

A Comparison of Posttraumatic Stress Disorder Between Combat Casualties and Civilians Treated at a Military Burn Center

Kathryn M. Gaylord, PhD, APRN, BC, John B. Holcomb, MD, and Maria E. Zolezzi, BA

Background: Posttraumatic stress disorder (PTSD) has been identified in 12% to 20% of noninjured veterans and in 32% of combat casualties. Eight percent of the US general population experience PTSD symptoms, whereas 25.5% of civilians with major burns have PTSD. Known predictors of physical outcomes of patients with burn are age, total body surface area (TBSA) burned, and Injury Severity Score (ISS). The United States Army Institute of Surgical Research Burn Center provides burn care for combat casualties and civilians. We hypothesized that we would find no

difference in PTSD incidence between these two populations and that age, TBSA, and ISS are associated with PTSD.

Method: We retrospectively examined the clinical records of 1,792 patients admitted between October 2003 and May 2008. Records were stratified by PTSD, age, TBSA, and ISS. PTSD scores were compared. Descriptive analyses were used.

Results: Four hundred ninety-nine patients (372 military [74.5%]; 127 civilians [25.5%]) were assessed for PTSD using PTSD checklist military and civil-

ian versions. PTSD was defined as ≥ 44 on the PTSD checklist instruments. We found no significant difference in PTSD between combat casualties and civilians (25% vs. 17.32%, $p = 0.761$). TBSA and ISS were significantly associated with PTSD; however, no association between age and PTSD was found.

Conclusion: The incidence of PTSD is not significantly different in burned combat casualties and civilians treated at the same burn unit. These findings suggest that PTSD is related to the burn trauma and not to the circumstances surrounding the injury.

J Trauma. 2009;66:S191–S195.

The primary psychologic disturbance after traumatic experiences is posttraumatic stress disorder (PTSD).^{1,2} PTSD results from experiencing or witnessing a range of extreme stressors, such as war and combat, assault, natural disasters, and severe injury. The course of PTSD may vary in symptom duration and level of disability and may have both immediate and long-term effects. The stress reactions of PTSD include but are not limited to nightmares and flashbacks, difficulty sleeping, and feeling detached or estranged. Much research has been conducted to identify risk factors for PTSD in civilians after natural disasters and in veterans after war. Military service members are at elevated risk for exposure to trauma such as explosion injuries and burns and thus, to PTSD.^{3,4} Surveys of noninjured service members returning from war have yielded estimates of a PTSD incidence of 12.6% for Iraq veterans and 6.2% for Afghanistan veterans.^{5,6}

The rate of PTSD increases from 12% to 20% to 32% when a combat veteran becomes a combat casualty.^{3,4} The rates of PTSD are generally lower in civilians than veterans. The prevalence of PTSD in the United States general population is 8%.⁷ The lifetime prevalence of PTSD is estimated to be 5% in men and 10% in women.⁸

Burn injury is a frequent and disabling consequence of the current war in Iraq and Afghanistan because of the use of explosive and incendiary devices. Because of lifesaving measures on the battlefield, more injured service members are evacuated for burn care. However, PTSD is known to be present in approximately 23% to 33% of individuals between 3 and 6 months postburn.^{9,10} All military combat casualties with burn injuries are treated at the United States Army Institute of Surgical Research (USAISR). The USAISR also provides burn care for civilians from the south Texas area who have severe burn injuries because of motor vehicle accidents, house fires, and explosions, among other causes. The same standard of burn care is provided for both combat casualties and civilians. Known predictors of physical outcomes of patients with burn are age, total body surface area (TBSA), and Injury Severity Score (ISS).^{11–13} Predictors of psychologic outcomes in patients with burn are less well known, but often include pain, delirium, avoidance of activities because of physical limitations, and social anxiety secondary to disfigurement.^{14–20} These characteristics present unique challenges that may confound the diagnosis of PTSD. PTSD was identified in 34% of a small sample of combat casualties treated at the USAISR burn center²¹ and has a wide

Submitted for publication January 22, 2009.

Accepted for publication January 22, 2009.

