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Psychological impact upon London Ambulance Service of the 2005 bombings

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Background This study was conducted following the London bombings of 7 July 2005.

Aims To assess the psychological impact of the 2005 London bombings on London Ambulance Service (LAS) personnel, risk factors for the development of psychological ill-health and employee awareness of post incident support.

Methods A total of 525 LAS personnel involved in the bombings, and a control group of uninvolved staff, were sent a questionnaire 2 months after the bombings. Main outcome measures were the presence of probable post-traumatic stress disorder (PTSD) measured using the Trauma Screening Questionnaire and substantial psychological distress using a tool identical to that used to assess the impact of these bombings on the population of London.

Results Fifty-six per cent of those who responded were involved in the bombings. Overall, including controls, the response rate was 32% (341). Four per cent of respondents reported probable PTSD and 13% reported substantial distress. Probable PTSD was more common in those involved in the bombings (6% overall), those working at the disaster scene and, in particular, at one of the incident locations (where 50% of all probable PTSD cases worked). The majority of staff were aware of the post incident support available and how to access this, particularly if personnel were involved in the bombings.

Conclusions The LAS did not report higher levels of probable PTSD and psychological distress than the rest of the London population; however, those more proximal to the incident were more likely to have been affected in spite of being aware of various staff support measures put in place.

Key words Emergency workers; London bombings; post-traumatic stress disorder; psychological distress; trauma.

Introduction

Four suicide bombers struck in central London on Thursday 7 July 2005, killing 52 people and injuring 700. The London Ambulance Service (LAS) responded to this major incident by deploying 100 vehicles and over 250 staff across five sites [1].

Traumatic events can lead to the development of psychological distress, lowered morale and organizational difficulty [2,3]. Some personnel may also go on to develop post-traumatic stress disorder (PTSD) although the sparse literature on the health of ambulance personnel does not indicate that they suffer from more mental health problems than the general working population [4]. A study on Australian Emergency Services personnel did not find that emergency workers were hardier than most, or have particular coping styles [5]. Two months after the Madrid bombings, only 2% of emergency personnel had depression and 1.2% had PTSD [6]. However, a study of UK ambulance staff found that 21% met PTSD criteria [7] and concluded that a substantial subgroup of emergency service personnel may require psychological support to process distressing work incidents. The authors suggested that information that normalizes post-traumatic symptoms might be helpful.

A number of support measures are available to LAS staff, including the provision of trauma risk management practitioners [8]. This study therefore aimed to investigate how the psychological impact of the London bombings on LAS personnel varied in relation to their involvement with the organizational response to the bombings. It also evaluated employee awareness regarding post incident personnel support.

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Methods

Two months after the London bombings (from hereon referred to as the bombings), contact was made with all 525 LAS personnel identified from the in-house database as being involved in the response to the bombings. A comparison group of 525 randomly selected LAS employees, stratified by age, role and gender, who were not involved in the response to the bombings were also contacted. Potential participants were sent an anonymous questionnaire to their work address accompanied by a return envelope and a letter explaining the purpose of the study. Workplace posters, general management reminders and a second round of questionnaires (sent a month after the first) helped maximize the response rate although may not have been done consistently.

Participants were asked about age, gender, previous exposure to major incidents, usual role and activities on the day of the bombings. The LAS supported maintaining staff confidentiality, which was achieved by excluding information which would specify an individual or small groups. Whilst having more information would have allowed for more complex analyses, the anonymity of the survey was agreed to by the ethics committee.

In order to avoid the inherent difficulties in making psychiatric diagnoses by questionnaires, we used the term 'probable PTSD' rather than actual PTSD. Probable PTSD was identified using the Trauma Screening Questionnaire, a well-validated screening tool used in several studies of post incident trauma [9]. A diagnosis of probable PTSD was provided by respondents endorsing at least six symptoms in any combination on the 10 symptom scale.

Substantial stress was defined as responding 'quite a bit' or 'extremely' to one or more of five symptoms associated with adjustment disorders, a measure identical to that used in studies of the impact of the 7th July bombings on the general population of London and the United States September 11th attacks [10].

