

Acute Stress Symptoms, Dissociation, and Depression among Rescue Personnel 24 Hours after the Bet-Yehoshua Train Crash in Israel: The Effects of Gender

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Abbreviations:

CES-D = Center of Epidemiologic Studies-Depression

DES = Dissociative Experience Scale

IES-R = Impact of Event Scale-Revised

PTSD = post-traumatic stress disorder

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Abstract

Introduction: The effect of immediate exposure to traumatic events and gender differences is under-studied in the literature. Most studies focus on acute stress disorder (ASD) and post-traumatic stress disorder (PTSD) phases in order to measure gender differences, and tend to neglect the immediate exposure to the disaster.

Hypothesis: The main hypothesis was that female rescue personnel would exhibit higher levels of acute stress symptoms, dissociation, and depressive symptoms in the 24 hours following a traumatic event.

Methods: Twenty-three rescue personnel participated in a search and rescue operation at the Bet-Yehoshua train crash in Israel. The rescue personnel group was divided based on gender. Each participant completed a demographic questionnaire including questions that assessed psychological symptoms and issues such as perceived threat to life, the Impact of Event Scale Revised (IES-R), the Dissociative Experience Scale (DES), and the Center of Epidemiologic Studies Depression questionnaire (CES-D). Statistical inferences were calculated using *t*-tests and chi-square tests, along with testing of covariance (MANCOVA) in order to identify which factors are related to psychiatric symptomatology following the immediate exposure to disaster.

Results: The results suggest that among rescue personnel, women did not differ in their levels of acute stress, dissociation, and depressive symptoms from men.

Conclusions: These results suggest the possibility that the gender differences in reactions to traumatic events do not emerge in the acute stress reactions (ASR) phase (up to 24 hours after the event), but later on when people have time to process the trauma. Another possibility that may explain the discrepancy between this study and the common knowledge in the literature is that women rescue personnel are considered a highly selected group, which does not reflect on the general population of women. More studies are needed in order to substantiate these results.

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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 consequent post-traumatic symptoms and post-traumatic stress disorder (PTSD).¹⁻³ The psychiatric literature show that the impact of large-scale disasters affects rescue forces for a long period of time, thus resulting in long-term post-traumatic symptoms.^{2,3} A substantial number of studies checked for post-traumatic stress among rescue personnel.¹⁻⁶ However, few studies have examined acute stress symptoms, dissociation, and depression within the first day after exposure to a traumatic event.⁷ Another important factor to be assessed among rescue personnel is the effects of gender differences, which has only been addressed by few studies.^{1,5-8}

The literature reports a consistent gap between men and women in their reactions to traumatic events. Studies that examined differences in the reaction to traumatic events among both genders found that women have a greater chance than do men to suffer from PTSD.^{9–11} Women have at least twice the risk of suffering from PTSD than men, even after controlling for sexual trauma.¹² From a clinical point of view, women tend to present higher prevalence of avoidance and hyper-arousal symptoms in comparison to men after exposure to traumatic events like motor vehicle accidents.¹³

A few studies have argued that women are more vulnerable to develop PTSD due to several gender delineations. However, when these methodological features were controlled, gender differences disappeared.^{14,15} These studies explain women's vulnerability as resulting from higher prevalence of sexual abuse and rape, the use of different coping styles, limited socioeconomic resources, and biological sex differences.¹⁴ Another claim is that gender differences are a result of higher prevalence of pre-existing psychiatric disorders, which are known to be related to higher prevalence of PTSD.¹⁵

An alternate view examines gender differences, psychological trauma, and PTSD in two unrelated dimensions. First, is the vertical axis of short-term vs. long-term effects of psychological trauma. Studies indicate that in the short period following the onset of a disaster (up to seven days), there are no gender differences in self-reported symptoms.^{6,16} However, opposite results are revealed in the long-term effects (more than one month).^{4,5,17} Second, on the horizontal axis is the general population vs. first responders (groups that deal with disasters and are exposed on a daily basis to elevated stress whether they are rescue personnel, police officers, firefighters, paramedics, nurses, physicians, etc). The findings in the general population show that women tend to suffer from more trauma and PTSD in comparison to men.^{10,17} Some studies showed no gender differences among first responders,^{16,18} in comparison to other studies show that women rescue personnel are at high risk for the development of PTSD.⁵

Another issue that has not been studied extensively is the level of dissociation among rescue personnel immediately after exposure to a traumatic event. The literature shows that dissociation immediately or shortly after exposure to traumatic events is an indicator for the subsequent development of PTSD.^{19,20} However, there are only a few studies that address acute stress symptoms, dissociation, and depression immediately after exposure to traumatic events.^{7,8,16} The purpose of this study was to examine acute stress symptoms, dissociation, and depressive symptoms among male and female rescue personnel immediately after exposure to a train crash.

