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## Original Research Reports

## Specific Pain Complaints in Iraq and Afghanistan Veterans Screening Positive for Post-Traumatic Stress Disorder

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**Background:** Post-traumatic stress disorder (PTSD) and pain are highly comorbid. **Objective:** The purpose of this study was to examine the association of PTSD with specific pain complaints in veterans of Operations Enduring and Iraqi Freedom (OEF/OIF). **Method:** A total of 381 primarily male (88.5%) veterans with a mean age of 30 years completed a battery of self-report questionnaires. A positive PTSD screen was defined as a score of  $\geq 40$  on the Davidson Trauma Scale. Logistic regression was used to examine the association of positive PTSD screen with specific pain complaints. **Results:** There were no significant demographic or physical and mental health differences between veterans who

screened positive for PTSD only and those with PTSD and at least one pain complaint, although differences on rates of combat injury and depression approached significance. Veterans who screened positive for PTSD were 2 to 3 times more likely to report abdominal pain, muscle aches or cramps, and joint aches, even after controlling for age, gender, combat injury, and depression. **Conclusions:** Similar to findings in other populations, there is a relationship between PTSD and pain complaints in OEF/OIF veterans. Future research should examine the mechanisms that link PTSD with specific pain complaints, especially abdominal pain.

(Psychosomatics 2013; xx:xxx)

Post-traumatic stress disorder (PTSD) is a debilitating illness characterized by symptoms of re-experiencing, avoidance, emotional numbing, and hyperarousal resulting from an emotionally traumatic event with actual or perceived threat.<sup>1</sup> Persons with military combat exposure are at high risk for developing PTSD.<sup>2,3</sup> Lifetime rates for PTSD range from 18% to 30% in Vietnam veterans.<sup>4</sup> In addition, as many as 80% of Vietnam veterans with PTSD have been reported to experience chronic pain.<sup>5</sup> Other studies in Vietnam veterans and those from other conflicts predating Operations Enduring and Iraqi Freedom (OEF/OIF) found increased rates for pain complaints, including overall bodily pain, migraines and headaches,<sup>6</sup> chronic low back pain, and general chronic pain secondary to systemic disease.<sup>7</sup>

The military operations in Iraq and Afghanistan have been unlike previous conflicts, especially because of the unpredictable nature of combat and guerrilla warfare, mul-

tiples and long deployments, the chronic threat of improvised explosive devices (IEDs), and advances in battlefield medicine that has led to increased survival from injuries with higher degrees of disability. Therefore, a growing body of research has begun to examine the impact of OEF/OIF deployment on the mental and physical health of military personnel and veterans.<sup>8-10</sup> Recent reports sug-

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gest high rates of mental health disorders, including PTSD and depression, among active duty military personnel and OEF/OIF veterans.<sup>8,11,12</sup> Further, pain is among the most prevalent complaints of those returning from OEF/OIF,<sup>13</sup> with reports of pain in up to 80% of OEF/OIF veterans and one-third reporting moderate to severe pain.<sup>14</sup> Another study found that 57% of studied veterans reported moderate to severe pain.<sup>15</sup> In addition, OEF/OIF veterans report high rates of specific pain complaints, including chronic widespread pain,<sup>13</sup> back and limb pain,<sup>15</sup> and headaches.<sup>16</sup>

Previous studies also have reported a high co-occurrence of general pain and PTSD<sup>17</sup> as well as poorer physical health functioning and PTSD<sup>18</sup> in OEF/OIF veterans. However, the rates of specific pain complaints in OEF/OIF veterans with PTSD or the role other factors, such as depression, may play in this relationship have not been fully explored. Further, no studies have examined demographic, physical and mental health differences between individuals with PTSD and those with both pain complaints and PTSD in OEF/OIF veterans.

