
Disability and Posttraumatic Stress Disorder in Disaster Relief Workers Responding to September 11, 2001 World Trade Center Disaster

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Empirical evidence suggests that social and occupational disability plays a significant role in posttraumatic stress disorder (PTSD). The purpose of this study was to assess the role of social/occupational disability and to identify predictors of the development of PTSD in a group of disaster relief workers (DRWs) who had been deployed to the World Trade Center (WTC) following September 11, 2001. Eight hundred forty-two utility workers completed a battery of comprehensive tests measuring PTSD and social occupational functioning. Results indicated a significant association between PTSD symptoms and impaired social/occupational functioning. Symptomatic workers were also more likely to have a history of trauma, panic disorder, and depression. Those with a history of trauma, depression, generalized anxiety disorder or panic reported significantly more disability than those without a psychiatric history. Careful screening of PTSD and social/occupational functioning in DRWs following a disaster is warranted so that early treatment can be undertaken to prevent a chronic and disabling course. © 2009 Wiley Periodicals, Inc. *J Clin Psychol* 65: 684–694, 2009.

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Introduction

There is mounting empirical literature documenting a substantial association between posttraumatic stress disorder (PTSD) and interference in social and occupational functioning. Many of the symptoms of PTSD such as feelings of

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detachment from others, restricted range of affect, and outbursts of anger may interfere with establishing and maintaining intimacy and commitment in relationships with others (Byrne & Riggs, 1996).

Several problems have been documented in interpersonal functioning in individuals with PTSD including social anxiety (Crowson, Frueh, Beidel, & Turner, 1998; Orsillo, Heimberg, Juster, & Garret, 1996); anger (Chemtob, Hamada, Roitblat, & Muraoka, 1994); sexual dysfunction (Letourneau, Schewe, & Frueh, 1997); unemployment, impulsive or violent behavior, family discord (Dowling, Moynihan, Genet, & Lewis, 2006; Jordan et al., 1992; Nezu & Carnevale, 1987); difficulties in interpersonal relationships (Norris et al., 2002; Palyo & Beck, 2005); and impairment in intimate relationships (Bolton et al., 2004).

Some of the core PTSD symptoms include concentration problems, sleep difficulties, and irritability, which all have the potential to negatively affect functioning at work. Difficulties in occupational functioning and job stress are documented across a number of studies (Breslau, Lucia, & Davis, 2004; Miller-Burke, 1998; Mitani, Fujita, Nakata, & Shirakawa, 2006; Norris et al., 2002).

In the immediate aftermath of September 11, 2001 (9/11), approximately 3,800 utility workers were deployed to the World Trade Center (WTC) site to respond to the need to shut off energy sources that were potentially feeding fires to lower Manhattan. Many of these Disaster Relief Workers (DRWs) undertook tasks that were life-threatening and were witness to horrifying images. Although there is converging evidence that DRWs are at risk for developing PTSD, the majority of DRWs exposed to traumatic events do not receive a PTSD diagnosis. Because prior trauma and psychiatric history have been shown to be among the most reliable premorbid predictors of PTSD in other populations (Brewin et al., 2000), the authors were particularly interested in examining what effect, if any, these factors may have on symptoms and functioning in this population of DRWs.

The purpose of this study was twofold: (a) to explore the relationship between PTSD and social/occupational functioning and, (b) to examine the association of history of trauma and psychiatric disorders and PTSD in a group of DRWs involved in the events of the 9/11 WTC disaster.

Method

Participants

Participants in this cross-sectional study were 842 utility workers deployed to the WTC in the immediate aftermath of the disaster on 9/11 and who participated in a larger study (Difede, Roberts, Jayasinghe, & Leck, 2005) examining the psychological sequelae of the event. Ninety-eight percent of the participants worked directly at the WTC site with 60% being present in the first week. These workers responded to the need to shut off energy sources potentially feeding fires, followed by restoring gas, steam, and electric power to lower Manhattan. Many undertook tasks that were life threatening and were witness to terrifying images including seeing people jumping and falling from the Towers, seeing people with significant injuries, observing grieving family members, and viewing body parts. Given their close proximity to "the pile" and the significant unstable conditions of the area in the first several weeks following the attack, many of these workers felt their lives to be in serious danger, and at times had to evacuate the area for safety.

