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Chronic Widespread Pain, Mental Health, and Physical Role Function in OEF/OIF Veterans

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ABSTRACT

Objective. Describe the associations among pain, mental health concerns, and function in veterans of Operation Enduring Freedom and Operation Iraqi Freedom (OEF/OIF).

Design. Retrospective review of self-reported, standardized clinical intake surveys.

Setting. A multidisciplinary deployment health clinic at a Veterans Affairs (VA) medical center.

Patients. The first 429 veterans of OEF/OIF presenting for clinical evaluation at a deployment health clinic.

Outcome Measures. Function, measured with the Role Physical (RP) scale of the Veterans RAND (VR)-36 survey, was compared for veterans with and without chronic widespread pain (CWP).

Results. After controlling for age, sex, and positive screens for depression and post-traumatic stress disorder (PTSD), the presence of CWP had a significant, clinically relevant, and independent effect on VR-36 RP (–6.2 points, $\Delta R^2 = 0.052$, $P < 0.001$). Mean VR-36 RP normed score was 43.3 (standard deviation 11.9). CWP was common (29%), as were positive mental health screens (PTSD 53%, depression 60%, alcohol misuse 63%).

Conclusions. In this sample of OEF/OIF veterans, the majority of whom reported good or better general health, CWP was common and related to poorer physical role function, independent of comorbid mental health concerns.

Key Words. Veterans; Pain; Depression; Post-Traumatic Stress Disorder

Introduction

Pain and mental health concerns are each highly prevalent in the general population and independently affect an individual's ability to function in their everyday activities. Previous studies have demonstrated the reinforcing impact of comorbid depression and chronic pain on function and mood [1–3]. Similarly, mental health concerns such as anxiety and post-traumatic stress disorder (PTSD) are also associated with chronic pain and function [4,5]. The comorbidity of pain and mental health conditions may result in a synergistic negative impact on function, implying the need to holistically assess and treat comorbid pain and mental health problems (see [1] for a review). Treatment studies of patients with comorbid pain and mental health conditions do not consistently show that treatment of the mental health condition alone results in improvement of the pain [2,5]. This suggests that both pain and mental health concerns must be addressed explicitly.

Pain and mental health concerns are also highly prevalent among veterans of Operation Enduring Freedom and Operation Iraqi Freedom

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(OEF/OIF). In a sample of OEF/OIF veterans seen in a southeastern VA medical center, approximately 47% reported at least a mild level of pain and 28% reported moderate to severe pain intensity [6]. OEF/OIF veterans also suffer from PTSD and substance use disorders at relatively high rates. Among those screened by the Department of Defense after deployment, rates of a positive PTSD screen (Primary Care PTSD screen score of 3 or 4) ranged from 6.2% to 14.3% and positive problem alcohol use (detected with a two-item screen) ranged from 11.8% to 15.0% [7]. Among veterans who seek care at the Veterans Health Administration (VHA), the presence of one or more diagnosis codes for a mental health condition was noted in the administrative records of 25% of OEF/OIF veterans, with PTSD being the most prevalent diagnosis (13%) and substance use disorder (excluding nicotine dependence) diagnosed in 5% [4]. Because of the prevalence of physical and mental health concerns among OEF/OIF veterans, the VHA has launched several initiatives to improve clinical care for these veterans. These include point-of-care screening for postdeployment health concerns such as PTSD and alcohol misuse, comprehensive management of chronic pain, better integration of mental health and primary care, and establishment of postdeployment clinics to focus on health concerns of recently returned combat troops.

One focus of VHA clinical assessment and management initiatives for OEF/OIF veterans is to improve function. These returning combat veterans are in their prime years of working, attending school, and raising families. The Veterans RAND-36 (VR-36) has been used widely in research with veterans and includes subscales specifically designed to assess the impact of pain and other health problems on function in usual home and work roles [8]. In addition, this psychometrically well-characterized measure confers the benefit of having been used in previously deployed populations thereby allowing comparisons across cohorts (for an example, see [9]). Assessing the link between function and the common concerns of pain, PTSD, depression and substance use disorders is critical to ensuring the best use of resources to optimize the function of these individuals.