The purpose of this study was threefold. First, we examined the demographic, physical health, and mental health differences between OEF/OIF veterans who screened positive for PTSD only and those who were positive for both PTSD and at least one pain complaint. Second, we assessed the association of screening positive for PTSD with several specific pain complaints in OEF/OIF veterans. Third, we explored the role of age, gender, combat injury, and depression on the relationship between PTSD and pain complaints.

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## METHODS

### Sample and Procedures

This study was part of a larger cross-sectional evaluation of OEF/OIF veterans registering for healthcare at the VA San Diego Healthcare System (VASDHS) from March to October, 2006. During this period, 459 veterans and reservists agreed to complete a battery of questionnaires at their initial registration visit with Member Services. Of these, 19 (4%) did not take part in OEF or OIF. Of the remaining 440 OEF/OIF veterans, 381 (87%) had completed data and were included in these analyses. The study was approved by the University of California, San Diego Institutional Review Board and by the VA San Diego Research and Development Committee. All authors had access to the data.

### Measures

Veterans completed a packet of standardized questionnaires and rating scales to assess demographic, military, and in-theatre factors, mental health symptoms, and health-related diagnoses and symptoms including pain complaints.

*Demographic and Military Variables* The demographic and military questions included information on age, gender, race/ethnicity, and branch of service.

*In-Theatre Variables* Veterans completed the Combat Exposure Scale, a 7-item measure of wartime stressors experienced by combatants.<sup>19</sup> A series of dichotomous questions (i.e., yes or no answer choices) asked about (1) experiencing an emotional trauma, including combat or noncombat experiences, (2) combat-related injury, and (3) a history of loss of consciousness due to head injury.

*Mental Health Symptoms* A battery of commonly used and well-validated questionnaires assessed for mental health symptoms. The Davidson Trauma Scale (DTS) was used to determine the degree of PTSD symptoms.<sup>20</sup> The DTS is an often-used measure of the frequency and severity of PTSD symptoms based on the Diagnostic and Statistical Manual of Mental Disorders, 4th edition, criteria.<sup>1</sup> This 17-item measure has good internal consistency and test-retest reliability.<sup>20</sup> Screening positive for PTSD was defined as positive endorsement of trauma exposure and a DTS score of 40 or higher. A two-item depression screener asked about feeling down, depressed or hopeless, and little interest or pleasure in doing things for the last month. This depression screener has been used routinely in other studies published on VA populations as a general screen for depression.<sup>21</sup> The measure is psychometrically sound, useful for detecting depression in primary care settings, and has similar test characteristics to other case-finding instruments.<sup>22</sup> A positive depression screen was defined as endorsement of both depressed mood and anhedonia.

The Alcohol Use Disorders Identification Test (AUDIT)<sup>23</sup> and Drug Abuse Screening Test (DAST)<sup>24</sup> were included to screen for drug and alcohol problems. Both the AUDIT and the DAST demonstrate strong sensitivity and specificity in identifying problematic alcohol and drug abuse, respectively.<sup>24,25</sup> Substance abuse was defined as a score of 5 or more on the AUDIT or a score of 2 or more on the DAST.

*Pain Complaints* Veterans also completed a 52-item checklist of medical symptoms that included items on

**TABLE 1. Characteristics of All Veterans and by Post-traumatic Stress Disorder and Pain Status**

Characteristic	Overall <i>n</i> = 381	PTSD Only <i>n</i> = 38	PTSD and Pain <sup>a</sup> <i>n</i> = 122
Male gender, %	88.5	86.8	90.2
Age, mean years (SD)	30.3 (8.2)	28.5 (8.5)	30.0 (7.6)
Race, %			
White	44.6	47.4	45.1
Black	16.1	10.5	18.0
Hispanic	21.8	36.8	20.5
Asian	13.4	5.3	12.3
Other	4.2	0.0	4.1
Service branch, %			
Army	22.3	34.2	26.2
Air Force	1.8	5.3	1.6
Marines	33.9	36.8	37.7
Navy	36.8	15.8	27.9
National Guard	5.3	7.9	6.0
Injured during combat, %	20.7	21.1	36.6
CES, mean score (SD)	13.8 (11.1)	20 (9.0)	20 (10.5)
Positive depression, %	44.6	65.8	77.6
Positive substance abuse, %	34.1	44.7	43.3
Loss of consciousness, %	6.8	5.3	13.4

PTSD = post-traumatic stress disorder; CES = Combat Exposure Scale.

