

The effects of different levels of exposure on persistence of stress disorders in rescue volunteers: the case of the ATR 72 air disaster in Palermo

Gli effetti di differenti livelli espositivi sulla persistenza dei disturbi da stress nei soccorritori volontari: il caso del disastro aereo dell'ATR 72 a Palermo

M. Ricciardi*, R. Valsavoia*, M. Russo**, L. Ferraro*, D. Alloro*, N. Messina*, A. Dolce***, D. La Barbera*

* Section of Psychiatry, Department of Biosperimental Medicine and Clinical Neuroscience, University of Palermo, Italy; ** Psychosis Clinical Academic Group, Institute of Psychiatry, King's Health Partners, King's College London; *** ISTAT, National Institute, Palermo

Summary

Background and objective

Emotional, behavioural and cognitive consequences of an air disaster on the direct and indirect victims and rescuers have not been investigated thoroughly, particularly due to the rarity of this type of event. Therefore exploring residual stress disorders in people involved in rescuing is worth undertaking. The aim of this study is to investigate persistence of stress disorders on the voluntary rescuers involved in the tragedy after the crash of the ATR 72 flight in water near Palermo (Italy), which occurred on August 6th, 2005. There were 16 deaths, 3 people missing and 23 survivors of the crash.

Method

We analysed peritraumatic reactions associated to the disaster in a sample of 103 voluntary rescuers after one year from the event. The sample was divided into two groups: Directly Exposed (DE) and Indirectly Exposed (IE). In particular, we examined specific risk factors "pre-disaster" (age, gender and other socio-demographic characteristics) and we estimated frequency of intrusive or avoidance symptoms, trait anxiety, arousal level, depression level and perceived social support. These were related to how much exposed and involved the rescuers were in the event.

Results

The sample was composed by 60.2% male and 39.8% female. There were no significant differences between men and women as regards age, level of education and employment status (Table I). Psychological assessment shows statistically significant differences between the two groups. In particular, the DE group presents higher level of stress, anxiety and arousal than the IE group. There were no significant differences in mean scores and variance of depression (Table II).

Conclusion

Two main findings emerged: a) despite the absence of influence of the risk factors identified by the scientific literature, it is still possible to observe significant levels of stress disorders 1 year after the event; b) high exposure levels lead to increased psychological problems such as anxiety, avoidance and somatic pain, however depression was not significantly present in neither of the two groups.

Further studies are needed to clarify the psychological impact of traumatic events on rescue volunteers in order to improve the management of emergency situations.

Key words

Stress • Air disaster • Voluntary rescuers

Riassunto

Introduzione e obiettivo

Le conseguenze emozionali, comportamentali e cognitive provocate da un disastro aereo sulle vittime dirette/indirette e sui soccorritori sono, ad oggi, poco indagate nel panorama della letteratura scientifica. La gravità dell'evento, tuttavia, seppur eccezionale e raro, impone l'ampliamento della conoscenza dei possibili disturbi da stress che residuano nei soggetti coinvolti.

Il presente studio indaga la persistenza dei disturbi da stress nella componente volontaria dei soccorritori coinvolti nel tragico evento dell'ammarraggio di un ATR 72 al largo di Palermo (Italia), avvenuto il 6 agosto del 2005. L'incidente causò un bilancio di 16 morti, 3 dispersi e 23 sopravvissuti.

Metodologia

Sono state esaminate le reazioni peritraumatiche associate al disastro in un campione di 103 soccorritori volontari ad un anno di distanza dall'evento.

Il campione è stato suddiviso in due gruppi: Esposti Direttamente (DE) e Esposti Indirettamente (IE). In particolare, sono stati analizzati specifici fattori di rischio "pre-disastro" (età, genere e altre caratteristiche socio-demografiche) e sono state valutate la frequenza di sintomi intrusivi o di evitamento, l'ansia di tratto, il livello di arousal, il livello di depressione e il supporto sociale percepito. Queste variabili sono state poste in relazione alla differente esposizione e coinvolgimento nell'evento dei soccorritori stessi.

Risultati

Il campione è composto dal 60,2% di uomini e dal 39,8 di don-

Corrispondenza

Daniele La Barbera, Section of Psychiatry, Department of Biosperimental Medicine and Clinical Neuroscience, University of Palermo, via La Loggia 1, 90129 Palermo, Italy • Tel. +39 091 6555164 • E-mail: labadan@unipa.it

ne. Non ci sono differenze significative tra uomini e donne per quanto riguarda l'età, il livello di istruzione e l'occupazione. La valutazione delle variabili psicologiche mostra differenze statisticamente significative tra i due gruppi. In particolare, il gruppo DE presenta più alti livelli di stress, ansia e arousal rispetto al gruppo IE. Non emergono, altresì, differenze significative per quanto concerne i sintomi depressivi.

