

## DEVELOPMENT, VALIDITY AND RELIABILITY OF FIRE AND RESCUE OFFICER TRAUMATIC EVENT CHECKLIST

Muhammad Naim Mat Salleh<sup>1</sup>, Halim Ismail<sup>1</sup>, Hanizah Mohd Yusoff<sup>1</sup>

<sup>1</sup>Department of Community Medicine, Faculty of Medicine, Universiti Kebangsaan Malaysia Medical Centre.

*\*Corresponding author: Dr. Halim Bin Ismail, Department of Community Medicine Faculty of Medicine, UKM Medical Centre, Jalan Yaacob Latif, Bandar Tun Razak, Cheras, 56000 Kuala Lumpur, halimismail@ppukm.ukm.edu.my*

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### ABSTRACT

**Background:** Fire and rescue officers' duties are characterised by a high level of work demand and exposure to physical and psychological stressors. A prolonged and repeated exposure to traumatic events could lead to chronic mental health issues, which may include post-traumatic stress disorder (PTSD). To fulfil criterion A of DSM-5, an exposure to traumatic events should be established and measured. Therefore, the aim of this study is to develop a new traumatic events checklist, specific to firefighters' duties, that may identify high-impact traumatic events which could lead to PTSD among firefighters.

**Materials and Methods:** A series of interviewer-assisted survey was conducted throughout the study among 90 respondents. Their responses were then analysed to ascertain themes of high-impact traumatic events among firefighters. The content of the checklist was validated by experts in related fields.

**Result:** A test-retest reliability study among 30 respondents produced a satisfactory kappa agreement within the range of 0.474 to 0.902. The intra class correlation (ICC) value representing the overall number of trauma incidents was acceptable with a value of 0.879 (95% C.I., 0.756-0.941) and a *p* value <0.001.

**Conclusion:** The Fire and Rescue Officer' Traumatic Event Checklist has been developed with a thorough process, and the reliability testing has shown a good outcome.

**Keywords:** Traumatic event, checklist, firefighters, validation, test-retest, validity, reliability

## 1.0 Introduction

Fire and rescue officers are generally considered to be at a greater risk for PTSD than many other occupations because their duties involve routine confrontations with traumatic stressors. A recently published meta-analysis of a worldwide current prevalence of PTSD among rescue workers yielded a prevalence of approximately 10% for PTSD, suggesting that approximately 150,310 first responders may meet the criteria for currently suffering from PTSD, and from the total, 7% of active fire-fighters suffer from PTSD (Berger et al., 2012). A different study done in Australia among active and retired fire-fighters showed a PTSD prevalence of 8% and 18%, respectively (McFarlane & Bryant, 2007).

Fire and rescue officers' duties are characterised by a high level of work demand and exposure to physical and psychological stressors (Benedek, Fullerton, & Ursano, 2007). A prolonged and repeated exposure to traumatic events could lead to chronic mental health issues, which may include post-traumatic stress disorder (PTSD)(McFarlane & Bryant, 2007). These traumatic events are crucial aspects that distinguish fire and rescue officers from those of other occupations and could be regarded as the main psychological stressors. They include incidents with the risk of death or severe injury to the firefighters or victims, or witnessing death and injuries, or participating in the prevention of death, or handling severe injuries (Haugen, Evces, & Weiss, 2012).

PTSD is included in a new category in *DSM-5*, Trauma- and Stressor-Related Disorders (Association, 2013). All of the conditions included in this classification require exposure to a traumatic or stressful event as a diagnostic criterion, and all of the criteria in *DSM-5* should be fulfilled for the diagnosis of PTSD.

To fulfil criterion A of *DSM-5*, an exposure to traumatic events should be established and measured. In previous studies, most adopted an approach of lifetime prevalence of PTSD among firefighters with the incorporation of a general traumatic event during one's lifetime. Therefore, the aim of this study is to develop a new traumatic event checklist, specific to fire and rescue officers' duties, that may identify high-impact traumatic events which could lead to PTSD among firefighters.

