



Original Article

A Case Study of the Effects of Posttraumatic Stress Disorder on Operational Fire Service Personnel Within the Lancashire Fire and Rescue Service



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ABSTRACT

Background: Lancashire Fire and Rescue Service (LFRS), the subject of this evaluative research document employs 1400 people. 80% of employees are operational firefighters and officers whom operate across a range of duty systems and support functions, providing prevention, protection and emergency response to the communities of Lancashire.

Methods: The overarching purpose of this epidemiological study is to assess the prevalence of post-traumatic stress disorder (PTSD) amongst operational LFRS personnel and to analyse the effects upon those who may be suffering from it, whether brought about by a single traumatic event or by repeated exposure to traumatic occurrences over a period of time. A combination of primary and secondary research was carried out. Primary data was collated using two recognised clinical questionnaires and statistical analysis was conducted with the aid of the software package SPSS.

Results: The findings and statistical analysis showed that out of the 100 people surveyed, 30% of respondents had signs of probable distress. Of this quota, 4% showed symptoms of PTSD. The study considers how an organisation can recognise and manage PTSD and provides recommendations to assist in better recognising and managing the associated risks.

Conclusion: Based upon the findings, the authors conclude that the level of PTSD within LFRS is slightly lower than those found in other studies undertaken within the Fire and Rescue Service sector. The paper provides recommendations for future studies and a series of actions for consideration by LFRS senior management to improve PTSD support services for employees.

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1. Introduction

1.1. Background

Fire and Rescue Service operational personnel are often exposed to highly pressured, dynamic, and rapidly evolving situations. The work can be extremely demanding, both physically and psychologically [2]. During their careers, most personnel will, at some point, be subjected to particularly traumatic and often tragic events [3], and evidence suggests that most firefighters' mortality and morbidity are related either directly or indirectly to the stressful nature of their work [4].

A study undertaken by Dahlan et al [5] reported that past traumatic incidents were the highest ranked source of stress

among UK firefighters. For the purpose of this article, the definition of a traumatic event (or incident) is taken to be “an event that involves actual or threatened death or serious injury; a threat to the physical health of self or others in which the person felt frightened, horrified, and helpless” [6].

Some earlier studies argue that firefighters are at increased risk of developing a variety of psychological, social, and physical reactions [7–12], one of which is the condition known as post-traumatic stress disorder (PTSD). According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; American Psychiatric Association) [13], the essential feature of PTSD is the development of characteristic symptoms after exposure to an extremely traumatic event or a stressor, which may manifest in feelings of arousal, intrusion, and avoidance. Linked to this trauma exposure a number of other

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common health sequelae, such as alcohol and drug abuse, depression, anxiety, and suicide [5,14], are frequently documented

Few empirical studies have systematically examined the cause and effect of work stresses affecting firefighters [5]. However, a number of authors have studied the prevalence rates of PTSD among firefighters and reported wide variances, from 6.5% [15] to 37% [16], but the sample size, profile, and measures used differed from one report to another [3].

Baker and Williams [17] also determined that individuals in different ranks reported differing levels of both organizational and operational stress (with those at “Leading Firefighter”, now known as the “Crew Manager” role, reporting the highest levels). Significantly, they also identified that those persons reporting higher levels of psychological distress also reported lower levels of confidence. This then raises the question of a potential link to fireground competency and safety.

Within Lancashire Fire and Rescue Service (LFRS) and neighboring counties, anecdotal evidence suggests that psychological impacts are acknowledged and receive attention through services such as occupational health; however, conditions such as PTSD tend to remain low profile, with minimal visibility and little or no education or awareness being raised among staff. This is a very different situation to the United States where a recent article published in the NFPA Journal [14], entitled “Trouble in Mind”, highlighted a growing problem of firefighter suicides (c.360 from 2000 to 2013; with a notable increase, more recently, of sixty in both 2012 and 2013). The more worrying aspect, however, is that the information used within the article is based solely on voluntary submissions, and therefore, the actual numbers could be significantly higher. Wilmoth [18] agrees with this standpoint, citing a stigma that makes it difficult for emergency responders to admit to behavioral issues linked to PTSD.

The view that firefighters are “rough and tough and can take on anything that the world can dish out” [19] is a common theme across the evidence base used in the preparation of this article. Haslam and Mallon [15] recognized this situation, explaining that the culture is one of nonadmission, whereas Baker and Williams [17] explain the culture as being one of stoicism and self-discipline, in which the very armor that firefighters use to protect themselves mentally could also be the blocker to maintaining their own mental health. Haslam and Mallon [15] concluded that many respondents felt unable to seek support within the workplace because of the macho image associated with the job; this is a position that is commonly inferred in many case studies [20–22].

Of equal significance are the organizational impacts that may arise as a result of PTSD cases, such as depression, anxiety, and substance abuse to name a few, going undiagnosed or misdiagnosed [6]. All these can result in extended periods of staff absence, increased health and safety risks, resignations, dismissals, or claims against employers [23].

This study aims to outline the effects that traumatic events may have on an individual, determine the various factors, which may result in symptoms being exhibited, and specifically consider the prevalence of PTSD within LFRS. It will provide evidence of how the FRS sector locally, nationally, and internationally is prepared to deal with such effects on their staff and assesses the adequacy of the services provided.

To achieve this, the study will focus on the published work on PTSD to provide appropriate definitions and determine signs and symptoms. These may present after traumatic short-term exposure or after repeated exposure to lower level incidents over more prolonged periods [24]. It will consider causal factors and investigate variables, which may or may not result in an individual developing PTSD.

1.2. Study significance

This study investigates the prevalence of PTSD among the operational LFRS personnel. Its significance lies in the insights it offers to the public sector organizations and its management in which their employees deal with traumatic and life-threatening events with the potential health risks of PTSD. The management structure of these organizations need to be aware of the range of the health conditions that might manifest as a result of exposure to these extreme traumatic events and as a result must be able to put into place programs of rehabilitation when necessary.

1.3. The problem

PTSD is defined by the National Institute for Health and Care Excellence [25] as “a disorder that develops in response to a stressful event or situation of exceptionally threatening or catastrophic nature (e.g., assault, road accident, disaster, or rape)”. It is the term used by psychiatrists to describe reactions that clinically cause significant impairment or distress within the functioning of people [6].

PTSD is clinically diagnosed by meeting the criteria in the DSM-V [26]. According to the DSM-V, the diagnosis of PTSD requires exposure to an event that involved or threatened death, violence, or serious injury. It may be firsthand (primary exposure) but can also result from a third party trauma and the human desire to want to help another, known as secondary stress. Table 1 shows PTSD exposure sources and symptoms.

For a diagnosis to be made, these symptoms need to be impacting significantly on an individual’s ability to function with a level of normality [26] for a period longer than 1 month [6]. The characteristics have been recognized in previous studies [28] as frequently manifesting in symptoms of reexperiencing, avoidance, and arousal.

1.4. Study area

Lancashire is a coastal county, bordered to the north by Cumbria, to the south by Merseyside, and to the east by North and West Yorkshire and the metropolitan county of Greater Manchester. It comprises 14 local authority areas, covering 1,189 square miles and has an estimated population of c. 1.5 million people [29]. This study will be conducted with data gathered from a cross section of 1,100 LFRS operational staff who operate countywide from 41 locations on a variety of shift systems see Table 2:

The shift system worked at each location is depicted within the map shown below in Fig 1:

The study compares the prevalence of PTSD levels within the LFRS sample of 150 people against the quoted lifetime prevalence levels of c.10.4% for women and 5% for men [6] (the variance between genders is thought to be due to exposure to different types of events and different ways of coping).

1.5. Study purpose

1.5.1. Aims

- To determine the extent of the prevalence of PTSD among operational personnel from LFRS.
- To investigate a range of variables that may affect the development of PTSD.
- To make recommendations to the LFRS that aims to mitigate threats derived from PTSD among firefighters.

Table 1
PTSD exposure sources and symptoms—World Health Organization and DSM-V

Source of exposure	Short-term symptoms (1 or more of the following)	Longer term symptoms (>1 month)
Experiencing or witnessing, in person, a traumatic event.	Suffering from distressing images and memories (reliving).	Avoidance of similar situations.
	Suffering nightmares about the event.	Being unable to recall parts of the event.
Learning that someone close experienced or was threatened by the traumatic event.	Suffering flashbacks involving reenactment of the event.	Feeling negativity toward self, others, and the world.
	Suffering emotional distress or physical anxiety symptoms if encountering a trigger of the traumatic event.	Feeling detached from family and friends and losing interest in activities previously enjoyed.
Being repeatedly exposed to graphic details of traumatic events.		Having an inability to show feelings.
		Irritability and anger.
		Dangerous or self-destructive behavior.
		Hypervigilance.
		Problems with concentration and/or sleep.