Procedure

The study was comprised of a comprehensive screening program consisting of a medical and psychological evaluation, which was conducted under the auspices of the company's occupational health department. All of the workers participated in the mandatory medical examination that included a voluntary psychiatric evaluation. The psychological evaluations were piggybacked onto annual fitness-for-duty evaluations for all utility workers who were deployed to work at the WTC in the immediate aftermath of 9/11. The Institutional Review Board of Weill Cornell Medical College approved the review of medical records from the psychiatric screening for research purposes. The psychiatric component of the evaluation was strictly voluntary and completely confidential. The screening of social/occupational functioning was included in the psychological evaluation 17–27 months following the WTC disaster and provided the investigators a unique opportunity to explore the presence of PTSD, social and occupational disability, and factors related to their presence in this group of DRWs. The psychological evaluation included self-report measures and structured clinical interviews. The clinical interviews took approximately one hour to complete. The interviews were conducted by several doctoral level (postdoctoral) psychologists who were trained on the measures by seasoned clinical psychologists from an academic medical institution. Intraclass correlations of independent ratings by a psychologist with 10 years experience ranged from .98 to .99.

Participant Demographics

Eight hundred forty-two workers completed the Sheehan Disability Scale (SDS; Sheehan, 1983) and the Clinician Administered PTSD Scale (CAPS; Blake et al., 1990, 1995), selected modules of the Structured Clinical Interview for the DSM-IV including major depressive disorder (MDD), generalized anxiety disorder (GAD), and panic disorder (PD). Overall, the group completing the SDS and CAPS consisted of primarily middle-aged, White, married men with the majority having at least a high school education (see Table 1).

Measures

Clinician-Administered PTSD Scale. The Clinician-Administered PTSD scale (CAPS; Blake et al., 1990, 1995) is a structured interview for PTSD that yields both a dichotomous (present/absent) diagnosis of PTSD and a continuous measure of PTSD severity. In this study, the index trauma was the September 11, 2001 World Trade Center Disaster. The CAPS assesses the frequency and intensity of each PTSD symptom on separate 5-point rating scales (0–4). Frequency and intensity may be summed for each item to yield a 9-point (0–8) severity rating, and severity ratings may be summed across items to yield severity scores for each of the three PTSD symptom clusters and for the full PTSD syndrome. A number of different scoring rules for the CAPS have been developed and evaluated (Weathers, Ruscio, & Keane, 1999). For this study we focused on the original scoring rule (F1/I2 rule), whereby an item with a frequency score of 1 or higher and an intensity score of 2 or higher is counted as a symptom toward a PTSD diagnosis. We examined two variants of the F1/I2 rule. The first variant, which involved the criteria from the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV;* American Psychiatric Association, 1994), required that a participant meet all three symptom

Table 1
 Characteristics of the Sample ($n = 842$)

Age, M (SD)	45.4 (9.8)
Gender	
Men	95.6%
Women	4.4%
Ethnicity	
African American	18.4%
White	64.1%
Hispanic	14.3%
Asian	.9%
Other	2.2%
Education	
Some or no high school	1.9%
High school graduate	42.8%
Some college or training	36.9%
College graduate	12.9%
More than college	5.6%
Marital status	
Cohabiting	2.3%
Separated or divorced	9.7%
Married	71.3%
Widowed	.5%
Single	16.3%

cluster criteria (Criteria B, C, and D). That is, participants were diagnosed with PTSD if they had at least one reexperiencing symptom (Criterion B), three avoidance and numbing symptoms (Criterion C), and two hyperarousal symptoms (Criterion D). The second variant, based on the work of Blanchard and colleagues (Blanchard et al., 1997), and referred to as subsyndromal, required that Criterion B be met, plus either Criterion C or Criterion D. Although the second variant is less stringent than the full *DSM IV* criteria, several studies have now documented that subsyndromal PTSD is associated with clinically significant impairment and predicts delayed-onset PTSD (Bryant & Harvey, 2002; Schützwohl & Maercker, 1999); it has sound psychometric properties and is a widely accepted criterion measure of PTSD (Weathers, Keane, & Davidson, 2001). The CAPS demonstrated excellent internal consistency reliability within this sample ($\alpha = .85$).

Sheehan Disability Scale. The Sheehan Disability Scale (SDS; Sheehan, 1983) is a 10-point visual analogue scale that assesses disability across three domains: work, social life, and family life. The three items may be summed into a single dimensional measure of global functional impairment that ranges from 0 (unimpaired) to 30 (highly impaired). It is recommended that clinicians pay special attention to patients who score equal to or above 5 on any of these three scales (Leon, Olfson, Portera, Farber, & Sheehan, 1997). This scale has been widely used in psychopharmacology randomized controlled trials and has strong internal consistency ($\alpha = 0.89$ for the three-item scale). The SDS demonstrated excellent internal consistency reliability within this sample ($\alpha = .91$). The SDS also has demonstrated construct validity (Leon et al., 1997) as well as criterion-related and discriminant validity (Leon, Shear, Portera, & Klerman, 1992).