## 2.0 Materials and Methods

### 2.1 Instrument

A series of interview with open ended questionnaires was administered among fire and rescue officers in stations with the highest reported emergencies cases throughout a particular year in the state of Selangor, Malaysia. The number of respondents was not fixed as the process would continue until the obtained responses reached saturation. The interviewer assisted the survey by using an open-ended questionnaire, which was adopted from the Life Event

Checklist-5 (LEC-5), an extended version of DSM-5, to fulfil criterion A of DSM 5 (Weathers et al., 2013). The questionnaire was designed to identify the most stressful events related to death that fire and rescue officers have ever encountered or experienced throughout their active service.

Protocols used during the interviewer-assisted survey:

- a) During your service as a firefighter, what was the worst incident you have ever experienced? Briefly describe the incident.
- b) Did the incident stress your feelings?
- c) How many times have you experienced this?
- d) When did the incident occur?
- e) Did the incident involve death or a life-threatening situation?
- f) How did you experience the event?

## 2.2 Interviewer-assisted survey

A series of interviewer-assisted survey was conducted throughout the study, and 97 responses were provided by 90 respondents who were fire and rescue officers from stations in the state of Selangor with highest number of emergency cases reported. Respondents were allowed to provide more than one event or incident for the questions. These responses were then analysed to ascertain the themes of high-impact traumatic events experienced by the firefighters. Additional information was also obtained from indirect discussions with the participating respondents.

## 2.3 Data analysis

**Table 1:** Frequency of the theme

Theme	n	%
Fatal fire incident	11	7.5
Corpses in horrific condition	42	28.8
Dangerous situation that is life-threatening	7	4.8
Fatal road accident	33	22.6
Deadly construction collapse	9	6.2
Suffering severe injuries	4	2.7
Survivor with serious injuries	1	0.7
Fatal water-related accident	7	4.8
Fatal explosion	4	2.7
Deadly natural disaster	9	6.2
Accident involving children	3	2.1
Failure to save victim	2	1.4
Rescuing victim of suicide attempt	1	0.7
An incident that claimed the life of a colleague	1	0.7

Fatal aviation accident	1	0.7
Attacked during an operation	1	0.7
An incident where a colleague suffered serious injuries	1	0.7
Had to injure the victim's body	1	0.7
Getting hurt by dangerous animals	2	1.4
Can feel the suffering of the victim	2	1.4
Fatal industrial accident	2	1.4
Exposed to hazardous materials	2	1.4

The qualitative data were analysed and the sub-themes contained in the fire and rescue officers' responses were identified. These sub-themes would then be categorized into more general themes using a manual coding strategy method. Finally, all the themes obtained were categorized into 22 different trauma events that were used to form the final checklist.

Table 1 shows the frequency of all 22 themes that were generated from the analysis based on participants' responses. It was found that the frequency of the theme 'corpses in horrific condition' was 28.8%, followed by the theme of 'fatal road accident' with a frequency of 22.6%, and the theme of 'fatal fire incident' showing a 7.5% frequency. Examples of the lowest themes were 'rescuing victim of suicide attempt;' 'an incident that claimed the life of a colleague;' 'fatal aviation accident;' 'attacked during an operation;' 'an incident where a colleague suffered serious injuries;' and 'had to injure the victim's body,' which contributed to a 0.7% frequency from the overall themes.

#### **2.4 Verification and triangulation process**

The initial list of the resulting traumatic events was verified by experienced senior officers from the fire-and-rescue stations to ensure the list covered the scope of the firefighters' duties well. Triangulation process was then carried out by a higher-ranking officer from the headquarter.

