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Pain Descriptors Used by Military Personnel Deployed to Iraq and Afghanistan Following Combat-Related Blast Experience

Kelcey J. Stratton, Ph.D.^{1,2,3}, Benjamin D. Wells, B.S.^{1,3}, Sage E. Hawn, B.S.^{2,3}, Ananda B. Amstadter, Ph.D.³, David X. Cifu, M.D.^{1,4}, and William C. Walker, M.D.^{1,4}

¹ Hunter Holmes McGuire VA Medical Center, 1201 Broad Rock Blvd. (116-B), Richmond, VA 23249, USA

² Department of Psychology, Virginia Commonwealth University, 806 West Franklin Street, PO Box 842018, Richmond, VA 23284, USA

³ Virginia Institute for Psychiatric and Behavioral Genetics, Virginia Commonwealth University, 800 East Leigh Street, Biotech 1, Suite 101, Richmond VA 23219, USA

⁴ Department of Physical Medicine and Rehabilitation, Virginia Commonwealth University, 1223 E. Marshall St., 4th Fl., PO Box 980677, Richmond, VA 23298, USA

The recent combat operations in Iraq and Afghanistan have produced a complex set of injuries for United States military Service Members (SMs) and Veterans. During Operation Iraqi Freedom (OIF), Operation Enduring Freedom (OEF), and Operation New Dawn (OND), SMs have sustained injuries from blasts resulting from the numerous improvised explosive devices deployed by insurgent forces; these events have resulted in significant numbers of blast-related injuries, including traumatic brain injury (TBI), persistent postconcussive syndrome (PPCS), posttraumatic stress disorder (PTSD), and pain. Pain is a particularly salient concern for returning SMs and Veterans; recent studies estimate that up to 80% of Veterans report pain following military service (Gironda, Clark, Massengale, & Walker, 2006; Higgins et al., 2014; Lew et al., 2009). Pain complaints may significantly complicate the course of treatment and long-term outcomes, and knowing the exact nature of the pain experienced by blast-exposed military personnel may help in the diagnostic process and inform treatment options.

Several studies have investigated the relationship between pain types, functioning, and disability status (e.g., Jensen, Smith, Ehde, & Robinsin, 2001; Leserman, Zolnoun, Meltzer-Brody, Lamvu, & Steege, 2006), and past work suggests that differentiation of pain regions and descriptors may be useful for diagnosis and treatment (Baron, Tölle, Gockel, Brosz, & Freynhagen, 2009). For example, patients reporting high degrees of affective pain may require a more behaviorally-based intervention than those with low degrees of affective pain in order to address mood, functioning, and interpersonal aspects of the pain experience (Feuerstein and Beattie, 1995). Moreover, medication decision-making must consider

Correspondence concerning this article should be addressed to: Kelcey J. Stratton, PhD, Hunter Holmes McGuire VA Medical Center, 1201 Broad Rock Blvd. (116-B), Richmond, VA 23249. Phone: 804-675-5000, ext. 2432; Fax: 804-675-6853; Kelcey.Stratton@va.gov.

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factors such as the temporality (e.g., acute versus intermittent versus chronic) and reactive nature (e.g., spontaneous versus evoked) of pain complaints in order to select the most appropriate intervention (Baron et al., 2009). Given the high prevalence and varied nature of pain among OEF/OIF/OND SMs (Gironda et al., 2006; Helmer et al., 2009), a better understanding of pain descriptors and subtypes has the potential to improve clinical efforts by targeting specific clusters of pain symptoms.

The Short-Form McGill Pain Questionnaire (SF-MPQ; Melzack, 1987) is often used for classification of pain subtypes. Melzack (1987) initially proposed a two-factor solution consisting of sensory and affective pain types. A number of subsequent factor analyses conducted on the SF-MPQ have yielded a range of pain subtypes with factor solutions ranging from two factors (Beattie, Dowda, & Feuerstein, 2004; Shin et al., 2007) to five factors (Cassisi et al., 2004; Niere, 2002). To date, no factor analytic studies have explored pain complaints in a blast-exposed military sample, and the constellation of symptoms related to blast trauma may yield distinctive pain factors, such as pain related to headache or musculoskeletal injury. Previous work in a clinical sample of headache patients demonstrated that the SF-MPQ can discriminate pain related to specific headache types (Niere, 2002), and therefore this instrument may be useful for determining whether certain pain descriptors can distinguish headaches versus other pain complaints related to blast trauma.