DSM-V, Diagnostic and Statistical Manual of Mental Disorders; PTSD, posttraumatic stress disorder.

Source: [26,27].

Table 2
LFRS shift systems

Whole time	Full-time staff working in a rotational shift system of 2 days, 2 nights, and 4 rest days.
Day crewed	Operate as full-time staff during the 3 day shifts of their duty period and respond from home (on a 5 minute response to station) on the same 3 evenings, followed by 3 rest days and repeated. Two opposing groups of staff rotate.
Day crewing plus	Work a self-rostered system responding from station during the day and from purpose-built accommodation on the station curtilage from early evening through the night.
Retained duty system	Respond from home or their primary employer's, to provide an operational response function.

LFRS, Lancashire Fire and Rescue Service.

1.5.2. Objectives

- To gain an understanding of the variations of PTSD among staff from LFRS and the effect of different contributory factors.
- To use a variety of statistical techniques to present and analyze the variations.
- To use a range of different modeling techniques to explore the significance of a number of variables.

2. Materials and methods

2.1. Literature review

This literature review explores existing literature on the topic of PTSD and the factors that may lead to its development. The findings of this review shape the remainder of this case study and enable conclusions to be considered alongside the findings of previous studies.

2.1.1. Child involvement

In traumatic events faced by firefighters, a common theme was the involvement of children in incidents. Clohessy and Ehlers [24] identified that such incidents were often perceived as the most stressful and frequently lead to intrusive memories. Boxer and Wild [30], Baker and Williams [17], and Haslam and Mallon [15]

identified that reports of children being involved/killed were the highest ranked stressors. Haslam and Mallon [15] cited more than 50% of respondents as being emotionally upset when reminded of the incident, with 33% having upsetting thoughts or images and 25% with sleep-related problems. Commonly cited reasons were that “it was a waste of a life” or that “familiarity” was a feature (i.e., the firefighter having children of his/her own). The second most traumatic aspect was purely the witnessing of gore, death, or a human undergoing severe pain and suffering [15]. Frequently respondents in such studies refer to thoughts of “I should have done more” and feelings of guilt and helplessness [28].

2.1.2. Coping strategies

No one knows in advance how they will react to a particular stressful event, [6] but crisis theory states that when a stressful event takes place, balancing factors can be implemented which can help one regain a sense of equilibrium [31].

Moran and Colless [32] suggest that coping is the most significant variable in being able to predict an individual's psychological well-being. However, wider factors such as what was happening in a person's life before the event (family difficulties, bereavements etc.) may also play a part in their ability to cope [6]. Equally, it is acknowledged that events which may cause emotional upset to one person may not have the same impact on others and that people will adapt in different ways to their environment [5].

Moran and Britton [33] found that their sample of emergency workers was in fact “no harder than most nor did they possess any particular coping styles”. In fact, their research supported the earlier findings of Kessler et al [34] whose study found little evidence to support intervention types that aim to aid coping efforts to master, tolerate, or reduce demands of fire service stress.

Moran [35] surmised that firefighters frequently describe their approach to emergency work as being a case of having a job to do and simply getting on with it. Various writers have referred to this phenomenon as “the employing of a professional armor” [17] or “the trauma membrane” [36].

Lou [37] suggested that coping behaviors are key factors in the link between managing stress and levels of job satisfaction achieved by individuals. This study provided evidence to support the somewhat logical rationale that a firefighter who can manage his/her stressors is likely to be happier in his work. Dahlan et al [5] drew a similar conclusion that a firefighter's ability to cope is actually more important and relevant to their effectiveness than their levels of personal motivation.

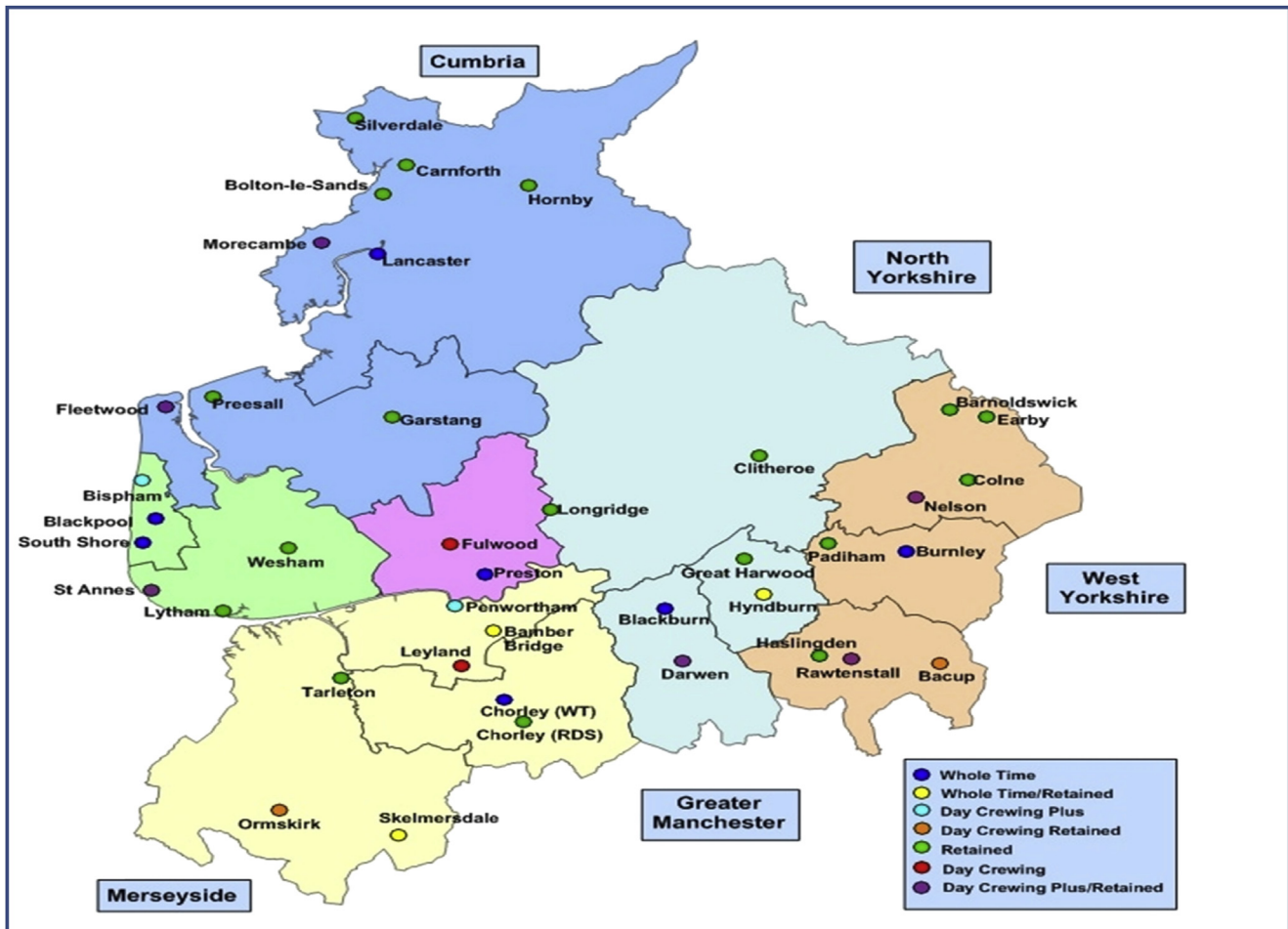


Fig. 1. LFRS locations and duty systems. LFRS, Lancashire Fire and Rescue Service.

2.1.3. Informal social support

A number of studies have been undertaken to consider the importance of informal social support (i.e., postincident discussions and debriefing) within the FRS context. Fullerton et al [9] suggested that the use of humor can increase social support and relieve stress [38,39]. In effect, it acts as a safety valve to release tension. This is a situation that occurs frequently in most fire stations around the country and indeed overseas in developed countries such as Canada [40].

Interestingly however, while concluding that high levels of social support may ostensibly buffer firefighters from PTSD, Haslam and Mallon [15] identified that in most cases, the respondents relied on their partners to be their listener and relief mechanism. This offers a contrary opinion to the personal view of Meroney [21] who indicated that the stress of the job and associated traumatic effects were somewhat normalized and effects were never discussed at home.