Conclusioni

I nostri risultati suggeriscono che, a fronte dell'influenza pressoché nulla dei fattori di rischio individuati nella letteratura scientifica, ad un anno di distanza dall'evento è ancora possibile

Introduction

People who are involved in rescuing or assisting victims of a disaster are more vulnerable to develop serious psychosomatic disorders. In particular, direct or indirect exposure to extreme traumatic events, involving close contact with death, serious injuries or other threats to one's own or others' life, could lead to the development of Post Traumatic Stress Disorder symptoms (PTSD-DSM-IV TR)¹. PTSD is diagnosed when symptoms such as intense fear, feeling defenceless or horrified, flashbacks, avoidance behaviours and increased arousal are present, in reaction to a traumatic event. For a diagnosis of PTSD, the symptoms must be present for more than a month and cause clinically significant discomfort in social and professional life, or in other important areas².

The scientific literature has shown subjects at higher risk of developing PTSD symptoms include: victims of natural and unnatural (caused by mankind and their actions) disasters, rescuers, voluntary and non-volunteer helpers, and anyone involved in a catastrophic event³. These subjects can be divided, based on exposure level to the critical event, into: primary or direct victims (subjects who were personally traumatized) and secondary or indirect victims (subjects who deteriorated in physical and mental health due to traumatic events experienced by others, for example, relatives, friends, psychotherapists, helpers and staff specialized in disaster management)⁴⁻⁷.

In particular, voluntary rescuers are considered subjects at high risk. Although they are required to cope with very traumatic events, they are often not properly trained, from a cognitive and emotional point of view, to cope with the severe stress related to this kind of emergency situation³. Moreover, by doing the same work as professional rescue workers, volunteers are exposed to the same level of emotional and psychological stimulation. In fact, voluntary workers are often involved in direct management of severely shocking events such as viewing dead, dismembered or decomposed bodies and seriously injured people. This is relevant as it is known that viewing human re-

osservare la presenza di significativi indici di stress nei soccorritori coinvolti a vario titolo.

Inoltre, maggiori livelli espositivi determinano un maggiore sviluppo di disagi psicologici in termini di ansia, evitamento e lamento somatico, ma non di depressione nei due gruppi.

Ulteriori studi, tuttavia, sono necessari per chiarire l'impatto psicologico di eventi traumatici sui soccorritori volontari al fine di migliorare la gestione complessiva delle situazioni di emergenza.

Parole chiave

Stress • Disastro aereo • Soccorritori volontari

mains, dismembered and/or decomposed human bodies increases risk of post-traumatic stress reactions⁸⁻¹⁵.

Moreover, voluntary workers play a role in management of secondary events which can account for a vicarious traumatization which is conceptualized as the psychological impact of traumatized victim on the operator and it can originate PTSD symptoms. Previously, Pearlman¹⁶ showed that vicarious traumatization frequently occurs in people very emotionally involved with victims; it can manifest in both physical and psychological symptoms such as depression, desperation, cynicism, alienation and an increased sense of vulnerability. The activities of voluntary rescuers, then, present all features underlying the development of stress reactions such as anger, irritability, fatigue, frustration and distress.

Compared to other disasters or catastrophic events of a similar scale, air tragedy evokes more feelings of terror and anguish in the majority of people. This is due to the dramatic, unpredictable and violent nature of this event which invokes a sense of powerlessness and the inevitability of death.

There are few reports in the literature regarding the issue of factors predisposing individuals to post-traumatic symptoms. Those that exist show specific risk factors which can be 'pre-disaster' risk factors (age, gender, disaster management inexperience, low educational level, low socio-economic status, presence of previous psychopathology) and 'post-disaster' risk factors (high level of exposure to and interaction with the victims of the disaster, high degree of identification with them, lack of emotional support, peritraumatic dissociation, repeated exposure to stimuli that recall the event, subsequent stress life events)¹⁷⁻¹⁹.

The most frequent psychological reactions are recurring intrusive images and smells, difficulty sleeping, nightmares and images of death during the night²⁰. These symptoms were also found in subjects involved in other major tragedies, such as the Tsunami in 2004 or the earthquake in Bam in 2005, which had a great impact in terms of death-rate and destruction of the area.

Much research shows that stress responses varies significantly between subjects and it is dependent on the degree of involvement and exposure to the critical event. In particular, those directly exposed may develop higher levels of symptoms than indirectly exposed subjects. However, even indirectly exposed subjects' risk of developing disorders remains significant^{6,21}.