This study aimed to explore characteristics of pain in a sample of OEF/OIF/OND SMs and Veterans through factor analysis of the SF-MPQ, with the purpose of understanding pain problems following combat-related blast exposure. A secondary aim was to explore the usefulness of identifying subtypes of pain based on the SF-MPQ descriptors by determining whether any of the statistically identified pain subtypes were related to the subjective reports of specific pain areas and complaints, and whether these subtypes differed according to reported mood symptoms. Results are discussed in terms of addressing pain symptoms in treatment, particularly as related to other common comorbidities among blast-exposed military personnel.

Method

Data were collected as part of a Congressionally Directed Medical Research Program investigating post-combat blast exposure and injuries sustained during OEF/OIF/OND. Eligible military SMs and Veterans had a blast experience within the past two years while deployed.

Procedure

The participating agencies' Institutional Review Boards approved this study, and informed consent was obtained from all participants. Participants completed a series of self-report questionnaires. Although many were enrolled at clinics, the research evaluations were separate from clinical care. Research staff supervised completion of all the questionnaires and provided additional instructions as needed.

Participants

Participants were recruited via letters, advertisements, and from ambulatory healthcare clinics at a mid-Atlantic VA Medical Center and at several Army and Marine Corps bases located in the mid-Atlantic region of the United States. For the present analyses, participants who reported at least one blast experience during combat were included in the study (N = 209). Blast experience was defined as having any of 15 queried symptoms or experiences occurring during or shortly after exposure to blast or explosion, and included items such as: dazed, saw stars, headache, dizziness, gap in memory, hearing loss, struck by debris, and knocked over or down.

Measures

Prior health and demographics questionnaire—A detailed health and demographics questionnaire was developed for the study. Questions assessed for basic demographic information (e.g., sex, age, marital status, race, education, military history) as well as selected psychiatric and medical histories, which were not the focus of the present report. For descriptive purposes, the number of individuals indicating clinically significant (i.e., scoring above clinical cut-offs on common screening assessments) symptoms of depression and PTSD is reported.

Short Form McGill Pain Questionnaire (Melzack, 1987)—This pain rating scale consists of 15 pain descriptors that are rated for intensity on a Likert scale from 0 (“none”) to 3 (“severe”); the range of possible scores is 0–45. The total pain score is often used in research and clinical applications, with higher scores indicating greater severity of current pain symptoms. The SF-MPQ has been shown to have strong psychometric properties, and it is sensitive to changes in pain scores over time and/or as a result of clinical intervention (Melzack, 1987). Internal consistency for the total SF-MPQ score in this sample was good (Cronbach's $\alpha = 0.86$).

Pain drawings—Participants were instructed to mark areas of currently experienced pain on drawings of the human body. Anterior and posterior displays of the body were provided. For the purposes of this study, pain was coded as present if the participant reported pain in any part of a specified area (e.g., pain noted in the right foot only was coded for pain in the foot region).

Statistical Analyses

A principal components analysis (PCA) was performed on the SF-MPQ items in order to explore subtypes of pain symptoms in this sample. The Kaiser criterion (Eigenvalues greater than 1.0) was used for initial factor extraction. Given the exploratory nature of this analysis, a varimax (orthogonal) rotation was used to gain a more interpretable factor matrix; this method keeps factors uncorrelated while increasing the meaning of factors, thereby allowing for clearer interpretation. The derived Anderson-Rubin factor scores were saved for further analyses. To test the associations between the factor scores and reported pain complaints, the saved factor scores were analyzed with independent samples t-tests for selected pain regions. Only the three most commonly reported pain regions (head, lower back, and knee) were

included for analysis due to sample and power limitations. All analyses were conducted using SPSS version 21.