Mitani et al [41] and Prag [42] postulate that social support improves the ability to manage stress and is effective in reducing burnout. It also reduces PTSD symptoms of fire service workers [42]. Boscarino et al [43] and Jonsson and Segesten [44] both support this view.

Conversely, Harris et al [45] consider that seeking treatment for personal mental health issues within the context of coworkers and the workplace, generally, may not be the most conducive way to achieve results, and Dahlan et al [5] found during their study that

the fostering of positive attitudes was actually the key contributing factor to their participants' health and well-being. This indicates that there is no firm conclusion as to what is the most useful way to support staff after traumatic incidents happen, and further investigations would be useful.

2.1.4. Common physiological responses

Haslam and Mallon [15] found that PTSD symptoms frequently manifested (33%) in the form of trouble sleeping, bad dreams, and reoccurring nightmares. Interestingly, almost double (65%) shared feelings of rumination, that is, they worried about, or visualized, the same event happening to themselves or members of their family ([15]). In the same study, 33% of respondents experienced, or had thoughts of, avoidance (e.g., taking a detour from a particular route to not pass a location or avoid a particular type of activity or smell which may remind them of the event). Such visual stimuli/smells are characteristic of PTSD [15,46].

While Joseph et al [47] and Ingledew and Cooper [48] determined that those exhibiting avoidance behaviors are more likely to be suffering greater psychological distress, Raphael et al [8] explained that avoidance was more likely to be a defense mechanism. Substance abuse and addictive behaviors such as eating, smoking, pornography, extreme exercising, shopping, gambling, and sex/love addiction are other functions commonly cited as being indicative of PTSD [9,14,19,24].

2.1.5. Age, length of service, and exposure

This factor has two clear viewpoints. The first is that the age and length of service are both protecting mechanisms. Mitani et al [41] reason that fire service workers with a long work history exhibit lower job stressors because they have learned skills that enable them to cope; essentially, they desensitize. They also considered that years of service moderate various job-related stressors which is similar to a view shared by Hytten and Hasle [49] that “seasoned emergency workers possess more effective cognitive and behavioral coping strategies”.

Conversely, there are counter arguments; Corneil [50] reported a positive relationship between years of service and PTSD, while Baker and Williams [17] also found it unsurprising that junior officers (who experienced and responded first to the majority of incidents) reported higher incident-related stress levels.

Moran and Britton [33] found that length of service as a volunteer firefighter was positively associated with both severity and chronicity of psychological reaction, citing possible reasons as less preparatory training or frequency of exposure when compared with the whole-time counterparts.

Contrarily, Beaton et al [12] found no evidence of “seasoning” in their study, nor did they find a correlation between years of service and PTSD.

2.1.6. Selection

Mitchell and Bray [51] posited that selection acts as a factor on PTSD vulnerability, and more attention needs to be paid when selecting new entrants. They shared a view that firefighters are undoubtedly a self-selected occupational group and, therefore, may not be representative of the general population in terms of personalities or coping strategies. Harris and Stacks [52] cite data from the Federal Emergency Management Agency survey that suggests that firefighters are overall a healthy group in terms of predisposition to mental health issues.

2.1.7. Alcohol and substance abuse

The World Health Organization [53] defines substance abuse as the harmful or hazardous use of psychoactive substances including alcohol and illicit drugs. Substance abuse may be regarded as just one of many forms of addiction (highlighted earlier).

Boxer and Wild [30] examined whether a link existed between psychological distress and alcohol use among firefighters. On considering the various stressors used in the self-report instruments, they found that, of the 145 participants, between 33% and 41% showed evidence of significant psychological distress, and of these, 29% had possible or probable problems with alcohol use. This compared to a US adult norm of around 13%. However, when logistic regression analysis was undertaken, no link was established between alcohol use and the 10 most highly ranked work stressors:

- Hearing that children are in a burning building
- Being concerned about possible exposure to unknown toxic substances
- Being concerned about exposure to AIDS, hepatitis, tuberculosis, etc.
- Believing that reverse prejudice exists toward nonminority groups
- Being disturbed by tone or intensity of bells
- Feeling responsible for other peoples' lives
- Feeling a lack of support from the local government
- Feeling that the public has the wrong idea of what firefighting work involves
- Feeling that there is insufficient manpower to deal with the workload

- Feeling overutilized for emergency medical service runs for nonemergency purposes.

This study failed to examine any further, whether the cumulative effect of repeated exposure could form the underlying reason for the higher levels of alcohol use among firefighters.

By comparison, the National Volunteer Fire Council [19] in the United States undertook a study and, while not directly diagnosing alcoholism among participants, did highlight that 42.5% (male) and 60% (female) respondents had engaged in binge-drinking activities in the previous 30 days. This formed a call for vigilance within the sector.

Boxer and Wild [30] cited a phenomenon known as the “healthy worker effect” that postures that among firefighters, healthier staff enter the workforce and remain employed whereas less healthy personnel may be derepresented either due to sickness or leaving the service, therefore presenting a form of selection bias. In essence, one could then postulate that the real levels of substance abuse may be considerably higher and that the same phenomenon may be applicable to PTSD too.

2.1.8. Formal debriefing/mental health professionals

A “critical incident” can be described as being exposed to personal loss or injury, traumatic stimuli, mission failure, or human error [45]. Such experiences have previously been reported to be capable of overwhelming a firefighter’s normal ability to cope [51,54].

Critical incident stress management originated in the United States in the 1980s as a peer support intervention for emergency service workers [6]. One component part of critical incident stress management was Critical Incident Stress Debriefing [54], also commonly referred to as psychological debriefing [55] or critical incident debriefing (CID) [6].

CID is a peer counseling group procedure with psychoeducational aspects which aims to deliver information on stress reactions after exposure to critical incident(s) [54]. Ideally, the CID is held between 72 hours and 14 days after incident [6] and aims to prevent psychological damage [56].

The concept is generally credited to the work of Jeffrey Mitchell [54] and thereafter Mitchell and Everly [57] and is led by one mental health professional, supported by trained sector peers [57]. The seven-step approach [6,57] aims to teach the recipients about their stress reaction:

- Facts
- Thoughts
- Reactions
- Normalization
- Future planning
- Coping
- Disengagement

It also aims to enable individuals and groups to have their needs assessed and receive practical support to reduce psychological distress post exposure [58]. CID aims to promote and facilitate recovery and develop/enhance natural resilience [6].

Sessions last for 1.5–3 hours and start with materials that the participants are more comfortable discussing before entering into more emotionally intense dialogs. The session is brought to a close with psychoeducational input.

While in widespread use, CID has its critics. Harris et al [45] refer to the rapid increase in the provision of CID services among operational and nonoperational personnel but point out that there is little empirical evidence of the effectiveness of CID, a point also made by Rose et al [58]. Harris et al [45] report a number of studies [59–61] that have made assumptions based on relatively

small sample sizes and posture a hypothesis that CID has no effect on PTSD. Similarly, Rose et al [58] cite other such reports [62–64]. These quote variables significantly affect the outcomes, examples being a lack of clarity on which disorders CID is intended to improve; a lack of evidence on the level of disorders which requires large-scale interventions; and a lack of evidence that correlates intervention with outcomes [62–64].

Rose et al [58] noted that the timing of such a debrief also has relevance because the prevalence of initial distress is much higher than that of PTSD, and therefore, owing to the short timescales involved in delivery, the potential exists that interventions (involving confronting distressing experiences) may be delivered needlessly to participants whose short-term symptoms may otherwise rapidly subside. They expressed a view that the use of single-session debriefing “cannot be recommended in either military or civilian life” and that CID did not prevent the onset of PTSD nor did it reduce any psychological distress, morbidity, depression, or anxiety, instead suggesting that it may increase the risk of PTSD and depression. Their recommendation was an endorsement of the National Institute for Health and Care Excellence (2005) approach of “screen and treat”.

Hytten and Hasle [49] found that there was no difference between those formally debriefed and those who received social support by chatting to colleagues.

Regel and Joseph [6] refute the critics of CID on the basis that only two studies may have had any such relevance, and in both cases, the participants were not of the groups that the interventions were intended for (i.e., one was a fire casualty and one from a road traffic collision). They also refer to flaws in methodologies used for those studies. They instead argue that a number of studies exist which do demonstrate positive outcomes from CID.