Despite the need to understand the functional impact of pain and mental health concerns, little has been published about these relationships in the large and growing cohort of OEF/OIF veterans. Jakupcak and colleagues produced a brief report demonstrating the association between increasing PTSD severity and worse health-related function as measured by five scales of the Medical Outcomes Study Short Form-36 in a small sample ($n = 108$) of returning OEF/OIF veterans [10]. However, the authors did not assess the role of pain in the analyses, and also did not report the sample means and standard deviations (SDs) for the functional outcome measures. Milliken et al. (2007) published a study reporting similar associations between PTSD and health-related function using measures of work-related disability and general health, but did not evaluate the contribution of pain to function [7]. Finally, LeardMann et al. (2009) have shown using the Millennium Cohort Study data that those deployed to OEF/OIF who had poorer predeployment function (measured using the Mental Composite Score and Physical Component Score from the VR-36) were at greater risk for postdeployment PTSD than those with normal function before deployment [11]. Again, however, there was no assessment of the specific role of pain. Thus, the associations among pain, comorbid mental health conditions, and function have not yet been well described in the OEF/OIF veteran population.

In order to address these gaps in knowledge, we describe the associations among self-reported chronic widespread pain (CWP), mental health concerns, and function in a sample of OEF/OIF veterans presenting for a multidisciplinary postdeployment evaluation at a VA medical center. We hypothesized that CWP of substantial or greater severity and positive screens for mental health concerns (independent variables) would be inversely and independently related to a veteran's ability to fulfill her/his usual physical role function at work and/or at home (outcome variable) after controlling for age and gender, both known to be associated with pain experience and physical role function. We also tested for an interaction between pain and mental health concerns on physical role function to determine whether the effect of comorbidity on physical role function is greater than the sum of their individual contributions.

Methods

Study Design

This is a retrospective review of a self-administered clinical intake survey. Subjects were the first 429 OEF/OIF veterans with complete data evaluated at the War-Related Illness and

Injury Study Center (WRIISC) in East Orange, NJ (June 2004-October 2008). The study was reviewed and approved with a waiver of informed consent by the Institutional Review Board.

Setting/Procedures

The WRIISCs are congressionally mandated postdeployment centers located in East Orange, NJ, Washington, DC, and Palo Alto, CA. Veterans were primarily referred by the local OEF/OIF program staff, veteran service organizations, fellow veterans, local Vet Centers, and VHA personnel (other than their primary care providers). The goal of the full-day, multidisciplinary evaluation is a holistic assessment of the individual with a particular focus on postdeployment concerns that may not be the focus of routine primary care. Many report physical and mental health symptoms, but some have no significant current concerns, and instead desire an "executive-style" complete examination. To characterize the health status of the sample, we note that responses to the first item ("In general, would you say your health is . . .") from the VR-36 were "excellent, very good or good" for 59.3% of patients, "fair" for 30.9%, and "poor" for 9.8%. Pain and mental health concerns are addressed during the comprehensive assessment, but are prioritized by the patient and providers relative to other issues of concern.

The evaluation begins with completion of a written survey of standardized screening instruments to assess military experience, demographics, symptoms, function, deployment-related exposure concerns, medication use, and previously diagnosed medical and mental health conditions. Although the content and length of this instrument varied slightly over time, the instruments included in this analysis were consistently administered. The program manager, nurse, or clinical educator assisted any veterans who had difficulty completing the survey.

Qualified clinicians with expertise in mental health, neuropsychology, medicine, deployment-related exposure concerns, social work, and educational needs reviewed the screening results and performed standard evaluations. Team members met at the end of all evaluations to formulate a plan and presented it to the patient for further refinement. The final plan was then communicated to the patient and his/her primary care provider for implementation after the visit. Follow-up phone calls by a social worker or nurse assessed adherence to the plan and engaged the veteran in creative problem solving to resolve barriers to implementation [12].

Instruments and Variables

Standardized instruments included in this analysis are the VR-36; the Patient Health Questionnaire-15 item (PHQ-15); and CWP, PTSD, depression, and problem alcohol use screening instruments. Age, sex, marital status, education, employment status, and military branch and component were self-reported on the intake forms. We used screening data rather than complete diagnostic information specifically to demonstrate that information obtained from brief screening instruments (albeit not diagnostic) can be useful in any health care setting to draw attention to potential areas of concern.