Results

Descriptive characteristics of the sample are given in Table 1. Participants reported an average SF-MPQ total score of 11.0 ($SD = 7.9$), indicating moderate pain symptoms. Fourteen participants reported a history of Attention Deficit/Hyperactivity Disorder, and $n = 3$ reported history of some other learning or speech difficulty. On psychiatric screening assessments, $n = 92$ scored above established cutoff scores for clinically significant symptoms of PTSD in military samples, and $n = 114$ scored above established cutoff scores for clinically significant depression. More detailed examination of mood and demographic correlates of pain symptoms is reported elsewhere (Stratton et al., 2014).

Principal Components Analysis

Examination of the correlation matrix and the Kaiser-Meyer-Olkin measure of sample adequacy (0.86) indicated that the scores were suitable for factor analysis. A PCA with varimax rotation yielded a four-factor solution that explained 58.8% of the total variance (Table 2). Inspection of the factor solution yielded interpretable groupings of pain symptoms. The first factor (Factor 1: "Affective") included descriptors that aligned with affective pain descriptors. The remaining three factors appeared to distinguish sensory aspects of pain. The second factor (Factor 2: "Acute") consisted of irregular and/or acute pain descriptors. The third factor consisted of three items ("aching," "tender," "splitting") that appeared to be mixed between intermittent and chronic pain descriptors (Factor 3: "Chronic/Intermittent"). The fourth factor appeared to characterize chronic or continuous sensory pain symptoms (Factor 4: "Continuous").

Factor Score Differences by Pain Area and Psychiatric Symptoms

To explore the relationship between the pain subtypes suggested by the factor loadings and self-reported pain complaints, the Anderson-Rubin factor scores were analyzed by selected pain areas as indicated on the pain drawings. Participants reported pain in 17 areas; head ($n = 131$), lower back ($n = 91$), and knee ($n = 58$) pain were the most commonly reported pain areas, followed by pain in the neck ($n = 37$), mid-back ($n = 32$), shoulder ($n = 32$), ankle ($n = 19$), and hip ($n = 16$) regions. Fewer than 15 participants reported pain in each of the following areas: wrist, ears, foot, leg, hand, elbow, arm, abdomen, and chest. Independent samples t-tests were conducted separately for each of the three most commonly reported pain regions (i.e., head, lower back, and knee) and the saved factor scores. Many of the participants reported pain in more than one area, and pain reports were not independent; thus, a separate t-test for each factor score was deemed an appropriate analysis of mean differences in factor loadings for each pain region (Table 3). Individuals who reported head pain scored higher on Factors 1, 2, and 3 than on Factor 4, and individuals who reported both lower back and knee pain had significantly higher scores on Factor 3 in comparison to the other factors.

There were also differences on the factor means based on the presence or absence of PTSD and depression symptoms. Individuals who reported high levels of PTSD symptoms evidenced higher factor means on each of the four factors than those who scored below the clinical cutoff: Factor 1, $F(1,203) = 8.18, p < .01$; Factor 2, $F(1,203) = 8.76, p < .01$; Factor 3, $F(1,203) = 9.64, p < .01$; Factor 4, $F(1,203) = 4.89, p < .05$. A similar pattern was found for depression, in which those scoring above the clinical cutoff scored higher on Factor 1, $F(1,202) = 12.64, p < .001$; Factor 3, $F(1,202) = 6.70, p < .01$; and Factor 4, $F(1,202) = 13.16, p < .001$. There were no significant differences in factor means for Factor 2, $F(1,202) = 1.78, p = .18$.

Discussion

The primary goal of this study was to explore characteristics of pain in a sample of OEF/OIF/OND combat SMs and Veterans through factor analysis of the SF-MPQ. Secondly, this study explored the identified subtypes of pain in relation to self-reported pain regions and mood symptoms in order to better understand how specific pain descriptors map onto physical pain locations and differ according to psychiatric concerns.