Further potential impact on well-being was ascertained by specifically looking at effects on day-to-day activities (on a five-point scale from none to extremely, a positive response was defined as endorsing one of the three highest scores) and whether the respondent had talked to someone about their feelings (on a four-point scale from none to a lot, a positive response was defined as endorsing one of the two highest scores). Participants were also asked when they would seek professional help if they were distressed.

To assess the post incident support plan, we asked if personnel had been made aware of the staff support measures after the bombings and if so whether they knew how to access or use them.

The primary outcome was assessed by evaluating the difference in substantial stress/probable PTSD between those who were and those who were not exposed to the bombings. The association between various risk factors and probable PTSD caseness in those involved in the bombings was evaluated by the chi-squared test (or two-tailed Fisher's exact test) and the Student's *t*-test (or Mann–Whitney *U*-test) as appropriate for categorical or continuous data, respectively. Factors associated with awareness of and knowledge on how to access available support were also considered using these statistical tests. All analyses were performed using SPSS for Windows (version 12.0).

The study received ethical approval from the Institute of Psychiatry Research Ethics Committee.

Results

Of the 1050 people contacted, 341 returned completed questionnaires, giving a response rate of 32%. Response bias could not be fully assessed due to the anonymity of responses. For ethical and confidentiality reasons, the only factors that could be assessed were gender, which did not show any response bias (30% of potential participants and 36% of responders were females) and role, where a disproportionate number of central ambulance control (CAC) staff responded (CAC staff were twice as likely to respond compared to other LAS staff).

The main characteristics of the sample population stratified according to their involvement in the response to the bombings are shown in Table 1.

Fifty-six per cent of respondents were involved in the incident. Those involved were significantly younger (mean age 37 years versus 40, $P < 0.05$), less likely to be frontline operational staff [44%, 95% confidence interval (CI) 37–52 versus 62%, 95% CI 53–71] and more likely to be managers (21%, 95% CI 15–27 versus 7%, 95% CI 3–13) and CAC staff (24%, 95% CI 18–30 versus 3%, 95% CI 1–8) compared with those who were not involved.

Those involved were more than twice as likely to have been affected (moderately or more) on a day-to-day basis (13% versus 5%, $P < 0.05$) and twice as likely to talk to others (moderately or more) about the events than those uninvolved (31% versus 16%, $P < 0.01$). Those involved were more likely to have had past exposure to a major incident (58% versus 44%, $P < 0.05$). There were no significant differences in gender or duration of employment between involved and uninvolved workers.

Overall, 4% of the sample reported probable PTSD and 13% reported substantial stress (Table 2). Those involved with the response to the bombings were more likely to report probable PTSD (6% versus 1%, $P < 0.05$) and substantial stress (15% versus 9%), although the latter was not statistically significant.

Amongst those involved in the bombings, those with probable PTSD were more likely to have had a role on the disaster scene than those without probable PTSD (42% versus 15%; $\chi^2 = 5.70$, $P < 0.05$). The time of

Table 1. Demographics and risk factors in the total sample and comparison between those involved and not involved in the bombings