Copyright © 2009 by Lippincott Williams & Wilkins

From the United States Army Institute of Surgical Research, Fort Sam Houston, Texas.

The opinions and assertions contained in this article are solely the authors' private ones and are not to be construed as official or reflecting the views of the United States Army or the Department of Defense. This manuscript was prepared by United States Government employees and therefore cannot be copyrighted and may be copied without restriction.

Address for reprints: Kathryn M. Gaylord, PhD, APRN, BC, United States Army Institute of Surgical Research, Fort Sam Houston, TX 78234-6315; email: Kathryn.gaylord@amedd.army.mil.

DOI: 10.1097/TA.0b013e31819d9c21

Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE 01 APR 2009		2. REPORT TYPE N/A		3. DATES COVERED -	
4. TITLE AND SUBTITLE A comparison of posttraumatic stress disorder between combat casualties and civilians treated at a military burn center				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S) Gaylord K. M., Holcomb J. B., Zolezzi M. E.,				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) United States Army Institute of Surgical Research, JBSA Fort Sam Houston, TX 78234				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release, distribution unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT UU	18. NUMBER OF PAGES 5	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

range (8–45%) in civilians with severe burn injuries treated in civilian community hospitals.^{22,23}

Burn injury, regardless of size, may lead to significant psychological trauma.²⁴ Because the USAISR burn center provides burn care to two distinct populations, we sought to compare the incidence of PTSD between these groups. We hypothesized that we would find no difference in the incidence of PTSD between combat casualties and civilians treated at the same burn center. We also compared differences in age, TBSA burned, and ISS.

PATIENTS AND METHODS

The records of patients admitted to the USAISR Burn Center between October 2003 and May 2008 were retrospectively reviewed for patient and injury demographics, including age, TBSA, and ISS. Patients' medical records (Essentris) and the trauma burn registry (established and maintained by USAISR) were crosschecked to verify names and admission dates. Completed PTSD surveys were collected, reviewed, and crosschecked for accuracy and completeness, then entered into excel spreadsheets (Microsoft, Redmond, WA). Total PTSD scores were calculated, as well as subset scores for the three distinct clusters of symptoms, reexperiencing, avoidance or numbing, and hyperarousal. Before commencement, the study was approved by the Brooke Army Medical Center Institutional Review Board.

Definition of TBSA and ISS

The extent of the burn was measured as a percentage of the TBSA. Burn size was calculated by completion of a Lund-Browder²⁵ diagram by the attending surgeon, documenting the extent of injury in each body region. ISS was calculated from the medical record, and obtained from the Trauma Burn Registry database.

Definition of PTSD

The "Diagnostic and Statistical Manual of Mental Disorders," 4th edition (DSM-IV) defines PTSD by several criteria: experiencing a traumatic stressor ("experienced or witnessed actual or threatened death, injury, or threat to physical integrity of self or others") reacted to with "intense fear, helplessness, or horror" (criterion A); intrusive recollections of the traumatic event (criterion B); avoidance or numbing (criterion C); and hyperarousal in the form of extreme startle reflex, inability to fall or stay asleep (criterion D); symptoms must be experienced for at least 1 month (criterion E); and the symptoms cause extreme distress or impairment in various areas of functioning (criterion F).¹ The DSM-IV further classifies PTSD into acute (symptom duration under 3 months) or chronic (symptom duration of 3 months or longer), and onset may be delayed (occurring 6 months after exposure). Subtypes classified by type of trauma, such as combat versus civilian or simple exposure versus repeated exposure are not recognized by the DSM-IV definition of PTSD. Acute stress disorder (ASD) and PTSD are prevalent after major burn injury. ASD can predict PTSD up to 24 months

later, and once established, PTSD usually persists.^{9,10} However, PTSD symptoms may occur as early as several weeks after experiencing the trauma in combat casualties.^{3–5}