The primary outcome measure was the VR-36 Role Physical (RP) scale which measures home- and work-related disability. This scale was selected as most representative of physical role function, or the overall ability to perform activities of daily living in this relatively young and functional cohort, and has excellent internal consistency (Cronbach's alpha = 0.95) [13]. The normed scores are presented. These are T-scores which are standardized from published results representative of the general U.S. population to a mean of 50 and SD of 10 with higher scores indicating better function [13].

Independent variables of primary interest were defined as follows:

1. *CWP*—Veterans with CWP reported pain located in all four quadrants of the body as determined in response to written descriptions of body location (e.g., right upper limb, left upper limb). In addition, the veteran had to report pain lasting for more than 3 months with a current pain severity of 3 or greater ("substantial, severe, or very severe"; 40.1% of the sample reported 3 or greater) on a Likert scale ranging from 0 ("none") to 5 ("very severe"). For comparison purposes, the normed VR-36 Bodily Pain (BP) scale is also reported. The BP scale measures pain severity and interference with daily tasks, with lower scores reflecting a greater impact of pain. We did not incorporate the BP scale into the definition of CWP due to high correlation of BP with the RP scale ($r = 0.590$, $P < 0.001$). Our definition of CWP, however, did demonstrate good construct validity when compared with the VR-36 BP scale (correlation coefficient = 0.66).

2. *PTSD*—The Primary Care-PTSD Screen (PC-PTSD) was used to screen for PTSD. It is a 4-item measure of PTSD with yes/no response options. We used a score of 3 or greater to indicate a positive screen for PTSD. A cutoff score of three or more "yes" responses has been shown to be optimally efficient by Prins et al. and yields a sensitivity of 0.78, a specificity of 0.87, and an overall efficiency score of 0.85 [14]. Similarly, a recent study of the PC-PTSD in soldiers returning from combat yielded a sensitivity of 0.76 and specificity of 0.92 in that population [15]. The VA currently uses the cutoff of 3 or greater for screening OEF/OIF veterans.
3. *Depression*—The VHA uses a modified version of the PHQ-2, a validated screening tool for depression [16]. The two items address mood and anhedonia, the hallmarks of a depressive episode. The VHA modification used yes/no answer choices to mirror the response options provided for the PC-PTSD. Endorsing both the dysphoric mood and anhedonia items was considered a positive screen for depression.
4. *Problem alcohol use*—The Alcohol Use Disorders Identification Test (AUDIT-C) is a 3-item screen for alcohol use [17]. A cutoff of 4 or more yielded a sensitivity of 0.91 and specificity of 0.70 in men. Consistent with current VHA policy, a score of 3 or more for women and 4 or more for men was considered positive for problem drinking.

Analysis

Prevalence of each independent variable of interest was calculated using the total number evaluated ($n = 429$) as the denominator. Raw scores of the VR-36 RP and BP scales were computed and standardized using published U.S. population norms and reported. These patient characteristics are reported using appropriate descriptive statistics for the total sample, those with and without CWP, and those above and below a median split on the BP scale (median score = 37.6). Bivariate relationships between these patient characteristics (including presence of CWP) and RP were then tested using chi-square and *t*-tests, as appropriate. Sequential linear regression models were developed to assess the independent association of age, gender, mental health concerns (depression, alcohol abuse, and PTSD), and CWP with function. We tested for interaction terms between CWP and mental health concerns if the mental health concern was associated with function in the main effects model at a level of $P < 0.10$. *P* values < 0.05 were considered statistically significant.

Results

Most veterans were unmarried men (mean age ± SD = 33.5 ± 10.0 years, range 21–62) who had completed some college courses, but had not received a bachelor's degree. Almost half were white (45.5%), 24.5% were black, 18.2% were another race, and 10.0% did not provide race information. They predominantly served in the army and in the Reserve/National Guard components (Table 1). Mean normed score for the sample on the VR-36 RP scale was 43.3 (SD 11.9), and 41.2 on the VR-36 BP scale (SD 10.7).

Almost one-third (28.9%) screened positive for CWP. Musculoskeletal concerns were commonly endorsed on the PHQ-15: 77.3% reported back pain (37.6% "bothered a little"; 39.7% "bothered a lot") and 79% reported arm, leg, or joint pain (34.3% "bothered a little"; 44.6% "bothered a lot"), with 65% endorsing both items. Mental health concerns were also prevalent: 53.4% screened positive for PTSD (range 0–4, mean = 2.4, SD = 1.6) and 59.7% for depression (range 0–2, mean = 1.3, SD = 0.9). The AUDIT-C screen indicated problem alcohol use in 60.1% of the sample (range 0–12, mean = 3.9, SD = 2.8); (Table 1).

