

Acute Stress Symptoms, Dissociation, and Depression Among Rescue Personnel 24 Hours after the Bet-Yehoshua Train Crash: The Effects of Exposure to Dead Bodies

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Abbreviations:

ASD = acute stress disorder
ASR = acute stress reaction
CES-D = Center for Epidemiologic Studies-Depression Scale
DES = dissociative experience scale
IES-R = Impact of Event Scale-Revised
MANCOVA = Multivariate analysis of covariance
PTSD = post-traumatic stress disorder

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Abstract

Introduction: The immediate impact of exposure to severe wounds, dead bodies, and immediate threat to life has been understudied. Most studies focus on the acute stress disorder and/or post-traumatic stress disorder phases in order to assess rescue personnel's symptomatology, and tend to neglect the immediate exposure to elements of the disaster.

Hypothesis: Rescue personnel who had a history of previous exposure to dead bodies would exhibit higher levels of acute stress symptoms, dissociation, and depressive symptoms within the 24 hours following a traumatic event.

Methods: Twenty-three rescue personnel participated in the search and excavation of dead and mutilated bodies following the Bet-Yehoshua train crash in Israel. The rescue personnel group was divided based on previous exposure to dead bodies. Each participant completed a demographic questionnaire, which included a question on perceived threat to life, the impact of event scale revised, the dissociative experience scale, and the center of epidemiologic studies depression questionnaire. Student's *t*-tests, along with multivariate analysis of covariance (MANCOVA) were conducted in order to learn which factors are related to psychiatric symptomatology following the immediate exposure to such stressors.

Results: Among rescue personnel, those with previous exposure to dead bodies did not differ in their levels of acute stress symptoms, dissociation, and depressive symptoms from those who were not previously exposed to dead bodies.

Conclusions: These results may suggest the possibility that the impact of exposure to dead bodies does not emerge in the acute stress reactions (ASR) phase (up to 24 hours after the event), but later when people have time to process the trauma. Another possibility is that the rescue coping mechanisms of detachment may serve as a buffer for the horrific sights encountered during the ASR period.

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Introduction

Exposure to dead bodies is considered one of the most traumatizing experiences for rescue personnel and a risk factor for the development of consequent post-traumatic symptoms and post-traumatic stress disorder (PTSD).^{1–3} The psychiatric literature indicates that the impact of large-scale disasters affects rescue forces for a long period of time following the exposure, resulting in long-term, post-traumatic symptoms.^{2–3} A substantial number of studies have checked for post-traumatic stress among rescue personnel.^{1–6}

Little or no studies have examined acute stress symptoms within the first day after exposure to a traumatic event. The effect of exposure to dead bodies on rescue personnel only has been addressed by few studies.^{1,5–7}

Based on the existing literature, it was predicted that among rescue personnel, the immediate acute stress symptoms would be higher among those who had had previous exposure to dead bodies. This hypothesis is based on studies that have considered exposure to dead bodies as an extremely stressful event for rescue personnel and resulted in a long-term psychological impact.¹

Methods

Event

On 12 June 2006 at 12:04 hours (h), a train heading north-bound to Haifa from Tel-Aviv collided with a pick-up truck that was trapped on the rails. The impact derailed the train and two train wagons overturned. The event resulted in five casualties and 79 injured passengers. It was the third largest train crash in Israeli history. A large group of rescue units (police officers, paramedics, firefighters, and rescue personnel specializing in large-scale disasters) were dispatched to the area due to the magnitude of the event. The rescue personnel were responsible for extracting the trapped civilians and retrieving the dead bodies. Rescuers were exposed to severe injuries and dead bodies and had to race against time in order to save the wounded, trapped survivors. They also faced a personal risk for serious injury from the metal debris. The rescue personnel unit worked at the scene for 12 hours, then returned home, and in the morning reported back to their base.

Sample

The population studied was the entire rescue unit that worked at the scene and handled dead bodies and severely injured victims. Other emergency forces that worked at the scene and had a lesser exposure such as firefighters, police officers, and medical teams, were not examined.

