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Langtry, J., Owczarek, M., McAteer, D., Taggart, L., Gleeson, C., Walshe, C., & Shevlin, M. (2021). Predictors of PTSD and CPTSD in UK firefighters. *European Journal of Psychotraumatology*, 12(1), Article 1849524. <https://doi.org/10.1080/20008198.2020.1849524>

**Published in:**  
European Journal of Psychotraumatology

**Document Version:**  
Publisher's PDF, also known as Version of record

**Queen's University Belfast - Research Portal:**  
[Link to publication record in Queen's University Belfast Research Portal](#)

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To cite this article: John Langtry, Marcin Owczarek, Donal McAteer, Laurence Taggart, Christina Gleeson, Catherine Walshe & Mark Shevlin (2021) Predictors of PTSD and CPTSD in UK firefighters, *European Journal of Psychotraumatology*, 12:1, 1849524, DOI: 10.1080/20008198.2020.1849524

To link to this article: <https://doi.org/10.1080/20008198.2020.1849524>



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Published online: 15 Jan 2021.



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## Predictors of PTSD and CPTSD in UK firefighters

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### ABSTRACT

**Background:** Globally, professional firefighters are often exposed to traumatic events and are at high risk of developing posttraumatic stress disorder (PTSD) symptoms.

**Objective:** With the publication of the 11th edition of the International Classification of Diseases (ICD-11) there arose a need for research based on the new diagnostic criteria, and the associated disorder, Complex PTSD (CPTSD).

**Method:** Participants were 1300 former or present firefighters from the UK. Prevalence rates of PTSD and CPTSD were estimated using International Trauma Questionnaire in accordance with ICD-11 criteria, and service related and personal trauma exposure were also assessed using an anonymous online questionnaire. Multinomial logistic regression was performed to assess how service and personal trauma exposure predicted PTSD and CPTSD.

**Results:** CPTSD criteria were met by 18.23% (95% CI 16.13–20.33%) and PTSD criteria were met by 5.62% (95% CI 4.37–6.87%) of the sample. Experiencing higher levels of service-related trauma significantly increased the risk for both PTSD and CPTSD, and nonwork related trauma uniquely predicted CPTSD but not PTSD.

**Conclusions:** This study provided the first examination of the new ICD-11 criteria for PTSD and CPTSD in a large sample of firefighters, and CPTSD was more common than PTSD. Exposure to multiple different types of trauma increased the odds of PTSD and CPTSD.

### Predictores de PTSD y CPTSD en bomberos del Reino Unido

**Antecedentes:** A nivel mundial, los bomberos profesionales están con frecuencia expuestos a eventos traumáticos y están en alto riesgo de desarrollar síntomas del trastorno de estrés postraumático (TEPT).

**Objetivo:** Con la publicación de la 11ª edición de la Clasificación Internacional de Enfermedades (CIE-11) surgió la necesidad de realizar una investigación basada en los nuevos criterios diagnósticos y el trastorno asociado, el TEPT complejo (TEPT-C).

**Método:** Los participantes fueron 1 300 bomberos, tanto en retiro como en servicio, del Reino Unido. Se estimaron las tasas de prevalencia del TEPT y del TEPT-C usando el Cuestionario Internacional de Trauma de acuerdo con los criterios de la CIE-11. También fueron evaluados la exposición a trauma personal y al relacionado con el servicio mediante un cuestionario anónimo en línea. Se realizó una regresión logística multinomial para evaluar cómo la exposición al trauma personal y del servicio predijeron el TEPT y el TEPT-C.

**Resultados:** Los criterios del TEPT-C fueron cumplidos por el 18,23% (95% IC 16,13% - 20,33%) y los criterios del TEPT fueron cumplidos por el 5,62% (95% IC 4,37% - 6,87%) de la muestra. Experimentar niveles más altos de trauma relacionado con el servicio aumentó significativamente tanto el riesgo del TEPT como del TEPT-C. El trauma no relacionado con el trabajo predijo de manera única el TEPT-C pero no el TEPT.

**Conclusiones:** Este estudio proporcionó la primera evaluación de los nuevos criterios de la CIE-11 para el TEPT y el TEPT-C en una muestra grande de bomberos. Asimismo, el TEPT-C fue más común que el TEPT. La exposición a múltiples traumas de distintos tipos aumentó la probabilidad de desarrollar el TEPT y el TEPT-C.