#### **2.5 Content validation and development of the Fire and rescue officers' Traumatic Event Checklist**

For content validation, the checklist was also validated by experts in related fields. The specialists involved were a psychiatrist, a psychologist, a public health (occupational health) specialist, and 3 senior fire-and-rescue officers. The selected experts have extensive experience and significant knowledge in their respective fields on the issues being studied. The selected experts were at least one of the following: 1) public health professional and academician with expertise on occupational health; 2) psychiatrist and academician who has published articles on PTSD; 3) a psychologist with experience in mental health management for firefighters; 4) senior fire-and-rescue officer who has been in active service for at least five years. The feedback received during each consultation session was used to further

enhance the final generated checklist. The checklist was developed originally in the Malay language and had undergone back-to-back translation to produce an English language version.

The main objective for developing a trauma checklist is to evaluate high-impact trauma incidents among fire and rescue officers. The produced checklist must include the following features: 1) easier readability level; 2) shorter use of time; and 3) easier judgments that are not too complex to be made by respondents (Carlson et al., 2011). The items from the formed checklist are based on combinations of several specific traumatic incidents that make the list more global and general.

In terms of simplicity and to enable a quick and concise response, this checklist has adopted the format for the Trauma History Screen (THS), requiring respondents to identify the trauma they had experienced based on the frequency of occurrence. The checklist also serves as a general guide to ensure that the listed traumatic events are brief, easy to understand, and reflect the various forms and types of traumatic incidents experienced by each fire and rescue officer.

### **2.6 Pre-test**

The checklist was pre-tested among 5 firefighters to review their understanding of the items. Their input was used to improve the wording arrangement and sentence structure in the checklist.

### **2.7 Reliability**

The checklist underwent testing to determine its reliability, using statistical testing. A total of 30 respondents participated in this study, which was conducted for 2 weeks in one-week intervals (Johanson & Brooks, 2010). Purpose sampling was used to determine the sample respondents, who consisted of firefighters and rescuers from the Selangor State Fire and Rescue Headquarters. The reliability test was performed using the Test-Retest method. The Kappa value was used for the approval of each item, where the value of '1' was given to a respondent's marking of an item and a value of '0' was given to an item without any response. This procedure is based on the checklist validation method by Gray, Litz, Hsu, and Lombardo (2004). To obtain correlation with the total number of trauma incidents, Intra Class Correlation (ICC) values were used.

### 3.0 Result

#### 3.1 Demographic characteristics

**Table 2:** The Characteristic of the respondents

Characteristics		n	%
Age	20-29	15	50.0
	30-39	10	33.3
	40-49	3	10.0
	50-59	2	6.7
Gender	Male	30	100
	Female	0	0
Ethnicity	Malay	25	83.3
	Others	5	16.7
Years of service	1-5	17	56.7
	6-10	3	10.0
	11-15	4	13.3
	16-20	2	6.7
	>21	4	13.3

The above table showed the demographics characteristics of the respondents involved in the study. All the respondent were males, majority of them were Malay (83.3%) in the age of 20-29(50.0%) years old and years of service of 1-5 years (56.7%)

#### 3.2 Reliability

**Table 3:** Reliability of the Fire and Rescue Officer Traumatic Events Checklist

Item	Kappa	p-value
Fatal road accident	0.619	<0.001
Fatal fire incident	0.706	<0.001
Fatal water-related accident	0.842	<0.001
Deadly natural disaster	0.902	<0.001
Handling corpses in horrific condition	0.772	<0.001
Accident involving children	0.783	<0.001
Facing a very dangerous situation that is life-threatening during operation	0.851	<0.001
Suffering severe injuries during operation	na	na
An incident that claimed the life of a colleague during operation	0.474	0.002
Fatal industrial accident	0.526	0.001
Fatal aviation accident	0.651	<0.001
Fatal explosion	0.651	<0.001
Failure to save victim	0.474	0.002
Exposed to hazardous materials during operation	0.772	<0.001
Dealing with survivor with serious injuries	0.842	<0.001
Attacked during an operation	0.851	<0.001
Getting hurt by dangerous animals during operation	0.889	<0.001
Had to injure the victim's body to save the victim	0.651	<0.001
Deadly construction collapse	0.634	<0.001
Rescuing victim of suicide attempt	0.851	<0.001