Because of the existing literature that showed mixed results, the hypothesis was based on the long-term effects of psychological trauma on rescue personnel. Thus, it was hypothesized that among rescue personnel, the immediate acute stress symptoms would be higher among female rescue personnel in comparison to males.

Event

On 12 June 2006 at 12:04 hours, a train heading from the city of Tel-Aviv northbound to Haifa collided with a pick-

up truck that was trapped on the rails. The impact derailed the train and led to the turning over of two railway cars. The disaster resulted in five casualties and 79 injured passengers. Due to the magnitude of the disaster (the third biggest train disaster in Israel's history), a large group of rescue units (police officers, paramedics, firefighters, and rescue personnel specializing in large events) were dispatched to the area. The rescue personnel were responsible for extracting the trapped civilians and retrieving the dead bodies. The 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.

Methods

Sample

The population studied was the entire rescue unit that worked at the crash site and handled victims with severe injuries and dead bodies. Other emergency forces that worked at the scene and had a lesser exposure, such as firefighters, police officers, and medical teams, were not examined. The rescue unit consists of soldiers trained for rescue missions in civil settings. Upon returning to the base the day following the event, rescue personnel were asked for consent to answer questionnaires regarding the crash.

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. *Demographic Questionnaire*—Seven questions addressing age, gender, marital status, education level, perceived threat to life, and exposure to dead bodies at the Bet-Yehoshua disaster site;
2. *Impact of Event Scale Revised (IES-R)*²¹—Is a 22-item scale is based on the original Impact of Event Scale (IES).²² It rates the severity of intrusion, avoidance, and hyper-arousal symptoms on a 5-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 >33 indicate a clinical level of traumatic distress;²³
3. *Dissociative Experience Scale (DES)*²⁴—Rates dissociative experiences on an 11-point frequency scale (0 = never; 10 = always; alpha = 0.82). 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. *Center for Epidemiologic Studies Depression Scale (CES-D)*²⁵—rates depressive symptoms on a 4-point severity scale (0 = rarely or none of the time (less than 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). Total scores of >16 indicate an increased risk for depression.²⁵

The IES-R and The DES are widely used to evaluate acute stress symptoms, post-traumatic symptoms, and dis-

Scale	Men (n = 10)	Women (n = 13)	Test statistics
Age, mean \pm SD	21.00 \pm 1.05	19.84 \pm 0.69	3.173*
Previous exposure – Yes, n (%)	8 (80.00)	6 (46.15)	2.600†
Perceived threat for life – Yes, n (%)	8 (80.00)	8 (61.53)	0.87†
IES-R, mean \pm SD	10.10 \pm 13.15	9.77 \pm 14.73	0.056*
DES, mean \pm SD	5.97 \pm 5.70	5.15 \pm 3.35	4.30*
CES-D, mean \pm SD	13 \pm 4.27	14.15 \pm 7.76	-0.422*

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Table 1—Participants' characteristics according to gender (CES-D = Center for Epidemiologic Studies-Depression; IDES = Dissociative Experience Scale; ES-R = Impact of Event Scale-Revised; SD = standard deviation)

*Groups compared using *t*-test.

†Groups compared using χ^2 test.

sociation. Internal consistency of the subscales of IES-R, calculated using Cronbach's Alpha, was found to be reliable (intrusion = 0.86, avoidance = 0.92, hyper-arousal = 0.83), and the questionnaire is valid as well. The DES24 is a reliable (Cronbach's Alpha = 0.82) and valid questionnaire that is used to assess retrospective reports of dissociation. The CES-D²⁵ is a reliable (Cronbach's Alpha = 0.77) questionnaire that is used to measure depressive symptoms.

Data Analysis

Demographic differences between the groups were tested using the *t*-test and chi-square tests. Multivariate analysis of covariance (MANCOVA) was used to investigate gender differences, while controlling for age, exposure to dead bodies, and perceived threat to life. All the analyses were conducted using SPSS program (SPSS, Inc., version 15, Chicago, IL).

Results

A group of 23 responses was eligible for analysis, representing the entire rescue unit that worked at the Bet-Yehoshua site.

Sociodemographic Properties

The mean value of the ages of the rescue team was 20.3 \pm 1.03 years (range = 19–23). The mean age for the men's group was 21.0 \pm 1.05 years (range = 20–23), and for the women's group was 19.8 \pm 0.69 years (range = 19–21). The unit consisted of 43.5% men (n = 10) and 56.5% women (n = 13). Only 4.3% of the rescue personnel were married (n = 1), and the other 95.7% (n = 22) were unmarried. The entire sample had a high school diploma and underwent the same military and rescue course training. All of the participants were exposed to dead bodies at the rescue. Of this unit, 39.1% (n = 9) were exposed for the first time to dead bodies, while 60.9% (n = 14) had a history of previous exposure to dead bodies. The sample was divided into two groups based on gender.