2.1.9. Recovery

Regel and Joseph [6] explained a concept of how individuals sometimes deal with their exposure to traumatic events. They likened it to a “hurriedly and poorly packed bag that when banged against something could burst open”, resulting in the psychological effects associated with PTSD. As recognized leading writers in this field, Regel and Joseph [6] explain that persons can “unpack and repack the bag in several ways” to make it better and produce a situation where one can “look into the bag” without any undue distress:

- Using numbness—a remoteness approach whereby only limited and gradual feelings are encountered;
- Reconsidering—try to make sense of what happened and rationalize it;
- Receiving physical and emotional support from others—benefits from informal social support;
- Monitoring own behavior/avoidance behaviors—confronting a situation but at a scale and speed that are not detrimental;
- Taking time out to process thoughts fully and avoid “packing the bag too hastily”;
- Physical exercise—to maintain psychological well-being;
- Effecting an early return to normal routines and considering new interests—although not so as to distract or prevent healing.

This literature review has examined the concept of PTSD and the various factors that may lead to the condition arising. It has also offered detail on why some people appear to be more at risk of succumbing to PTSD than others and why some are able to cope more effectively in the aftermath of a traumatic event.

Importantly, this review has also provided insight into protective factors, support mechanisms, and the arguments that continue to exist on the benefits and limitations of each.

The areas discussed within this literature review will be considered further in the context of an in-depth analysis into the potential prevalence of PTSD among LFRS staff. It allows for an academic approach to be adopted and enables a comprehensive study into the risk posed to LFRS and the suitability of current arrangements that are in place to manage PTSD risk.

2.2. Methodology

2.2.1. Introduction

The first step was to conduct secondary research on PTSD which was carried out through the university search engine known as Scopus and through various internationally based organizations, such as the World Health Organization, etc. This was to collect various standpoints, opinions, and hypotheses that could be explored.

A level of knowledge and understanding was then reached by the researcher whereby opinions and perspectives could be discussed and either substantiated or rebuffed by virtue of the case studies, reports, and texts that were available. This enabled the researcher to remain objective throughout the study to differentiate fact from supposition or opinion.

The next stage was to conduct quantitative research in the form of questionnaires to establish the prevalence of PTSD within LFRS. Kienzler and Pedersen [65] advise that almost every trauma-related study should include some measures of PTSD symptoms to provide information about how respondents view their symptoms in a context that is not influenced by direct interaction with an interviewer.

It should be noted that although a number of different measures of PTSD exist, no single measure can definitely determine whether or not an individual has PTSD; instead, multiple measures should be administered [66]. Therefore, the adopted methodology was to settle on the use of two recognized clinical questionnaires. Solomon et al [66] stated that with the help of self-report instruments, response accuracy may be increased, especially for those informants who are reluctant to reveal their experiences to another person directly.

While a number of historic USA-derived screening tools were available, the development of culturally sensitive psychological tests and symptom checklists for assessing anxiety and depression is promoted [67]. These include among others the Impact of Event Scale—Revised, the General Health Questionnaire-28 (GHQ-28), the Harvard Trauma Questionnaire, the Hopkins Symptom Checklist-25, and the Posttraumatic Stress Disorder Symptom Scale (PSS). Accordingly, the GHQ-28 and PSS questionnaires were subsequently selected.

2.2.2. General Health Questionnaire

The GHQ-28 [68] is used to indicate psychological well-being and detect possible cases of psychiatric disorders (psychiatric morbidity) [69]. The reason for using this questionnaire was to identify aspects of poor physical health [70] and problems in intimate and family relationships [71] which are frequently associated with PTSD.

The GHQ-28 is commonly used as a community-screening tool and for the detection of nonspecific psychiatric disorders among individuals in primary care settings [65]. It is a self-report instrument comprising four subscales measuring somatic symptoms (physical rather than psychological), anxiety/insomnia, social dysfunction, and severe depression. It has been recommended in previous studies for screening trauma victims [8], and although developed in the United Kingdom, it has been widely employed in other countries (translated into c.38 languages and >50 validity studies completed) [68].

A number of different scoring systems can be applied, but for the purposes of this study, the preferred Likert scale was applied (0-1-2-3) [72] to the descriptive answers. This produces a maximum score of 84 across the 28 questions.

2.2.3. Posttraumatic Stress Disorder Symptom Scale

The PSS consists of two pages; the first is essentially a set of “qualifying questions” which lists a set of traumatic events or situations. Page 2 details 17 further questions that diagnose PTSD according to DSM criteria and assess the severity of PTSD symptoms. Questions are grouped around “reexperiencing” (5 questions), “avoidance” (7 questions), and “arousal” (5 questions). Under DSM, PTSD is diagnosed if at least one reexperiencing, three avoidance, and two arousal symptoms are revealed (at a rating of 2 or 3). The exposure had to have taken place more than one month before. As per the GHQ, these questions are answered using the Likert scale with the maximum score across the 17 questions being 51, representing the total severity score [1]. This allows the PSS to be used as either a categorical or dimensional measure. Where this questionnaire differs from the GHQ-28 is in the scoring descriptors of “0 = Not at all”, “1 = Once per week or less/A little bit/Once in a while”, “2 = 2–4 times per week/Somewhat/Half the time”, “3 = 3–5 or more times per week/Very much/Almost Always”; these were altered to reflect the same scoring descriptors used within the GHQ-28. This was to make interpretation and analysis of the results more consistent.

Although the application of the PSS for emergency service workers has been limited in other studies, it is frequently referred to as being used for circumstances such as rape victims; for this reason access to psychometric data for such samples was also very limited; nonetheless, the questionnaire draws some correlations with aspects considered under the GHQ-28. A modified version of this scale exists which includes both frequency and intensity ratings. This allows assessment of symptoms related to multiple traumatic events [66], and perhaps, this assessment type could also be a useful alternative to the PSS.

2.3. Collection of data

Operational staff were approached during the late 2014 and early 2015 and asked to provide consent to participate. Stations, watches, or groups who offered willingness to participate were then sent copies of the consent form, GHQ-28 and PSS for completion privately and confidentially. To ensure anonymity, completed questionnaires were return mailed in a self-addressed envelope to the authors. From this point, the completed returns were kept securely stored and not shared with third parties.

The aim was to collect 150 responses representing 13.5% of the operational workforce; 100 responses were returned. This number is lower than expected, possibly due to unwillingness to assist in the study because of ongoing industrial action over pension changes within the UK FRS.

Responses came from a cross section of the operational staff; however, it should be noted that LFRS, in common with most other UK FRS, remains a predominantly male environment (c.96%), but no specific reference was made to gender, ethnicity, or age; therefore, these factors will be outside of the scope of this study.

2.4. Analysis of data

Once the data were collated, statistical analysis using a combination of thematic and graphical analysis was then completed. In addition, appropriate for our case study was to use descriptive and summary statistics such as the mean and standard deviation to indicate what the average numbers and variations for different phenomena were, so as to determine if relationships existed.

On completion of the analysis, the findings were then compared with observations from other literature sources to determine how our results fitted with their findings. The outcomes of this analysis are discussed in the remainder of this article along with the conclusions that were drawn.

3. Results and discussion

3.1. General Health Questionnaire

Within the range of 0–84, a score of 23 or 24 is deemed to be the threshold for the presence of distress [73]. For this study, a total score of 23 or above has been taken as being the baseline. Of the 100 persons sampled, 30 individuals showed probable signs for the presence of distress (30%). The GHQ results are divided into four sections based on the subject headings within the questionnaire:

- A. Somatic Symptoms
- B. Anxiety/Insomnia
- C. Social Dysfunction
- D. Severe Depression

The results collected have provided ordinal data that produce greater opportunities for analysis because it not only classifies subjects but also ranks them in terms of the degree to which a characteristic is present [74]. Table 3 shows the results of the respective surveys and the analysis following it. Generally, categories 0 and 1 are positive responses i.e., no real change from before, and categories 2 and 3 are negative response i.e., a bigger change than normal.

Within Section A (Somatic Symptoms), the first four questions tend toward psychological symptoms whereas the other three relate more toward physical symptoms. The questions which provoked the most negative responses were A1, A2, and A3 with question A3 “Feeling run down and out of sorts” and A2 “Been feeling in need of a good tonic” presenting the highest negative responses (26%). Question A5 “Been getting any pains in your head” and A7 “Been having hot or cold spells” received answers of a “0” or “1” (90%) which for the purpose of this survey have been classed as positive responses. In summary, Section A showed that there is a prevalence of more psychological symptoms than physical, and these represent a situation that is worse than the norm.