In bivariate analyses, CWP was associated with a positive screen for PTSD and depression ($P < 0.001$ for both), but not problem alcohol use (Table 1). In those with CWP, the VR-36 RP normed score mean was 36.8 (SD 11.9) and the VR-36 BP normed score mean was 33.2 (SD 7.3). Being married was also associated with presence of CWP ($P < 0.05$). Results using the median split of the BP scale scores for comparison showed similar results to the presence of CWP except for the additional statistically significant associations between both older age and National Guard component and lower BP score (indicating more pain severity/interference; Table 1). A RP score less than the median of 44.6 was associated with presence of positive screens for PTSD and depression, older age (all *P*s < 0.001), unemployment, and serving in a branch other than the Marines (both *P*s < 0.05; Table 2). The presence of CWP was more common among those with RP and BP scores less than the median (indicating worse physical function and more pain severity/interference; both *P*s < 0.001).

Table 1 Bivariate relationships between veteran characteristics and pain measures

		Chronic Widespread Pain			Pain Function (VR-36 BP)		
	Total Sample (N = 429)	Absent (71.1%; N = 305)	Present (28.9%; N = 124)	Statistical Comparison	<Median (51.3%; N = 220)	>Median (48.7%; N = 209)	Statistical Comparison
Demographics							
Sex							
Male	83.9% (360)	72.8% (262)	27.2% (98)	$\chi^2 = 3.08$, NS	50.3% (181)	49.7% (179)	$\chi^2 < 1$, NS
Female	16.1% (69)	62.3% (43)	37.7% (26)		56.5% (39)	43.5% (30)	
Age							
(Mean, SD)	33.5 (10.0)	33.3 (10.0)	34.3 (10.0)	$t(1,427) < 1$, NS	35.0 (10.2)	32.1 (9.6)	$t(1,427) = 2.96$, $P < 0.05$
Ethnicity*							
Hispanic	33.5% (124/370)	64.5% (80/124)	35.5% (44)	$\chi^2 = 1.91$, NS	58.1% (72)	41.9% (52)	$\chi^2 = 3.1$, NS
Non-Hispanic	66.5% (246/370)	71.5% (176/246)	28.5% (70)		48.4% (119)	51.6% (127)	
Race							
White	45.5% (195)	67.7% (132)	32.3% (63)	$\chi^2 = 2.02$, NS	49.2% (96)	50.8% (99)	$\chi^2 < 1$, NS
Not white	54.5% (234)	73.9% (173)	26.1% (61)		53.0% (124)	47.0% (110)	
Education							
HS or less	35.0% (143)	66.4% (95)	33.6% (48)	$\chi^2 = 2.98$, NS	56.6% (81)	43.4% (62)	$\chi^2 = 7.61$, $P < 0.05$
Some college	41.1% (168)	75.0% (129)	25.0% (42)		43.5% (73)	56.5% (95)	
College grad+	24.0% (98)	68.4% (67)	31.6% (31)		58.2% (57)	41.8% (41)	
Employment							
Employed	56.3% (237)	70.9% (168)	29.1% (69)	$\chi^2 < 1$, NS	49.4% (117)	50.6% (120)	$\chi^2 < 1$, NS
Not employed	43.7% (184)	70.7% (130)	29.3% (54)		53.8% (99)	46.2% (85)	
Marital status							
Married	34.7% (149)	65.1% (97)	34.9% (52)	$\chi^2 = 3.99$, $P < 0.05$	60.4% (90)	39.6% (59)	$\chi^2 = 7.60$, $P < 0.05$
Not married	65.3% (280)	74.3% (208)	25.7% (72)		46.4% (130)	53.6% (150)	
Branch							
Navy	8.2% (35)	74.3% (26)	25.7% (9)	$\chi^2 < 1$, NS	51.4% (18)	48.6% (17)	$\chi^2 = 6.25$, NS
Marine	16.9% (72)	69.4% (50)	30.6% (22)		40.3% (29)	59.7% (43)	
Air force	3.3% (14)	71.4% (10)	28.6% (4)		71.4% (10)	28.6% (4)	
Army	71.5% (304)	70.7% (215)	29.3% (89)		53.3% (162)	46.7% (142)	
Component							
Active duty	39.1% (161)	70.2% (113)	29.8% (48)	$\chi^2 = 2.18$, NS	48.4% (78)	51.6% (83)	$\chi^2 = 3.78$, $P < 0.05$
National guard	37.1% (153)	68.0% (104)	32.0% (49)		58.2% (89)	41.8% (64)	
Reserve	23.8% (98)	76.5% (75)	23.5% (23)		48.0% (47)	52.0% (51)	
Mental Health Screening							
PTSD†							
Positive	53.4% (229)	62.4% (143)	37.6% (86)	$\chi^2 = 17.89$, $P < 0.001$	65.5% (150)	34.5% (79)	$\chi^2 = 39.76$, $P < 0.001$
Negative	46.6% (200)	81.0% (162)	19.0% (38)		35.0% (70)	65.0% (130)	
Depression‡							
Positive	59.7% (256)	63.3% (162)	36.7% (94)	$\chi^2 = 18.86$, $P < 0.001$	65.2% (167)	34.8% (89)	$\chi^2 = 49.46$, $P < 0.001$
Negative	40.3% (173)	82.7% (143)	17.3% (30)		30.6% (53)	69.4% (120)	
Alcohol§							
Positive	62.5% (268)	74.3% (199)	25.7% (69)	$\chi^2 = 3.47$, NS	48.5% (130)	51.5% (138)	$\chi^2 = 2.20$, NS
Negative	37.5% (161)	65.8% (106)	34.2% (55)		55.9% (90)	44.1% (71)	