### 英国消防员中PTSD和CPTSD的预测因子

**背景:** 在全球范围内,专业的消防员经常暴露于创伤事件,出现创伤后应激障碍(PTSD)症状风险较高。

**目的:** 随着《国际疾病分类第十一次修订本》(ICD-11)的发布,出现了对于基于新诊断标准以及相关疾病复杂性PTSD(CPTSD)的研究需求。

**方法:** 参与者为1300名英国前役或现役消防员。使用与ICD-11标准一致的国际创伤问卷估计了PTSD和CPTSD的流行率,使用在线匿名问卷评估了服役相关和个人创伤暴露。进行了多项式逻辑回归以评估服役和个人创伤暴露如何预测PTSD和CPTSD。

**结果:** 此样本中18.23% (95%CI 16.13%-20.33%) 达到CPTSD标准, 5.62% (95%CL 4.37%-6.87%) 达到PTSD标准。经历更高水平的服役相关创伤显著增加了PTSD和CPTSD的风险,非工作相关创伤仅预测了CPTSD,无法预测PTSD。

### ARTICLE HISTORY

Received 2 March 2020  
Revised 14 October 2020  
Accepted 26 October 2020

### KEYWORDS

PTSD; Complex PTSD; firefighters; Trauma; International Trauma Questionnaire

### PALABRAS CLAVE

TEPT; TEPT complejo; bomberos; Cuestionario Internacional de Trauma

### 关键词

PTSD; 复杂性PTSD; 消防员

### HIGHLIGHTS

- Emergency service personnel are at elevated risk of stress related disorders due to the work related trauma exposure.
- Evidence has shown that rates of posttraumatic stress disorder (PTSD) in samples of firefighters are higher than the general population.
- This study aimed to assess rates of PTSD and Complex PTSD (CPTSD) in a large sample of UK firefighters. It was predicted that ongoing exposure to stressful and traumatic events as a firefighter may result in high levels CPTSD.
- PTSD and CPTSD were assessed using a standardised measure, the International Trauma Questionnaire, and the ICD-11 PTSD criteria were met by 5.62% of the participants, and 18.23% met the criteria for CPTSD.
- The experience of increased traumatic work-related events increased the likelihood of both PTSD and CPTSD, however non-work related stressors were only associated with CPTSD.

**结论:** 本研究首次在一个消防员的大样本中对ICD-11 PTSD和CPTSD新标准进行了考查, CPTSD比PTSD更普遍。暴露于多种不同类型的创伤增加了PTSD和CPTSD的几率。

As a key feature of many emergency service professions globally, exposure to traumatic events gives rise to many psychological problems, of which posttraumatic stress (PTS) has seen a substantial focus in research (Petrie et al., 2018). A major meta-analytic study of the prevalence of posttraumatic stress disorder (PTSD) symptoms among emergency workers by Berger et al. (2010) estimated the global prevalence at 10%. This is higher than the recent general population estimates of 2.9% for the UK (Jonas et al., 2011) and 4% based on combined data from 24 different countries (Petrie et al., 2018). However, all previous estimates of PTSD in firefighters have been based on criteria from the Diagnostic and Statistical Manual (DSM). The global diagnostic system, the International Classification of Diseases (ICD), was recently revised for the 11<sup>th</sup> edition (ICD-11: World Health Organization, 2018), and this marked a significant divergence from the current version of the DSM (DSM-5: American Psychiatric Association, 2013). The ICD-11 criteria for PTSD specify a reduced set of ‘core’ PTSD symptoms, aimed at reduction of potential over-diagnosis of PTSD and its comorbidity with other mental disorders when compared to ICD-10 (Glück, Knefel, Tran, & Lueger-Schuster, 2016). The ICD-11 also saw the introduction of a ‘sibling’ disorder, Complex PTSD (CPTSD).