Within Section B (Anxiety/Insomnia), the first two questions relate to insomnia and the remainder to anxiety. Question B2 “Had difficulty in staying asleep once you are off” had the highest proportion of negative responses (36%) followed by B3 “Felt constantly under strain” and B4 “Been getting edgy and bad-tempered,” both scoring 26%. It is worth noting that B3 scored the highest number of the most negative response “Much more than usual” (10%).

Section C (Social Dysfunction) is a measure of the impact of PTSD on an individual’s ability to conduct normal social interactions. For all questions, most responses were positive with respondents either “Better than usual” or “Same as usual” (responses ranging from 82% to 98%). In summary, most responses were of a positive nature when compared with the other sections of the GHQ-28.

Most questions within Section D (Severe Depression) scored a “0” or “1”. Owing to the serious nature of the questions, this is expected. The question with the most notable response was D1, “Been thinking of yourself as a worthless person,” with 30% of respondents scoring a “2” or “3,” which being a significantly higher negative response than normal.

It was also notable that the number of respondents to D6 “Found yourself wishing you were dead and away from it all” had no negative responses, whereas D7 “Found that the idea of taking your own life kept coming into your mind” had two negative responses

Table 3
Responses to the General Health Questionnaire (GHQ-28)

Question number	Question	Response category			
		0	1	2	3
A1	Been feeling perfectly well & good health?	12	66	22	0
A2	Been feeling in need of a good tonic?	36	38	24	2
A3	Been feeling run down and out of sorts?	38	36	26	0
A4	Felt that you were ill?	54	30	14	2
A5	Been getting any pains in your head?	68	22	10	0
A6	Been getting a feeling of tightness or pressure in your head?	78	10	10	2
A7	Been having hot or cold spells?	70	20	8	2
B1	Lost much sleep over worry?	28	54	16	2
B2	Had difficulty in staying asleep once you are off?	32	32	28	8
B3	Felt constantly under strain?	38	36	16	10
B4	Been getting edgy and bad-tempered?	42	32	24	2
B5	Been getting scared or panicky for no good reason?	72	22	16	0
B6	Found everything getting on top of you?	48	34	14	4
B7	Been feeling nervous and strung up all the time?	60	28	10	2
C1	Been managing to keep yourself busy and occupied?	16	82	2	0
C2	Been taking longer over the things you do?	6	76	18	0
C3	Felt on the whole you are doing things well?	6	82	12	0
C4	Been satisfied with the way you've carried out your tasks?	8	80	8	4
C5	Felt that you are playing a useful part in things?	16	68	16	0
C6	Felt capable of making decisions about things?	6	76	18	0
C7	Been able to enjoy your normal day-to-day activities?	6	76	18	0
D1	Been thinking of yourself as a worthless person?	10	60	28	2
D2	Felt that life is entirely hopeless?	72	22	6	0
D3	Felt that life isn't worth living?	76	20	4	0
D4	Thought of the possibility that you might make away with yourself?	84	12	4	0
D5	Found at times you couldn't do anything because your nerves were too bad?	90	4	6	0
D6	Found yourself wishing you were dead and away from it all?	84	16	0	0
D7	Found that the idea of taking your life kept coming into your mind.	82	16	2	0

(termed as “Has crossed my mind”). In summary, the vast majority of responses within this section were of positive nature.

3.2. Posttraumatic Stress Disorder Symptom Scale

Given that the responding group was operational fire service personnel, it was expected that many would answer positively to having experienced or witnessed the “qualifying” situations listed on page 1 of the questionnaire, and indeed, this was so in 100% of occasions.

As previously discussed, the PSS questionnaire's questions can be divided into three sections: reexperiencing, arousal, and avoidance. Table 4 shows the results and analysis of the following categories.

0 Not at all

1 Once per week or less/a little bit/once in a while

2 2–4 times a week/somewhat/half the time

3 3–5 or more times a week/very much/almost always

The first five questions summarize the questions relating to reexperiencing from the PSS. Most respondents scored 0, “Not at all” for most questions, with approximately 7% of the sample scoring 2–3 relating to “Rather more than usual” and “Much more than usual”.

For the avoidance questions 6–12, most respondents scored 0, “Not at all”. Approximately 7% of the sample scored 2–3 relating to “Rather more than usual” and “Much more than usual”. This was similar to that seen for the reexperiencing questions.

The arousal questions 13–17 saw the highest number of respondents scoring 2–3 “Rather more than usual” and “Much more than usual” compared with the other sections with approximately 13% of the sample.

For the final part on the questionnaire, the results are given in Table 5.

To summarize, arousal saw the largest variation in responses with more respondents scoring “2” “Rather more than usual” or “3” “Much more than usual” than in the other sections. Reexperiencing saw the least variation with most respondents scoring “0” “Not at all”. These results will be discussed further in the following sections.

The analysis has been divided into two sections, first the GHQ-28 and then the PSS.

3.3. General Health Questionnaire

From looking at the results of the GHQ-28, it was decided to divide the findings into three sections corresponding to physical symptoms, positive emotions, and negative emotions. This was to determine how the most significant symptoms manifest in the most significant emotions. The categories are shown in Table 6 below:

To determine the most significant variables, the average number of negative responses from the GHQ-28 has been calculated by adding together those responses that scored ≥ 2 . Standard deviation was then applied to determine which variables were significant. The results are shown in the Table 7.

Any variables that were higher than one standard deviation above the average were considered a warning sign and therefore

Table 4
Responses to the Posttraumatic Stress Disorder Symptom Scale (PSS) questionnaire

Question number	Question	Response category			
		0	1	2	3
1.	Having upsetting images about the traumatic event that comes into your head when you did not want them	70	22	8	0
2.	Having bad dreams or nightmares about the traumatic event	70	22	8	0
3.	Reliving the traumatic event (acting as if it was happening again)	74	24	2	0
4.	Feeling emotionally upset when reminded of the traumatic event	84	12	4	0
5.	Experiencing physical reactions when reminded of the traumatic event (sweating and increased heart rate)	58	30	10	2
6.	Trying not to think or talk about the traumatic event	78	20	0	2
7.	Trying to avoid activities or people that remind you of the traumatic event?	76	10	10	4
8.	Not being able to remember an important part of the traumatic event?	74	16	6	4
9.	Having much less interest or participating much less often in important activities?	86	8	2	4
10.	Feeling distant or cut off from the people around you	82	12	6	0
11.	Feeling emotionally numb (unable to cry or have loving feelings)?	72	20	6	2
12.	Feeling as if your future hopes or plans will not come true	82	14	2	2
13.	Having trouble falling or staying asleep	72	18	10	0
14.	Feeling irritable or having fits of anger	44	32	16	8
15.	Having trouble concentrating?	62	24	12	2
16.	Being overly alert?	46	40	8	6
17.	Being jumpy or easily startled?	80	18	0	2

Table 5
Positive responses for “Have any of the above problems interfered with the following?”

Work	34	Family relationship	32
Household duties	24	Sex life	14
Friendships	26	General life satisfaction	30
Fun/leisure activities	22	Overall functioning	24
Schoolwork	4		

Table 6
Categories applied to GHQ-28 questionnaire results

Categories	Section of GHQ-28 questionnaire
Physical symptoms	Somatic Symptoms Anxiety and Insomnia
Positive emotions	Social Dysfunction
Negative emotions	Severe Depression

GHQ, General Health Questionnaire.

Table 7
Application of standard deviation to GHQ-28 results

Statistical Data	Physical symptoms	Positive emotions	Negative emotions
Average number of negative responses	19.57	13.71	7.42
Standard deviation	7.69	5.82	10.17
Significant scores >	27.26	19.53	17.6

GHQ, General Health Questionnaire.

significant. For sections A and B (symptoms), this affected the following one variable B2, “Had difficulty in staying asleep once you are asleep”, which with a score of 36 was over two standard deviations above the mean. The same methodology was then applied to Section C, Social Dysfunction, and D, Severe Depression (Emotions). For Section C, no variables were found to be significant. In Section D, just one variable was found to be more than one standard deviation above the average. This was (D1), “Been thinking of

yourself as a worthless person” with a score of 30. This variable was over two standard deviations above the mean and was, therefore, seen as being very significant.

3.4. Posttraumatic Stress Disorder Symptom Scale

Of the 100 people questioned using the PSS, four people were identified as having symptoms of PTSD. This accounts for 4% of the total sample. All these four people surprisingly did not score significantly in the GHQ-28 as expected (with scores ranging from 9–43). In fact, only two people identified as high risk from the GHQ-28 (scoring 43) went on to show symptoms of PTSD. The other two participants identified in the sample as having PTSD scored GHQ-28 scores of below 10.