An incident where a colleague suffered serious injuries during operation	0.712	<0.001
Can feel the tremendous suffering of the victim	0.798	<0.001

na = not available

The above table shows the Kappa agreement value from the test and retest reliability testing. It ranges from 0.474 and 0.902 with  $p$  value  $<0.05$ . However, the kappa agreement for item “Suffering severe injuries during operation” was unable to be computed as no respondent had indicated the item during the study. The Intra class Correlation (ICC) of the overall number of trauma incidents was 0.879 (95% C.I. 0.756-0.941) and a  $p$  value  $<0.001$ .

#### 4.0 Discussion

It is important to identify the trauma experienced by the respondents, as it crucial in meeting criterion A for PTSD in DSM-5. The type and severity of traumatic events, which differ in frequency and type of traumatic-incident exposures, may become potential risk factors associated with the recognised differences in post-trauma symptoms (Del Ben, Scotti, Chen, & Fortson, 2006). Another study found that exposure to unusually traumatic experiences, such as multiple traumatic events in emergency services, can lead to a considerable increase in emotions (Angleman, 2010), whereas another study found that a fire and rescue officer who had attended more than 21 fatal incidents during his year of service was associated with higher odds of suffering from PTSD (Harvey et al., 2016).

Several research tools measure PTSD-related trauma, such as Trauma History Screen (THS)(Carlson et al., 2011), Life Event Checklist-5 (LEC-5)(Weathers et al., 2013), and Firefighters Trauma Screen (FTHS) (Alghamdi, 2015). However, although those studies listed some of the most common traumatic events, they did not specifically describe the trauma that may be experienced by fire and rescue officers in Malaysia, especially in Selangor.

This trauma checklist takes a similar approach to several research tools that measure the incidence of trauma in a study related to PTSD. Among them is the Trauma History Screen (THS), where it has a list of trauma incidents, as well as the frequency of which they are experienced. It uses shorter phrases and shorter formats to make it easier for fire and rescue officers of various ranks to understand a statement upon reading and relate it quickly to their task.

Overall, the Trauma Incident Checklist is an effective study tool to meet criterion A in DSM-5 in identifying more specific traumatic events among fire and rescue officers, with regard to rescue operations. This is consistent with the content validity of the checklist done by experts with appropriate experience from various disciplines in related fields.

This study has been tested and found to demonstrate good reliability based on kappa values, as well as the Intra Class Correlation (ICC) obtained. The kappa value of each item ranged from 0.474 to 0.902, from moderate to excellent (Landis & Koch, 1977). However, the item

pertaining to 'suffering severe injury during operation' found that the kappa values were not reported because all respondents who participated in this validation study had never experienced such a traumatic event. This is consistent with the findings from the qualitative analysis, where the frequency of themes for fire and rescue officers with severe injuries was among the lowest.

The Intra Class Correlation (ICC) value representing the overall number of trauma incidents experienced by the respondents was also acceptable, with a value of 0.879 (95% S.K, 0.756-0.941) and a  $p$  value  $<0.001$  (Koo & Li, 2016). Compared to a previous study (Alghamdi, 2015), which examined the reliability of a research tool developed by the researcher i.e. the Fire Fighter History Screen (FFHS), which had involved of 22 respondents showed a correlation of 0.75

## 5.0 Conclusion and recommendation

The Fire and rescue officers' Traumatic Event Checklist have been developed with a thorough process. As a whole, the reliability testing has shown a good value in detecting traumatic incidents that may have been experienced by firefighters and rescuers especially in state of Selangor, Malaysia. Therefore, it could serve as an important screening checklist in psychological screening for PTSD among fire and rescue officers.

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## Declaration

Author(s) declare that there is no competing interest in this study.

## Authors contribution

Author 1: Idea conceptualizing, literature review, drafting the final manuscript

Author 2: Advice and guidance during manuscript preparation

Author 3: Advice and guidance during manuscript preparation



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