Upon returning to base the day following the event, the rescue personnel were asked and gave their consent to complete questionnaires regarding the event. A group of 23 responses was eligible for analysis. This represents the entire rescue unit that worked at the site of the crash.

Sociodemographic Properties

The mean age of the rescue team was 20.3 ± 1.03 years $\pm$ SD (range 19–23 years). The unit consisted of 43.5% men ($n = 10$) and 56.5% women ($n = 13$). Only one of the rescue personnel was married. All participants were high school graduates. All the participants were exposed to dead bodies at the crash site. Of this unit, 39.1% ($n = 9$) were exposed for the first time to dead bodies at the site, and 60.9% ($n = 14$) had a history of previous exposure to dead bodies. The sample was divided into two groups based on the exposure to dead bodies at the site.

The mean age of the novel exposure group was 20.1 ± 0.60 years; range 19–21), and the group contained more women (77.8%; $n = 7$) than men (22.2%; $n = 2$).

The mean age of the previous exposure group was 20.5 ± 1.22 years; range 19–23), and consisted of more men (57.1%; $n = 8$) than women (42.9%; $n = 6$).

Instruments and Measures

The questionnaire was a six-page, 57-item, self-report instrument in Hebrew, which was administered by trained personnel as part of a larger study. The questionnaire consisted of four parts:

1. The first section (seven questions) dealt with demographic factors, including age, gender, marital status, education level, perceived threat to life, and exposure to dead bodies at the Bet-Yehoshua site;
2. The second part was the Impact of Event Scale Revised (IES-R).⁹ This 22-item scale is based on the Horowitz

et al original Impact of Event Scale (IES).⁹ It is used to rate the severity of intrusion, avoidance, and hyperarousal symptoms on a five-point severity scale (0 = not at all; 4 = extremely; $\alpha = 0.92$). The total score is the sum of all items (range 0–88). Total scores ≥ 30 indicate the existence of a clinical level of distress;¹⁰

3. The third part was the 28-item Dissociative Experience Scale (DES), which is used to rate dissociative experiences on an 11-point frequency scale (0 = never; 10 = always; $\alpha = 0.82$).¹¹ The total score is the average of the 28 item's scores (score range 0–100). Total scores of ≥ 30 are considered the cutoff score for clinically related dissociation; and
4. The fourth part was the 20-item Center for Epidemiologic Studies Depression Scale (CES-D),¹² which is used to rate symptoms on a four-point severity scale (0 = rarely or none of the time (<1 day); 3 = most or all of the time (5–7 days); $\alpha = 0.85$). The total score is the sum of all items after inverting the four positive items (score range 0–60). A total score of ≥ 16 indicates an increased risk for the development of depression.¹²

The IES-R and the DES are used widely to evaluate acute stress symptoms, post-traumatic symptoms and dissociation. Internal consistency of the subscales of IES-R, calculated using Cronbach's Alpha, was found to be reliable (intrusion = 0.86, avoidance = 0.92, hyperarousal = 0.83), and the questionnaire is valid as well. The DES is a reliable (Cronbach's Alpha = 0.82) and valid questionnaire that assesses retrospective reports of dissociation.¹¹ The CES-D is a reliable (Cronbach's Alpha = 0.77) questionnaire that measures depressive symptoms.¹²

Data Processing

Demographic differences between the groups were tested using Student's *t*-test and chi-square tests. Multivariate analysis of covariance (MANCOVA) was used to investigate the differences between the previous exposure to dead bodies group and the novel exposure group, while controlling for age, gender, and perceived threat to life.

All the analyses were conducted using SPSS program (SPSS, version 11.5, Chicago, IL).