The PSS questionnaire is divided into three sections: reexperiencing, avoidance, and arousal. Based on the findings from the literature and results, this analysis aims to see how the different sections of the PSS manifest in people’s everyday lives.

Again, to determine the most significant variables, the average number of negative responses from the GHQ-28 has been calculated by adding together those responses that scored ≥ 2 . Standard deviation was then applied to determine which variables were significant. The results are shown in the Table 8.

For the reexperiencing section, only one variable question 5 “experiencing physical reactions when reminded of the traumatic event (sweating, increased heart rate)” was significant. For the avoidance section, question 7 “trying to avoid activities or people that remind you of the traumatic event” was significant. For the arousal section, again only one question 14 “feeling irritable or having fits of anger” was significant.

Table 8
Application of standard deviation to PSS results

Statistical Data	Reexperiencing	Avoidance	Arousal
Average number of negative responses	6.80	7.14	12.80
Standard deviation	3.90	3.98	7.95
Significant scores >	10.70	11.12	20.75

PSS, Posttraumatic Stress Disorder Symptom Scale.

From the results section, counts were also made on each of the variables that were identified as interfering with aspects of everyday life after exposure to a traumatic event. These were “work”, “household duties”, “friendships”, “fun/leisure activities”, “schoolwork”, “family relationships”, “sex life”, “general life satisfaction”, and “overall functioning” as shown in Fig. 2.

The variables that showed the highest count and were supported from secondary research were “work”, “family relationships”, and “general life satisfaction”. However, it is seen that sex and education seem to have the lowest count and may suggest that there may be some strategies used to deal with matters of distress.

3.5. Discussion

On completing this research, some interesting observations have been made. The most important being the number of people within LFRS who show signs of distress as highlighted from the GHQ-28 questionnaire and those people who exhibit probable symptoms of PTSD as identified by the PSS questionnaire.

The results from the GHQ-28 highlighted that 30% of the respondents surveyed showed signs of probable distress. If this number was multiplied to represent the number of LFRS employees, approximately 300 operational members of staff could hypothetically be suffering from distress.

Although the research provides evidence that the vulnerability to PTSD does not directly correlate with the GHQ-28 outcomes, it does show that those with poor general health are more susceptible to developing PTSD. This means that potentially 30% of LFRS operational personnel are at risk of developing PTSD.

On analyzing the results of the PSS, four of the 100 people surveyed showed symptoms of PTSD. By scaling these responses up in the same way as for the GHQ-28, LFRS potentially could have approximately 40 cases of PTSD which are presently undiagnosed and untreated, accounting for 4% of the operational workforce. This is lower than what has typically been found in the previously published reports where scores as low as 5% have been obtained [3].

As the analysis shows, both the GHQ-28 and PSS questionnaires were completed. This was to determine whether general health

affected PTSD. The results were inconclusive as of the four people who showed symptoms of PTSD, only two people were identified as high risk from the GHQ-28 (scoring 43). The other two participants identified in the sample as having PTSD scored GHQ-28 scores of below 10. As a result, it was not possible to establish whether general health did influence the development of PTSD symptoms.

The analysis of the results produced some interesting findings. From the GHQ-28, it was determined that emotions affect physical symptoms, supporting the theory that comorbid mental health issues could potentially bring about the development of PTSD.

Interestingly, from a productivity perspective, some of the evidence suggests that the coping strategies used by firefighters are actually more important than their levels of personal motivation, as motivation itself may be directly affected by an individual’s ability to cope with the trauma that they witness. Certainly, this survey of LFRS staff highlighted that some will throw themselves into distraction activities (such as sex or education).

LFRS currently adopt an “opt-in” approach to CID; however, this has both advocates and critics. The cultural appetite for engaging in this process is presently limited, and a number of variables exist which may determine the effectiveness of CID such as the timing of the debrief, the duration, or the qualifications, expertise, and training of the facilitator.

The literature review highlighted that CID supporters claim some highly positive outcomes, yet their findings tend not to appear within professional journals. Conversely, several of the less positive studies referred to earlier within this text, which cast doubt over the success of CID, are visible throughout a number of professional medicine and psychology journals. Equally, if no baseline assessment has been undertaken, the outcomes may not be valid, given that the subject may have had existing conditions such as a premorbid personality.

3.6. Recommendations from the study

Current practices within the LFRS are carried out on an optional basis on the part of employees. There is a nonmandatory CID process which employees can take part in if they wish. There is also

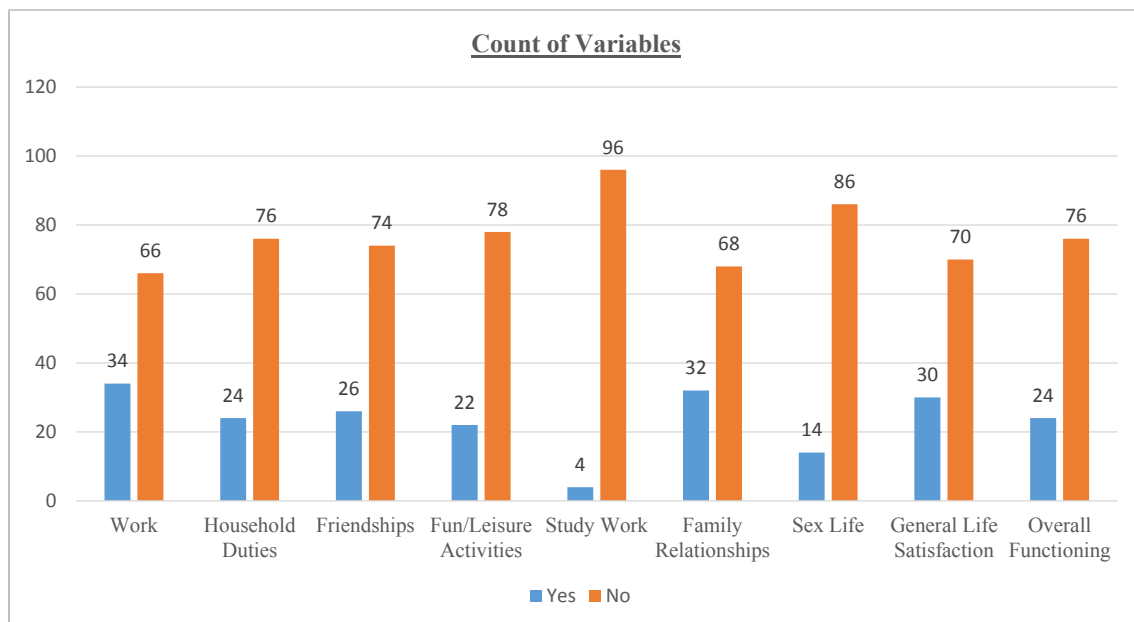


Fig. 2. Count of variables interfering with aspects of everyday life.

voluntary counseling service that is available if required and generally, staff is expected to keep an eye on anyone who has recently experienced a traumatic event within the organization.

Based on the findings of both the primary and secondary research completed, this article proposes that LFRS should consider the provision of organizational and leadership practices that aim to mitigate threats derived from PTSD among firefighters; these include the following:

- Delivery of education packages aimed at increasing awareness of stress and PTSD in order that individuals are able to identify the symptoms in themselves and their colleagues at an early stage.
- Mental health screening for new entrants to take into account dispositional variables, which may already exist in applicants.
- Routine screening to facilitate identification and assessment of behavioral issues (such as PTSD) by the means of annual fitness tests and routine medical examinations. This provides a “background reading” for staff in the event of a traumatic event occurring which may require CID or professional health-care involvement.
- Liaison with the military (using existing associations) to learn from their findings and adapt and introduce training for implementation within LFRS.
- Revising the workplace significant incident protocol to include automatic directing of affected staff to trained behavioral health experts.
- An option for immediate access to professional services in the first instance rather than via CID, so as to offer sufferers the earliest and perhaps optimum chance of recovery.
- Development of a Web/mobile app, similar to Pocket Peer that combines Web training with information on symptom recognition and provides direct links to professional services.
- As the UK FRS broadens its skill base to adopt new work streams such as Community First Responding, FRSs should recognize that the increased activity levels and exposure to new incident types (many of which may involve children) could have health impacts for staff, both immediate and longer term.

4. Conclusions

The primary research shows that a PTSD problem does exist within LFRS but at a level which is lower than that found in other similar studies and indeed lower than the quoted lifetime prevalence levels of c.10.4% for women and 5% for men. This supports the position of Brown et al [72] that exposure does not automatically mean the development of psychological distress.