The objective of this research is to determine the presence of psychological disorder in volunteer rescue workers one year after an air tragedy. The event analyzed is the air tragedy which occurred on the 6th of August 2005, when the ATR 72 Tunis Airlines flight from Bari, Italy to Djerba, Tunisia crashed into the sea, 12 miles north of Palermo, Italy, due to an engine failure. It caused 16 deaths (including a child), 3 people missing and 23 survivors. Emergency services involved were the police, fire brigade, doctors and volunteer rescue workers, who provided survivors and relatives of victims with medical care and psychological support.

The current research has two goals: to assess the development of stress symptoms following a traumatic event such as an air tragedy, by highlighting the predictive factors of PTSD in voluntary rescue workers involved in the disaster; and to investigate within the sample any significant differences in symptoms, according to the different levels of exposure and involvement, and/or the presence of other risk factors of PTSD in recovery operations and support to victims.

Material and methods

One year after the crash, 103 subjects involved in the rescue operations of the ATR 72 air tragedy underwent assessment to investigate predictive elements for post-traumatic disorders.

Subjects

The 103 subjects were recruited. They were affiliated to several voluntary organizations of the Regional Civil Protection. Specific tasks carried out during the rescue operations were: coordination of the rescue activities and logistic and psychological support for survivors and victims' relatives.

More specifically, their main activities were meeting and supporting victims' relatives when identifying their relatives' bodies and rescued luggage, supporting victims' relatives during the police investigation and the forensic investigations, and updating them as necessary on the state of injured people and the search for the missing. Some volunteers were involved in searching for missing people and rescuing the victims from the sea. On the whole, psychological support was given to 23 surviving passengers and 110 relatives of the victims.

Measures

Assessment was carried out by a team of trained psychologists. Socio-demographic information was collected, and a psychological battery, designed to evaluate predictors of PTSD, was administered.

The following instruments were used to investigate PTSD predictors: the Impact Scale of Event (IES)²² evaluated frequency of intrusion or avoidance symptoms following a traumatic event; the State-Trait Anxiety Inventory (STAI-X2)²³ estimated trait anxiety (that is, to what extent anxiety is a steady, underlying condition); the Psychophysiological Questionnaire (QPF)²⁴ which measured arousal level; the Beck Depression Inventory-II (BDI)²⁵ probed depressive symptoms; and the Crisis Support Scale (CSS)²⁶ estimated level of perceived social support.

The level of exposure to the traumatic event was not equal for all the subjects. Hence sample was classified as either directly or indirectly exposed. Directly Exposed (DE) were those who had close contact with victims because of their role involved searching for and recovering bodies, rescuing survivors, clothing and moving dead bodies. Indirectly Exposed (IE) were those who saw the victims at the mortuary and had direct contact only with the surviving passengers. Their role involved supporting relatives of the victims, finding and giving back rescued luggage, updating families on the state of injured and helping to searching for the missing passengers.

Statistical analysis

Descriptive statistics of distribution such as mean (M), median (Me), standard deviation (SD) and range (R) were used, along with the Kruskal-Wallis test (KW) to evaluate statistically significant differences between groups IE and DR groups. Confidence Intervals (CI) and a *p* value for statistical significance set at 0.05 were considered (<http://www.medcalc.be>).

Results

As shown on Table I, the sample was composed by 103 subjects, 60.2% (N = 62) males, 39.8% (N = 41) females. With regard to "exposure", 25 subjects were assigned to the DE group and 78 to the IE group. Women were proportionately more highly represented in the DE group (44% vs. 38.4% of presence in the IE). Mean age was of 40.4 years (range 17-73) with no significant difference between men and women (39.5 and 41.8, respectively), or in the exposure classification groups. The whole group had a higher level of education than the Italian national average: 13% of the subjects reached a degree qualification, 52% senior high school qualification, 31% junior high school, 4% primary school. There were no differ-

TABLE I.
Socio-demographic characteristics of the sample. *Caratteristiche socio-demografiche del campione.*

	All	DE Group	IE Group
N	103	25	78
M/F	62/41	14/11	48/30
Age (mean \pm SD)	40.2 \pm 12.6	39.7 \pm 12.3	40.7 \pm 12.7
Educational qualification			
High	67 (65%)	16 (64%)	51 (65.4%)
Middle	32 (31.1%)	8 (32%)	24 (30.8%)
Low	4 (3.9%)	1 (4%)	3 (3.8%)
Occupation			
Full time	71 (68.9%)	18 (72%)	53 (67.9%)
Part time	32 (31.1%)	7 (28%)	25 (32.1%)

ences in education between the DE and IE groups. Only 8% of the subjects were not in full-time employment (this was predominantly among the youngest group), and no differences in employment status were found between the two groups. Within the group in general, subjects had no critical financial or family situations, previous psychological problems, or psychiatric or psychotherapeutic treatment.

The analysis of the Impact Scale Event (ISE) results show strong and statistically significant difference in values for those people who were directly *versus* indirectly exposed to the event (median 23 for DE and 9.5 for IE, $p < 0.001$ Kruskal-Wallis test). In particular, in the DE group 20% of subjects exhibited severe stress values²², compared to rates of 8% in the IE group.