Professional firefighters, as emergency workers, are often exposed to traumatic events that can elicit a stress response. Traumatic stress can arise as a result of taking part in life-threatening situations and being witness to scenes of horror and destruction (Jeannette & Scoboria, 2008). Research on firefighters who have been exposed to major catastrophic events (e.g. World Trade Centre, wildfires) showed a pattern of elevated long-term PTSD (Berninger et al., 2010; Psarros et al., 2018). Epidemiological studies have suggested that, due to ongoing exposure to consistent occupational demands placed upon them, firefighters experience high rates of PTSD (McFarlane & Bryant, 2007; Wagner, Heinrichs, & Ehler, 1998). Wagner et al. (1998), in their study of a representative sample of German firefighters, reported a prevalence rate of 18.2%. Del Ben, Scotti, Chen, and Fortson (2006) suggested a prevalence of 5–8%. Corneil, Beaton, Murphy, Johnson, and Pike (1999) examined firefighters in the USA and Canada and suggested a 22% prevalence for the USA and 17% for Canada, while Shin, Jeon, and Sakong (2012) examining a Korean metropolitan sample reported a prevalence of 15.1%. However, studies examining PTSD in emergency workers focus on three main ‘branches’ of emergency personnel: police officers, ambulance personnel and firefighters. Berger et al. (2010) in their metanalysis, suggest

that prevalence of PTSD varies significantly in these three branches with firefighter PTSD prevalence rates (7.30%, 95% CI = 3.60–11.00) lower than ambulance workers (14.60%, 95% CI = 8.80, 20.30) but higher than police officers (4.70%, 95% CI = 1.20–8.30). Previous findings of prevalence of PTSD in firefighters suggest variation in prevalence rates of 5–22%.

The similarity among all these studies is that they have used an assessment of PTSD that was based on the DSM criteria. In ICD-11, requirements for PTSD diagnosis, compared to previous conceptualisations of the disorder, are more specific compared to the DSM-5 (Brewin et al., 2017). Therefore, previous research that included measures of PTSD optimised for diagnostic criteria of the DSM-5 may show prevalence rates different to what would be obtained by ICD-11 criteria. Considering the increased specificity of ICD-11 PTSD and CPTSD diagnoses, it was previously suggested that samples exposed to repeated traumatic events are significantly less likely to meet the ICD-11 criteria for PTSD (and, thus, CPTSD) when compared to DSM-5 diagnostic recommendations. It was also suggested that under ICD-11 diagnosis, negative clinical and behavioural correlates such as depression and suicidal ideation are more severely pronounced (Hyland, Shevlin, Fyvie, & Karatzias, 2018). It is hoped that these methodological strengths will lend themselves to development of future treatment programmes. However, while National Institute for Health and Care Excellence (NICE, 2018) guidance provides recommendations for trauma focused cognitive behavioural therapy and Eye Movement Desensitization and Reprocessing (EMDR) in treating PTSD, the International Society for Traumatic Stress Studies recommendations for CPTSD include both trauma- and non-trauma focused approaches along with a recommendation for EMDR (ISTSS, 2019). While it is acknowledged that individuals who experienced repeated childhood trauma (more characteristic for CPTSD than PTSD) have diminished therapeutic outcomes, the debate on whether CPTSD requires or indeed benefits from distinct treatment approaches is still not concluded (Cloitre et al., 2011; De Jongh, Amann, Hofmann, Farrell, & Lee, 2019; De Jongh et al., 2016; Karatzias et al., 2019).

There are only a limited number of studies that examined large samples of emergency personnel in terms of PTSD/CPTSD prevalence rates. Brewin, Miller, Soffia, Peart, and Burchell (2020) suggested that among UK’s police personnel, prevalence rate of PTSD was 8.0% and that of CPTSD was 12.6% – revealing a trend of CPTSD being higher than PTSD. This finding was not replicated based on the analysis of data from a nationally representative

general population sample: a rate of 3.4% for PTSD and 3.5% for CPTSD were reported (Cloitre et al., 2019); Israel rates were reported as 9.0% for PTSD and 2.6% for CPTSD (Ben-Ezra et al., 2018); Germany showed rates of 1.5% for PTSD and 0.5% for CPTSD: Maercker, Hecker, Augsburger, & Kliem, 2018). It would appear that the rates of both PTSD and CPTSD are higher for emergency personnel compared to the general population.

ICD-11 recognises two distinct conditions related to posttraumatic stress: posttraumatic stress disorder (PTSD) and Complex posttraumatic stress disorder (CPTSD). The criteria for PTSD comprises three symptom clusters: re-experiencing of trauma in the present (RE), avoidance of traumatic reminders (AV) and a persistent sense of threat that manifests in increased arousal and hypervigilance (TH); the symptoms must also follow exposure to a traumatic event (WHO, 2018). CPTSD, in addition to the three clusters of PTSD, requires an individual to endorse the following symptoms that reflect disturbances in self-organisation (DSO): affective dysregulation (AD), negative self-concept (NSC) and disturbances in relationships (DR; WHO, 2018).