Row percentages are reported for chronic widespread pain and pain function columns.
* 59 participants did not indicate their ethnicity.
† PC-PTSD greater or equal to 3.
‡ Positive to both mood and anhedonia item.
§ AUDIT-C greater than 4 for men or 3 for women.
AUDIT-C = Alcohol Use Disorders Identification Test; HS = high school; PC-PTSD = Primary Care-post-traumatic stress disorder; SD = standard deviation; VR-36 BP = Veterans RAND-36 Bodily Pain; NS = nonsignificant.

Table 2 Bivariate associations between veteran characteristics and normed VR-36 Role Physical score

Physical Role Function (VR-36 RP)	<Median (50.6% N = 217)	>Median (49.4% N = 212)	Statistical Comparison
Demographics			
Sex			
Male	50.3% (181)	49.7% (179)	$\chi^2 < 1$, NS
Female	52.2% (36)	47.8% (33)	
Age			
Mean (SD)	35.7 (10.6)	31.4 (8.9)	$t(1,427) = 4.23$, $P < 0.001$
Ethnicity*			
Hispanic	52.4% (65)	47.6% (59)	$\chi^2 < 1$, NS
Non-Hispanic	50.4% (124)	49.6% (122)	
Race			
White	52.3% (102)	47.7% (93)	$\chi^2 < 1$, NS
Not white	49.1% (115)	50.9% (119)	
Education			
HS or less	49.7% (71)	50.3% (72)	$\chi^2 = 4.53$, NS
Some college	44.6% (75)	55.4% (93)	
College grad+	58.2% (57)	41.8% (41)	
Employment			
Employed	45.6% (108)	54.4% (129)	$\chi^2 = 6.56$, $P < 0.05$
Not employed	58.2% (107)	41.8% (77)	
Marital status			
Married	57.0% (85)	43.0% (64)	$\chi^2 = 3.82$, NS
Not married	47.1% (132)	52.9% (148)	
Branch			
Navy	54.3% (19)	45.7% (16)	$\chi^2 = 8.82$, $P < 0.05$**
Marine	34.7% (25)	65.3% (47)	
Air force	50.0% (7)	50.0% (7)	
Army	53.9% (164)	46.1% (140)	
Component			
Active duty	49.7% (80)	50.3% (81)	$\chi^2 = 1.69$, NS
National guard	54.9% (84)	45.1% (69)	
Reserve	46.9% (46)	53.1% (52)	
Mental health screening			
PTSD†			
Positive	69.9% (160)	30.1% (69)	$\chi^2 = 73.09$, $P < 0.001$
Negative	28.5% (57)	71.5% (143)	
Depression‡			
Positive	66.0% (169)	34.0% (87)	$\chi^2 = 60.49$, $P < 0.001$
Negative	27.7% (48)	72.3% (125)	
Alcohol§			
Positive	48.8% (126)	51.2% (132)	$\chi^2 < 1$, NS
Negative	53.2% (91)	46.8% (80)	