The effects of age, previous exposure to dead bodies, or perceived threat to life were evaluated using the *t*-tests and

chi-square tests. There was a statistically significant difference between the men's group and the women's group in age ($t(21) = 3.173$; $p = 0.05$). However, no significant differences between men and women were found with previous exposure to dead bodies ($\chi^2(21) = 2.600$; $p > 0.05$), or perceived threat ($\chi^2(21) = -0.87$; $p > 0.05$). Independent *t*-tests were conducted and yielded no significant differences between the two exposure groups on IES-R scores ($t(21) = 0.056$; $p > 0.05$), DES scores ($t(21) = 0.430$; $p > 0.05$), or CES-D scores ($t(21) = -0.422$; $p > 0.05$) (Table 1). Multivariate analysis of covariance (MACOVA) was conducted for gender while controlling for age, exposure to dead bodies, and perceived threat to life (Table 2). No statistically significant effects were found.

Discussion

There were no significant gender differences in the IES-R, DES, and CES-D scores among men and women rescue personnel. These findings contradict the study hypothesis and are partially inconsistent with previous studies, which suggested a stronger inclination of women as opposed to men to develop trauma-related disorders.^{5,9,10} However, these findings are inline with previous research that showed no gender differences in the immediate aftermath after exposure to trauma,¹⁶ and lack of gender differences as found among hospital personnel during war.¹⁸

A number of explanations can account for these results. First, women rescue personnel may be more resilient than the general population of women, due to selection bias. These women work in positions of control, in a situation in which they have a well-defined duty, and for which they are trained and prepared. Indirect evidence for this was found in a study of hospital personnel during war, in which there were no gender differences among physicians in their levels of post-trauma distress and depression.¹⁸ In addition, well-defined coping styles emerge from the unit's procedures. These may result from several factors such as the: (1) same

Demographic	Dependent Variable	df	F	p-value	Partial η^2
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
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	0.091	0.001
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
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 comparing gender differences on traumatic, dissociative, and depressive symptoms among rescue personnel ($n = 23$). Age, previous exposure to dead bodies, and perceived life threat serve as covariates in this analysis (CES-D = Center for Epidemiologic Studies-Depression; DES = Dissociative Experience Scale; IES-R = Impact of Event Scale-Revised)

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

military and rescue training; (2) usage of coping mechanism (defense mechanism) like macabre jokes; (3) intense social support within the unit; (4) morale; (5) unit cohesiveness; and (6) the narrative value of saving lives. These may diminish the effects of gender and decrease coping style bias.^{14,15} Therefore, it could be argued that the selection bias and the effective use of coping mechanisms in this sample increase the homogeneity of the gender groups reducing the differences in psychological reactions.

Second, participants in other studies usually were examined weeks, months, or even years after exposure to the traumatic event.^{17,20} The current study is among a small number of studies to assess acute stress reactions within days of exposure to the traumatic event.^{6,7,16} This may suggest that in the immediate time range following the event, personal differences are suppressed. It is possible that gender differences become salient only after a latency period.

Limitations

The most notable limitation in this study is the sample size ($n = 23$), which is relatively small in comparison to similar studies.^{5,20} Therefore, it might be that the small sample size did not have enough statistical power to detect statistically significant differences between the groups. This limitation can be explained by the fact that in other disasters in Israel, the number of rescue personnel working at the disaster site is similar.^{6,7,16} Nonetheless, it should be noted that the 100% response rate strengthens the results. In addition, the lack of gender differences also is supported by the results of the partial Eta square that reflect the effect size. In this study, the

effect size was extremely small, thus strengthening the claim that the lack of gender differences were genuine albeit the low number of participants. Although these findings could be explained by statistical means when considering the small sample size, they could also suggest that an immunizing effect occurred. An immunizing effect was previously found among hospital personnel during war,¹⁸ and also among rescue personnel with previous exposure to dead bodies, as opposed to rescue personnel without such a history.^{6,7,16,18}

It also is possible that other individual difference factors might play a role, or that the exposure to dead bodies *per se* in highly trained responders does not add to the stress experience.

Lastly, the study did not examine comparison groups such as police officers, firefighters, and medical teams, who were present at various stages at the scene. Another comparison group that was not examined in this study 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.¹⁶

Practical Implications

Careful selection of rescue personnel along with appropriate educational training should be essential for all rescue personnel that are expected to be exposed to traumatic scenes and might help to prevent higher proportions of women suffering from PTSD or trauma related syndromes among first responders. There also may be certain professions that supersede gender differences, becoming more dominant

factors among those selected as first responders in the face of trauma and adversity.^{16,18}

Future Research

This study should be replicated longitudinally among a much larger sample that may help to answer the question of whether women are less vulnerable due to the selection and training process, or due to subsequent different mecha-

nisms, which make women more vulnerable. In addition, other first responders groups that have had previous exposure to traumatic events should be studied to assess the cumulative effect of exposure. In conclusion, contradictory to what was expected, the results showed no gender differences in the acute stress reaction phase within 24 hours following a traumatic event. Additional studies are needed in order to further substantiate these findings.

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