Current understanding of CPTSD is that it arises in conditions of cumulative trauma (repeated trauma, different forms of trauma) and suggests an additive effect of childhood and adult traumatic events (Cloitre et al., 2009; Courtois, 2004). The effects of the traumatic events are exacerbated under conditions where escape is not possible due to physical, psychological, maturational, family/environmental or social constraints (Herman-Lewis, 1992). In the case of firefighters, there exist accounts of individuals being 'locked-in' in a cycle of perpetual trauma exposure, where one is expected to rapidly return to an 'operationally ready' status after returning from an emergency deployment (Barnes, 2000). Moreover, as well as the direct exposure to trauma, the nature of this occupation brings with it an ongoing threat of exposure to traumatic events which, by some accounts, is only slightly elevated during shifts with actual emergency deployment compared to 'uneventful' shifts (Lim, Ong, & Phoon, 1987). Under these circumstances, it is therefore expected that firefighters may be at risk of developing CPTSD symptoms and, given that PTSD and CPTSD differ in their line of treatment (Ford & Courtois, 2014), obtaining information about the prevalence of the disorders is crucial and clinically relevant.

Despite an increase in the research on the effects of stress on firefighters, the literature is still scarce when compared to studies of other emergency service personnel (Haslam & Mallon, 2003; Jahnke, Poston, Haddock, & Murphy, 2016; Kim et al., 2019). To the knowledge of the authors, there has been no large-scale research conducted on ICD-11 PTSD and CPTSD in firefighters, so the primary aim of this study is to provide an estimate of PTSD and CPTSD in UK firefighters. The second

aim of the study is to examine demographic, occupational and personal trauma exposures as risk factors for PTSD and CPTSD.

## 1. Methods

### 1.1. Participants

Data collection commenced during August 2015 and was completed at the end of May 2017. Invitations to participate in the survey were sent to current and retired firefighters from the UK and Republic of Ireland by email that included a link to an anonymous online questionnaire. The emails were sent by the Fire Brigades Union, Retained Firefighters Union, Fire Service Benevolent Fund and the Chief Fire Officers Association. Inclusion criteria were that participants were over the age of 18 and were currently, or had previously been, employed by the Fire and Rescue Service in England, Scotland, Wales, Northern Ireland or the Republic of Ireland. Potential participants were informed about the nature of the survey using an online information sheet and were required to actively consent by clicking a 'Yes' button. The project received ethical approval from the first author's Institutional Review Board. The final sample comprised of 1300 former or present UK ( $N = 1260$ , 96.9%) and Republic of Ireland ( $N = 40$ , 3.1%) service firefighters. The sample obtained, while not stratified, represents a substantial part of the total population of firefighters, which at the time when data gathering was concluded was estimated to be around 32,500 (Home Office Statistical Bulletin, 2018).

Various layers of support and protection for the participants were used in this study. First, potential participants were provided with detailed information on the content of the survey before they were asked to provide informed consent. Second, participants were provided with the name and contact details of the principal investigator, Dr John Langtry, in the event of experiencing distress. Dr Langtry was a fully trained and certified mental health practitioner in the Northern Ireland Fire Service specialising in PTSD. Third, information and contact details for organisations that offer psychological support and help were provided at the end of the survey.

### 1.2. Analysis

The analysis was performed in two stages. First, rates of probable PTSD and CPTSD diagnoses were calculated following the ITQ diagnostic rules. Second, a multinomial logistic regression was conducted. The outcome variable was categorical, representing (1) probable CPTSD, (2) probable PTSD and (3) no diagnosis. The demographic predictor variables were age, sex, marital status and education. Work related variables included highest rank in the firefighting service, and the summed

score of the service related trauma variable. The summed score of the personal related trauma variable was also included.

### 1.3. Measures

#### 1.3.1. Demographics

Information was gathered pertaining to age, sex, marital status, highest rank in the firefighting service and education (Table 1).