Assessment of PTSD

For this study, PTSD was defined as a score of 44 or greater on the PTSD checklist (PCL). The PCL is a self-rated interval-level rating scale used to screen for PTSD. The PCL-military and PCL-civilian versions have been widely used in both military and civilian groups, both injured and noninjured. The PCL requires the identification of a specific traumatic event or occurrence from which symptoms are thought to be triggered, the "reference trauma." The PCL consists of 17 items, each designed to capture one of three distinct clusters of symptoms representing the B, C, or D diagnostic criteria described for PTSD in the DSM 3rd edition (1980) and DSM-IV (1994). These three clusters are labeled as reexperiencing ("B" items, 1–5), avoidance or numbing ("C" items, 6–12), and hyperarousal ("D" items, 13–17). The frequency of occurrence of each symptom for the past year is marked using a 1 (not at all) to 5 (extremely) scoring. At least 16 of the 17 items must be completed for the test result to be considered useful.²⁶ Scores are derived by summing the weighted frequencies for all items marked. Scores can range from 17 to 85. A total score of 44 or higher indicates the presence of PTSD (≥ 44). By lowering the cutoff score to 44, overall diagnostic efficiency is improved to 0.90, yielding a sensitivity of 0.778, a specificity of 0.864, and correctively identifies 17 of 18 participants with PTSD.²⁷

The USAISR Psychiatric Mental Health Nurse Practitioner (PMH-NP) or his designee administered the PTSD Checklist (PCL-military) or (PCL-civilian) versions to patients with burn at discharge or when patients were referred for evaluation of symptoms of PTSD by clinical burn staff. All patients with alert scores (≥ 44) on the PCL were evaluated by the PMH-NP in a structured clinical interview. Military patients needing further behavioral health care or long-term follow-up were referred to the Brooke Army Medical Center Behavioral Health Clinic. All military patients discharged from the USAISR Burn Center are assigned to a Warrior Transition Unit until final disposition of healthcare. In the Warrior Transition Unit, all combat casualties are reassessed for PTSD. Civilians with alert scores (≥ 44) on the PCL are also evaluated by the PMH-NP in a structured clinical interview. Once discharged, the patient's case manager refers the patient to the closest community mental health center for follow-up care. Both military and civilian patients receiving follow-up burn care in the USAISR outpatient burn clinic may be reassessed for PTSD if demonstrating continued symptoms.

Statistical Analysis

Data were analyzed using SAS version 9.1 (SAS Institute, Cary, NC). Descriptive analyses were performed. Univariate analyses were performed using two-sample Student's *t* tests for continuous parametric variables and Wilcoxon tests for nonparametric variables, as well as χ^2 tests for categorical variables.

Table 1 Combat Casualties, PCL-M Assessment Data

	PTSD		No PTSD	
	N	Mean	N	Mean
Gender (% male)	93	94.6%	279	97.1%
Age (yr)	86	25.1 ± 5.84	255	25.7 ± 5.94
TBSA	92	18.1 ± 16.43	272	15.59 ± 17.72
ISS	91	15.11 ± 12.83	270	11.85 ± 12.01

PCL-M, PTSD checklist military.

Table 2 Civilians, PCL-C Assessment Data

	PTSD		No PTSD	
	N	Mean	N	Mean
Gender (% male)	22	68.2%	105	80%
Age (yr)	18	38.4 ± 13.4	93	38.85 ± 16.23
TBSA	22	20.98 ± 25.26	100	12.80 ± 13.18
ISS	19	7.58 ± 9.32	95	7.95 ± 8.33

PCL-C, PTSD checklist civilian.