Factor analysis identified a four-factor solution on the SF-MPQ. Results revealed interpretable factors corresponding to affective, acute sensory, continuous sensory, and an intermittent cluster of pain symptoms that appear to fall between acute and chronic pain descriptors. This solution is largely consistent with past work with this scale, in which affective descriptors tend to load on a single factor (Burckhardt & Bjelle, 1994; Melzack, 1987), and sensory items have often been found to load onto distinct acute and continuous factors (Burckhardt & Bjelle, 1994; Dworkin et al., 2009). Included in our sample was the third factor, comprised of the descriptors “aching,” “tender,” and “splitting,” which may be interpreted to describe characteristics of headache or musculoskeletal pain. Notably, these descriptors have been identified as common descriptors of headache complaints in a previous study of civilians (Niere, 2002), and given the sample's exposure to blasts and potential occurrence of mild TBI or PPCS, the third factor may reflect, in part, these headache-related pain symptoms.

A secondary aim was to explore whether the identified subtypes of pain descriptors corresponded to discrete pain areas, as indicated by the responses on pain drawings. Analyses of the pain regions demonstrated that Factor 3 (“Chronic/Intermittent”) was related to head, low back, and knee pain, while Factors 1 (“Affective”) and 2 (“Acute”) corresponded only to head pain. The items on Chronic/Intermittent factor may reflect a particularly salient constellation of symptoms in our sample, and further study of headache and musculoskeletal pain descriptors is warranted. Head pain was also associated with descriptors representing the acute and affective components of pain, which may indicate the subjective experience of sudden onset of headache symptoms accompanied by significant emotional distress. Indeed, headache-related pain has been found to significantly interfere with functioning and contribute to affective distress (Holroyd, Malinoski, Davis, & Lipchik, 1999; Merikangas & Stevens, 1997). For our participants, head pain appears to be associated with a wide variety of pain characteristics, suggesting significant variability in pain experience and pain-related distress in this area.

The occurrence of emotional distress in the context of physical pain is common and has important implications for clinical intervention. Although a more detailed analysis of the influence of mood symptoms, such as depression and PTSD, on pain reports was outside the scope of this study, preliminary analyses showed that individuals reporting clinically significant symptoms of depression and PTSD scored more highly on the pain factors, indicating greater pain-related distress. It is important to note that mood and pain symptoms often co-occur, resulting in a challenging and complex array of polytraumatic, or multiple trauma, symptoms that provide challenges for effective assessment and rehabilitation efforts (Dobscha et al., 2009; Lew et al., 2009). The co-occurrence of pain and psychiatric disorders, for example, has been shown to be related to greater intensity of affective distress, higher levels of life interference, and greater disability than individuals with an independent disorder (Sherman, Turk, & Okifuji, 2000; Villano et al., 2007). Indeed, emotional distress is an important component of overall pain experience, and concerns related to fear of pain, self-efficacy, coping, and control of pain are influenced by intensity and duration of pain; moreover, an individual's psychological and cognitive-perceptual style can also impact pain experience (Feuerstein & Beattie, 1995). Identification of affective components of pain may guide treatment planning. For example, affective pain may require behavioral interventions designed to alleviate suffering and promote positive coping and self-efficacy, and integrated treatments to address both pain and psychiatric symptoms may be effective for addressing comorbid and mutually-influencing symptoms.

Several limitations to this study must be noted. Our analyses are based on cross-sectional, self-report data, and there is a potential for bias in the participants' self-report of their pain experiences and symptoms. The present analyses focused primarily on pain symptoms and identified pain regions, and did not fully account for the potential influence of depression, PTSD, PPCS, or TBI symptoms on pain reports. Further, the study sample of relatively young, primarily male SMs and Veterans reflects a particular composition of military personnel, and the findings may not generalize to the general population or even other military samples; there is evidence that pain experience may differ by certain demographic characteristics (e.g., Cassisi et al., 2004), and more work is needed to better understand pain experience in diverse samples. Finally, we were not able to differentiate between pain that was directly related to blast experience versus pain that was not related to blasts. Although we attempted to reduce heterogeneity by examining pain only among those individuals exposed to a blast, additional work may further distinguish unique pain experiences associated with specific injury characteristics or experiences.

In conclusion, analysis of SF-MPQ pain descriptors suggests that SMs and Veterans experience a variety of pain symptoms that may reflect unique aspects of the pain experience related to headache, musculoskeletal pain, and emotional distress. Knowledge of the nature of the pain experienced by blast-exposed military personnel may assist the diagnostic process and inform both behavioral and pharmacological treatment interventions.