#### 1.3.2. Traumatic exposure

Due to the nature of the study, traumatic exposure was divided into two categories separating trauma related to firefighting service from traumatic events in the private life of firefighters. Both of the scales were developed for the purposes of this study (by a retired firefighter) due to validated scales that encompassed the lived experience of firefighters being unavailable.

Service related trauma included items pertaining to being exposed to: (1) serious fire, (2) explosion prior to arrival at scene, (3) explosion after arrival at scene, (4) natural disaster in familiar location, (5) natural disaster in unfamiliar location, (6) rescue where casualty was in imminent life threatening situation, (7) incident where own life was, or was believed to be, in imminent danger, (8) military combat, or war-like, situation, (9) incident involving serious injury or death of an adult, (10) incident involving serious injury or death of a child and (11) incident involving serious entrapment of casualty or casualties. The answers to the items were coded as (0) 'not experienced' and (1) 'experienced' and summed to produce a continuous score with potential range

from 0 to 11. Cronbach's alpha scores within the sample was good ( $\alpha = .772$ ).

Personal trauma questions asked the participants about: (1) life threatening illness in close family member, (2) life threatening illness in self, (3) incident where life was, or was believed to be, personally threatened, (4) involved in a natural disaster where life was not threatened, (5) witnessed the death of unknown person(s), (6) involved in a terrorist incident where lives were not at risk and (7) involved in a man-made disaster incident where lives were not at risk. The answers to the items were coded as (0) 'not experienced' and (1) 'experienced' and summed to produce a continuous score with potential range from 0 to 7. Cronbach's alpha for the scale within the sample was acceptable ( $\alpha = .631$ ).

After completing the trauma exposure section of the questionnaire, participants were asked 'Please think about the experience that troubles you most and answer the questions with regard to this experience. Answer the following while thinking about how true each statement is for you'. A questionnaire skip was also included based on the response to the statement, 'If none, state "None" and move on to the next question'. A 'None' option was provided, and if this was selected the PTSD section was skipped. If 'None' was not selected then the participants completed the International Trauma Questionnaire (ITQ; Cloitre et al., 2018).

#### 1.3.3. International Trauma Questionnaire

The International Trauma Questionnaire (ITQ; available in full at: <https://www.traumameasuresglobal.com/itq>) is a self-report measurement tool for ICD-11 PTSD and CPTSD (Cloitre et al., 2018). It is composed of 12 items, six of which measure PTSD symptoms and six

**Table 1.** Descriptive statistics for sample stratified by probable diagnostic status.

	ICD-11 CPTSD (N = 237)		ICD-11 PTSD (N = 73)		Non-symptomatic (N = 990)		Total (N = 1300)	
	N	%	N	%	N	%	N	%
Gender								
Male	224	94.5	70	95.9	953	96.3	1247	95.9
Female	13	5.5	3	4.1	37	3.7	53	4.1
Marriage atatus								
Single	12	5.1	1	1.4	47	4.7	60	4.6
Married	167	70.5	61	83.6	746	75.4	974	74.9
Divorced, separated or widowed	31	13.1	6	8.2	77	7.8	114	8.8
Living with partner	25	10.5	5	6.8	116	11.7	146	11.2
Firefighter rank (highest held)								
Firefighter/control operator	72	30.4	16	21.9	271	27.4	359	27.6
Crew manager	53	22.4	17	23.3	206	20.8	276	21.2
Watch manager	52	21.9	18	24.7	249	25.2	319	24.5
Station manager	27	11.4	14	19.2	128	12.9	169	13.0
Group manager or higher	28	11.8	6	8.2	122	12.3	156	12.0
Education								
GCSE or lower	103	43.5	40	54.8	371	37.5	514	39.5
A level	45	19.0	11	15.1	197	19.9	253	19.5
HNC/HND or equivalent	45	19.0	8	11.0	196	19.8	249	19.2
BSc and higher	44	18.6	14	19.2	226	22.8	284	21.8
	Mean	(SD)	Mean	(SD)	Mean	(SD)	Mean	(SD)
Age	48.92	(8.30)	48.05	(7.645)	47.08	(9.044)	47.47	(8.86)
Total service-related trauma	8.79	(1.80)	9.17	(1.37)	8.11	(1.84)	8.30	(1.85)
Total personal trauma	3.55	(1.84)	3.23	(1.60)	2.84	(1.62)	2.99	(1.68)