Structured Clinical Interview for DSM-IV. The Structured Clinical Interview for DSM-IV (SCID; First, Spitzer, Gibbon, & Williams, 1995) is a semistructured diagnostic interview designed to determine major Axis I diagnoses according to the criteria set by the *DSM IV*. The SCID's psychometric properties have been well established (interrater reliability = .70-.94; test-retest reliability = κ .6 or above).

Trauma History Questionnaire. The Trauma History Questionnaire (THQ; Foa & Rothbaum, 1985) is a 13-item measure developed to document lifetime trauma history. The THQ was the foundation of the Standardized Assault Interview (Rothman, Foa, Riggs, Murdock, & Walsh, 1992), which demonstrates excellent interrater reliability. The THQ inquires if the participant has ever witnessed or experienced traumatic events such as natural disasters; accident/injury; sudden, life-threatening illness; military combat; death of a friend/family member in an accident or by murder; sudden, unexpected death of a close family member; assault; childhood abuse; or coerced sexual contact. The THQ also has an Other category. For the purposes of the present study, a dichotomous variable (history of trauma yes/no) was used in the statistical analysis.

Statistical Methods

Means and standard deviations were computed for social/occupational functioning and PTSD symptomatology (continuous measure total CAPS severity score) for the total group and those with and without PTSD symptoms. An analysis of variance (ANOVA) and Kruskal-Wallis test were conducted between the three diagnostic groups (full criteria, subsyndromal, no PTSD) to determine whether there were significant differences between the groups on disability as measured by the SDS.

Pearson correlations were performed between the SDS and total CAPS score in subjects with symptoms of PTSD (full criteria and subsyndromal) to determine the strength of the relationships between disability and PTSD symptomatology. Chi square analyses were performed for each of the three PTSD groups (full criteria, subsyndromal, and no PTSD) with regard to a history of trauma, MDD, GAD, and PD to determine the associations between PTSD and other psychiatric history. Major depressive disorder, PD, and GAD were specifically examined because these were the most common comorbid diagnoses in this population. *t* Tests were conducted comparing subjects with trauma, MDD, GAD, and PD to those without prior trauma, MDD, GAD, and PD on the SDS. Finally, a multiple regression analysis was conducted to determine if the CAPS predicted disability as measured by the SDS after controlling for prior trauma and psychiatric history. With regard to the SDS, a Cronbach alpha was computed as a measure of internal consistency reliability, to confirm that the SDS is a reliable measure of disability.

Results

Levels of Social/Occupational Functioning and PTSD Severity

Of the total group ($n = 842$), 50 subjects met full criteria for PTSD (5.9%) and 49 subjects (5.8%) were rated as having subsyndromal PTSD. The full criteria and subsyndromal groups were mutually exclusive of each other. As seen in Table 2, the group with full PTSD displayed mild disability in the area of work, social and family life. The group with subsyndromal PTSD displayed minimal to mild disability in work, social and family life and moderate PTSD symptomatology. The group with no PTSD displayed none to minimal disability in work, social and family life.

Table 2
Means and Standard Deviations for Social/Occupational Disability and PTSD Symptomatology

	Full PTSD (<i>n</i> = 50)	Subsyndromal (<i>n</i> = 49)	No PTSD (<i>n</i> = 743)	Total sample (<i>n</i> = 842)
SDS Total ^a	11.88 (6.28)	8.94 (8.15)	2.14 (4.26)	3.16 (5.51)
SDS Work ^b	3.10 (2.30)	2.70 (2.70)	0.62 (1.40)	0.89 (1.70)
SDS Social life ^c	4.50 (2.50)	3.00 (3.00)	0.71 (1.50)	1.09 (2.00)
SDS Family life ^d	4.30 (2.80)	3.30 (3.00)	0.82 (1.70)	1.18 (2.20)
CAPS Total	53.22 (14.66)	31.82 (11.18)	6.33 (7.27)	10.59 (14.72)

Note: SDS = Sheehan Disability Scale; CAPS = Clinician Administered PTSD Scale.