Results

There were no significant differences between the novel exposure group and previous exposure group in age ($t(21) = -0.882$; $p > 0.05$), gender ($\chi^2(21) = 2.600$; $p > 0.05$), or perceived threat ($\chi^2(21) = -1.311$; $p > 0.05$). The mean value for the scores of IES-R was 8.33 ± 16.89 for the novel exposure group and 10.93 ± 11.90 for the previous exposure group. The mean DES score for the novel exposure group was 4.66 ± 3.61 and for the previous exposure group, 6.04 ± 4.93 . The mean value for the CES-D score was 15.56 ± 9.13 for the novel exposure group and 12.43 ± 3.65 for the previous exposure group. Independent *t*-tests yielded no statistically significant differences between the two exposure groups on IES-R scores ($t(21) = -0.434$; $p > 0.05$), DES scores ($t(21) = -0.726$; $p > 0.05$), or CES-D scores ($t(21) = 1.157$; $p > 0.05$) (Table 1).

Multivariate analysis of covariance (MANCOVA) was conducted for previous exposure to dead bodies while con-

Scale	Novel exposure group (n = 9)	Previous exposure group (n = 14)	Test statistics
Age, mean $\pm$ SD (years)	20.1 $\pm$ 0.60	20.5 $\pm$ 1.22	-0.882*
Gender—women, n (%)	7 (77.8)	6 (42.9)	2.600†
Perceived threat for life—yes, n (%)	5 (55.6)	11 (78.6)	1.31†
IES-R, mean $\pm$ SD	8.3 $\pm$ 16.89	10.93 $\pm$ 11.90	-0.434*
DES, mean $\pm$ SD	4.7 $\pm$ 3.61	6.04 $\pm$ 4.93	-0.726*
CES-D, mean $\pm$ SD	15.6 $\pm$ 9.13	12.4 $\pm$ 3.65)	1.157*

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Table 1—Participants' characteristics according to previous exposure to dead bodies (CES-D = Center for Epidemiologic Studies Depression, DES = Dissociative Experience Scale, IES-R = Impact of Event Scale-Revised)

*Groups compared using *t*-test test

†Groups compared using χ^2 test; §*p* <0.05, ††*p* <0.01, †††*p* <0.001

Demographic	Dependent Variable	df	F	<i>p</i> -value	Partial η^2
Previous exposure to dead bodies	IES-R	1,18	0.425	0.523	0.023
	DES	1,18	0.253	0.621	0.014
	CES-D	1,18	0.939	0.345	0.050
Age	IES-R	1,18	1.743	0.203	0.088
	DES	1,18	0.291	0.596	0.016
	CES-D	1,18	0.013	0.910	0.001
Gender	IES-R	1,18	0.470	0.502	0.025
	DES	1,18	0.032	0.861	0.002
	CES-D	1,18	0.008	0.931	0.001
Perceived life threat	IES-R	1,18	1.197	0.288	0.062
	DES	1,18	0.121	0.733	0.007
	CES-D	1,18	0.001	0.974	0.001

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Table 2—Multivariate analysis of covariance (MACOVA) table for previous exposure to dead bodies while controlling for age, gender, and perceived life threat (n = 23) (CES-D = Center for Epidemiologic Studies Depression, DES = Dissociative Experience Scale, IES-R = Impact of Event Scale-Revised)

**p* <0.05, †*p* <0.01, ††*p* <0.001

trolling for age, gender, and perceived threat to life (Table 2). No statistically significant effects were found.

Discussion

Previous studies have reported that exposure to dead bodies constitutes a risk factor for the development of an acute stress disorder and subsequent PTSD.^{1,5,13,14} In contrast to these studies, it was found that rescue personnel who had experienced exposure to dead bodies were not significantly different in their acute stress symptoms, levels of dissociation, or depressive symptoms from rescue personnel who were exposed only to injuries. The first and foremost explanation is the length of time that elapsed between the exposure to the traumatic event and the measurements. This study focused on the immediate response to the traumatic event, while most studies that found exposure to dead bod-

ies as being a significant risk factor for PTSD conducted their initial assessment at least one week following the event.^{1,5,13,14}

Although this finding could be explained by statistical means when considering the small sample size, it also could suggest that an immunizing effect took place. An immunizing effect previously was identified among hospital personnel during war.¹⁵ It also is supported partially by previous studies, where an immunizing effect was found among rescue personnel with previous exposure to dead bodies, as opposed to rescue personnel without such a history.⁶