measure disturbances in self-organisation (DSO) symptoms. The scale, asking participants about symptom endorsement, utilises a 5-point Likert scale ranging from 'Not at all' (0) to 'Extremely' (4). On the PTSD subscale, two items measuring the 'Re-experiencing' symptom cluster ask about experiencing 'Upsetting dreams' and 'Reliving event in the here and now'. The 'Sense of threat' cluster was measured by 'Being on guard' and 'Feeling jumpy/startled' items. 'Avoidance' was measured by items pertaining to 'internal' and 'external' reminders of trauma. The DSO subscale measured the following: Affective Dysregulation by 'Long time to calm down' and 'Numb' items, Negative Self-Concept by 'Failure' and 'Worthless' items, and Disturbances in Relationships by 'Feel cut-off from others' and 'Difficulty staying close to others' items. Possible scores for both subscales range from 0 to 24. The PTSD subscale showed a satisfactory Cronbach's alpha ( $\alpha = .856$ ) and the DSO subscale showed an excellent one ( $\alpha = .918$ ).

The ITQ also uses three items to measure functional impairment (FI) associated with social, occupational/educational and other important areas. These FI items use a 5-point Likert scale ranging from 0 (*Not at all*) to 4 (*Extremely*). In accordance with the ICD-11 criteria, probable PTSD required endorsement of at least one item from each of the symptom clusters pertaining to PTSD symptoms (RE, AV, TH) as well as one functional impairment item to be considered as satisfying PTSD diagnosis criteria. In addition, if a participant also endorsed at least one item from each of the DSO symptom clusters (AD, NSC, DR) and at least one functional impairment question related to the DSO symptomatology as well as satisfying the PTSD diagnostic criteria, the participant is considered as satisfying the CPTSD diagnosis. Item endorsement is based on a score of  $\geq 2$  ('Moderately') for all items. Therefore, three groups of participants were developed for the purposes of analysis in the current study: (1) those meeting the CPTSD diagnosis criteria, (2) those meeting the PTSD (but not CPTSD) diagnosis criteria and (3) those not meeting any diagnostic criteria.

## 2. Results

Descriptive statistics for the entire sample, and stratified by probable diagnostic status, are presented in Table 1. Participants were mostly men (95.9%), aged between 18 and 61 years old (mean = 47.47 years,  $SD = 8.86$ ) and most were currently married (74.9%). The mean number of reported service-related traumas, with a possible range of 0 to 11, was 8.30 ( $SD = 1.85$ ; median = 9.00). This was proportionally higher than the mean number of personal related traumas of 2.99 ( $SD = 1.68$ ; median = 3.00), from a possible range of 0 to 7. The correlation between

the number of service and personal related traumas was  $r = .49$  ( $p < .001$ ). The most endorsed service-related traumatic events were 'Serious fire' (99.8%) and 'Rescue where casualty was in imminent life threatening situation' (98.5%) with 'Military combat or war-like situation' being endorsed the least (20.5%). The most endorsed personal trauma item was 'Life threatening illness in close family member' (81.9%) and the least endorsed was 'Life threatening illness in self' (17.5%).

Based on the ITQ scores, 18.23% (95% CI 16.13–20.33%) met the CPTSD criteria and 5.62% (95% CI 4.37–6.87%) met the PTSD criteria as outlined in the ICD-11 (Table 2). Table 2 includes the results of the multinomial logistic regression model. The model containing age, sex, highest firefighting rank, marriage/partner status, education level and both service-related and personal trauma quartiles was statistically significant ( $\chi^2(28) = 101.96$ ,  $p < .001$ ). For CPTSD there were three statistically significant predictors of belonging to this class when compared to the non-symptomatic class. Each traumatic event, both related to service and personal life, increased the odds of belonging to this class (service-related trauma events: OR = 1.180,  $p = .002$ ; personal life trauma events: OR = 1.191,  $p = .002$ ). Having the rank of 'firefighter/control operator' also predicted belonging to the CPTSD class (OR = 1.781,  $p = .045$ ). For the PTSD class, only the number of service-related trauma increased the odds of belonging to the class when compared to the non-symptomatic group (OR = 1.523,  $p < .001$ ). The results show that a probable PTSD diagnosis was predicted by service-related traumatic events (OR = 1.523,  $p < .001$ ) but not personal life trauma.