^a $F(2,839) = 138.09, p < .001.$

^b $F(2,839) = 88.96, p < .001.$

^c $F(2,838) = 145.99, p < .001.$

^d $F(2,839) = 108.35, p < .001.$

Group Differences on Disability and PTSD Severity

Analysis of variance (ANOVA) revealed significant group differences between no PTSD, subsyndromal PTSD, and full PTSD on the SDS. Post hoc analysis revealed that the full PTSD group had significantly higher scores on the SDS than those in the subsyndromal group and no PTSD group and that those in the subsyndromal group had significantly higher scores than those who were negative for PTSD.

Although ANOVA is relatively robust to unbalanced designs, we were concerned that the magnitude of the sample size difference in group membership would bias the findings. To address this, we repeated the analysis using a nonparametric analogue of ANOVA, the Kruskal-Wallis Test. Patterns of findings were identical with full PTSD having significantly higher mean rank SDS scores compared to subsyndromal and no PTSD and subsyndromal PTSD having significantly higher mean rank SDS scores than the no PTSD group ($p < .05$).

Relationship Between Social/Occupational Functioning and PTSD Severity

A statistically significant positive correlation was shown between the CAPS total score and the SDS ($r = .47, p < .001$) in workers with PTSD symptoms (full criteria PTSD and subsyndromal PTSD) demonstrating an increase in social/occupational disability associated with increased PTSD severity.

Prior Trauma and Psychiatric History

With regard to past trauma history, both the full and subsyndromal PTSD groups had rates of trauma at about 50% whereas the no PTSD group had a 37% rate of past trauma (see Table 3). Of note, the traumas endorsed on the THQ occurred prior to the 9/11 WTC disaster. With regard to past psychiatric history, the PTSD group showed higher rates of MDD, PD, and GAD than the subsyndromal group who showed higher levels than the no PTSD group. Chi squared analyses revealed significant associations between PTSD (Full, Subsyndromal, No) and a history of trauma and MDD indicating that individuals with PTSD were more likely to have had a history of trauma, MDD, and PD. A significant association was not found between PTSD and GAD.

Table 3
Group Rates of Trauma and Psychiatric History

	Full PTSD (<i>n</i> = 50)	Subsyndromal (<i>n</i> = 49)	No PTSD (<i>n</i> = 743)	Total group (<i>n</i> = 842)
GAD ^a	2.4%	6.3%	2.1%	2.3%
PD ^b	29.5%	6.3%	4.1%	5.6%
MDD ^c	44.4%	20.8%	12.6%	15.1%
Trauma ^d	54.3%	55.1%	36.7%	39.0%

Note: GAD = Generalized anxiety disorder; PD = panic disorder; MDD = major depressive disorder.

^a $\chi^2(3) = 6.4, ns.$

^b $\chi^2(3) = 50.21, p < .001.$

^c $\chi^2(3) = 46.54, p < .001.$

^d $\chi^2(3) = 13.05, p < .05.$

Table 4
t Tests for History of Trauma, MDD, GAD, and PD on the SDS (*Ms*, *SDs*)

	Present SDS	Absent SDS	<i>t</i> Test (<i>df</i>)	<i>p</i> Value
	Yes	No		
Trauma	4.0 (6.0)	2.6 (5.0)	-3.5973 (635.43874)	.00035 < .001
MDD	6.8 (7.5)	2.6 (4.9)	-6.01 (144.63832)	.000000015 < .001
PD	7.2 (7.3)	3.0 (5.4)	-3.885.11 (49.00831)	.00031 < .001
GAD	6.4 (8.1)	3.1 (5.4)	-1.742.54 (18.38825)	< .0991

Note: MDD = Major depressive disorder; GAD = generalized anxiety disorder; PD = panic disorder; SDS = Sheehan Disability Scale. Levene tests were significant for all tests, therefore, reported results are adjusted for unequal variances. Exact *p* values are presented to illustrate level of significance after Bonferroni correction, which resulted in a *p*-value threshold of .0125. Bolded *p* values denote significance.

As shown in Table 4, results from *t* test analyses reveal that workers with trauma histories, MDD and PD reported significantly more disability than those without; this was not the case for history of GAD. To compensate for the multiple comparisons used in these tests, the critical *p* value was Bonferroni adjusted to $p < .0125$. Levene tests were significant indicating unequal variances between the groups; adjusted *ts* and *dfs* are reported.

PTSD Severity as Predictor of Disability

Multiple regression analysis was used to determine if PTSD severity predicts disability. Trauma, past PD and MDD, and current PD and MDD were entered into the regression model first in order to control for their effects. Total CAPS score was entered on the last step to examine the effect of PTSD symptomatology on disability over and above the other factors. Results indicate that PTSD severity significantly predicted disability after controlling for past and current psychiatric disability (including generalized MDD and PD), and trauma history, accounting for just over 17% of the variance (see Table 5).

