support. J Psychiatr Res 2011;45:720–6.

29 Beck AT, Steer RA, Ball R, Ranieri W. Comparison of Beck Depression Inventories-IA and–II in psychiatric outpatients. J Pers Assess 1996;67:588–97.

30 Beck AT, Steer RA, Ranieri WF. Scale for Suicidal Ideation: Psychometric properties of a self-report version. J Clin Psychol 1988;44:499–505.

31 Davidson JR, Book SW, Colket JT, et al. Assessment of a new self-rating scale for posttraumatic stress disorder. Psychol Med 1997;27: 153–60.

32 Connor KM, Davidson JR. Development of a new resilience scale: The Connor-Davidson Resilience Scale (CD-RISC). Depress Anxiety 2003;18:76–82.

33 Buysse DJ, Reynolds CF 3rd, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: A new instrument for psychiatric practice and research. Psychiatry Res 1989;28:193–213.

34 Sherbourne CD, Stewart AL. The MOS social support survey. Soc Sci Med 1991;32:705–14.

35 Kulka, RA, Schlenger, JA, Fairbank, JA, et al. 1990. Trauma and the Vietnam war generation: Report of findings from the National Vietnam Veterans Readjustment Study. In: Brunner/Mazel, ed. New York.

36 Lipton RB, Bigal ME. The epidemiology of migraine. Am J Med 2005;118(suppl 1):3S–10S.

37 Booth-Kewley S, Schmied EA, Highfill-McRoy RM, et al. Predictors of psychiatric disorders in combat veterans. BMC Psychiatry 2013;13:130.

38 Seal KH, Metzler TJ, Gima KS, et al. Trends and risk factors for mental health diagnoses among Iraq and Afghanistan veterans using Department of Veterans Affairs health care, 2002–2008. Am J Public Health 2009;99:1651–8.

39 Oliva EM, Midboe AM, Lewis ET, et al. Sex differences in chronic pain management practices for patients receiving opioids from the Veterans Health Administration. Pain Med 2015;16:112–8.

40 Chen EH, Shofer FS, Dean AJ, et al. Gender disparity in analgesic treatment of emergency department patients with acute abdominal pain. Acad Emerg Med 2008;15:414–8.

41 Hoffmann DE, Tarzian AJ. The girl who cried pain: A bias against women in the treatment of pain. J Law Med Ethics 2001;29:13–27.

42 Butler, M, Kane, RL, McAline, D, et al. Integration of mental health/substance abuse and primary care. Evidence reports/technology assessments, No. 173. Rockville, MD: Agency for Healthcare Research Quality; 2008. https://www.ncbi.nlm.nih.gov/books/NBK38632/. Accessed June, 2016.

43 Beehler, GP, Funderburk, JS, King, PR, et al. The role and functions of embedded behavioral health providers in VA primary care–mental health integration. Current evidence and future directions. A VA Center for Integrated Healthcare White Paper. Center for Integrated Healthcare, Buffalo, NY; 2015.

44 Bryan CJ, Morrow C, Appolonio KK. Impact of behavioral health consultant interventions on patient symptoms and functioning in an integrated family medicine clinic. J Clin Psychol 2009;65 :281–93.

45 Funderburk JS, Dobmeyer AC, Hunter CL, Walsh CO, Maisto SA. Provider practices in the primary care behavioral health (PCBH) model: An initial examination in the Veterans Health Administration and United States Air Force. Fam Syst Health 2013;31:341–53.

46 Szymanski BR, Bohnert KM, Zivin K, McCarthy JF. Integrated care: Treatment initiation following positive depression screens. J Gen Intern Med 2013;28: 346–52.

47 Tsan JY, Zeber JE, Stock EM, Sun F, Copeland LA. Primary care–mental health integration and treatment retention among Iraq and Afghanistan war veterans. Psychol Serv 2012;9:336–48.