## 3. Discussion

The primary aim of this study was to examine prevalence of probable PTSD and CPTSD among firefighters. Results showed a substantial level of PTSD (5.62%) and a higher level of CPTSD (18.23%) among this sample of UK firefighters. These results for PTSD are not dissimilar to previous research on PTSD rates in firefighters with Del Ben et al. (2006) reporting rates of 5–8%, and Berger et al. (2010) reporting a rate of 7.40%. The rates reported by Corneil et al. (1999, US 22% and Canada 17%), Wagner et al. (1998, 18.2%), and Shin et al. (2012, 15.1%) were much higher. These discrepancies could be a result of differing diagnostic approaches; the DSM-5 was previously shown to produce higher rates compared to the ICD-11 (Shevlin et al., 2018).

CPTSD was found to be more common than PTSD. Due to the recent inclusion of CPTSD in the ICD-11 as a disorder, there is a dearth of research evidence on the rates of CPTSD in emergency personnel. However, a recent study on UK military

**Table 2.** Results of the multinomial logistic regression predicting probable diagnostic status ('no diagnosis' is the reference category).

	ICD-11 CPTSD				ICD-11 PTSD			
	B	se	OR (95% CI)	<i>p</i>	B	se	OR (95% CI)	<i>p</i>
Age	0.018	.011	1.018 (.997–1.039)	.086	−0.020	.018	0.980 (.947–1.014)	.251
Gender								
Male	−0.553	.390	0.575 (.268–1.235)	.156	−0.695	.655	0.499 (.138–1.803)	.289
Female								
Marriage status								
Single	0.361	.410	1.434 (.642–3.204)	.379	−0.527	1.120	0.590 (.066–5.297)	.638
Married	−0.014	.257	0.986 (.596–1.633)	.957	0.594	.495	1.812 (.687–4.779)	.230
Divorced, separated or widowed	0.563	.330	1.756 (.920–3.353)	.088	0.518	.646	1.679 (.473–5.956)	.423
Living with partner	0 <sup>b</sup>	.			0 <sup>b</sup>	.		
Firefighter rank (highest held)								
Firefighter/control operator	<b>0.577</b>	<b>.289</b>	<b>1.781 (1.012–3.137)</b>	<b>.045</b>	0.412	.547	1.509 (.517–4.409)	.452
Crew manager	0.375	.292	1.454 (.821–2.578)	.200	0.565	.533	1.759 (.619–4.999)	.289
Watch manager	0.085	.282	1.089 (.626–1.893)	.763	0.527	.516	1.695 (.617–4.655)	.306
Station manager	0.043	.311	1.044 (.568–1.920)	.890	0.882	.521	2.415 (.870–6.700)	.090
Group manager or higher	0 <sup>b</sup>	.			0 <sup>b</sup>	.		
Education								
GCSE or lower	0.251	.228	1.285 (.821–2.010)	.272	0.571	.357	1.771 (.880–3.562)	.109
A level	0.208	.257	1.231 (.744–2.036)	.419	−0.192	.438	0.825 (.350–1.946)	.661
HNC/HND or equivalent	0.212	.252	1.236 (.755–2.025)	.399	−0.588	.489	0.555 (.213–1.450)	.230
BSc and higher	0 <sup>b</sup>	.			0 <sup>b</sup>	.		
Total service-related trauma	<b>0.165</b>	<b>.053</b>	<b>1.180 (1.063–1.310)</b>	<b>.002</b>	<b>0.421</b>	<b>0.097</b>	<b>1.523 (1.259–1.843)</b>	<b>.000</b>
Total personal trauma	<b>0.175</b>	<b>.053</b>	<b>1.191 (1.074–1.320)</b>	<b>.001</b>	−0.037	0.083	0.964 (.818–1.135)	.657

Significant effects are presented in bold. <sup>b</sup> = reference category.

veterans (Murphy et al., 2020) showed that probable CPTSD (56.7%) was more common than PTSD (14.0%). This is consistent with research based on clinical samples of poly-victimised help-seeking adults (Karatzias et al., 2017), treatment-seeking Syrian refugees (Vallières et al., 2018) and Danish veterans (Folke, Nielsen, Andersen, Karatzias, & Karstoft, 2019).