* 59 participants did not indicate their ethnicity; ** post hoc analyses indicated that Marines are less likely to function below the median ($\chi^2 = 8.73$, $P < 0.005$).
† PC-PTSD greater or equal to 3.
‡ Positive to both mood and anhedonia item.
§ AUDIT-C greater than 4 for men or 3 for women.
AUDIT-C = Alcohol Use Disorders Identification Test; HS = high school; PC-PTSD = Primary Care-post-traumatic stress disorder; SD = standard deviation; VR-36 RP = Veterans RAND-36 Role Physical.

To examine the effects of mental health concerns and CWP on physical role function (VR-36 RP normed score), we developed a series of linear regression models (Table 3). After an initial model containing only control variables of age and sex, Model 2 showed that mental health concerns of PTSD and depression predicted more than a full SD decrement in physical role function (–13.5 points), and accounted for 23.1% of the variance ($P < 0.001$). Alcohol use did not contribute significantly to this model. A further reduction in function was observed when CWP was included in the model (Model 3; –6.2 points; $\Delta R^2 = 0.052$; $P < 0.001$). Importantly, the effects of screening positive for PTSD and depression remained significant in the model that included CWP. In order to examine the possibility that the impact of CWP on function is moderated by comorbid mental health concerns, we tested interaction terms in the model (PTSD × CWP and depression × CWP). The moderator variables, however, did not account for any additional significant explained variance in function (Model 4). The final adjusted model (Model 3) accounted for 35.3% of the variance in physical role function.

Table 3 Sequential regression models of the association between chronic widespread pain and positive mental health screens and normed VR-36 Role Physical score, controlling for age and sex

	Model 1 ($\Delta R^2 = 0.081$)*			Model 2 ($\Delta R^2 = 0.231$)*			Model 3 ($\Delta R^2 = 0.052$)*			Model 4 ($\Delta R^2 < 0.001$)		
	B	SEM	Sig.	B	SEM	Sig.	B	SEM	Sig.	B	SEM	Sig.
Constant	53.9	2.3	<0.001	61.5	2.0	<0.001	62.5	2.0	<0.001	62.3	2.1	<0.001
Age	–0.34	0.06	<0.001	–0.33	0.05	<0.001	–0.32	0.05	<0.001	–0.31	0.05	<0.001
Sex	0.93	1.5	NS	0.42	1.3	NS	–0.18	1.3	NS	–0.13	1.3	NS
Depression				–6.3	1.1	<0.001	–5.5	1.1	<0.001	–5.4	1.2	<0.001
PTSD				–7.2	1.1	<0.001	–6.4	1.1	<0.001	–6.2	1.2	<0.001
CWP							–6.2	1.1	<0.001	–5.5	2.0	<0.01
CWP × Depression										–0.66	2.7	NS
CWP × PTSD										–0.38	2.6	NS

* $P < 0.001$.
CWP = chronic widespread pain; PTSD = post-traumatic stress disorder; SEM = standard error of the mean.

Discussion

Our study provides the most detailed analysis to date of the hypothesized associations among pain, mental health concerns, and function in OEF/OIF veterans. It confirms the expected associations between more severe pain, depression and PTSD, and worse function in a sample of 429 veterans who were evaluated at a VHA comprehensive, multidisciplinary postdeployment clinic that has no explicit focus on mental health concerns or pain. It extends our knowledge of these associations by demonstrating that despite having good or better health on average, CWP was related to veterans' ability to function in their usual work and home roles over and above age, gender, and mental health concerns. These results demonstrate the importance of systematically screening for and assessing CWP, PTSD, and depression in newly returning OEF/OIF veterans.