However, there are two key differences between these two studies. First, in Ben-Ezra *et al*, the entire rescue group was exposed to dead bodies at the site of the bombing.⁶ Second, in the current study, there was no statistically significant difference between the novel exposure group and the previous exposure group in their history of life-threat-

ening events. These results also are in concurrence with studies showing that previous exposure to aerial disasters reduces the development of post-traumatic symptoms from a subsequent exposure to another air disaster.⁷

Another possible explanation for these findings stems from the fact that the group in this study was carefully selected and highly homogenous. The group members were first selected for their personal characteristics. During their training and preparation for duty, there was another selection process. Finally, they were all trained and prepared to deal with traumatic events. Previous studies suggested that well-trained and prepared professionals, such as physicians, show higher resiliency compared to nurses and administrative staff due to their detachment mechanisms that may serve as a buffer for horrific sights during the ASR period. Thus, it is feasible that well-trained rescue personnel are immune, to some extent, from the dose-response effect.¹⁶ Even though the dose-response model received substantial empirical support,^{17,18} it was found that under high levels of stress, additional stress would have only a small contribution to the traumatic effect.¹⁷⁻¹⁹ For these reasons, the study population of rescue personnel cannot be compared to non-professionals.

This study emphasizes the importance of checking the acute stress symptoms, dissociation levels, and depressive symptoms after exposure to a traumatic event. These reactions (within the first days after the traumatic event) are considered to be predictors of subsequent post-traumatic symptoms.²⁰⁻²¹ In the case of motor vehicle crashes, the development of PTSD one year after the event can be predicted as early as one week following the event.²² However, this is not the case in this study due to the lack of differences between the novel exposure group and the previous exposure group.

Three limitations of this study must be addressed. First, the sample was small ($n = 23$) in comparison to other studies.^{5,7} However, it should be noted that the 100% response rate strengthens the results. In addition, this limitation can be explained by the fact that during other events in Israel, the number of rescue personnel working at the site was similar.⁶

Second, it might be that the small sample size did not have enough statistical power to detect differences. Other individual difference factors might play a role, or the exposure of highly trained responders to dead bodies does not add to the stress experienced.

Third, the study did not examine comparison groups such as police officers, firefighters, and medical teams that were on-site at various stages. Another optional comparison group that was not examined here was rescue personnel who had multiple exposures to different events, but were not involved in this specific event. This is an important issue when seeking to gain a longitudinal perspective on exposure to dead bodies and on the cumulative effect of earlier exposures to traumatic events.²³

The main aim of this study was to examine if previous exposure to dead bodies resulted in a higher level of acute stress symptoms, a higher level of dissociation, and a higher level of depressive symptoms following a traumatic event. An interesting result that derived from this study is that most rescue personnel who were exposed to dead bodies coped well. This might suggest that rescue personnel are more resilient to the sight of dead bodies than are non-professionals who happen to be in the vicinity. The reason for this may stem from several factors such as training, usage of coping mechanism (defense mechanism) like macabre jokes, intense social support within the unit, morale, unit cohesiveness, and the narrative value of saving lives.

Conclusions

More research is needed in order to determine whether exposure to dead bodies can be considered by itself, a dominant risk factor for subsequent post-traumatic symptoms and PTSD, or only a contributing factor within the framework of traumatic events. Such research should be conducted on rescue personnel and civilians alike in order to learn the long-term effects of exposure to dead bodies during traumatic events.