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Table 1

Descriptive characteristics of the sample.

	N	%
<i>Sex</i>		
Male	202	96.7
Female	7	3.3
<i>Race</i>		
White/Caucasian	164	78.5
African American	32	15.3
Other Race	13	6.2
<i>Deployment Location^a</i>		
Operation Enduring Freedom		
1 deployment	119	
2 deployments	31	
Operation Iraqi Freedom		
1 deployment	71	
2 deployments	29	
3 or more deployments	10	
Other Deployment Location	33	
<i>Branch of Service^a</i>		
Army	88	42.1
Navy	4	1.9
Air Force	2	1.0
Marines	117	56.0
<i>Number of Blasts Experienced During Deployment</i>		
1	43	20.5
2	41	19.6
3	29	13.9
4	15	7.2
5	5	2.4
More than 5	76	36.4
<i>Proximity to Worst Blast Event</i>		
Within 5 feet	80	38.3
Between 5-10 feet	46	22.0
Between 10-15 feet	26	12.4
Over 15 feet	57	27.3
<i>Number of Blast Symptoms Endorsed for Worst Blast Event</i>		
1-3	46	22.0
4-6	65	31.1
7-9	57	27.3
10-12	37	17.7
13-15	4	1.9

Note:

^a Some participants endorsed more than one response

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Table 2

Principal components analysis of the Short-Form McGill Pain Questionnaire in a sample of blast-exposed Iraq and Afghanistan combat Service Members and Veterans (N = 209).

	Component			
	1 (Affective)	2 (Acute)	3 (Chronic/Intermittent)	4 (Continuous)
Q15: Punishing-Cruel	.75	.24	-.03	.05
Q14: Fearful	.72	.03	.22	.17
Q9: Heavy	.64	.07	.41	.26
Q13: Sickening	.54	.51	.10	.07
Q7: Hot-Burning	.54	.12	.14	.38
Q12: Tiring-Exhausting	.36	.23	.30	.30
Q4: Sharp	.15	.75	.16	.14
Q3: Stabbing	.15	.77	-.01	.09
Q2: Shooting	.08	.73	.18	.19
Q1: Throbbing	.10	.56	.38	.02
Q8: Aching	.02	.15	.86	.21
Q10: Tender	.33	.15	.57	.10
Q11: Splitting	.40	.33	.49	-.12
Q5: Cramping	.08	.20	.18	.82
Q6: Gnawing	.28	.10	.03	.78
Initial Eigenvalue	5.27	1.45	1.09	1.02
% Variance After Rotation	17.32	17.25	12.54	11.70

Notes: Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

Table 3

Independent sample t-tests for the associations of head, lower back, and knee pain with Short Form-McGill Pain Questionnaire factor scores.

	Mean	SD	t	p
<i>Head Pain</i>				
Factor 1			2.64 ^a	.01
Yes	.13	1.10		
No	-.21	.76		
Factor 2			4.13	<.001
Yes	.22	1.03		
No	-.36	.85		
Factor 3			3.92	<.001
Yes	.20	.97		
No	-.34	.97		
Factor 4			.74 ^a	.46
Yes	-.04	1.10		
No	.06	.81		
<i>Low Back Pain</i>				
Factor 1			.15	.88
Yes	.01	1.07		
No	-.01	.95		
Factor 2			.20	.84
Yes	.02	.95		
No	-.01	1.04		
Factor 3			4.06	<.001
Yes	.31	.89		
No	-.24	1.01		
Factor 4			.83	.41
Yes	.07	.98		
No	-.05	1.01		
<i>Knee Pain</i>				
Factor 1			.52	.60
Yes	.06	1.17		
No	-.02	.93		
Factor 2			.94 ^a	.39
Yes	-.10	.85		
No	.04	1.05		
Factor 3			2.76 ^a	.01
Yes	.28	.86		
No	-.11	1.03		
Factor 4			1.08	.28

	Mean	SD	t	p
Yes	.12	.90		
No	-.05	1.04		

Note:

^a Levene's test of homogeneity of variances was significant, and figures given represent equal variances not assumed.