From studying the variables that affect PTSD, it can be determined that no conclusive relationship exists between general health and PTSD within LFRS, with the main variables affecting the development of PTSD being emotions which manifest themselves into physical symptoms.

Secondary research has shown that incidents involving children are the most commonly cited factor for the development of PTSD within FRS personnel. Evidence from Haslam and Mallon [15] suggests that this difficulty in dealing with child victims is borne mainly from a sense of identification between the victims and one's own children.

While research suggests that PTSD manifests itself in a person's day-to-day life through reexperiencing, avoidance, and arousal, it was clear from the respondents to this study that arousal was the most significant detriment to a person's everyday life. This was displayed through the existence of anxiety, depression, addictive behaviors, and insomnia.

Conclusions from the secondary research show that although the culture of the UK FRS remains one of required fortitude and endurance, this strength may also present a risk in the form of lower levels of self-reported stress, probably for many years. Based on the primary research undertaken, it is clear that LFRS presently has a number of personnel experiencing adverse psychological and physical reactions, many of which may be going undiagnosed and untreated at the present time.

Where incidents are discussed in the social setting i.e., after incident, they can tend to be done so using humor, so one could argue that the historic culture within the UK FRS actually presents a natural remedy within the workplace. Whereas this may benefit some personnel and help them to contextualize and perhaps “place in a box” that specific occurrence, for others it may place pressure on them to conceal or deny their true feelings again leading to PTSD symptoms going undiagnosed and untreated.

It is clear from the research undertaken that the role of an emergency responder, and specifically a UK firefighter, has the potential for exposure to traumatic sights, smells, and sounds, creating memories which in some cases will last a lifetime. This article supports the continued development of organizational and leadership practices to assist LFRS in planning for, and mitigating against, the inevitable threat that arises from exposure to traumatic incidents.

4.1. Limitations of study and suggestions for future research

One of the limitations of the study was that the intention was to draw findings from a larger sample size than was achieved; national environmental factors (the ongoing industrial dispute) within the sector affected the ability to deliver this. It is therefore a recommendation of this article that a wider study be undertaken, perhaps on a north-west regional footprint to obtain both a wider sample and detect variances between FRS and between firefighters working in urban and rural environments. With the relevant consents, such a study could also consider the implications of gender, age, ethnicity, position within the organizational structure, and whether whole time or retained duty system. This would then allow for the prevalence of PTSD to be compared with sociodemographic factors and any geographical variations.

It should also be noted that the sample used was from within a single county. Lancashire is predominantly rural with several large conurbations. It does not face the same level of challenges and perhaps more serious threats and events as may be seen by some larger metropolitan FRS. As a result, caution should be applied to the current findings when considered in the context of other FRS areas.

To fully appreciate the benefits associated with CID, further research could be undertaken within LFRS (or regionally) to examine more closely the interactions of participants, the outcomes, and the how CID or the involvement of professionals may deliver better outcomes for staff.

Finally, as the nature of a UK firefighter's role continues to evolve with greater exposure via new aspects such as emergency medical response, the exposure to distressing events within our communities also increase. It is recommended that LFRS commission further works to explore the expected implications of such new work streams and the potential impacts to inform the future needs of the service.

Conflicts of interest

All authors have no conflicts of interest to declare.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.shaw.2017.11.002>.