On the STAI-X2, a higher tendency to develop trait anxiety was seen in the DE group. The median of the DE group was 38 compared with 36 in the IE group ($p = 0.041$ KW test). These scores were found in the 44% of rescuers in DE with score lower than 40²⁷ against the 29% of subjects in IE.

Further differences were found between the two groups in the arousal level probed with the QPF. In fact, the median value was 9 in the DE group (range 2-38) and 8 in the IE group (range 2-24). These scores shown a trend of significance ($p = 0.06$ KW test).

Depression, as assessed with the BDI, is detected in both groups with similar mean scores and variance. In both groups, 16% of subjects presented dysphoria, while only 3 subjects in the whole sample went over the threshold values for depression.

The Crisis Support Scale (CSS) similar scores for both groups, with high total scores (median 51, range 12-78).

Discussion and conclusion

This study took place one year after the ATR 72 flight crashed into the sea, near Palermo, Italy, on the 6th of August 2005. The goal of the research was to assess traumatic reactions associated with the disaster, persistence of intrusive and avoidance symptoms, "trait anxiety", arousal, depression and perceived social support levels

TABLE II.
Psychological assessment in the groups. *Valutazione psicologica nei gruppi.*

TEST	All	DE	IE	Significant differences (KW test for median)			
	M \pm S	Me (R)	M \pm S	Me (R)	M \pm S	Me (R)	
IE Scale	15.1 \pm 12.2	12 (1-53)	25.0 \pm 13.3	23 (5-53)	11.9 \pm 10.0	9.5 (1-39)	*
STAI-X2	37.3 \pm 7.2	37 (9-56)	39.7 \pm 6.3	38 (27-51)	36.6 \pm 7.3	36 (9-56)	*
QPF	9.4 \pm 6.8	8 (1-38)	12.6 \pm 9.0	9 (2-38)	8.4 \pm 5.5	8 (1-24)	*
BDI	5.4 \pm 5.8	4 (0-33)	5.4 \pm 6.5	4 (0-30)	5.5 \pm 5.5	4 (0-33)	
CSS	50.3 \pm 13.3	51 (12-78)	50.8 \pm 10.8	49 (23-68)	50.1 \pm 14.0	52 (12-78)	

* Significant (p value < 0.05).

in a group of 103 rescue workers, employed in recovery and support operations. Another aim of the study was to evaluate how stress symptomatology and PTSD were predicted by different levels of exposure (direct and indirect, as previously defined).

Firstly, these results do not show any differences between groups in terms of predisposing risk factors. Hence there was no distortion in the results based on these factors, and as such the results can be interpreted as being due to differences in direct or indirect exposure between the groups. These results are consistent with the most recent research which considers the role of distress vulnerability as inversely proportional to the emotional impact of the traumatic event^{28 29}. In particular, according to the Davidson and Foa's *bidimensional continuum* model (claiming the chance to develop PTSD is influenced by both severity of trauma and vulnerability factors), this study is at the extreme of the continuum whereby the role of other possible risk factors is "null" and the role of the event is "maximum".

Although in the absence of risk factors and presence of good levels of perceived social support, these findings show the persistence of stress symptoms one year after the traumatic event and that the higher exposure levels lead to more severe feeling of anxiety, avoidance symptoms and physical distress (statistically significant difference – p value < 0,05 – between DE and IE group), but not depressive symptoms.

The traumatic reactions associated with the disaster are anxiety, high level of arousal and avoidance symptoms. These reactions are higher in the DE group than IE group. As consequence, the DE group has probably the highest risk to develop a PTSD disease.

There are not significant differences between groups in BDI score (depression). Possible explanation for this absence of variability of depressive symptoms between distributions are:

- firstly, the short time from the event (1 year). In fact, the depressive symptoms usually arise as a result of a chronic PTSD;
- secondly, the good level of perceived social support seems to play an important role as protective factor for the onset of depression³⁰.

In conclusion, although risk factors for people involved in rescue work are known, our research has shown the necessity of further investigation regarding the interaction between disaster relief and development of psychological problems in voluntary rescue workers. Research should be focused on the relationship between volunteers directly involved in the emergency actions and their higher vulnerability to psychological distress.

Hence, more studies are necessary not only in relation to the fundamental role played by volunteers and for the psychological impact of traumatic events on them (partic-

ularly those direct involved), but also in order to provide adequate management policies and protocols governing the activities of volunteer rescue workers in emergency situations³¹⁻³³.

Declaration of Interest

None of the authors of this paper has any interest or he/she received any form of support, including that from drug companies and honoraria for lectures and consultancies, potentially in conflict with this scientific work.

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