Discussion

A number of interesting findings emerged from this study. Approximately 12% of DRWs examined had substantial symptoms of PTSD. The rate of significant PTSD

Table 5
 Regression of Posttraumatic Stress Disorder Severity (CAPS total on Disability [SDS])

Predictor	Variable	Cumulative R^2	F	df	β	t
Step 1		.019	14.5**	768		
	Trauma				.136	3.8**
Step 2		0.88	18.4**	768		
	Trauma				.13	3.69**
	Past PD				.093	2.6*
	Past MDD				.214	5.9**
	Past GAD				.03	.84
Step 3		.214	29.68**	768		
	Trauma				.08	2.53*
	Past PD				.06	1.84
	Past MDD				.16	4.47**
	Past GAD				-.04	-1.09
	Current PD				.06	1.83
	Current MDD				.336	10.08**
	Current GAD				.101	2.6*
Step 4		.388	60.28**	768		
	Trauma				-.007	-2.31
	Past PD				.10	3.36*
	Past MDD				.002	.06
	Past GAD				.036	1.17
	Current PD				.136	4.17**
	Current MDD				.06	1.61
	Current GAD				.490	14.7**
	CAPS Total					

Note: GAD = Generalized anxiety disorder; PD = panic disorder; MDD = major depressive disorder; CAPS = Clinician Administered PTSD Scale; SDS = Sheehan Disability Scale. * $p < .01$. ** $p < .001$.

symptoms in this sample is consistent with what has been documented in the literature related to disaster relief workers worldwide (Marmar et al., 1999). It is also similar to the 12.4% prevalence rate among rescue and recovery workers following the September 11, 2001 WTC disaster (Perrin et al., 2007). Kessler, Sonnega, Bromer, Hughes, and Nelson (1995) report rates ranging from 11–48% of trauma-exposed individuals who develop PTSD in the general population. This study and others cited in this report show DRWs falling on the low end of the percentage range of individuals developing PTSD following exposure to a traumatic event. One explanation for this finding may be related to the fact that DRWs are a self-selected group who are involved in high-risk duties and may therefore be expected to display resilience in the event of disaster. Resilience may be related to working towards a common goal that contributes to a sense of personal meaning and value. It is important to note that although DRWs may demonstrate mental and emotional resilience, they may react intensely afterwards (Young et al., 1998).

In terms of social and occupational disability, the symptomatic group of workers had mild levels of social/occupational disability, which was significantly greater than the asymptomatic group. These results are consistent with preexisting research that suggests that PTSD can have a negative impact on social and occupational functioning. However, these findings are unique in that they explore the relationship between PTSD and disability in disaster workers.

Of noteworthy significance, workers with PTSD who had a previous trauma and psychiatric illness were at a greater risk for impairment in their social and

occupational roles. For clinical psychologists who evaluate and treat patients with PTSD, this finding underscores the importance of eliciting a thorough history of prior trauma and psychiatric illness.

Another finding from the present study provides support for the utility of the Sheehan Disability Scale (SDS) as a measure of social and occupational functioning outside of a clinical population and suggests that the SDS has high internal consistency reliability. A limitation, however, to the current study is the SDS was the only measure used to assess social and occupational functioning. Another limitation is the THQ, though brief and inclusive of major trauma categories, comes from unpublished work; therefore, the findings related to trauma history in this study should be cautiously interpreted.

Other limitations, apart from the obvious sampling restrictions to disaster relief workers, include the cross-sectional nature of the methodology. These results may not generalize to other populations and due to the cross-sectional approach, causal relationships cannot be inferred. Longitudinal studies examining social and occupational disability in DRWs exposed to traumatic events would be helpful to identify the course of disability and symptoms over time.

Beyond screening for the presence of occupational and social functioning in workers exposed to traumatic events, future studies are needed to examine treatments aimed at preventing the chronic maintenance of symptoms and disability and restoring optimal functioning in interpersonal relationships and work effectiveness. For example, Tiet et al. (2006) found “approach coping” significantly predicted better family and social functioning in individuals with PTSD. Approach coping includes actively confronting difficult situations, focusing on positive aspects of a situation and working hard to problem solve. Studies examining the effectiveness of such skills would be most useful. Additionally, further research examining the relationship between PTSD and occupational functioning in DRWs following other disasters (e.g., Katrina, the Tsunami) are warranted to determine if there is consistency with the current findings of DRWs following the events of 9/11.

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