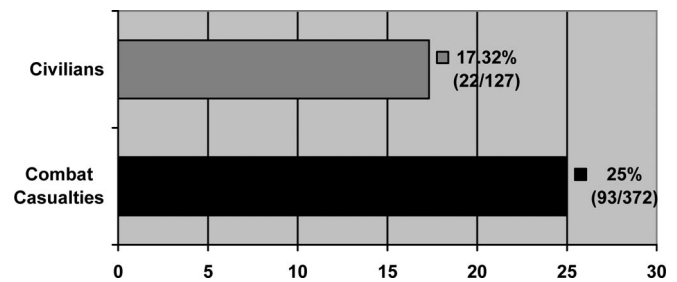
RESULTS

During the study period from October 2003 to May 2008, 1,792 patients were admitted to the USAISR for burn treatment. Of these, 499 patients were assessed for PTSD using the PTSD Checklist (PCL). The sample included 372 combat casualties (74.5%) and 127 civilians (25.5%). Combat casualties were primarily men (359 vs. 13), whereas three fourths of civilian subjects were men (99 vs. 28). Mean age was lower in combat casualties than civilians (26 vs. 39) and age range was narrower in combat casualties than in civilians (18–45 vs. 16–79 years). The mean TBSA was slightly higher for combat casualties than for burned civilians (16.23 vs. 14.27). TBSA was higher in subjects with PTSD as compared with those without PTSD (18.66 vs. 14.84, $p = 0.017$). The mean ISS was almost one third higher for combat casualties than for civilians (12.7 vs. 7.9, $p = 0.031$). Burn characteristics are listed in Tables 1 and 2.

There was no significant difference in the incidence of PTSD between burned combat casualties and burned civilians (25% vs. 17.32%, $p = 0.761$) treated with the same standard of care (Fig. 1).

More than three fourths of burned combat casualties and burned civilians did not have PTSD (75% vs. 83%) at time of discharge from the USAISR Burn Center. Age was not significantly different between civilian and military patients suffering from PTSD (27.4 ± 9.2, $p = 0.18$). Both TBSA (18.7 ± 18.4, $p = 0.02$) and ISS (13.8 ± 12.6, $p = 0.03$) were higher in those subjects with PTSD than in those who did not have PTSD. A comparison of PTSD, age, TBSA, and ISS are described in Table 3.

In addition, the subset scores for PTSD were significant between the two groups: reexperiencing cluster (10.32 vs. 8.83, $p = 0.00$), avoidance or numbing (12.20 vs. 11.28; $p = 0.01$), and hyperarousal (12.20 vs. 8.98, $p = 0.00$). The PCL subsets are listed in Table 4.

**Fig. 1.** Incidence of PTSD in burned combat casualties and civilians.**Table 3** Comparison of PTSD, Age, Total Body Surface Area, and Injury Severity Score in Combat Casualties and Civilians

	PTSD	No PTSD	<i>p</i>
Age	27.4 ± 9.2	29.3 ± 11.4	0.18
TBSA	18.7 ± 18.4	14.8 ± 16.6	0.02*
ISS	13.8 ± 12.6	10.8 ± 11.3	0.03*

* $p \leq 0.05$.**Table 4** Comparison of PCL Subsets Between Combat Casualties and Civilians

	Combat Casualty	Civilian	<i>p</i>
Subset 1			
Reexperiencing	10.31 ± 5.17	8.83 ± 4.93	0.0003*
Subset 2			
Avoidance or numbing	12.20 ± 6.13	11.28 ± 6.26	0.0162*
Subset 3			
Hyperarousal	11.33 ± 5.6	8.98 ± 5.04	<0.0001*

* $p \leq 0.05$.

DISCUSSION

This study examined differences in PTSD between burned combat casualties and burned civilians treated at the same center with the same standard of care. The analysis confirmed our hypothesis that the incidence of PTSD does not differ between combat casualties and civilians despite dissimilarities for age (higher in civilian group), TBSA (slightly higher in combat casualties), and ISS (higher in combat casualties). The study identified an association between TBSA and ISS with PTSD in burned combat casualties and civilians. Older studies of PTSD after burn injury did not find a relationship between burn severity and the development of PTSD.^{22,28} Our data demonstrate that the psychological outcome of PTSD may be related to the traumatic event, the burn injury, and not the environment where the event occurred.