References

- [1] Foa EB, Riggs DS, Dancu CV, Rothbaum BO. Reliability and validity of a brief instrument for assessing post-traumatic stress disorder. *J Trauma Stress* 1993;6(4):459–73.
- [2] Lusa S, Häkkinen M, Luukkonen R, Viikari-Juntura E. Perceived physical work capacity, stress, sleep disturbance and occupational accidents among firefighters working during a strike. *Work Stress* 2002;16(3):264–74.
- [3] Del Ben KS, Scotti JR, Chen Y-C, Fortson BL. Prevalence of posttraumatic stress disorder symptoms in firefighters. *Work Stress* 2006;20(1):37–48.
- [4] Beaton RD, Murphy SA. Sources of occupational stress among firefighter/EMTs and firefighter/paramedics and correlations with job-related outcomes. *Prehosp Disaster Med* 1993;8(2):140–50.
- [5] Dahlan A, Malek M, Mearns K, Flin R. Stress and psychological well-being in UK and Malaysian fire fighters. *Cross Cult Manag An Int J* 2010;17(1):50–61.
- [6] Regel S, Joseph S. Post-traumatic stress. Oxford University Press; 2010.
- [7] Duckworth DH. Psychological problems arising from disaster work. *Stress Health* 1986;2(4):315–23.
- [8] Raphael B, Lundin T, McFarlane C. A research method for the study of psychological and psychiatric aspects of disaster. *Acta Psychiatr Scand* 1989;80(S353):1–75.
- [9] Fullerton CS, McCarroll JE, Ursano RJ, Wright K. Psychological responses of emergency workers: firefighters and trauma. *Am J Orthopsychiatry* 1992;62:371–7.
- [10] Carlier I, Gersons B. Trauma at work: post-traumatic stress disorder—an occupational health hazard. *J Occup Heal Saf Aust New Zeal* 1994;10:264.
- [11] Marmar CR, Weiss DS, Metzler TJ, Ronfeldt HM, Foreman C. Stress responses of emergency services personnel to the Loma Prieta earthquake Interstate 880 freeway collapse and control traumatic incidents. *J Trauma Stress* 1996;9(1):63–85.
- [12] Beaton R, Murphy S, Johnson C, Pike K, Corneil W. Coping responses and posttraumatic stress symptomatology in urban fire service personnel. *J Trauma Stress* 1999;12(2):293–308.
- [13] Association AP. Diagnostic and statistical manual of mental disorders (DSM-4®). Am Psychiatr Pub; 1994.
- [14] National Fire Protection Association. Trouble in mind [Internet]. 2014. Available from: <http://www.nfpa.org/newsandpublications/nfpa-journal/2014/may-june-2014/features/special-report-firefighter-behavioral-health>. [Accessed 27 September 2014].
- [15] Haslam C, Mallon K. A preliminary investigation of post-traumatic stress symptoms among firefighters. *Work Stress* 2003;17(3):277–85.
- [16] Bryant RA, Harvey AG. Posttraumatic stress in volunteer firefighters: predictors of distress. *J Nerv Ment Dis* 1995;183(4):267–71.
- [17] Baker SR, Williams K. Relation between social problem-solving appraisals, work stress and psychological distress in male firefighters. *Stress Health* 2001;17(4):219–29.
- [18] Wilmoth JA. Trouble in mind [Internet]. 2014. Available from: <http://www.nfpa.org/newsandpublications/nfpa-journal/2014/may-june-2014/features/special-report-firefighter-behavioral-health>. [Accessed 15 September 2014].
- [19] National Volunteer Fire Council. Suicide in the fire and emergency services: adopting a proactive approach to behavioural health awareness and suicide prevention [Internet]. National Volunteer Fire Council. 2012. Available from: <http://www.nvfc.org/health-and-safety-news/nvfc-releases-report-and-webinar-on-suicide-in-the-fire-and-emergency-services>. [Accessed 15 September 2014].
- [20] Senn R. Post traumatic stress disorder: one firefighters story [Internet]. 2010. Available from: <http://www.fireengineering.com/articles/print/volume-163/issue-12/features/post-traumatic-stress-disorder-one-firefighters-story.html>. [Accessed 26 September 2014].
- [21] Meroney B. Dealing with PTSD in the fire service [Internet]. 2013. Available from: <http://www.firefighternation.com/article/management-and-leadership/dealing-ptsd-fire-service>. [Accessed 15 September 2014].
- [22] National Health Service. Post traumatic stress disorder (PTSD) – Andy's story [Internet]. 2013. Available from: <http://www.nhs.uk/Conditions/Post-traumatic-stress-disorder/Pages/realstoriespage.aspx>. [Accessed 2 March 2015].
- [23] Ministry of Defence. Trauma awareness in firefighter leadership training [Internet]. 2011. Available from: http://www.ptsdresolution.org/pdf/P_27-31_Trauma_Awareness.pdf. [Accessed 10 September 2014].
- [24] Clohessy S, Ehlers A. PTSD symptoms, response to intrusive memories and coping in ambulance service workers. *Br J Clin Psychol* 1999;38(3):251–65.
- [25] National Institute for Health and Care Excellence. Post traumatic stress disorder (PTSD) – support for education and learning [Internet]. 2012. Available from: <http://www.nice.org.uk/guidance/cg26/resources>. [Accessed 21 September 2014].
- [26] Association AP. Diagnostic and statistical manual of mental disorders (DSM-5®). American Psychiatric Pub; 2013.
- [27] World Health Organisation. Guidelines for the management of conditions specifically related to stress [Internet]. 2013. Available from: http://www.who.int/mental_health/emergencies/stress_guidelines/en/. [Accessed 25 February 2015].
- [28] Briere J. Psychological assessment of adult posttraumatic states. Washington, DC: Am Psychol Assoc; 1997. p. 26–9.
- [29] Lancashire County Council. District population [Internet]. 2014. Available from: <http://www3.lancashire.gov.uk/corporate/web/?siteid=6120&pageid=39945>. [Accessed 2 January 2015].
- [30] Boxer PA, Wild D. Psychological distress and alcohol use among fire fighters. *Scand J Work Environ Health* 1993;121–5.
- [31] Aguilera DC. Crisis intervention: theory and methodology [Internet]. Mosby, 1998 (Crisis Intervention). Available from: <https://books.google.co.uk/books?id=c6pHAAAAMAAJ>. Accessed April 2015.
- [32] Moran C, Colless E. Positive reactions following emergency and disaster responses. *Disaster Prev Manag An Int J* 1995;4(1):55–60.
- [33] Moran C, Britton NR. Emergency work experience and reactions to traumatic incidents. *J Trauma Stress* 1994;7(4):575–85.
- [34] Kessler RC, Price RH, Wortman CB. Social factors in psychopathology: stress, social support, and coping processes. *Annu Rev Psychol* 1985;36(1):531–72.
- [35] Moran CC. Personal predictions of stress and stress reactions in firefighter recruits. *Disaster Prev Manag An Int J* 2001;10(5):356–65.
- [36] Lindy JD. The trauma membrane and other clinical concepts derived from psychotherapeutic work with survivors of natural disasters. *Psychiatr Ann* 1985;15(3):153–60.
- [37] Lou L. Work motivation, job stress and employee well-being. *J Appl Manag Stud* 1999;8(1):61–72.
- [38] Palmer CE. A note about paramedics' strategies for dealing with death and dying. *J Occup Psychol* 1983;56(1):83–6.
- [39] Rosenberg L. A qualitative investigation of the use of humor by emergency personnel as a strategy for coping with stress. *J Emerg Nurs JEN Off Publ Emerg Dep Nurses Assoc* 1991;17(4):197–202.
- [40] Corneil DW. Prevalence of post traumatic stress disorders in a metropolitan fire department; 1993.
- [41] Mitani S, Masatoshi F, Nakata K, Shirakawa T. Impact of post-traumatic stress disorder and job-related stress on burnout: a study of fire service workers. *J Emerg Med* 2006;31(1):7–11.
- [42] Prag PW. Stress, burnout, and social support: a review and call for research. *Air Med J* 2003;22(5):18–22.
- [43] Boscarino JA, Figley CR, Adams RE. Compassion fatigue following the September 11 terrorist attacks: a study of secondary trauma among New York City social workers. *Int J Emerg Ment Health* 2004;6(2):57.
- [44] Jonsson A, Segesten K. Guilt, shame and need for a container: a study of post-traumatic stress among ambulance personnel. *Accid Emerg Nurs* 2004;12(4):215–23.
- [45] Harris MB, Baloglu M, Stacks JR. Mental health of trauma-exposed firefighters and critical incident stress debriefing. *J Loss Trauma* 2002;7(3):223–38.
- [46] Helzer JE, Robins LN, McEvoy L. Post-traumatic stress disorder in the general population. *N Engl J Med* 1987;317(26):1630–4.
- [47] Williams RM, Joseph S, Yule W. The role of avoidance in coping with disasters: a study of survivors of the capsizing of the "Herald of Free Enterprise. *Clin Psychol Psychother* 1994;1(2):87–94.
- [48] Ingledeu DK, Cooper CL. Coping research in the UK: do we know enough to apply it? In: *International Journal of Psychology*. 27 Church Rd, Hove, East Sussex, England BN3 2Fa: Psychology Press; 1996. 2011 p.
- [49] Hytten K, Hasle A. Fire fighters: a study of stress and coping. *Acta Psychiatr Scand* 1989;80(s355):50–5.
- [50] Corneil W. Traumatic stress and organizational strain in the fire service; 1995.
- [51] Mitchell J, Bray G. Emergency services stress: guidelines for preserving the health and careers of emergency services personnel. PO Box 15, Ellicott City, MD: Chevron Publ Corp; 1990.
- [52] Harris MB, Stacks J. A three year five state study on the relationships between critical incident stress debriefings, firefighters disposition, and stress reactions. Commerce 1998.
- [53] World Health Organisation. Guidelines substance abuse [Internet]. 2015. Available from: http://www.who.int/topics/substance_abuse/en/. [Accessed 25 February 2015].
- [54] Mitchell JT. When disaster strikes: the critical incident stress debriefing process. In: *Journal of emergency medical services* 1983. p. 36–9.
- [55] Dyregrov A. Caring for helpers in disaster situations: psychological debriefing. *Disaster Manag* 1989;2(1):25–30.
- [56] Bolwig TG. Debriefing after psychological trauma. *Acta Psychiatr Scand* 1998;98(3):169–70.
- [57] Mitchell JT, Everly GS. Critical incident stress debriefing—CISD: an operations manual for the prevention of traumatic stress among emergency service and disaster workers. Chevron Pub; 1996.
- [58] Rose SC, Bisson J, Churchill R, Wessely S. Psychological debriefing for preventing post traumatic stress disorder (PTSD). *Cochrane Libr* 2002;2:1–34.

- [59] Bisson JI, Deahl MP. Psychological debriefing and prevention of post-traumatic stress. *Br J Psychiatry* 1994;165:717–20.
- [60] Foa EB, Meadows EA. Psychosocial treatments for posttraumatic stress disorder: a critical review. *Annu Rev Psychol* 1997;48(1):449–80.
- [61] Stephens C. Testing a multi-dimensional model of organisational traumatic stress [Internet]. 1997. Available from: <http://www.massey.ac.nz/~trauma/issues/1997-1/cvs1.htm>. [Accessed 6 February 2015].
- [62] Shalev AY. Debriefing following traumatic exposure. In: *Individ Community Responses to Trauma Disaster Struct Hum Chaos* 1994. p. 201–19.
- [63] Raphael B, Meldrum L, McFarlane AC. Does debriefing after psychological trauma work? Time for randomised controlled trials. *Accid Emerg Nurs* 1996;4(2):65–7.
- [64] Litz BT, Gray MJ, Bryant RA, Adler AB. Early intervention for trauma: current status and future directions. *Clin Psychol Sci Pract* 2002;9(2):112–34.
- [65] Kienzler H, Pedersen D. Using qualitative and quantitative research methods in the study of mental and trauma-related disorders. *Fr McGill Ca*; 2007.
- [66] Solomon SD, Keane TM, Newman E, Kaloupek DG. Choosing self-report measures and structured interviews. *Trauma Res Methodol* 1996:56–81.
- [67] Mollica RF, Caspi-Yavin Y, Bollini P, Truong T, Tor S, Lavelle J. The Harvard Trauma Questionnaire: validating a cross-cultural instrument for measuring torture, trauma, and posttraumatic stress disorder in Indochinese refugees. *J Nerv Ment Dis* 1992;180(2):111–6.
- [68] Goldberg DP, Hillier VF. A scaled version of the General Health Questionnaire. *Psychol Med* 1979;9(1):139–45.
- [69] Ali D. General Health Questionnaire-28 [Internet]. 2010. Available from: www.rehabmeasures.org/Lists/RehabMeasures/DispForms.aspx?ID=909. [Accessed 12 March 2015].
- [70] Young KM, Cooper CL. Occupational stress in the ambulance service: a diagnostic study. *Health Manpow Manage* 1997;23(4):140–7.
- [71] Psych Central. PTSD and relationships [Internet]. Psych Central. 2015. Available from: <http://psychcentral.com/lib/ptsd-and-relationships/000664>. [Accessed 30 March 2015].
- [72] Brown J, Mulhern G, Joseph S. Incident-related stressors, locus of control, coping, and psychological distress among firefighters in Northern Ireland. *J Trauma Stress* 2002;15(2):161–8.
- [73] Sterling M. General Health Questionnaire–28 (GHQ-28). *J Physiother* 2011;57(4):259.
- [74] White SH. Show me the proof!: tools and strategies to make data work for you. Lead+ Learn Press; 2005.