<sup>a</sup> PTSD and Pain participants had a positive PTSD screen and at least one pain complaint.

## RESULTS

Initial analyses indicated that other than branch of service, the 381 OEF/OIF veterans who completed the assessment packet did not differ significantly from the 59 OEF/OIF veterans who were excluded from the analyses because of missing data. A larger proportion of incomplete packets than complete packets were from the Marines (39% vs. 34%,  $P < 0.001$ ). Nonetheless, veterans from the Navy and Marines constituted the largest proportion for both completers and non-completers.

Of the 381 veterans with complete data, 160 (42%) screened positive for PTSD and 221 (58%) did not screen positive for PTSD. Table 1 presents the characteristics of the overall sample as well as for those who screened positive for PTSD only and those who screened positive for both PTSD with at least one pain complaint. A majority of the sample was male (88.5%) with a mean age of 30 years (SD = 8.2). The sample was ethnically diverse and represented primarily the Navy (36.8%), Marines (33.9%), and Army (22.3%). Nearly 21% of the sample reported injury during combat and respondents had a mean score of 13.8 (SD = 11.1) on the Combat Exposure Scale corresponding with light to moderate combat exposure. About 45% and 34% of the sample screened positive for depression and substance abuse, respectively; 7% reported a loss of consciousness. Compared with veterans who were positive for PTSD only ( $n = 38$ ), those with PTSD and at least one pain complaint ( $n = 122$ ) had higher rates of combat injury ( $\chi^2 [1, n = 381] = 3.23, P = 0.07$ ) and depression ( $\chi^2 [1, n = 381] = 2.20, P = 0.14$ ), but these differences approached significance. There were no other differences between groups.

Table 2 presents the unadjusted and adjusted ORs and 95% CIs for the association between positive screen for PTSD and the specific pain complaints. Veterans who were positive for PTSD were significantly more likely to report abdominal pain (OR = 4.5, 95% CI = 2.3–9.1),

stomach or abdominal pain, muscle aches or cramps, joint pain or aches, and back pain or spasms. Veterans indicated if the symptom was currently a problem. This checklist was similar to those used in previous studies of health symptoms in veterans.<sup>26</sup>

## Statistical Analyses

Descriptive analyses, including *t*-tests for continuous variables and  $\chi^2$  for dichotomous variables, were used to examine differences between veterans with complete data and those who were excluded from the analyses because of missing data, and to characterize the sample and examine the demographic and other differences between veterans who screened positive for PTSD only and those who were positive for both PTSD and at least one pain complaint. Unadjusted logistic regression analyses were conducted to examine the association between PTSD and specific pain complaints and to determine odds ratios (OR) and 95% confidence intervals (CI). These were followed by logistic regression analyses that controlled for age, gender, depression, and combat injury. Significant *P* value was set at 0.05. All analyses were conducted using SAS v. 9.2 (SAS Institute Inc., Cary, NC).

**TABLE 2. Unadjusted and Adjusted OR and 95% CI for the Association between PTSD and Pain Complaints**

Pain Complaints	Unadjusted	Adjusted <sup>a</sup>
	OR (95% CI)	OR (95% CI)
Stomach or abdominal pain	4.5 (2.3–9.1)	2.8 (1.3–6.4)
Muscle aches/cramps	3.8 (2.3–6.4)	2.7 (1.5–4.9)
Joint aching or pain	2.3 (1.5–3.5)	2.1
Back pain or spasms	2.1 (1.4–3.2)	1.5 (0.9–2.5)

<sup>a</sup> Adjusted for age, gender, combat injury, and depression.