The results of the present examination combined suggest that almost 24% of the firefighters in this sample meet the criteria for PTSD or CPTSD. PTSD has previously been described as a factor in diminishing one's quality of life and physical health. The problem is further exacerbated by the cost stemming from diminished job performance and treatment cost (Ferry et al., 2015; Jo et al., 2018; Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995). Therefore, future examinations should focus on appropriate debriefing methods and cost-effective treatment (Regel, 2007).

The second aim of the present examination was to identify risk factors for PTSD and CPTSD. The results suggest that for CPTSD, both service-related and unrelated trauma as well as lowest firefighter rank predict the disorder. For PTSD diagnosis, when compared to the 'no diagnosis' class, only service-related trauma showed positive significant effects. These results suggest that factors such as being married, educated and male, previously described as protective in the case of PTS disorders, don't show inoculating effects for firefighters (Breslau, 2009; Christiansen & Hansen, 2015; Coker, Weston, Creson, Justice, & Blakeney, 2005). In contrast to the findings of Shin et al. (2012), the highest rank attained in the firefighting service also did not show any significant effects. It may be possible that

high levels of persistent stress associated with the nature of firefighting service is a nullifying factor for these individual differences, a phenomenon previously observed in populations with high PTS disorders prevalence (Hyland et al., 2018). That only the lowest firefighting rank showed significant effects on the CPTSD diagnosis could be explained by several factors. It could be speculated that, due to the trauma experienced, firefighters who start experiencing PTS symptoms that impair their performance may leave the service before qualifying for promotion, creating a bias explaining the lack of effect for both higher ranks of service and age, favouring older, perhaps more resilient, firefighters. Future research could examine cases where firefighters quit the service to paint a fuller picture of the phenomenon.

Despite not explicitly examining the difference between the diagnostic schemas offered by the DSM-5 and ICD-11, this study was the first to examine post-traumatic stress in firefighters that also included CPTSD. The results highlighted a probable phenomenon of great importance for therapeutic outcomes in firefighters affected by PTS, namely that CPTSD is potentially more common than PTSD in the firefighters population. Given that the symptom profile of CPTSD involves dysregulated emotions and negative self-concept (that could fall into Criterion D and Criterion E symptoms in the DSM), they do not necessarily have to be endorsed to satisfy the DSM-5 PTSD criteria. Furthermore, disturbance in ones relationships is not included in the DSM-5 as a diagnostic requirement for the disorder. There is a growing body of research showing a delineation between therapeutic outcomes based on PTSD and CPTSD diagnosis (Bisson et al., 2019). Given that the CPTSD diagnosis is unavailable under



the DSM-5, in addition to present results suggesting most firefighters satisfy the CPTSD diagnostic criteria, the present study informs future clinical endeavours.

The findings of this study, despite being the first examination of its kind, should be interpreted with some limitations in mind. First, it is unclear how representative this sample is of all UK and Republic of Ireland firefighters. Second, time and resource constraints associated with data collection deemed it impossible to collect longitudinal data, therefore we were unable to collect data on all firefighters who had left the service. Third, the ITQ is a self-report measure and so the clinical status of participants was not confirmed by clinical assessment. Fourth, both scales used to measure trauma exposure were not previously validated and presented low (but acceptable; Nunnally, 1994) Cronbach's alpha scores (Service related trauma  $\alpha = .77$ , Personal trauma  $\alpha = .63$ ). The measures of traumatic experience used in the study also did not include childhood traumatic experiences and could have been improved by providing information about recency of the trauma experienced as well as affect associated with the event (e.g. loss, guilt etc.). Fifth, the analysis did not account for psychological help (e.g. debriefing, therapy, medication) that the participants received post-traumatic exposure. Finally, the response rate could not be determined as the participation emails were sent by the project partners.

In conclusion, the current results provide initial information on the prevalence of CPTSD and PTSD among a large sample of UK firefighters. Nearly 24% of firefighters meet the diagnostic criteria for either probable PTSD or CPTSD, and the prevalence of CPTSD was higher than PTSD. Traumatic events, but not demographic factors, were found to uniquely predict meeting the diagnostic criteria. Service-related trauma was a significant predictor of both CPTSD and PTSD and individuals experiencing personal trauma were at a higher risk of CPTSD but not PTSD.

### Data availability statement

Due to the nature of this research, participants of this study did not agree for their data to be shared publicly, so supporting data is not available.

### Disclosure statement

No potential conflict of interest was reported by the authors.

### Funding

No funding was associated with this project.

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