We identified an incidence rate of PTSD between 17% and 25% in burned combat casualties and civilians using the PCL self-report survey. A previous study of 76-burned combat casualties from the same burn center identified the rate of PTSD as 34% using the PCL.²¹ This higher rate might be attributed to differences in burn characteristics. Studies using self-report sur-

veys of PTSD other than the PCL found similar incidence rates ranging from 21% to 34%: the Davidson Trauma Scale,^{10,19} the Impact of Events Scale,⁹ and the Stanford Acute Stress Reactions Questionnaire.²⁸ Studies that used validated structured clinical interviews found prevalence rates for PTSD in patients with burn ranging from 20% to 45%.⁹ Studies of PTSD in patients with burn have identified substantial variability across studies, which may be because of small sample sizes, use of different assessment methods and instruments, variation in the timing of assessments, and the complexity of accurately diagnosing traumatic stress disorders.¹⁸

The PTSD assessments were administered close to the time of discharge from the burn center. A limitation of the study was that the date of injury was not considered, thus there is no consistency in the timing of the assessments. Because of the larger burn size, combat casualties had longer hospitalizations than burned civilians. Because duration of symptoms is a differential criteria for the diagnosis of ASD (<30 days) vs. PTSD (>30 days), some of the subjects may actually be experiencing ASD.⁹ However, the symptoms are the same and should be assessed and treated when symptoms occur to prevent the development of PTSD.⁹

We used the PCL, both military and civilian versions, to screen both combat casualties and civilians for PTSD. The self-report questionnaire is a diagnostically efficient, relatively short instrument that is easy to administer and is commonly used to screen PTSD in military populations.^{3,4,26,29} However, the PCL has not been validated in active duty samples. PTSD screening for research in patients with burn in civilian burn centers was conducted using both self-report instruments and structured interviews to assess PTSD,¹⁸ but not primarily the PCL. The limitation of self-report questionnaires is the confounding of posttraumatic stress symptoms and injury-related phenomena.³⁰

Avoidance and numbing were the primary symptoms reported by both burned combat casualties and civilians in the study; however, all three symptom clusters were reported. This is different from what was found by Difede et al.⁹ who used the Impact of Events Scale and reported that arousal symptoms were the most common symptom experienced by participants. Further exploration of differences in symptomatology is warranted.

CONCLUSION

We have shown that PTSD is common in burned combat casualties and civilians treated at the same burn center despite differences in age, TBSA, and ISS. These findings suggest that PTSD is related to the burn trauma and not to the circumstances surrounding the injury. The association between TBSA, ISS, and PTSD attest to the need for PTSD assessment as a standard of care in patients with severe burn injuries. Future intervention studies should be conducted that include both combat casualties and civilians treated at the USAISR.