Variable	Total sample ($N = 341$)	Sample with complete data	7/7 present[a]		Significance test
Where response given	*n* (%)	*n* (%)	No, $n = 150$	Yes, $n = 191$	Chi-squared test
Gender					
Male	216 (64)	194 (65)	73 (68)	121 (64)	NS, $\chi^2 = 0.32$
Female	122 (36)	102 (35)	35 (32)	67 (36)	
Role					$P < 0.01$, $\chi^2 = 43.97$
Operational staff	165 (49)	149 (50)	66 (62)	83 (44)	
Management	51 (15)	46 (16)	7 (7)	39 (21)	
Control centre	60 (18)	48 (16)	3 (3)	45 (24)	
Support staff	26 (8)	21 (7)	14 (13)	7 (4)	
Other	33 (10)	33 (11)	16 (15)	17 (7)	
Daily effects					$P < 0.05$, $\chi^2 = 5.26$
None	182 (54)	156 (52)	66 (62)	90 (47)	
Little	124 (37)	111 (37)	35 (33)	76 (40)	
Moderate	20 (6)	17 (6)	3 (3)	14 (7)	
Quite a bit	12 (3)	12 (4)	1 (1)	11 (6)	
A lot	1 (0)	1 (0)	1 (1)	0 (0)	
Talked about events					$P < 0.01$, $\chi^2 = 21.37$
Not	85 (25)	71 (24)	41 (38)	30 (16)	
Little	171 (50)	152 (50)	50 (46)	102 (53)	
Moderately	62 (18)	56 (19)	13 (12)	43 (23)	
A lot	23 (7)	20 (7)	4 (4)	16 (8)	
When want help					NS, $\chi^2 = 10.92$
Within a day	104 (42)	90 (41)	39 (48)	51 (37)	
Within a week	59 (24)	53 (24)	14 (17)	39 (28)	
Within few months	40 (16)	37 (17)	10 (12)	27 (19)	
Never	46 (18)	41 (18)	19 (23)	22 (16)	
Previous trauma exposure					$P < 0.05$, $\chi^2 = 5.80$
Yes	177 (53)	157 (53)	46 (44)	111 (58)	
No	160 (47)	138 (47)	59 (56)	79 (42)	
Aware of support					$P < 0.01$, $\chi^2 = 16.71$
Yes	261 (79)	231 (80)	69 (67)	162 (87)	
No	70 (21)	58 (20)	34 (33)	24 (13)	
Knowledge of accessing help					$P < 0.01$, $\chi^2 = 9.76$
Yes	273 (82)	242 (83)	77 (73)	165 (88)	
No	61 (18)	51 (17)	28 (27)	23 (12)	
Age	341	Mean difference (SD) 2.8 (1.1), 95% CI = 0.6–5	Mean (SD) 40.2 (9.1)	Mean (SD) 37.1 (10)	t-test = 2.52, $P < 0.05$
Service duration	340	Median (IQR) 8 (10)	Median (IQR) 8 (12)	8 (10)	Mann–Whitney, $P = 0.38$

NS, not significant; IQR, interquartile range. Shading is used to divide the relevant questions into two categories.

[a]Total respondents for a certain question may be less than the number of questionnaires returned due to incomplete questionnaires.

arrival on scene, the severity of casualties that the participant dealt with, previous exposure to a major incident, age, gender, role and duration of employment were not associated with poorer psychological outcomes.

Looking specifically at the locations from which staff were working, 50% of all probable PTSD cases were accounted for by those who worked at a specific location—Location C (95% CI 25–75; $\chi^2 = 12$, $P < 0.01$).

Overall, the level of awareness of support measures in place and knowledge of how to access them was very high (~80%) and did not differ significantly between those with or without probable PTSD. Those involved were more likely to have been made aware of available support (87% versus 67%, $P < 0.01$) and know how to access this (88% versus 73%, $P < 0.01$) than those uninvolved.

Table 2. Psychological impact as related to involvement

Variable		Total sample, $N = 341$ (%)	Sample with complete data, n (%)	7/7 present		Significance test
				No	Yes	
PTSD caseness	Yes	14 (4)	13 (4)	1 (1)	12 (6)	Fisher's exact, $P < 0.05$
	No	327 (96)	286 (96)	107 (99)	179 (94)	
Substantial stress	Yes	42 (12)	39 (13)	10 (9)	29 (15)	Chi-squared, NS,
	No	299 (88)	260 (87)	98 (91)	162 (85)	$\chi^2 = 2.14$

NS, not significant.

More distressed personnel were less likely to report wanting assistance from a mental health professional in the first week after a potential future incident (40% versus 67%) but this was not statistically significant.

Discussion

Overall, 4% of study participants were identified as having probable PTSD with those involved in responding to the bombings reporting probable PTSD about seven times as often as those who were not. Those most affected psychologically were personnel working at the actual disaster scene and at one site in particular. Although 13% of the sample reported experiencing substantial stress, this was not associated with responding to the bombings. Generally, study respondents were aware of the support measures available and how to access them, especially if they had been involved in responding to the event. However, this did not appear to influence the rate of probable PTSD.

As with all cross-sectional studies, our results are only indicative of association and not causation [11]. The fair response rate makes it impossible to determine the exact prevalence of probable PTSD and may limit generalizability. Further, this low prevalence led to a potential under-powering of the study to detect some associations found in other studies e.g. previous trauma. The response rate also makes our results vulnerable to influence by selection and reporting bias.