These results also support the importance of a holistic, biopsychosocial approach for management of health concerns in OEF/OIF veterans. For those with CWP and positive screens for depression and/or PTSD, the clinician should consider multidisciplinary pain management involving the primary care provider, a behavioral medicine expert, physical medicine and rehabilitation services, pain specialists, and/or orthopedists [18]. The VHA National Strategic Plan for Pain Management calls for a stepped approach to pain management, with simpler pain complaints being addressed in primary care and more complex cases being referred to multidisciplinary teams and specialists. The high prevalence of comorbid CWP and mental health concerns in our sample suggests a high demand for multidisciplinary treatment. Although the referral and day-long nature of the WRIISC evaluation may bias the sample toward more affected OEF/OIF veterans, it was noted that on average, scores on the RP scale were within one SD of the population mean.

We did not find empiric evidence of an interaction or moderator effect of pain and mental health concerns on function in our analysis. Previous studies have also shown mixed results regarding a demonstrable interaction between these factors, despite growing appreciation for the overlap in neurologic pathways between the experiences of pain, anxiety, and depression [2,5]. It is likely that our definitions of CWP and positive screens for depression and PTSD captured more heterogeneous groups, including individuals with less severe manifestations, thus possibly reducing the power to demonstrate an interaction. Future research using actual diagnoses of depression and PTSD might reveal a nonadditive effect of comorbid pain and PTSD or depression on function.

Our report also extends previous findings that pain is common in OEF/OIF veterans, including self-reported CWP as defined here and pain interference as measured by the VR-36 BP scale. Our definition of CWP, while not extensively evaluated, addresses three critical domains of chronic pain: chronicity (3 or more months), distribution (four body quadrants), and intensity (current pain $\geq$3 on a scale from 0 to 5). Separate from CWP, the high proportions of patients reporting musculoskeletal pain on the PHQ-15 in this sample (65% reporting both limb and axial pain) are consistent with our prior report in a much smaller subset of these veterans ($n = 56$) in which musculoskeletal complaints were documented in the evaluation summaries of 64.3% of patients [12]. Similarly, Gironda et al. found 82% of their sample of OEF/OIF veterans with chronic pain had a documented diagnosis of musculoskeletal or connective tissue

disorders [6]. Clearly, musculoskeletal pain is a common issue in these returning combat veterans.

Prior work examining the relationship between alcohol misuse and function has not consistently demonstrated physical function, in particular, to be associated with alcohol misuse, although mental function typically is lower in those who misuse alcohol [19]. We found that a positive screen for alcohol use disorders was not associated with physical role function in this sample. Similarly, we found that a positive screen for alcohol misuse was not associated with pain in this sample, a finding that echoes prior work in a chronic back pain sample [20]. Further work will be needed to clarify the associations among pain, function, and alcohol misuse preferably using designs that can address causality. Finally, several significant associations suggest new avenues for research including the observed associations between education, branch of service, and physical role function, and between service component, marital status, and pain.

Several limitations of this research should be noted. We used screening tools for depression, PTSD, and alcohol use disorders that are widely used in VHA care to assess potential issues requiring further evaluation. Not surprisingly, our screening-based prevalence rates for these mental health issues are higher than previously reported based on diagnosis codes [4]. In addition, our prevalence rates also may be higher because of the focus on postdeployment health issues in our multidisciplinary clinic and/or self-selection into an evaluation at the WRIISC by individuals with mental health problems. Because this group of veterans had mean physical role function in the normal range, however, the data suggest that mental health concerns and pain are important for function even in a group who are currently able to perform most of their usual work and home roles. The significant associations between positive PTSD and depression screens, and physical role function in the presence of CWP, demonstrates the importance of what may be subclinical mental health problems. These results fit with a growing literature on the impact of subsyndromal PTSD on function [21–23]. As with any cross-sectional study, the associations detected among pain, mental health concerns, and function cannot be assumed to be causal and additional research is necessary to determine the causal linkages.

Our results imply that health care providers must be prepared to address the severity, chronicity, and impact of pain concerns as well as comorbid mental health concerns to improve the function of OEF/OIF veterans. These conditions have a potent impact on function, despite nearly average function in the sample overall. Recent reports provide models for improving care for OEF/OIF veterans with comorbid CWP and mental health concerns [24,25]. Given the prevalence and impact of these problems on function, clinicians and researchers should work to identify, perfect, and disseminate best practices for the treatment of CWP, depression, and PTSD in this group of combat veterans.

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