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muscle aches or cramps (OR = 3.8, 95% CI = 2.3–6.4), joint aches (OR = 2.3, 95% CI = 1.5–3.5), and back pain or spasms (OR = 2.1, 95% CI = 1.4–3.2) than veterans without PTSD. Adjusting for age, gender, combat injury, and depression reduced these effects, however, the association with abdominal pain (OR = 2.8, 95% CI = 1.3–6.3), muscle aches or cramps (OR = 2.7, 95% CI = 1.5–4.9), and joint aches (OR = 2.1, 95% CI = 1.2–3.4) remained significant; the association with back pain or spasms approached significance (OR = 1.5, 95% CI = 0.9–2.5). These findings suggest that age, gender, combat injury, and depression only partially explain the relationship between a positive PTSD screen and these specific pain complaints.

## DISCUSSION

This study focused on the relationship between a positive screen for PTSD and specific pain complaints in a cohort of OEF/OIF veterans. We found substantial rates of positive PTSD, depression, and substance abuse screens in the sample. There were few demographic, physical health, and mental health differences between OEF/OIF veterans who screened positive for PTSD only and those who screened positive for both PTSD and at least one pain complaint; the differences on rates of combat injury and positive depression screens approached significance. We also found that a positive PTSD screen was associated with significantly higher odds of abdominal pain, musculoskeletal pain, joint pain, and back pain. Adjusting for age, gender, combat injury, and depression diminished the strength of these associations but aside from the link with back pain, all associations remained significant.

Previous research has found that individuals with PTSD and chronic pain report higher ratings of psychiatric distress, greater disability, and more intense pain compared with those with PTSD or chronic pain only.<sup>27–29</sup> These previous findings are in contrast to ours and suggest that the more substantial morbidity associated with comorbid PTSD and pain may happen specifically when pain is long-lasting or chronic. We did find that veterans with PTSD and at least one pain complaint were more likely to have experienced combat and to screen positive for depression, but these findings were not statistically significant, likely due to low power. Future research should explore the role of combat as well as depressive symptoms in the link between PTSD and pain, and distinguish between combat-related trauma and noncombat trauma (i.e., military sexual trauma) in theatre. Additional research can

also address the morbidity associated with PTSD and pain as pain complaints develop over time and become more chronic in OEF/OIF veterans.

A large body of research has documented a variety of pain complaints in veterans with PTSD.<sup>2,5,7,30</sup> In contrast to previous studies in Vietnam veterans but similar to one study in Gulf War veterans,<sup>30</sup> we saw an increased association of PTSD with abdominal pain. One possible explanation is the increased experience with blast exposure in OEF/OIF veterans. Blast exposure related to IEDs is specifically related to body cavity pain, including abdominal pain, as well as PTSD and traumatic brain injury.<sup>31</sup> Alternately, studies, primarily with women and noncombat trauma, have linked PTSD with irritable bowel syndrome, a condition with abdominal pain as a key feature.<sup>32–34</sup> The link between PTSD and gastrointestinal conditions such as irritable bowel syndrome should be fully explored in OEF/OIF veterans. In addition, future research can better examine the role of blast exposure in the complex relationship between PTSD, traumatic brain injury, and various pain complaints, as well as a comprehensive and interdisciplinary approach to assessment and treatment of these conditions.

We also found that age, gender, depression, and combat injury did not completely account for the relationship between PTSD and pain complaints other than back pain. This is of particular interest since previous studies have found comorbid depression to be either a mediator or moderator of increased pain in PTSD patients.<sup>35,36</sup> Others also have found that although depression may attenuate the relationship between PTSD and physical health functioning, PTSD remains a significant factor in poorer physical health functioning and greater bodily pain.<sup>37</sup> Together with our findings, these discrepant results suggest that further evaluation of the overlapping and unique roles of PTSD and depression in pain is warranted.