Low response rates have been observed in similar studies [12,13]. Participation rates for epidemiological studies are declining [14] but reassuringly with little evidence for substantial bias due to non-participation [15].

Regional differences in the extent to which employees were encouraged, by managers, to return their questionnaires could have influenced responses.

We could not assess several potential confounders for operational reasons e.g. a prior or current history of other mental health disorders or social support. It can be assumed that those deemed fit for work were deployed on the day and were therefore psychologically well. It is possible that those in the control group may have been less likely to be deployed due to higher rates of mental illness. This would underestimate the true difference between the two groups.

Many of these limitations uniformly affect the majority of post disaster research, which is often opportunistic [16].

The rate of probable PTSD is of the same order of magnitude as other studies examining first responders in emergency services. Emergency staff reported PTSD prevalence rates between 10 and 17% and between 3 and 7 months after a major rail accident [17]. A study conducted after an aeroplane crash on disaster workers revealed significantly higher rates of PTSD at 13 months in exposed subjects [18]. Interestingly, some cross-sectional studies not related to specific incidents report higher rates of PTSD in ambulance staff (up to 21%) [7], although a different measuring tool was used and the high rate was attributed to background stressors, which were not considered in our study. The variation in prevalence rates among the exposed may reflect differences in the types of exposure [19], diagnostic criteria used to determine morbidity [20] and types of trauma, where going down in tunnels might have caused a threat to life and fear for their own safety [21]. Studies of emergency workers are hard to compare due to the variation in response rates and scope for response bias [22].

In our study, only 13% of LAS respondents reported substantial levels of stress while a similar study of Londoners after the 7 July 2005 bombings found that 31% reported substantial stress [23]. This difference may be due to a longer delay between the bombings and our study (2–4 months) compared with the London population study (11–13 days). For many exposed individuals, psychological symptoms abate over the course of several months or longer. For example, 1 month after the September 11th attacks, it was estimated that 7.5% of Manhattan residents would meet the criteria for PTSD, which dropped to only 1.7% at 4 months [24]. Our lower rate may also reflect a possibility that emergency service workers are likely to be among the more psychologically robust groups within society [22].

In our study, only three factors were associated with the presence of probable PTSD, all of which were operational, and one reflecting the demographic predictors

found in other studies [25]. Involvement in the LAS response to the London bombings and directly working at the disaster scene (with greater exposure to unpleasant stimuli including assisting the wounded), rather than more peripherally, increased the risk of probable PTSD. Given the main role of the LAS, it is important to note that dealing with casualties *per se* was not a specific association and it is possible that personnel perceived a threat to their life, which can predict PTSD after major trauma [26]. Workers at Location C (which had the highest number of fatalities and was a hazardous environment to work in [27]) accounted for half of all the probable cases of PTSD in this study.

Those who were more distressed perceived themselves to need less professional help suggesting they either recognized that distress did not necessitate immediate professional help, preferring, as is common in military personnel, to rely on informal sources of support [3], or had a fear of being stigmatized. In the US military personnel, those with a mental disorder were twice as likely as those without to report concern about possible stigmatization and other barriers to seeking mental health care [28]. Only one-quarter of those with severe symptoms after the September 11th attacks were obtaining treatment [29]. Concerns about confidentiality and career prospects can also deter staff from seeking help [30]. Knowing about the varied sources of possible support and how to access them was not associated with a better psychological outcome, suggesting possible stigma.

In conclusion, some 2–4 months after the 7th July bombings, LAS personnel reported a low prevalence of probable PTSD and psychological stress. While those directly involved in the organizational response to the event were more likely to show signs of distress and to meet criteria for probable PTSD, the absolute numbers of personnel affected were small in those who responded. The majority of staff were well informed as to how to access support should they have needed it.

Key points

- Overall, 4% of respondents reported probable post-traumatic stress disorder and 13% reported substantial distress; this is of the same order of magnitude as other studies examining first responders.
- Probable post-traumatic stress disorder was more common in those directly involved in the bombings, those working on the disaster scene, and one site in particular; the risk assessment process should take into account these factors during the post-incident support process.
- The majority were aware of support measures; however, this did not influence the incidence of probable post-traumatic stress disorder and the reasons for this should be investigated further.

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Conflicts of interest

None declared.

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