REFERENCES

1. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders. 4th ed. Washington DC: American Psychiatric Association; 1994.
2. Crowell TA, Kieffer KM, Siders CA, Vanderploeg RD. Neuropsychological findings in combat-related posttraumatic stress disorder. *Clin Neuropsychol*. 2002;16:310–321.
3. Hoge CW. Deployment to the Iraq War and neuropsychological sequelae. *JAMA*. 2006;296:2678–2680.
4. Hoge CW, Castro CA, Messer SC, McGurk D, Cotting DI, Koffman RL. Combat duty in Iraq and Afghanistan, mental problems, and barriers to care. *N Engl J Med*. 2004;351:13–22.
5. Smith TC, Ryan MA, Wingard DL, Slymen DJ, Sallis JF, Kritzer-Silverstein D. New onset and persistent symptoms of posttraumatic stress disorder self reported after deployment and combat exposures: prospective population based US military cohort study. *J Clin Psychiatry*. 2008;65:29–36.
6. Vasterling JJ, Proctor SP, Amorosa P, Kane R, Heeren T, White RF. Neuropsychological outcomes of army personnel following deployment to the Iraq War. *JAMA*. 2006;296:519–529.
7. Kessler RC, Sonnega A, Bromet E, Hughes M, Nelson CB. Posttraumatic stress disorder in the National Comorbidity Survey. *Arch Gen Psychiatry*. 1995;52:1048–1060.
8. Kinder LS, Bradley KA, Katon WJ, Ludman E, McDonnell MB, Bryson CL. Depression, posttraumatic stress disorder, and mortality. *Am Psychosomatic Med*. 2008;70:20–26.
9. Difede J, Ptacek JP, Roberts J, et al. Acute stress disorder after burn injury: a predictor of posttraumatic stress disorder? *Psychosom Med*. 2002;64:826–834.
10. McKibben JB, Bresnick MG, Wiechman Askay SA, Fauerbach JA. Acute stress disorder and posttraumatic stress disorder: a prospective study of prevalence, course, and predictors in a sample with major burn injuries. *J Burn Care Res*. 2008;29:22–35.
11. Ehde DM, Patterson DR, Weichman SA, Wilson LG. Post-traumatic stress symptoms and distress following acute burn injury. *Burns*. 1999;25:587–592.
12. Wolf SE, Kauvar DS, Wade CW, et al. Comparison between civilian burns and combat burns from Operation Iraqi Freedom and Operation Enduring Freedom. *Ann Surg*. 2006;243:786–795.
13. Perry S, Difede J, Musngi G, Frances AJ, Jacobsberg L. Predictors of posttraumatic stress disorder after burn injury. *Am J Psychiatry*. 1992;149:931–935.
14. Fauerbach JA, Pruzinsky T, Saxe GN. Psychological health and function after burn injury: setting research priorities. *J Burn Care Res*. 2007;28:587–592.
15. Patterson DR, Everett JJ, Bombardier CH, Questad KA, Lee VK, Marvin JA. Psychological effects of severe burn injuries. *Psychol Bull*. 1993;113:362–378.
16. Patterson DR, Tininenko J, Ptacek JT. Pain during burn hospitalization predicts long-term outcome. *J Burn Care Res*. 2006;27:719–726.
17. Norman SB, Stein MB, Dimsdale JE, Hoyt DB. Pain in the aftermath of trauma is a risk factor for post-traumatic stress disorder. *Psychol Med*. 2007;38:533–542.
18. Esselman PC, Thombs BD, Magyar-Russell G, Fauerbach JA. Burn rehabilitation: state of the science. *Am J Phys Med Rehabil*. 2006; 85:383–413.
19. Lawrence JW, Fauerbach JA. Personality, coping, chronic stress, social support and PTSD symptoms among adult burn survivors: a path analysis. *J Burn Care Rehabil*. 2003;24:63–72.
20. Yehuda R. Risk and resilience in posttraumatic stress disorder. *J Clin Psychiatry*. 2004;65:29–36.
21. Gaylord KM, Cooper DB, Mercado JM, Kennedy JE, Yoder LH, Holcomb JB. Incidence of posttraumatic stress disorder and mild traumatic brain injury in burned service members: preliminary report. *J Trauma*. 2008;64:S200–S206.

22. Yu B-H, Dimsdale JE. Posttraumatic stress disorder in patients with burn injuries. *J Burn Care Rehabil.* 1999;20:426–433.
23. Willebrand M, Andersson G, Ekselius L. Prediction of psychological health after an accidental burn. *J Trauma.* 2004;57:367–374.
24. Fauerbach JA, McKibben J, Bienvenu OJ, et al. Psychological distress after major burn injury. *Psychosom Med.* 2007;69:473–482.
25. Lund CC, Browder NC. The estimation of areas of burns. *Surg Gynecol Obstet.* 1944;79:352–358.
26. Weathers FW, Litz BT, Herman DS, Huska JA, Keane TM. The PTSD Checklist (PCL): reliability, validity, and diagnostic utility. Paper presented at the annual meeting of the International Society for Traumatic Stress Studies, San Antonio, TX; 1993, October.
27. Blanchard EB, Jones-Alexander J, Buckley TC, Forneris CA. Psychometric properties of the PTSD checklist (PCL). *Behav Res Therapy.* 1996;34:669–673.
28. Fleming MP, Difede J. Effects of varying scoring rules of the Clinician Administered PTSD Scale (CAPS) for the diagnosis of PTSD after acute burn injury. *J Trauma Stress.* 1999;12:535–542.
29. Bliese PD, Wright KM, Adler AB, Cabrera O, Castro CA, Hoge CW. Validating the primary care posttraumatic stress disorder screen and the posttraumatic stress disorder checklist with soldiers returning from combat. *J Consult Clin Psychol.* 2008; 76:272–281.
30. O' Donnell ML, Creamer M, Pattison P, Atkin C. Psychiatric morbidity following injury. *AM J Psychiatry.* 2004;161:507–514.