Current models aiming to explain the comorbidity of PTSD and chronic pain also acknowledge the intertwined nature of PTSD and pain. The shared vulnerability model suggested by Asmundson et al.<sup>38</sup> predicts that individual factors predispose people to develop both PTSD and chronic pain. The mutual maintenance model for PTSD and pain proposes that mechanisms such as depression, anxiety sensitivity, or pain perception may maintain or exacerbate symptoms of both PTSD and chronic pain.<sup>39</sup> It is important that future research examine both vulnerability and maintenance factors that may explain the comorbid relationship between PTSD and pain complaints and con-



ditions. Our findings on the potentially different associations of PTSD with various pain complaints suggest that the underlying mechanisms may be unique to different pain complaints and conditions. Understanding the similarities and differences in the mechanisms that underlie the relationship between PTSD and specific pain complaints and conditions will facilitate more tailored prevention and treatment strategies.

Our findings also support the need for a multidisciplinary approach to the assessment and treatment of both mental and physical health symptoms in OEF/OIF veterans. The comprehensive screening and follow-up assessment of both trauma-related symptoms and pain and other physical symptoms in veterans with and without physical injury is likely to facilitate early detection and timely and broad treatment. Although evidence-based treatments are available for both PTSD and pain conditions, only a handful of treatment protocols have been developed that address PTSD and pain in combination.<sup>40</sup> Clearly, more research is needed to determine optimal treatment of OEF/OIF veterans with these co-occurring symptoms.

This study has several limitations. First, our findings are based on self-reported data and could have been affected by recall bias. Relatedly, the PTSD, depression, and substance abuse measures were brief screening instruments not designed for diagnosis of these conditions but for quick identification of individuals who would benefit from additional assessment. In addition, the measure of pain complaints focused only on self-reported presence of pain and did not provide any information on severity or impact on function. Thus, findings from this study should be replicated using a comprehensive and clinically-based assessment of PTSD, other mental health symptoms, and pain complaints. Second, we had no information on veterans' history of pain symptoms prior to deployment to OEF/OIF, nor the course of their pain complaints. Therefore, we must reiterate that our findings are based on cross-sectional data and do not imply that PTSD causes pain or that preexisting history of pain symptoms predisposes one to the development of PTSD. Third, the data presented here were collected in 2006 and may not fully represent the characteristics of veterans who have served in OEF/OIF since then. Nonetheless, our findings of the link between PTSD and pain complaints are consistent with previous research and further highlight the need to examine the interplay of PTSD and pain in

OEF/OIF veterans. Finally, the sample of OEF/OIF participants was not randomly selected. This point is underscored by differences in the branch of service reported by veterans who completed the assessment packet and those who did not, a variable that may be confounded by clinically relevant exposures. In addition, we obtained data from veterans who were attending a VA Medical Center to register for healthcare. It is likely that once discharged from the military, those who are experiencing mental health symptoms are more likely to seek treatment and register for VA healthcare. Indeed, the substantially high rates of positive PTSD, depression, and substance abuse screens we observed suggest that newly registering veterans may represent a self-selected treatment-seeking sample. Thus, our findings may only be relevant to veterans seeking care at a VA Medical Center.

In conclusion, we found that OEF/OIF veterans who screened positive for PTSD were 2 to 3 times more likely to report a number of pain complaints than those without PTSD, even after controlling for age, gender, combat injury, and depression. Future research can delineate the role of combat vs. noncombat trauma in theater in relation to pain complaints. In addition, other research can focus on the role of blast exposure and depression as well as further examining vulnerability and maintenance factors associated with comorbid PTSD and specific pain complaints and conditions. Veterans could benefit from an interdisciplinary assessment and treatment approach that addresses both mental and physical health symptoms. This line of investigation will be valuable to healthcare providers caring for OEF/OIF veterans to help improve their care.

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