References

1. Ursano RJ, McCarroll JE: The nature of the traumatic stressor: Handling dead bodies. *J Nerv Ment Dis* 1990;178:396-398.
2. Stephens C, Miller I: Traumatic experiences and post-traumatic stress disorder in the New Zealand police. *Policing* 1998;21:178-191.
3. Renck B, Weisaeth L, Skarbo S: Stress reactions in police officers after a disaster rescue operation. *Nord J Psychiatry* 2002;56:7-14.
4. North CS, Tivis L, McMillen C, Pfefferbaum B, Spitznagel EL, Cox J, Nixon S, Bunch KP, Smith EM: Psychiatric disorders in rescue workers after the Oklahoma city bombing. *Am J Psychiatry* 2002;159:857-859.
5. Fullerton CS, Ursano RJ, Wang L: Acute stress disorder, posttraumatic stress disorder, and depression in disaster or rescue workers. *Am J Psychiatry* 2004;161:1370-1376.
6. Ben-Ezra M, Essar N, Saar R: Post-traumatic reactions among rescue personnel 96 hours after the Hilton Hotel bombing in Sinai: The effect of previous exposure. *Stress Health* 2005;21:269-272.
7. Dougall AL, Herberman HB, Dalahanty DL, Inslicht SS: Similarity of prior trauma exposure as a determinant of chronic stress responding to an airline disaster. *J Consult Clin Psychol* 2000;68:290-295.
8. Weiss D, Marmar C: The Impact of Event Scale—Revised. In: Wilson J, Keane T (eds), *Assessing Psychological Trauma and PTSD*. New York: Guilford, 1997, pp 168-189.
9. Horowitz M, Wilner M, Alvarez W: Impact of Event Scale: A measure of subjective stress. *Psychosom Med* 1979;41:209-218.
10. Creamer M, Bell R, Failla S: Psychometric properties of Impact of Event Scale—Revised. *Behav Res Ther* 2003;41:1489-1496.
11. Bernstein EM, Putnam FW: Development, reliability, and validity of a dissociation scale. *J Nerv Ment Dis* 1986;174:727-735.
12. Radloff LS: The CES-D scale: A self-report depression scale for research in the general population. *Appl Psych Meas* 1977;1:385-401.
13. Resnick HS, Yehuda R, Pitman RK, Foy DW: Effects of previous trauma on acute plasma cortisol level following rape. *Am J Psychiatry* 1995;152:1675-1677.
14. Wagner D, Heinrichs M, Ehler U: Prevalence of symptoms of posttraumatic stress disorder in German professional firefighters. *Am J Psychiatry* 1998;155:1727-1732.
15. Palgi Y, Ben-Ezra M, Essar N: The effect of prolonged exposure to war stress on the comorbidity of PTSD and depression among hospital personnel. *Psy Res*; In press.
16. Ben-Ezra M, Palgi Y, Essar N: Impact of war stress on PTSD symptoms in hospital personnel. *Gen Hosp Psychiatry* 2007;29:264-266.
17. March JS: What Constitutes a Stressor? The "Criterion A" Issue. In: Davidson JRT, Foa EB (eds), *Posttraumatic Stress Disorder: DSM-IV and Beyond*. Washington, DC: American Psychiatric Press, 1993, pp 37-54.
18. Jones E, Wessely S: Psychiatric battle casualties: An intra- and interwar comparison. *Br J Psychiatry* 2001;178:242-247.
19. Harvey PD, Yehuda R: Strategies to Study Risk for the Development of PTSD. In: Yehuda R (ed), *Risk Factors for Posttraumatic Stress Disorder*. Washington, DC: American Psychiatric Press, 1999, pp 1-22.

20. Brewin CR, Andrews B, Valentine JD: Meta-analysis of risk factors for post-traumatic stress disorder in trauma-exposed adults. *J Consult Clin Psychol* 2000;68:748–766.
21. Ozer EJ, Best SR, Lipsey TL, Weiss DS: Predictors of posttraumatic stress disorder and symptoms in adults: A Meta-analysis. *Psychol Bull* 2003;129:52–73.
22. Koren D, Arnon I, Klein E: Acute stress response and posttraumatic stress disorder in traffic accident victims: A one-year prospective, follow-up study. *Am J Psychiatry* 1999;156:367–373.
23. Breslau N, Chilcoat HD, Kessler RC, Davis GC: Previous exposure to trauma and PTSD effects of subsequent trauma: Results from the Detroit area survey of trauma. *Am J Psychiatry* 1999;156:902–907.